REVIEW

December 2005

The use and effectiveness of synchronous audiographic conferencing in modern language teaching and learning (online language tuition): a systematic review of available research

Review conducted by the Modern Languages Review Group

It is what we think we know already that often prevents us from learning. (Claude Bernard)

Knowledge, to become Wisdom, needs Judgement. (Lord Samuel)

Education is the systematic, purposeful reconstruction of experience. (John Dewey)

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CONFLICTS OF INTEREST

Every effort has been made in the review process to follow the EPPI-Centre guidelines, and methodology for systematic reviewing. As practitioners in the field of language learning and teaching, or ICT, we acknowledge the possibility that interest and knowledge in the field may have influenced the review in ways which are not apparent to us.

ACKNOWLEDGEMENTS

LIST OF ABBREVIATIONS

CAI	Computer-aided or assisted instruction
CALL	Computer-assisted language learning
CMC	Computer-mediated communication
DE	Distance education
DfES	Department for Education and Skills
DLE	Distance language education
EFL	English as a foreign language
ELT	English language teaching
EPPI-Centre	Evidence for Policy and Practice Information and Co-ordinating Centre, Social Science Research Unit, Institute of Education, University of London (UK)
ESL	English as a second language
ESOL	English for speakers of other languages
F2F	Face to face
ICT	Information and communications technology
NGfL	National grid for learning
NNS	Non native speakers
ODL	Open and distance learning
SAC	Synchronous audiographic conferencing
OU	Open University (UK)
SCMC	Synchronous computer-mediated communication
SSATCC	Scale to study attitudes towards college courses

The opinions expressed in this publication are not necessarily those of the EPPI-Centre or the funders. Responsibility for the views expressed remains solely with the authors.

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SUMMARY

Background

Language learning, perhaps more than many other curricular subjects, depends on interaction between individuals, particularly for the oral and aural aspects of language relative to reading and writing. However, it is not always practical, easy or desirable to get groups of learners in the same place at the same time. The advent of the virtual classroom over networked systems liberates both the learner and providers of training from these constraints to varying degrees. It means, for example, that a group of learners (whether 3 or 20 individuals) can get together and extend their language learning activity beyond the regular confines of time (scheduled classes) and space (the physical classroom). Not only does this virtual learning environment possibly replicate the traditional environment, it may offer other, different benefits or even disadvantages. Around the beginning of the 1990s, a number of computer technologies (platforms, software, programs) generally developed for the business world and online meetings, started to be used in education. They were combined in various configurations of elements – including text chat (email) and instant messaging, web cameras, screens for writing and drawing, channels for speaking in real time, and shared internet browsers. In the field of education, they have been called variously 'e-learning tools', 'online tuition', 'computer-mediated communication', but, more precisely, they have become known as 'audiographic conferencing systems' or 'synchronous web-conferencing'. When used in real time, the term 'synchronous' is added and together these form the topic of interest of this review: synchronous audiographic conferencing.

Aims

The aim of this review is to identify and evaluate available research evidence on the use and effectiveness of synchronous audiographic conferencing in modern language learning and teaching.

Review questions

The primary question addressed in the map is as follows:

What empirical research (including reviews of such research) could be found on the use and effectiveness of synchronous audiographic conferencing in language learning and teaching?

The primary question of the in-depth review is as follows:

What is the evidence concerning effectiveness of SAC in language learning as demonstrated by the available empirical research?

Methods

Inclusion criteria

Studies were included in the descriptive map of research if they met the following criteria:

1. of empirical research (including systematic reviews of such research)

2. about language learning

3. about a synchronous audiographic conferencing (SAC) intervention, where SAC is defined as bi-directional multipoint speaking/listening that involves text manipulation (e.g. whiteboard, concept map, document and file display area)

4. carried out in a formal setting, such as groups of learners in schools, universities and language centres

5. carried out since 1990

Search strategy

Reports were sought via database searches and searches of specific journals or conference proceedings. Key databases were identified and a draft search strategy was developed during March and April 2004. A cut-off date of 31 January 2005 was set for the retrieval of papers to be considered in this version of the review. The searches were carried out between May and August 2004. References were held and managed in an Endnote database. A summary of the search strategy is presented here.

The databases searched were as follows:

1. Academic search premier
2. ArticleFirst
3. Australian Education Index
4. British Education Index
5. Dissertation Abstracts
6. Education-line
7. ERIC
8. Index to theses
9. ISI Web of knowledge
10. Linguistics Abstracts online
11. MLA international bibliography
12. PapersFirst
13. ProceedingsFirst
14. ScienceDirect
15. WorldCat
16. Zetoc Electronic Table of Contents

The terms used for searching were as follows:

1. computer mediated communication

2. language learning or language-learning
3. audio-graphic or audiographic

No systematic effort was made to identify relevant studies in the non-English language research literature, although any non-English language reports found would have been included in the review. Updates of the review will include handsearches of non-electronically indexed journals and conference proceedings, and searches of the non-English literature.

Characterising studies

Retrieved reports that met the inclusion criteria were classified according to a standardised keywording system developed by the EPPI-Centre (EPPI-Centre, 2002). This classifies studies in terms of the type of study; the country where the study was carried out; the educational focus of the study; and the study population.

An additional set of review-specific keywording questions was developed by the reviewers and these were also applied to each study. These criteria described the conferencing software, details of the intervention, the language of study, the participants involved, the outcomes of interest and the reported findings.

In-depth review

In the published protocol for the review, the authors specified the methods for describing and appraising a potential subset of studies within the map.

In establishing the criteria for which studies to include in the in-depth review, the team balanced the need to focus on research, such as large scale studies that control for various sources of bias, with other descriptive research that also forms part of the overall picture for the purposes of policy considerations.

In order to be included in the in-depth review, studies not only needed to meet all the criteria for inclusion in the map but also to be primary reports of experimental studies testing the effect of a language learning intervention against another intervention, or standard practice or no intervention. Screening for the in-depth review was carried out by two reviewers per study. These reviewers worked independently of each other and then conferred to reach consensus over inclusion and exclusion.

Further methods for description, quality appraisal and synthesis within the in-depth review were developed by the reviewers and can be found in the review protocol.

Results

Mapping of all included studies

Altogether, the map included 14 reports on studies conducted since 1990. Four of the studies considered both learners and teachers while another three studies focused primarily on the teachers but also gave information on the learners.

What sorts of studies were found?

All 14 studies described the interventions being evaluated or observed, and so generically can be considered as descriptive intervention studies. There was a range of researcher manipulation in these studies as some were designed as experimental and others were more naturalistic and observational. Nine had specific interventions, although some of these were not set up as prospective studies, while five were naturalistic observational studies. Not all the studies looked only at language learning, but all included it, and over half covered the use of SAC in the *standard curriculum* as the primary interest point. The studies had various descriptive or evaluative aims, including investigating interaction, effectiveness, satisfaction, practice of the language, attitude and suitability of the tool in question. The majority of the studies were in the secondary or post-secondary sectors and were carried out in Australia, the UK, USA, and Canada. The conferencing platforms involved were Electronic Classroom, NetMeeting, Lyceum, PC + telephone, Telelearning + Optel, QuikCams + C-USeeMee, VoxChat + email. Broadly speaking, the studies all reported positive findings (i.e. none found against SAC), but as none was included for in-depth review, assessment of reliability of the results was not possible.

Studies for the in-depth review stage

No studies were included for in-depth review as none met the inclusion criteria (comparative studies testing the effect of the intervention).

Conclusions

Implications for teaching practice and policy-makers

As a result of no experimental studies currently being available for in-depth review, research-based implications cannot be drawn regarding policy and practice at this point in time. However, this does not mean that synchronous audiographic conferencing should be excluded from teaching practice and policy making but that such decision cannot be based on experimental research evidence.

Implications for research

There is obviously a need for larger scale, robust studies looking at the effectiveness of SAC in relation to various outcomes. However, it remains to be seen if a certain antipathy towards comparative studies and randomised trials will

prevent much experimental research evidence becoming available. The USA government (Whitehurst, 2002) and that of the UK (Morrison, 2001) to an extent have expressed a need for large scale randomised field experiments, but the research establishment, at least in the UK, has yet to respond.

Rather than looking directly at synchronous audiographic conferencing (SAC) effectiveness, an alternative angle of approach might be to consider how best to design tasks for SAC within the computer-mediated communication (CMC) interactionist paradigm.

While research can rarely provide *definitive* answers to education questions, the more that it can be brought together, the more likely it will serve to focus the issues, highlight the gaps, test theories and interventions, and to contribute to an increase in the probability that intended educational aims may be reached.

Strengths and limitations

The map of research, and the description contained in this review lays down a baseline for the research evidence relating to the effectiveness of synchronous audiographic conferencing in language learning. While definitive statements on the effectiveness of SAC are not possible at this moment, the studies identified in the map address the issue and make available important information regarding the question.

The time and resources have not been available to do any extensive handsearching of journals not indexed electronically, although this remains a long-term objective. The results will be incorporated into updates of the review.

For updates of this review, effort will be put into searching for reports of studies published in the non-English language research literature and any ongoing postgraduate projects.

It should be borne in mind that the studies included in this review have not been assessed for their reliability, or strength in addressing the question and at best can only really be considered pointers towards a sound evidence base. Their proposals in most cases still need testing on larger numbers of learners and learning situations.

There may still be technical difficulties with SAC, depending on individual systems, internet provision, and technical capability. Both teachers and learners wishing to use SAC will need to persevere and appropriate support will need to be given.

In conclusion, until there are high quality comparative controlled studies, with strong qualitative studies to provide detail and situated explanations of events and mechanisms, and examining the effects of interventions on individuals rather than populations, the picture cannot be fully understood. Without such research, there will always remain more doubt than is necessary: were the outcomes achieved because of SAC, or would they have been achieved in a traditional face-to-face situation in any case?

1. BACKGROUND

1.1 Aims and rationale for current review

The aim of this review is to identify and evaluate available research evidence on the use and effectiveness of synchronous audiographic conferencing (SAC) in language learning and teaching.

1.1.1 SAC context and current state of the art

Language learning, perhaps more than many other curricular subjects, depends on the interaction between individuals and particularly for the oral and aural aspects of language relative to reading and writing (Anderson, 2004; Jones and Schieman, 1995). However, it is not always practical, easy or desirable to get groups of learners in the same place at the same time and the advent of the virtual classroom over networked systems liberates both the learner and providers of training from these constraints to varying degrees. It means, for example, that a group of learners (whether 3 or 20 individuals) can get together and extend their language learning activity beyond the regular confines of time (scheduled classes) and space (the physical classroom). Not only does this virtual learning environment possibly replicate the traditional environment (Oliver and Reeves, 1994), it may well go beyond it and offer additional benefits.

Numerous platforms and software exist, some more integrated than others (see Appendix 3.1). An example of one such platform that combines voice, text chat/instant messaging, and graphics is *Lyceum*, the British Open University's platform for synchronous audiographic conferencing (SAC).
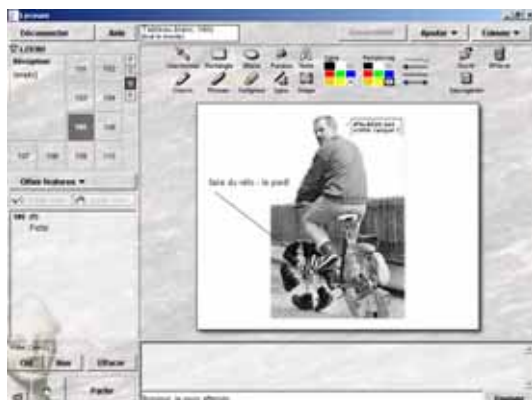
A screen print from Lyceum (with French interface), showing the main features available for learning activities – whiteboard for shared graphics and documents work, text chat box below it, and at the bottom left, buttons to activate the speaking functions.

Much is made of the applicability of computer-mediated communication (CMC) to language teaching and learning, and one configuration of this which is becoming more common is the use of software packages, via the internet, that allow language learners to congregate and communicate (conferencing) in real time (synchronous) on a many-to-many basis, both formally and informally, and in both spoken and written modes (audiographic). Such SAC is a logical extension of video- and tele-conferencing and text-based messaging or chat room technologies as a medium for language learning. It is increasingly being used as a means of replicating, or extending – in what is also called sometimes 'a virtual

learning environment – the activity and interaction of a traditional language learning classroom.

One of the questions that needs to be addressed is whether or not it is sufficient to see the new learning spaces as replicates of conventional classroom settings, and if it is possible or not to transpose theories and good practice that were developed for the latter, to the rapidly developing CMC environment. It is not clear to what extent education, sociocultural theories, or the communicative approach to language learning are appropriate or sufficient (Garrison, 2000). Recently, the consensus has tended towards the conclusion that there is an imperfect fit and it is increasingly agreed that at the very least concepts of new literacy need incorporating (Chapelle, 1997; Warschauer, 1997; Le Baron, 2001; Zhao, 2004; Strother, 2002; Hampel and Hauck, 2004). The limitations of the early video-conferencing modes, primarily one-directional and didactic, are clear and, for example, Ashton (1995) wrote:

> Communications technologies have been used to deliver higher education to distance learners since the 1920s when university-owned radio stations first began operation. Successive technologies such as television, time-share computing and videoconferencing have been utilized to extend the reach of on-campus instruction. Following New York University's introduction of Sunrise Semester in the 1950s, televised courses have been the primary means of delivering college instruction into the home. But broadcast television is a largely passive medium, and student interactions with faculty and other students are limited to the occasional phone call or letter. Videoconferencing systems have made televised instruction interactive, but only those students who work at or can get to a business or university videoconferencing site can participate in these courses. (p 8)

Technological developments have resulted in an environment some 50 years later in which it is increasingly straightforward in the developed world for anyone to have internet access either at home, at work or both, and to be able to communicate online in a number of different ways. In the field of language learning, the progression over time from audio-visual methods and video conferencing, to home computers, to computer-aided instruction (CAI), to internet access, to CMC to e-learning, and even to m-learning (mobile-learning) has led to online tuition with synchronous audiographic conferencing as opposed to mere delivery of materials by electronic means.

A screen shot of NetMeeting showing the video conferencing facility

Over the last two decades, computer-assisted language learning (CALL) technology has moved from the use of a computer in order to improve discrete language learning areas on a drill-based approach, to communication via a

computer with other language learners in local and global networks, and has overcome the initial computer-as-tutor mode (Hampel, 2003). Although this move turned the computer into a tool for collaboration among students at a distance, getting together and working collectively was, until recently, restricted to written communication. In the 1990s, however, internet-based audiographics conferencing systems became available and offered a way of directly developing communicative aural and oral skills. Such tools[1] – which allow for synchronous voice communication over the Internet – give language learners the opportunity also to improve their speaking skills in an online environment (Hauck, 2005; Felix, 2004; Kotter, 2001).

Since the late 1980s much has been written and published on the subject of CMC and various conceptual and theoretical frameworks are emerging – mainly in a *post hoc* fashion, but very little experimental research appears to have been carried out to look at its effectiveness in pedagogic terms, and even less looking at it in the schools context. There has been greater use of technology enhanced education in schools in Australia, the USA and Canada, no doubt because of distance and geographical isolation as much as anything else, but the same shortage of systematic evaluation pertains (Moore *et al.*, 2000), and particularly in the field of language teaching and learning.

Advances in technology make computer-assisted language learning more dynamic, but the main features of CMC which distinguish it from face-to-face (f2f) communication still hold true as described by Warschauer (1997). CMC is characterised by:

> […] five particular features which taken in sum distinguish CMC from other communication media. These features are that CMC is (1) text-based and computer-mediated, (2) many-to-many, (3) time- and place-independent, (4) long distance, and (5) distributed via hypermedia links. (p 1)

However, technology has developed further since this article was published and should no longer include a restriction to text-based communication. Warschauer's (1997) five features are still useful inasmuch as many of the audio platforms now tend to incorporate an element of text-based communication, hence the need for a term incorporating both the audio and visual graphics (not just video or webcam) aspects: 'audiographic'. Asynchronous tools (recording and playback, and email capability) make communication time-independent, but synchronous tools (such as SAC) make communication time-dependent, although place-independent.

The attractiveness of the audiographic conferencing technology and the potential that it offers to language learning and teaching is clear and it is these that occupy much of the published work on the subject (De Schutter *et al.*, 2004; Xie, 2002; Jones and Schieman, 1995; Warschauer, 1997; Felix, 2004; McLoughlin and Krakowski, 2001; Hampel, 2004; Ally, 2004). Despite this pioneering spirit (Taylor and Swannell, 2001), take-up of distance or remote language tuition by learners has not been as great or as rapid as might be expected, regardless of its potential, and a number of possible explanations have been proposed, including technological difficulties (e.g. unstable platforms, poor sound quality, absence of broadband connectivity in some places) desire for face-to-face contact (social

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[1] More details on how SAC can be used in language learning are given in Appendix 1.1.

aspects of learning), or simply lack of awareness and understanding of the new technologies.

This leaves language-learners, practitioners, and policy-makers in the position of not really knowing how effective such a mode of language learning is, compared with, say, the traditional face-to-face classroom, or compared with not having tuition at all. What its potential new value is or what it might do has not been examined so far.

As the drive to incorporate more and more technology into learning continues proactively (for example, the National Grid for Learning in the UK, and the E-learning action plan from the European Commission), concomitant with (inherently desirable) political imperatives to widen participation and access to education, the issues surrounding the relative merits of tuition mode become more salient, and the need to establish baselines of evidence of effectiveness and usage becomes more pressing (Strother, 2002; Shachar and Neuman, 2003) – all the more so as claims of standard practice and best practice begin to emerge without consensus on conceptual framework, criteria of evaluation or effectiveness.

Some researchers go as far as describing this impact of the recent developments in online communication technologies as a possible paradigmatic shift in language teaching and learning (Shachar and Neuman, 2003). However, this shift may be a quantitative increase in interaction (Anderson, 2004; Zhao, 2004; Rehn and Towers, 1994; Felix, 2004) and a more obvious focus on pedagogical principles than in the past but may not involve any qualitative changes (Hampel and Hauck, 2004). By this is meant that online technologies allow more interaction between users and that this need only be seen in a context of established pedagogies like constructivism and interaction. Others incline towards a position that recognises the potential for benefits through the introduction of new literacies (additional value?) – but still without this amounting to any paradigm shifts.

The claims concerning the benefits of SAC and online learning more generally include the following, some of which are self-evident and do not need copious research to demonstrate them, while others are more contentious:

- improved access to learners who are geographically or physically remote and otherwise unable to access the learning community/language class

- facility for practice and access to materials and learners at any time outside the formal setting

- opportunities for expression and use of the so-called 'new literacies' developing around ICT skills: these include information technology skills in research, collaboration, online reading, writing, listening and speaking, etc. as well as the technological affordances, including webcamming and recording, for the purposes of replay and revision, of real-time internet classes

- enablement of economies of scale – 'classroom' space not limited as in a traditional setting, the classroom can extend beyond traditional geographical boundaries

- creation and development of new communities of learners

- opening-up of new possibilities for schools in terms of homework, out of school practice, tandem learning and international collaboration

- enhancement of opportunities for intercultural communication and competence development

The business world tends to take a more utilitarian view of the advantages, if not a straightforward cost-benefit perspective. However, education can no longer avoid the rationalist drives from governments intent on getting value for money. When viewed from a business perspective, Forster (2002) in an interesting paper entitled *The business of being online and international,* gives an example estimate of the sums involved which suggest that, if online learning captures 20% of the market amounting to some 32 million students in 2025, the market would be around some 144 billion dollars. Such perspectives are implicit in the UK's National Grid for Learning strategy, one of whose main stated objectives alongside more educationally oriented aims, is to make

> Britain a centre for excellence in the development of networked software content, and a world leader in the export of learning services (NGfL website, background link)

The UK Government is keen on relating its ICT strategies to research and other evidence, and in a comprehensive report commissioned on more generic issues related to use of ICT in schools (Comber *et al.* (2002), although this has been updated since with subsequent reports), it is clear that the increased incorporation of home use of computers would feature in paradigms of good practice; one of the recommendations in the study states

> There is recognition among teachers that a more flexible approach is required if ICT is to be effective. Changes in lesson style to allow a less formal classroom atmosphere, greater pupil autonomy, differing modes of teacher/pupil interaction, and flexible study space are all recognized as key success factors for effective use of ICT. Further good practice should also be developed in facilitating greater links between home and school use of ICT. (p 1)

The utilitarian view of the benefits of online learning, which tends to focus on cost savings, includes low cost expansion due to the absence of a need for new accommodation and buildings, increases in the number of places available, the possibility to offer services even with low demand or dispersed enrolments, and the ability to leverage the limited number of teachers available (Forster, 2002).

However, any interpretation posited primarily on cost control is called into question by the fact that online services are currently almost always offered in conjunction with traditional modes and this in reality creates additional costs on all axes. Rarely is one mode offered on its own. It may even be that the optimal benefits of online tuition are realised only in a mixed mode environment where individuals' choice is widened rather than dichotomised. Additional costs may also need to be borne by the students because of the need for broadband connectivity and computer facilities in the home or other location where the online tuition takes place.

Enthusiasm is not shared universally, and criticism includes charges of overstatement of the benefits. For example, Johnston (1999) cited in Hampel and Hauck (2004), claims:

> that on-line learning has appropriated notions such as flexibility and efficiency and skewed their meanings so as to make it appear that on-line learning is the panacea for all our ills. (p 68)

In his view, the only flexibility offered by online courses is that of time asynchronicity and self-pacing. Hampel and Hauck (2004) add:

> Examination of the relevant findings in written CMC brings to light a number of issues. Although some studies show that CMC can encourage classroom interaction and student participation, limited and irregular participation with small groups of students has been identified as a risk (see Perkins, 1999). (p 69)

Any slowness of uptake in the use of audiographic conferencing may be no more than a resistance to change often seen with the introduction of novel approaches in areas where established orthodoxies are entrenched, but such resistance in the educational arena may not only be on the part of the learner. Practitioners too may be hesitant to embrace the new technologies: age, for example, is often suggested as a strong influence, and is often also compared with the willingness of the young to adapt.

However, the slow uptake of SAC may run a lot deeper and involve a causal relationship with learner or individual preferences, with the social and community aspects of face-to-face learning. Learners (and teachers) may consciously or subconsciously want real-time face-to-face interaction with their fellow learners quite simply because they are gregarious and like the company, and this may be a major factor in the slow uptake of independent, geographically isolated learning (however much the SAC might facilitate the learning). Another reason for slow uptake might be the technological challenges SAC poses and technophobia in general, for example, the perceived difficulty of installing software, systems crashing, user-friendliness, etc.

This said, SAC may provide answers to some of the perceived inadequacies. For example, video-conferencing and webcamming may, for some, meet the gregariousness needs; for others, the visual anonymity and social distance may be preferable Moreover, the high quality of sound files and sound channels are vital given the absence of paralinguistic features and body language in dialogues. The question remains then whether or not any disadvantage associated with the absence of face-to-face and a visual element can be mitigated with SAC for those who might not necessarily use it by preference.

Development in Australia of Electronic Classroom (for Mac) from 1990 and of Lyceum in the UK at the Open University have been at the leading edge of audiographic software for online education application. Thousands of learners have already used the Open University's Lyceum software. Elsewhere, commercial platforms have been developed and have emerged from combinations of software. Microsoft developed NetMeeting and now has its platform LiveMeeting, which it uses for web casts, in-house training, client and meeting needs, and which is available to customers as a commercial service; Wimba provides voice software which can be used in conjunction with text chat

and graphic platforms, such as WebCT, in a similar way, and a number of other developmental programs have explored similar means of communication. The overall conferencing landscape is dynamic with platforms and companies appearing, merging and disappearing in relatively short timeframes. There are, in early 2005, at least 50 different platforms available for online communication and many can share applications or functionalities to match the synchronous audiographic capabilities of integrated platforms, such as Lyceum or Electronic Classroom.

In its application to language learning, the Open University's Lyceum platform is probably at the forefront, although it is not available outside the OU. It offers tuition, and not just e-delivery, via the internet using a dedicated synchronous audiographic conferencing tool that was developed specifically for distance learning. The Department of Languages, for example, currently offers choice of mode of tuition (online or face-to-face) on most of its courses in French, Spanish and German. However, take-up by learners continues to increase only slowly and little empirical evidence has yet been published as to its effectiveness.

Unlike other commercially available platforms, Lyceum is dedicated in-house software developed for pedagogical application. Its potential for use in schools is obvious and, at a time when language teaching in the state system is enduring a certain turbulence, the value of enhancements to language learning should not be underestimated, neither should it be promulgated as that 'panacea for all ills' (Johnston, 1999, p 87).

Much research in the area concentrates on aspects of innovation, whether they highlight the advantages and disadvantages of online tuition versus face-to-face whether they intend to sketch guidelines for effective use of conferencing tools, or whether they explore issues freely. Case studies and anecdotal reports bear witness to interest in the area, but currently, no reports of prospective comparative studies dealing with effectiveness have been identified.

Although most studies situate their approach within a theoretical background, few researchers base their conclusions/findings on reliable experimental studies. Warschauer (1997) made this point, understandable in 1997. Despite the passage of time since then, it remains the case that the use of CMC is not sufficiently research-based. He wrote:

> In addition, published accounts of how these features have been put to use in the language classroom will be surveyed and discussed. In some cases these accounts constitute rigorous research studies; in other cases they represent teachers' personal evaluations of what they have done in their classes. As this area of inquiry becomes more mature, it will of course be desirable to depend more on the former and less on the latter. (p 1)

The framework in which SAC and other forms of CMC are generally placed tends to be (socio-) constructivist in terms of learning, and interactionist in terms of language learning. Chou (2001; also see Lamy, 2004) summarises this paradigm:

> Many constructivist theorists agree that the works of Vygotsky and Piaget had a strong influence on the formation of constructivist philosophy [...]. Constructivist theorists who draw from Piaget put more emphasis on individual constructions of knowledge as a result of interaction with the physical environments. Constructivist theorists who are influenced by

Vygotsky posit that knowledge is constructed through the appropriation of culturally relevant activities. In other words knowledge is co-constructed with peers or experts and through the immersion in a social context. (p 176)

This review seeks to address these issues for synchronous audiographic conferencing, with a focus on effectiveness, with reference to all available empirical research that can be identified.

1.2 Definitional and conceptual issues

1.2.1 Definition of synchronous audiographic conferencing (SAC)

The term is an unwieldy one for something quite straightforward in reality, but its precision is necessary in order to avoid the difficulty of pinning down exactly what is meant among the plethora of terms that are increasingly used: for example, online tuition, e-learning, teleconferencing, etc. The vital elements of SAC are the ability of users to speak and listen and use text tools, all in real time rather than recorded. Distinguishing elements of SAC are as follows:

Integrated software, incorporating:

1. Bi-directional multipoint speaking/listening (that is, a group of people who can speak to each other rather than web broadcast of one to many that characterised early videoconferencing)

2. Text manipulation (e.g. whiteboard, concept map, document and file display area)

Text chat or instant messaging, video, videoconferencing and shared website browsing may also be incorporated. Furthermore, some programmes offer additional facilities including recording, replay, file and application sharing, assessment and evaluation, and course management tools. None appear to have all these facilities, but several (notably Electronic Classroom, Lyceum and LiveMeeting) have many while a combination of features may also be achieved by using two programs at the same time (for example, Groupboard with Yahoo + NetMeeting, or Horizon Wimba in conjunction with platforms such as ILS, WebLab, LiveClassroom or EduVoice). Inevitably, only a snapshot of the platforms available is possible here due to the rapid rate of expansion and proliferation in the field (Cramer, 2002).

The term 'synchronous audiographic conferencing' is appearing more often in the research and pedagogical literature, particularly as the educational field begins to appreciate the difference between e-learning and e-delivery.

1.2.2 Additional definition issues

Effectiveness

There is no simple definition of effectiveness primarily because it is related to purpose and that may change according to any given situation. However, in essence and in the framework of this review, it is understood as an intervention or programme that results in 'better learning' of the language in question. The outcomes measured and evaluated in research studies will likely all contribute to effectiveness in some way or another, and are therefore accepted as factors that may contribute to effectiveness, and this may include, for example, the recording of tutors' opinions and perceptions on SAC as, say, measures of their comfort level with the technology.

While it is important not to exclude professional opinion of 'best practice' or other recommendations for how to design activities and pedagogical tasks, it is also sensible to recognise the limitations of claims, particularly when they are given outside the context of particular purposes.

e-learning vs e-delivery

The distinction is often ignored in the literature, particularly with marketing imperatives and the 'marketisation' of education sanctioning a loose use of the term 'e-learning' to peddle an image of up-to-datedness. Much of the genuine e-learning debate centres around interaction and communication, while the vast majority of e-learning references actually only refer to e-delivery of materials in a one-directional sense. However, some research bears the distinction in mind, when looking at effectiveness issues via learning outcomes. Although not about language learning specifically or SAC, a study by Hoyt (1999) does consider delivery as distinct from learning itself:

> This study examines the effect of delivery method on student academic performance controlling for learner characteristics and student academic preparation. Comparisons were made between television, interactive video, Internet, and in-class lecture courses. Results indicate that technologically delivered courses can be as effective as traditional methods of course delivery. However, the academic performance of students may also be lower or higher in technologically delivered courses when comparing them with students in regular on-campus sections. The need to consider teaching methods, curriculum, course design, and instructor skills and abilities in future research is discussed. (p 1)

1.3 Policy and practice background

1.3.1 Evidence-based policy

The need for an evidence base concerning SAC is perhaps becoming clearer as educational institutions struggle in many cases to find funds to resource the introduction of technological innovations and networks. Networks, such as the London Grid for Learning, make clear the desire for extra materials to be available for school learners of Spanish, and a paper available on their website also

describes how to incorporate videoconferencing (http://www.lgfl.net/lgfl/accounts/content/),but how are schools to decide whether to invest on that as opposed to SAC with which learners could also do further practice, away or at school and perhaps with considerably less expense incurred by the school? Equally, without a quality appraised research evidence base, institutions such as the UK's Open University may be missing opportunities to understand why take-up of SAC in its language course remains relatively low. (About the same numbers do not take up tuition at all as take up SAC (<15%), while 60% choose face-to-face.)

Pedagogical effectiveness is not the only factor dictating decisions on costly investment. Innovation almost for its own sake may also be a valuable driver (Taylor and Swannell, 2001) and cost may also take precedence (Strother, 2002).

1.4 Research background

No systematic reviews or comprehensive overviews of the use or the effectiveness of SAC in language learning have been identified. However, a number of reviews and an abundance of research are available comparing aspects, including effectiveness, of face-to-face learning and distance education (DE) (De Freitas and Roberts, 2004; Phipps and Merisotis, 1999; Slavin, 2002; Bernard *et al.*, 2004; Shachar and Neumann, 2003; Zhao *et al.*, 2004; Moore *et al.*, 2004; Olson and Wisher, 2002). To a certain extent it may be possible to refer to this research as a proxy for comparisons between face-to-face language learning and SAC.

As section 1.1 describes, however, distance learning and online learning can cover a multitude of approaches, and with this in mind the distinction between SAC and synchronous text-based platforms becomes relevant. Much of the DE research in the area of e-learning deals with asynchronous rather than synchronous, and text-chat/instant messaging rather than audio and it remains to be seen how much may be borrowed from the generic research in DE in order to address the question of this review (Freiermuth, 2001; Warschauer, 1997; Sotillo, 2000; Schwienhorst, 2002).

There is a considerable amount of descriptive research in which authors do not study an intervention, and an abundance of opinion reports and articles which describe cases and examples of SAC being used. Reports that are not empirical research studies, while often interesting and informative, are beyond the scope of this review.

No overviews or systematic reviews of the use of synchronous audiographic conferencing have been found, but one review is known of that looked at studies of interactive technologies (which could include SAC) and face-to-face in distance education in the US school system. This review, by Cavanaugh (2001), included three studies in language learning in a meta-analysis of a total of 19 that spanned the curriculum. The finding (a significant summary effect size of 0.147) was that distance learning is more effective than traditional classroom instruction. This appears to conflict with a number of other systematic reviews or meta-analyses that have reported finding 'no significant difference' between the effects of distance education and face-to-face classrooms (Phipps and Merisotis, 1999; Moore *et al.*, 2000; Shachar and Neumann, 2003; Bernard *et al.*, 2004; De Freitas and Roberts, 2004; Zhao, 2004) However the story is more complex, as

Cavanaugh conducted a meta-analysis on the sub-group of three studies of language learning and this did find a difference but, in this case, the summary effect was in the other direction: that is, showing distance learning as inferior to face-to-face.

As a previous systematic review in the area of language learning has shown (Hassan *et al.*, 2005), the outcomes of training (competence, performance, learning, etc.) in research studies have often not been measured by standardised tools or means. Sometimes proficiency has been an outcome of interest, sometimes not. The effect of interventions usually has not been assessed by delayed and long-term post-intervention testing. A significant amount of research has been carried out in the area, but without any harmonisation in approach. Aggregation of findings across the field is therefore not straightforward, a finding also reported in a recent EPPI-Centre systematic review of ICT (Andrews *et al.*, 2002). Some of the research identified for this current review has apparently not been cited, yet contains extensive research data.

1.5 Authors, funders and other users of the review

1.5.1 Users of the review

The review is intended for a number of different end users, but ultimately it is learners of foreign languages who stand to benefit most directly from any reliable knowledge originating from research (Felix 2004, Strother 2002). If it can be shown via research (and other evidence as a review cannot definitively answer the question and there will always be caveats) that SAC is no less effective than face-to-face language learning, then the profession can inform its policy and practice decisions with greater confidence.

Other questions are already emerging as practice becomes clearer: for example, surrounding such issues as the kind of tasks to design and the learning outcomes to pursue for both general and specific circumstances. In addition to benefiting learners, it is hoped that teachers of languages and researchers of means and methods will be also able to make use of the review.

Policy-makers – both those dealing with evolving educational practice in schools in e-learning, for example, and also funders of research – should be able to find something of value in the snapshot of research that such a review can provide.

The review is overdue, not only in relation to European initiatives to implement its policies on e-learning (Brussels, 2001), or in the context of current US policy strongly encouraging experimental research (Whitehurst, 2003), or in relation to practice in Canada and Australia where distance education (DE) has a strong profile as a means of overcoming distance constraints, but also in order to provide a baseline on an understanding of the effectiveness of SAC, albeit a snapshot subject to rapid change in the field. The UK Government in early 2005 remains committed to evidence-informed policy and practice.

1.5.2 Authors

The authors of the review all have an interest in the knowledge that the review can uncover and present, and as such they represent the various parties likely to use the review – the technological and development aspects, school teaching, higher education and research.

1.6 Review questions

The primary concern addressed by the map is to uncover whatever empirical research (including reviews of such research) can be found on the use and effectiveness of synchronous audiographic conferencing in language learning and teaching.

The primary concern of the in-depth review is to address the question of effectiveness of SAC in language learning as demonstrated by the available empirical research.

2. METHODS USED IN THE REVIEW

2.1 User-involvement

The intention was to involve potential users of the review and to seek their input to defining outcomes that the review might be interested in, specifically the following:

- A number of policy-makers were approached and invited to be involved at all stages.

- Teachers in schools were identified and invited to become involved, and, among other things, to comment on drafts of the review.

- Research colleagues were approached and asked to act as readers at all stages of the review.

- University learners were approached for comments on the protocol and review drafts and for feedback in the form of a perspective piece.

Methods for this participation included the following:

- critical reading of drafts of the protocol and review

- focused involvement of users to assist in incorporating outcomes relevant to language learners

In addition, the possibility of involving specialist languages colleges in the UK is being investigated.

2.2 Identifying and describing studies

2.2.1 Defining relevant studies: inclusion and exclusion criteria

The review's protocol specified that, in order to be included in the map, reports had to:

1. be of empirical research (including systematic reviews of such research)

2. involve research subjects who were learners of languages in institutional settings

3. have a research focus on synchronous audiographic conferencing

These criteria were elaborated so that reports were ultimately included in the map if they were:

1. of empirical research (including systematic reviews of such research)

2. about language learning

3. about a synchronous audiographic conferencing (SAC) intervention, where SAC is defined as bi-directional multipoint speaking and listening that involves text manipulation (e.g. whiteboard, concept map, document and file display area)

4. carried out in a formal setting such as groups of learners in schools, universities and language centres

5. carried out since 1990

Where the protocol had specified that studies must involve learners of languages as research subjects, this criterion was relaxed to include studies that involved only teachers as participants. It was agreed that such studies could have relevance since they implicated learners.

1990 was agreed as the earliest date of relevant studies, as the technologies prior to that would be more or less irrelevant. It was also known to the reviewers that one of the earliest platforms of SAC (Electronic Classroom) was introduced around 1990 and, although it is no longer supported or developed, its conception and architecture have survived in current platforms.

2.2.2 Identification of potential studies: search strategy

Reports were sought via database searches and searches of specific journals or conference proceedings.

Key databases were identified so as to access a range of publication types and a draft search strategy was developed during March and April 2004. A cut-off date of 31 January 2005 was set for the retrieval of papers to be screened for inclusion in this version of the review. The search was carried out between May and August 2004. References were stored and manipulated in an Endnote database. A summary of the search strategy is presented as Appendix 2.1.

No systematic effort was made to identify relevant studies in the non-English language research literature, although any non-English language reports found were included in the review process.

2.2.3 Screening studies: applying inclusion and exclusion criteria

The mapping inclusion/exclusion criteria were first applied independently to 1,255 abstracts and/or titles of reports by two of the reviewers and/or one of the librarians assisting with searching. At this stage, 167 references were excluded.

The resulting 1,088 titles and abstracts were screened by all four authors, each reference being screened by two reviewers. This set of references was classified Relevant, Irrelevant or NotSure. The term 'Relevant' was applied to references which met the exclusion criteria, 'Irrelevant' to references which did not meet the criteria and 'NotSure' to borderline references. This stage of screening excluded a further 1,020 references.

The remaining 68 full text documents were sought for those classified as Relevant or NotSure. Excluded references were retained for background and supporting

material. 60 of the full text documents were screened, with a further 46 studies excluded because they did not meet the inclusion criteria. Four studies were not screened because they were not obtainable and a further four were not screened because they were not retrieved until after the cut-off date.

The EPPI-Centre link person (MN) checked a 10% sample randomly selected by the Review Group from the EndNote database held at the Review Group base.

2.2.4 Characterising included studies

Retrieved reports that met the inclusion criteria were classified according to a standardised keywording system developed by the EPPI-Centre (EPPI-Centre, 2002). This classifies studies in terms of the type of study; the country where the study was carried out; the educational focus of the study; and the study population.

An additional set of review-specific keywording questions were developed by the reviewers (see Appendix 2.4) and these were also applied to each study. Questions included the name of the conferencing software, tool or platform, the first and second language of the learners, details of the intervention and outcomes, and the reported findings.

2.3 In-depth review

The authors developed methods for describing and appraising a potential subset of studies within the map (an in-depth review, or synthesis).

In establishing the criteria for which studies to include in the in-depth review, the team weighed up the need to focus on research (such as large scale studies that control for sources of bias) with descriptive research that also forms part of the overall picture for the purposes of practice and policy considerations. The criteria reflect the decision to focus at this stage on comparative experimental studies that may have been carried out.

To be included in the in-depth review, studies needed to meet all the criteria for inclusion in the map (described in section 2.2.1), but also needed to be primary reports of experimental studies testing the effect of a language learning intervention against another intervention, standard practice or no intervention. Screening for the in-depth review was carried out by two reviewers per study. These reviewers worked independently of each other and then conferred to reach consensus over inclusion and exclusion.

Further methods for description, quality appraisal and synthesis within the in-depth review were developed by the reviewers. These can be found in the review protocol.

3. IDENTIFYING AND DESCRIBING STUDIES: RESULTS

This chapter reports the results of searching for and screening studies for this review. It then describes in detail the characteristics of studies found and included in this review's systematic map – that is, empirical studies of the use of synchronous audiographic conferencing (SAC) for language learning in formal settings and conducted since 1993.

3.1 Studies included from searching and screening

Twelve hundred and fifty-five (1,255) citations were found through the searches described in section 2.2.2. Figure 3.1 summarises the number of reports at each stage of the review. Following screening of titles and abstracts and de-duplication of reports, 1,020 reports were excluded, leaving 68 reports for further consideration for which full hard copies were sought through library loans or other means. Of these, full text reports for 57 studies were obtained before the retrieval cut-off date and, of these, 43 failed to meet the map's inclusion criteria and so were excluded (listed in section 6.2). Four reports were unobtainable by the cut-off date and four are unobtainable (according to Document Loans at the British Library); these are listed in section 6.3. Therefore a total of 14 studies were included in the map at this stage (section 6.1).

3.1.1 Search and screening results and the broader research base

A large body of research on e-learning, online tuition, materials design for the web and related issues was found during the process of searching and screening. Due to the apparent scarcity of such research, the searching was necessarily wide. We estimate that the research included in our map, and focused tightly on synchronous audiographic conferencing constitutes a high proportion of the total number of research reports on the precise topic. Other reports abound, including anecdotal, theoretical and reports not based on research, and particularly studies describing potential benefits of SAC.

Given the rapidly evolving nature of this area of research, we feel that ongoing studies will become available soon enough. Any such studies will be added to this review where appropriate.

Studies that were not included in our map, but that may be of value include

1. studies of the use of audiographic conferencing but not in the domain of language learning
2. individual case studies and ethnographical studies
3. studies and systematic reviews comparing distance language learning with face to face, traditional classroom
4. studies evaluating the use of CMC technologies in distance language learning, even if they are not SAC

Figure 3.1: Record of search process and yields
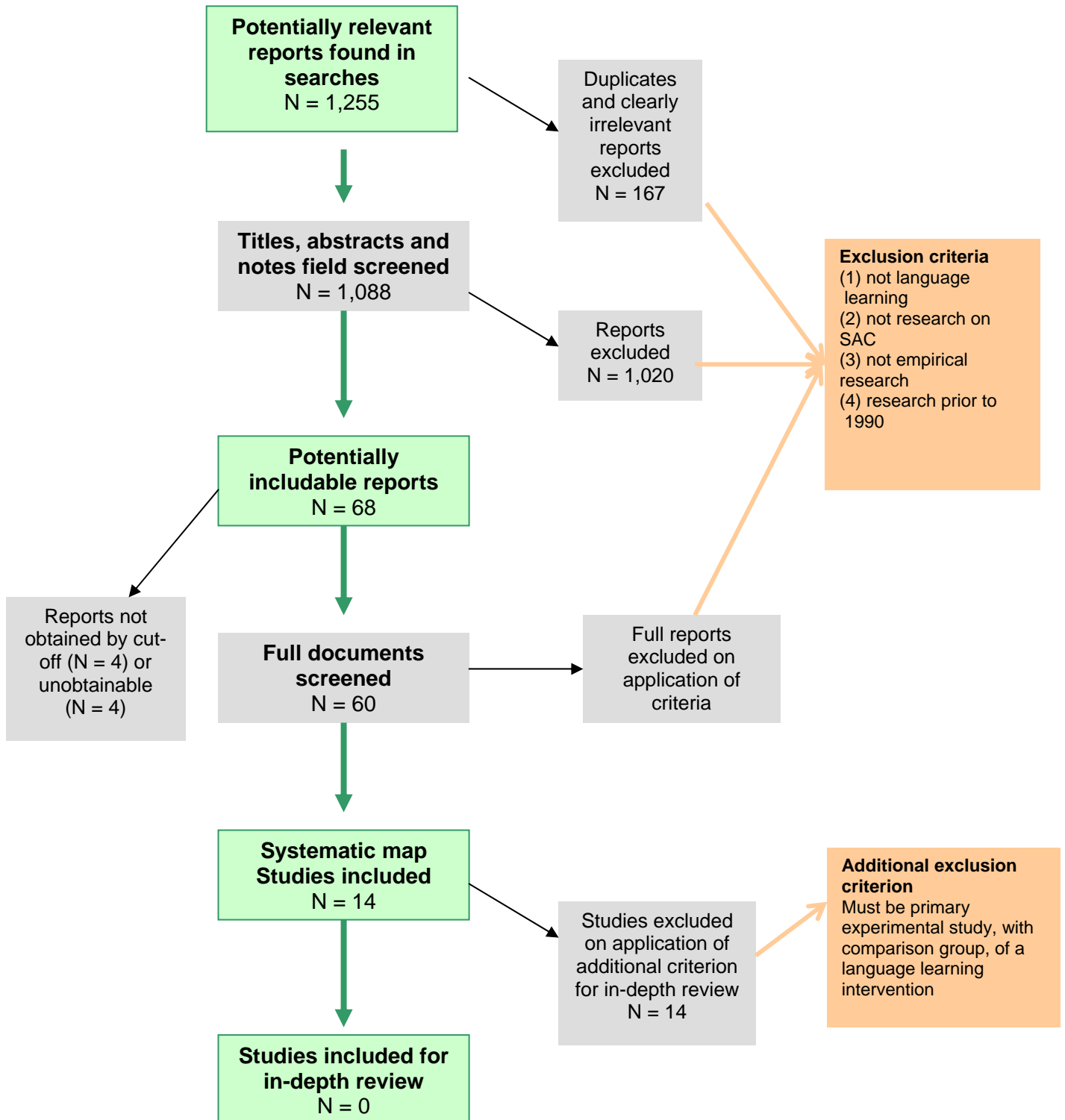
3.2 Characteristics of the included studies

The map includes 14 reports on studies conducted between 1990 and August 2004. The following sections describe a number of key aspects of the studies (also see Appendix 3.2).

3.2.1 Study dates

Although the origins of SAC go back to the early 1990s when Electronic Classroom, for example, was introduced, it was only in the mid-1990s when sound, graphics and instant messaging started to appear in more integrated platforms. It is perhaps this that is reflected in the number of studies over time as shown in Table 3.1.

Table 3.1: Studies by year (N = 14 studies, mutually exclusive)

Date	N
1994	2
1995	1
1996	1
1997	1
1998	1
1999	1
2000	1
2001	1
2003	2
2004	3
Total	*14*

3.2.2 Study size

Four of the studies considered both learners and teachers, and reported to some degree on each. Another three studies focused (indicated with an * in Table 3.2) primarily on the teachers but also gave information on the learners. It is, frankly, difficult to consider one without the other, so the differences are more to do with reporting than anything else.

Three studies gave no information about sample size, although in two cases the reports were not intended to cover full details of the study: Felix (2004) was a short report of a study in a conference paper, while Ellis *et al.* (1996) were not focusing in detail on the individual cases in their case study report.

Table 3.2: Sample size in studies (N = 14)

Study	Teachers	Learners
Wang (2004)		(8 started) 4
Erben (1998)		1 class
Batt (2003)	3	'and their classes'
Levy and Kennedy (2004)		4
Kotter (2001)		Phase 1: 36 Phase 2: 45
Hampel (2003)	6	12
Boyd* (1995)	21	
McLoughlin* (1999)	5?	5 groups 30
Cifuentes and Yu-Chth (2000)*	102	
Oliver and McLoughlin (1997)*	6	6 groups 29
McGreal (1994)		(language learners in total of 62) 2
Oliver and Reeves (1994)		(schools in 4 regions)?
Ellis *et al.* (1996)	not stated	not stated
Felix (2004)	not stated	not stated

3.2.3 Study type

All 14 studies described the interventions being evaluated or observed, and so generically can be considered as descriptive intervention studies (see Appendix 3.2). There was a range of researcher manipulation in these studies as some were designed as experimental and others were more naturalistic and observational: nine had specific interventions, although some of these were not set-up as prospective studies, while five were naturalistic observational studies. Details are given in the individual study descriptions in section 3.3.

Table 3.3: Study methodology characteristics (N = 14, mutually exclusive)

Type	N	Study
Observational (naturalistic)	4	Ellis *et al.* (1996), Hampel (2003), Oliver and McLoughlin (1997), Oliver and Reeves (1994)
Observational (naturalistic, comparative)	1	McGreal (1994)
Case study (experimental)	2	Boyd (1995), Erben (1998)
Descriptive (experimental)	5	Batt (2003), Felix (2004), Kotter (2001), Levy (2004), Wang (2004)
Comparative study (experimental, controlled trial)	1	Cifuentes and Yu-Chth (2000)
Action research (experimental)	1	McLoughlin (1997)
Total	*14*	

3.2.4 Language skills

Not all the studies looked specifically at languages or language learning, but all included foreign language learning in one way or another. Seven studies looked at languages only as part of the study rather than as the primary focus. Six

studies looked at more than one foreign language, while one study did not report the language in question (excluded from table).

Table 3.4: Languages studied in 13 of the studies (N = 13, not mutually exclusive)

Language	N
Japanese	5
French	4
German	5
Spanish	1
Latin	1
Italian	2
Chinese	1
Studies with more than one foreign language (FL)	6
Studies with FL as secondary focus	7

3.2.5 Intervention type

Over half of the 14 reports cover the use of SAC in the standard curriculum as the primary interest point and in this sense incline towards naturalistic evaluations rather than experimental classroom interventions. The remaining six reports cover interventions around the issue of introducing new technology or looking at specific tasks or uses of the SAC technology.

No distinction is being made here, however, between teacher and learner as the recipient of the intervention.

Table 3.2.5: Interventions (N = 14, codes mutually exclusive)

Intervention type	N
Use of SAC in regular curriculum	8
Introduction of new technology	2
Videoconferencing *versus* Desktop videoconferencing	1
Use of SAC for specific experimental task	3
Total	*14*

3.2.6 SAC platforms used in the studies

Only Electronic Classroom and Lyceum are integrated SAC platforms, while the others are combinations of audio tool + graphic tool + conferencing tool in varying configurations. See section 3.2.14 for more on the technologies.

Table 3.6: Conferencing platforms used in studies (N = 14, mutually exclusive)

Conferencing platform	N	Studies
Electronic Classroom	5	Ellis *et al.* (1996), Erben (1998), McLoughlin (1999), Oliver and Reeves (1994), Oliver and McLoughlin (1997)
NetMeeting	2	Levy and Kennedy (2004), Wang (2004)
Lyceum	2	Hampel (2003), Felix (2004)
PC+telephone	1	Batt (2003)
Telelearning+Optel	2	Boyd (1995), McGreal (1994)
QuickCams+C-USeeMee	1	Cifuentes andYu-Chth (2000)
VoxChat+email	1	Kotter (2001)
Total	*14*	

3.2.7 Intervention length

Table 3.7: Intervention length (N = 14, mutually exclusive)

Intervention duration (weeks)	Sessions	Atudy
30 (3 school terms)	Not reported	McLoughlin (1999)
24	10	Hampel (2003)
12	learners decide	Felix (2004)
12	1	Kotter (2001)
4	4X30 mins	Erben (1998)
?	5X90 mins	Wang (2004)
?	3X50 mins	McGreal (1994)
School year (1 hour observed)	3 a week	Oliver and Reeves (1994)
School year	Not reported	Oliver and McLoughlin (1997)
Details not available	Not reported	Batt (2003), Boyd (1995), Cifuentes and Yu-Chth (2000), Ellis *et al.* (1996), Levy and Kennedy (2004)
Total		*14*

3.2.8 Outcomes measured and aim of study

Five studies looked broadly at interaction as the outcome of interest, while one looked explicitly at effectiveness (regardless of definition issues at present). The other outcomes of interest were satisfaction, challenges of SAC, practice of the FL, attitude, and suitability of the tool in question. Two studies did not explicitly state what they were assessing.

Taken in a wide sense, effectiveness could comprise all of the outcomes measured in these studies. However, for precision of measurement of effectiveness, greater harmonisation of outcome assessment is clearly desirable.

Table 3.8: Outcome measured and aim of study (N = 14, mutually exclusive)

Outcome	Aim/research question	Broad area (no. of studies), Studies
Higher order thinking	Does use of technology enhance communication?	Interaction (5) Batt (2003), Erben (1998), Kotter (2001), McLoughlin (1999), Oliver and McLoughlin (1997)
Critical incidents	What influence does SAC have on interaction?	
Learner confidence	What are the relationships between SAC, interaction, confidence, competence, and support requirements?	
Interactive competence		
Support requirements		
Interaction	Does interaction promote L2 acquisition?	
Discourse features		
Interactivity	What forms of interactivity are supported by the technology? How much do teachers employ the interactions? What is the impact on the education?	
Extent of use of SAC	What is the influence of time, experience, administrative support on instructional change?	Professional development (1) Boyd (1995)
Professional growth (teachers)		
Impact on learners		
Effectiveness	How does the deployment of SAC over time work?	Effectiveness (1) Ellis *et al.* (1996)
Sense of reward	Are virtual meetings as rewarding as face-to-face meetings?	Satisfaction (1) Cifuentes and Yu-Chth (2000)
Not stated	What are the challenges of teaching online?	Challenges of SAC (1) Hampel (2003)
Pronunciation, vocabulary, accuracy, form	Does SAC provide a means for learners to practice the TL outside class time?	Practice of FL (1) Levy and Kennedy (2004)
Reflection on process		
User friendliness	How suitable technically is NetMeeting to support oral and visual interaction?	Platform suitability (2) Wang (2004), Oliver and Reeves (1994)
Audio and video quality		
Reliability		
Cost		
Equity and access	What is the effect of using SAC for delivery of school curriculum (increase access, expand opportunities, improve achievement, reduce gender bias in subject choice)?	
Attitude	What is the attitude of learners towards online learning?	Attitude (1) McGreal (1994)
Anxiety	Do anonymous online environments make students feel less anxious?	Affective factors (1) Felix (2004)

3.2.9 Outcome measurement instruments/tools

Table 3.9: Data recorded, tools used, broad study aim (N = 13, mutually exclusive)

Data	Tool	Aim
Audio-recordings, video-recordings	COLT Batt (2003)	Interaction
Learner discourse, video-recordings (2 studies)	Observation, discussion, reflection Levy and Kennedy (2004), McLoughlin (1999)	
Critical incidents and events	Observation, interview Erben (1998)	
Confidence, competence, needs	Questionnaire Kotter (2001)	
Extent of use of SAC, professional growth, institutional change, student impact	Interview, discussion, observation Boyd (1995)	Professional development
Deployment of SAC over time	Ellis *et al.* (1996)	Effectiveness
Factors in sense of reward	Questionnaire Cifuentes and Yu-Chth (2000)	Satisfaction
Opinion	Survey, logs, observation Hampel (2003)	Challenges of SAC
Video-recordings	Analysis Oliver and McLoughlin (1997)	Practice of FL
User-friendliness, audio and video quality, cost, reliability	Survey, questionnaire Wang (2004)	Platform suitability
Information gathering, logical contingency assessment, observation and measurement of applications in context, assessment of incongruities between intentions and occurrence	Observation, interview, questionnaire Oliver and Reeves (1994)	Equity and access to education
Survey	Scale to Study Attitudes Towards College Courses (SSATCC) McGreal (1994)	Attitude to online learning

Note: One report did not give details (Felix, 2004).

3.2.10 Education sector

As shown in Table 3.10, the majority of studies were in the secondary or tertiary sectors. Secondary education is covered in one way or another by 8 of the 14 studies, and the tertiary sector by 7, while elementary and/or primary only figure in three of the studies.

Table 3.10: Education sector (N = 14, mutually exclusive)

Education sector	N
Primary	1
Elementary, secondary and tertiary	1
Primary and secondary	1
Secondary and tertiary	1
Secondary	5
Tertiary	5
Total	*14*

Education sector	Study
Higher education	Boyd (1995), Erben (1998), Felix (2004), Hampel (2003), Kotter (2001), Levy and Kennedy (2004), Wang (2004)
Secondary school	Batt (2003), Boyd (1995), Cifuentes and Yu-Chth (2000), McGreal (1994), Ellis *et al.* (1996), Erben (1998), McLoughlin (1999), Oliver and Reeves (1994)
Primary	Batt (2003), Erben (1998), Oliver and McLoughlin (1997)

3.2.11 Country of studies

Table 3.11: Country of study (N = 14, mutually exclusive)

Country	N
Australia	8
Australia and UK	1
UK	2
USA	2
Canada	1

3.2.12 Studies by publication type and date

Fourteen studies were found in the 11 years from 1994 to 2004, and six of those in the years 2001 to 2004. With developments in the use of CMC technologies, the advent of cheaper and more accessible broadband, a larger increase might be expected in the use of SAC and studies of it in the more recent years. It would be surprising if this did not accelerate and become more evident.

Table 3.12: Study by publication type and date (N = 14, mutually exclusive)

	Journal article	PhD thesis	Conference paper
1994	1		1
1995		1	
1996			1
1997	1		
1998			1
1999	1		
2000	1		
2001	1		
2002			
2003		2	
2004	2		1
Total	*7*	*3*	*4*

3.2.13 Aim and findings as reported in the studies

The findings as reported by the study authors are not unanimously in favour or against SAC (nor should they necessarily be so). It may, however, indicate the need for well-designed empirical studies, with larger numbers in the samples, preferably randomised and with controls for comparison. As no studies met the inclusion criteria for this review, the studies below have not been assessed with regard to their methodologies or their reliability in relation to answering the review question. They do, however, provide information relevant to the focus of the review.

Table 3.13: Aims and findings as reported in studies

Study	Aim (paraphrased)	Reported findings and conclusions
Batt (2003)	Does the interaction using telematics PC+telephone promote L2 acquisition?	Little evidence of learners initiating discourse Teacher-centredness of platform
Boyd (1995)	What's the influence of time, experience, admin and support on instructional change when introducing Telelearning+Optel?	Disappointing effect on learning outcomes Process of implementing innovation is poorly understood.
Cifuentes and Yu-Chth (2000)	Can virtual meetings with CU-SeeMe+QuickCams be as rewarding as face-to-face meetings (including for language teachers)?	No difference was found between desktop videoconferencing and face-to-face.
Ellis *et al.* (1996)	Was Electronic Classroom deployed effectively over time?	Electronic Classroom was effective in a variety of educational environments.
Erben (1998)	What is the effect of Electronic Classroom on interaction?	Electronic Classroom facilitates instructional teacher training in immersion language teaching with technoliteracy.

Study	Aim (paraphrased)	Reported findings and conclusions
Felix (2004)	How do tutors and learners find the use of Lyceum to teach German	Multimodality of the platform appeals to learners.
Hampel (2003)	What are the challenges of teaching German with Lyceum?	Learners reported positive feedback, perceived improvement in oral skills, but that technical difficulties of the platform have an effect on learning.
Kotter (2001)	What's the relationship between use of VoxChat+email+website and interactive competence and confidence?	Learners, even weak ones, were productive, but initially reluctant. Sense of isolation reduced. 20% dropped out due to technical problems.
Levy and Kennedy (2004)	Does NetMeeting provide practice opportunities for learners outside organised teaching time?	Action through task and reflection can be supported (online).
McGreal (1994)	Is there a difference in attitudes between online and face-to-face distance learners in Ontario schools using Optel+PC?	No difference
McLoughlin (1999)	Does the use of Electronic Classroom enhance higher order thinking for gifted learners (included students of Italian)?	Higher order thinking was enhanced – evidenced in greater interaction, and changes in learner dialogue.
Oliver and McLoughlin (1997)	What forms of interactivity are supported by audiographics technology, how much do teachers make use of them, and what is their impact on quality of education?	The six teachers made significant use of the audioconferencing link to manage and direct the remote learning and to present content discursively. Learners generally found the environment engaging and motivating.
Oliver and Reeves (1994)	Does the use of Electronic Classroom facilitate meeting the objectives of the PCAP programme to increase students completing 12 years of schooling, expand opportunities for rural school leavers, improve student achievement, and reduce gender bias in subject choice?	Unclear. Conclusions do not report against the aims. However, it is reported that 'telematics was judged to be successful, cost-effective and capable of delivering these programmes'.
Wang (2004)	Is NetMeeting suitable to support oral and visual interaction (with learners of Chinese)?	Data support the use of NetMeeting in DLE for provision of oral-visual interaction.

3.2.14 Synchronous audiographic platforms in the studies

The following descriptions give brief overviews of the main functionality and affordances of the various SAC platforms in the studies covered.

Lyceum

 'Lyceum is a [...] synchronous, collaborative tool developed to enhance the specific interactive needs of distance-based students at the British Open University. It provides [...] audio conferencing and supports it with [...] functional

visual components' (Clark *et al.*, 2004, p 2). It comprises audio, text chat, graphics area for whiteboard, document board or concept map. It can be used by two users or a group together meeting centrally or in breakout rooms.

NetMeeting

It is an integrated platform that comprises textchat, whiteboard, file transfer, sharing, and a self-image window (video) and an audio channel. Developed by Microsoft, it was available free via the internet but is no longer supported.

Electronic Classroom

It is an audiographics package designed for Apple Macintosh computers, and widely used in Australian schools in the 1990s but is no longer supported. It incorporated whiteboard, textchat and audio.

Telewriter and OPTEL

'The modem transmits and receives voice and computer data over the telephone lines. A graphics tablet (called the PenPad) connected to the base computer serves as an electronic blackboard with several colour options.' (Boyd, p 11)

CU-SeeMe + Trans-Texas Video Conference Network + VTEL hardware

School and university computers in an established network were used with conferencing software (CU-SeeMe) which incorporates videoconferencing with instant messaging.

Voxchat+email+dedicated website

It is a web-based audio platform produced by VoxWare; it is no longer available.

(See Appendix 3.1 for a more comprehensive list of platforms identified during the course of this review preparation.)

3.3 Identifying and describing studies: quality-assurance results

The following summaries of the studies included in the descriptive map focus on aspects of those studies that are most relevant to the question of this review. Readers should refer to the studies themselves for more complete details. Readers should note that these studies did not meet the inclusion criteria for in-depth review and therefore the following summaries are not based on systematic data-extraction and the studies have not been critically appraised or quality assessed.

1. *The communicative orientation of virtual language teaching in upper primary and lower secondary telematics in Western Australia* (Batt, 2003)

This PhD study reports on an investigation into the effect on second language acquisition of the interaction that is observed when using telematics (in this case computer and telephone links) to teach Japanese. Three teachers were observed,

and audio- and video-recordings were made of the classes. Teacher questionnaires, observations of the interactions, focus group discussions and follow-up interviews were the instruments used as well as the communicative orientation of language teaching (COLT) observation scheme. This was used to provide a framework in which classroom discourse could be compared with features of natural language considered to be facilitative of L2 acquisition.

Results appeared not to display communicative features of interaction – including use of the target language, interaction in group work, use of extended text, use of authentic resources, reaction to message and clarification request.

The author reports that the telematics environment was highly teacher-centred, the computer was used as a controlling device and that these were factors impinging on communicative orientation of the interactions. He adds that the absence of a visual element also contributed to teachers using a more directive style, particularly when silences were then filled by teacher talk.

The author concludes that the communicative features need to be emphasised and made more prominent in the interactions in the telematics environment.

2. *The implementation of a microcomputer-based audiographic teleconferencing system: a case study of distance education at secondary and post-secondary levels* (Boyd, 1995)

Languages were only a part of the focus of this study which used a microcomputer and telephone platform comprising Telelearning and Optel to teach learners of French, German, Spanish and Latin (among other subjects). It was carried out in 1989/90 and 1992/93 with secondary and post-secondary learners in Louisiana in the USA. The focus was on the 16 instructors at LSU and the five instructors at a Louisiana school who were introducing the new technology for distance learning.

Using a case study approach, the study observed instructional change using new technology, obtaining data on the outcomes of interest: certain factors influential on instructional change, including time, experience and administrative support. These data were obtained via a questionnaire to faculty members and administrators.

The author reports that the process of implementing an innovation was poorly understood, and led to distorted evaluation and decision-making. The author concludes that implementation is dependent on individual instructors, but also that resistance may be encountered from teachers *and* learners.

Not much is reported specifically for languages, but, according to the authors, some of the benefits in using the technology included using the coloured graphics for highlighting syntactic features, and using the whiteboard to focus learners with use of the cursor for salience. Some sites had technical difficulties with slow response.

3. *Virtually field-based teacher education: can it work?* (Cifuentes and Yu-Chth, 2000)

In this study, in Texas, of meetings between three mentor-teachers and 102 pre-service teachers, the researchers compared face-to-face meetings with video-conferencing and desktop video-conferencing. During the meetings, the

participants discussed their plans for multimedia lessons that they had designed in groups following a brief given as part of their educational technology course at the university.

The teachers were all training to teach most school subjects at secondary level, including foreign languages. In addition to learning how to prepare multimedia lessons for their subject, they also then met using interactive conferencing to discuss their plans, and these meetings included discussion of their value in learning.

Data were gathered via a survey following the meetings. It included eight Likert-scale items related to the teachers' sense of reward concerning the meetings. Qualitative data were collected via questions in the survey on learning outcomes from the meetings, factors facilitating learning, and factors limiting learning. Notes were also made during the meetings.

According to the report, the data indicate that the trainee teachers found the three formats for the meeting equally rewarding and there were no significant differences between groups regarding perceived clarity, meeting of goals, gaining of perspective, interest, positive effect, desire to continue the partnership, benefit to all participants, and overall issue of reward.

The researchers conclude that virtual meetings can effectively substitute for face-to-face meetings. 'Open interaction among PSTs (pre service teachers) and mentor teachers facilitated individuals construction of meaning regarding lesson development, multimedia design, and teaching in general' (p 297).

4. *Half a decade of audiographics development: a case history of Electronic Classroom and its users* (Ellis *et al.* 1996)

In 1990, Electronic Classroom[1] (for Mac) was introduced into Australian schools and, by 1996, was being used in a variety of educational settings throughout the K12 curriculum in both rural and urban areas, and also in technical and university sectors in more than 1,000 sites around the country. In this report, the authors focus on its development and usage, including cases of its use in language learning settings.

The authors describe the main features of Electronic Classroom (version 3 in 1996) as a platform with graphics tools, electronic whiteboard, movie support, invisible text and speech bubbles (teacher control features), multimedia support and the major benefits, including lower costs for remote schools, reliable network, real-time audio and video, and multiple-site connection, geographically unbound.

Three secondary schools in Queensland used it in a trial project to teach Japanese; elsewhere in Queensland it was used for secondary French, while in New South Wales it was used for secondary German.

The features described in relation to languages are four major uses of the whiteboard in clean, partially filled, filled, and multimedia modes. The benefits referred to included shared classroom experiences, the ability for learners to return and listen again to sound files (EC provided both synchronous and asynchronous learning), and text support for audio files.

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[1] Electronic Classroom is no longer current or supported although it is still being used by clients (communication with Robert Crago, March 2005).

The authors conclude that, after five years of use, audiographics can be shown to be used effectively in a wide variety of educational environments. The technology is not age-specific, and patterns of usage have been less dictated by the technology than by management factors such as levels of learners, teachers and the curriculum. In some cases, whole educational environments were built around Electronic Classroom, while in other cases it was used as support to reinforce and amplify existed materials or classroom practice. They make a point that, when educational technology is well-embedded and accepted, this may be seen as a indicator of success and they cite a learner who said 'Audiographics is just, you know, school. School is school.' (p 13).

5. *Constructing learning in a virtual immersion bath: LOTE teacher education through audiographics* (Erben, 1998)

This case study evaluated the use of audiographics (Electronic Classroom) with third-year university teacher trainees in Australia in 1998. The teachers studied their regular teacher training unit dealing with immersion teaching, but in Japanese (the language they would be teaching) in immersion mode. In their 16 half-hour sessions over four weeks, they focused on the differences and similarities between face-to-face and online mediated interaction.

Specifically, they addressed the questions of how interaction is mediated through audiographics, and in what ways teacher-student self-regulation is facilitated or constrained where language is being taught through immersion and online.

Using case-study methodology, the unit of analysis was the 'critical incident' involving observation and description of the event, with explanation for its meaning in the immediate context of its occurrence. Transcripts and computerised audio and video evidence were analysed and categorised for linguistic and pedagogical practices within critical incidents.

The main measures of analysis of interactions reported 'amplifications' and 'reductions': that is, for the former, cases where the mediated nature of the interaction at a distance requires participants to 'increase production, frequency and/or intensity of cues/signs and behaviours – in order to achieve the same desired effect as if the same cue, sign or behaviour was produced in a face-to-face classroom'. Reduction is basically the opposite of this. The authors report that, during the course of the study, the number of amplifications and reductions diminished as participants adapted to the use of audiographics.

The authors conclude that the study 'indicates that an immersion education through audiographic technology is not only possible but highly facilitative of instructional practices that promote the negotiation of content through language immersion [...] the student [teacher] is far more active in regulating a range of pedagogical and linguistic processes compared with face-to-face immersion education contexts' (p 245).

6. *Performing beyond the comfort zone: giving a voice to online communication* (Felix, 2004)

This short report of a conference paper refers to an ongoing study in Australia, comprising 12 weeks in 2004 and replicated with a different cohort in 2005, of advanced German learners using Lyceum, the British Open University's SAC platform. The objective for the students is to meet both during the two weekly

organised sessions and informally outside these, and to produce a piece of work of their own choosing, to be posted on a website.

The learners are specifically encouraged to use all the tools available in Lyceum, including to 'post ideas, photos or graphics on the document module, exchange views using the concept map and look at Web-based sound and video materials together through the browser function' (p 290).

The author reports preliminary findings that the multimodal nature of Lyceum appeals to students, that students exploit the platform by deploying their own adaptive strategies, and the collaborative nature of their activity (in helping colleagues to use the tools).

The author also describes and contrasts Lyceum with two other virtual learning environments (Traveler and WebCT + Wimba), neither of which has integrated graphics.

7. *Theoretical perspectives and new practices in audio-graphic conferencing for language learning* (Hampel, 2003)

This naturalistic study evaluated the use of Lyceum, the Open University (OU) SAC platform, in the teaching of German. The course was the standard curriculum second level OU German course, and the tutorials took place between February and July 2002. Six tutors and 12 students took part in the 75-minute sessions. The study focused on the viability of online tuition and the experience for tutors and students.

Data were collected by observation in the sessions by the researchers, from logs kept by student volunteers, and by a questionnaire.

The author reports that technical difficulties were a major issue, as well as absence of body language, and the complexity of multitasking in the multimodal environment of Lyceum. Most agreed that their oral communication skills improved; all agreed that it presented an opportunity to practise, and to share texts. There was a sense of excitement and stimulation with a knock-on positive effect on motivation; students had greater control than in face-to-face of the learning situation; multimodality is a positive attribute.

8. *Developing distance language learners' interactive competence: can synchronous audio do the trick?* (Kotter, 2001)

The report describes a pilot study at the Open University (UK), using VoxChat, an internet-based audioconferencing tool in conjunction with email and a website. Nine groups of French and German learners met once a week (and additionally outside organised sessions) for three months in 1998–99. The tasks, made available a week in advance on the project website, were designed to engage students in collaborative projects that were 'true to life but also encouraged them to experiment with their target language'.

There were two phases to the project: (1) October 1998 to January 1999 trialling the environment with learners who had just finished their course, and (2) March to June 1999, which ran alongside students' regular courses. Both phases involved learners from the German first-level course and the French second-level course. (N= approximately 36 in two German and one French group in Phase 1, and N=45 in four German and two French groups in Phase 2.)

Data collected included copies of student email, audio-recordings of the sessions, tutor observations, and learner feedback through a series of four questionnaires.

The authors include in their conclusions positive findings that learners with limited competence claimed some facility at chatting, although some learners had to overcome anxiety and initial reluctance. Students increased their language learning, awareness and competence in the target language, and felt that conferencing reduced any sense of isolation often typical of distance learners. About 20% of the students dropped out, owing to technical problems.

9. *A task-cycling pedagogy using stimulated reflection and audio-conferencing in foreign language learning (*Levy and Kennedy, 2004)

Four learners of Italian, all women between 19 and 23, and at an advanced level, were invited to take part in the study using NetMeeting. The study was based in Australia. Their brief was to use NetMeeting as a vehicle for communicating (outside the organised contact hours, and at a distance) while carrying out a project to create web pages that would be useful to young Australians visiting Italy and living in an Italian city for a period of time. The researchers chose NetMeeting principally 'as conferencing software [that] provides for shared practices that enhance understandings across the community of learners' (p 55). They note particularly its features: real-time audio and video, text-based chat, document-sharing and whiteboard graphics exchange.

The authors describe the approach and the intervention as theory-driven. The 'stimulated reflection' comprised sessions in which teacher and student discussed video-recordings of the computer screen and voices made during the learners' work. The aim was to 'recall process' and to 'reflect on product'.

In the conclusions, the authors report that the approach shows that action through the task and reflection through the audio-visual recordings can be supported (by NetMeeting).

Their plans for follow-up research include longitudinal study concerning, among other things, whether or not language points are absorbed and learned through the process and evidenced in later sessions, and whether or not there is evidence of greater learner autonomy.

10. *Comparison of the attitudes of learners taking audiographic teleconferencing courses in secondary schools in northern Ontario* (McGreal, 1994)

Secondary school learners in 11 francophone and 16 anglophone schools in remote areas of Northern Ontario received the regular curriculum but delivered online using Optel and the computer as part of an audiographic conferencing 'kit' that also included fax, audiotape player, VCR and television. The package was part of an arrangement under Contact North/Contact Nord that served 'over 130 sites in communities across Northern Ontario'. Among the curriculum subjects was French as a second language (for the anglophone sector) and, in this study, it comprised nine learners – of whom only two, however, were in the online group as the other seven were face-to-face learners.

The purpose of the study was to 'investigate the effect of proximity to or remoteness from the teacher on the attitudes of students in Northern Ontario,

although the researcher states clearly that the results cannot be generalised to other situations due to the small sample size in the study.

The learners' attitudes were assessed using a scale to study attitudes towards college courses (SSATCC) and the authors conclude that the findings support the researcher's hypothesis that there is no significant difference in attitude towards their courses between the students taking courses onsite and those at distance locations.

11. *Providing enrichment and acceleration in the electronic classroom: a case study of audiographic conferencing* (McLoughlin, 1999)

This study trialled in 1998 the use of Electronic Classroom with gifted secondary learners in Australia. It looked at use of the conferencing platform in five curriculum subjects, including the learning of Italian. Thirty secondary-school learners, aged approximately 12, in five groups across four locations, used the technology for three ten-week terms. The aim was to investigate whether audiographic conferencing would foster the skills of negotiation, verbal elaboration and peer revision of ideas.

Using an action research approach, and focusing on the teachers as much as on the learners, the intervention took place in three phases. During Phase 1 (term 1), conferenced lessons were recorded on video. Following analysis and discussion, teachers revised and devised strategies into an intervention for Phase 2, with protocols to improve students' verbal thinking skills. These interventions were carried out. In Phase 3, teachers reflected on their changed practices and then planned further strategies to increase higher-order thinking.

Data were gathered on learner discourse, in recorded videos and these were analysed for evidence of higher order thinking (cognitive accountability, critical enquiry, interpretation and reflection).

The author reports positive results which 'demonstrated the capacity of teachers to embrace change in their own teaching environments and to support improved levels of higher order thinking' (p 67). However, the author also states that 'no specific measure of academic success was linked to the increase in higher order thinking for the participants'. The technology was used 'as a cognitive and social tool to augment discussion, to display ideas and to enable collaborative construction of ideas across the geographically separated classrooms' (p 67).

12. *Interactions in Audiographic Teaching and Learning Environments* (Oliver and McLoughlin, 1997)

This Australian study of secondary school language learners (five groups learning Japanese and one group taking French) looked at interaction between the learners and the teachers of the six groups as they followed classes in the regular curriculum. The audiographics platform used is not described, and a single one-hour recorded video of each group, from towards the end of the school year, was used for the observations and evaluations of interaction.

The researchers used a framework they had devised for evaluating live interactive TV (LIT) and they looked at interaction in a framework of type of interaction (teacher to class; teacher to student; student to teacher; student to student(s))

and along parameters of social, procedural, expository, explanatory and cognitive interactions.

The authors report that the study found that teachers made significant use of the audioconferencing link to manage and direct the remote learning environment, and to present lesson content in a discursive mode. 'The computer link was rarely used in ways that took advantage of the interactive rather than the display capabilities of the technology'.

13. *An investigation of the use of telecommunications to increase equity and access to education in rural schools in Western Australia* (Oliver and Reeves, 1994)

This report of a conference presentation is a descriptive account of the use of Electronic Classroom in four regions of Western Australia on the PCAP project, a federal government funded initiative seeking to improve access and education outcomes in specific areas. Two of the regions used SAC for the teaching of languages (English as a second language, Japanese), among other subjects.

The study reports on delivery of the school curriculum, but it does not give details of sample size, school stage, or other demographics, nor of the interventions. It makes broad general observations, without data or supporting evidence. The authors report positive 'results' from the use of Electronic Classroom.

14. *Supporting synchronous distance language learning with desktop videoconferencing* (Wang, 2004)

This study, carried out in Australia with initially five students of Chinese at Griffiths University, looked at the use of NetMeeting with specific tasks designed to improve learners' speaking skills. Sessions ranged from 60 to 90 minutes and a total of 29 sessions were attempted although, due to technical issues, 10 of these were incomplete. The aim was to evaluate the effectiveness and efficiency of internet-based desktop video-conferencing in the support of oral-visual interaction in DLE.

Data were collected in the form of the perceptions and feedback from the students, via post-trial survey, and the author's personal observations. Main outcomes of interest were perceptions on user-friendliness, audio and video quality, other features of pedagogical value, reliability and cost.

The authors report that the study found that NetMeeting was easily installed and was user-friendly. Three technical constraints were internet bandwidth (affecting quality of sound), latency (delay, break-up in sound), and the power of individual PCs used. The conclusions presented by the authors do not describe pedagogical aspects of the study (reported elsewhere in Wang, 2004) but do report the ease with which the four students accepted videoconferencing, and the potential of such platforms.

4. IN-DEPTH REVIEW: RESULTS

4.1 Selecting studies for the in-depth review

To be included in the in-depth review the study had to meet the criteria for inclusion in the systematic map:

- in the area of language learning

- an intervention carried out in a formal setting, such as groups of learners in schools, universities and language centres

- a study of primary empirical research

- research carried out since 1990

The study also had to meet a further second stage in-depth review criterion:

- experimental studies testing the effect of the intervention against another intervention, or standard practice or no intervention

None of the studies in the map are 'experimental studies testing the effect of the intervention against another intervention, or standard practice or no intervention' and therefore there no in-depth review is currently possible.

The only comparative studies of SAC identified were the following:

1. *Cifuentes and Yu-Chth (2000)*, looking at the use of desktop videoconferencing for teacher training meetings. Language learning per se was not involved, so the study does not meet inclusion criteria for in-depth review, but the study *is* included in the map as the participants in the study, some of whom were language teachers, were using ICT to prepare their language lessons. The study is therefore 'in the area of language learning'

2. *McGreal (1994)*, which was a descriptive study and did not involve a specific language learning intervention in the comparison, and was therefore not included for in-depth review. Like the Cifuentes and Yu-Chth (2000) study, it does include a language learning element to it.

4.2 Nature of involvement of users in the review and its impact

Due to time constraints and an apparent reluctance to get involved, it has proved difficult to secure user participation at the time of going to publication. Efforts are continuing to involve policy-makers.

Six policy-makers were individually approached and nominally agreed to some involvement but none has responded to follow-up requests. A school in Milton Keynes has been provisionally identified but has not yet been contacted. Input

has been received and incorporated in the protocol from two research colleagues. A number of other individual researchers who have been contacted have not responded. One Open University student, who has used SAC for language learning, has provided feedback on both the protocol and review drafts, and is providing feedback to the reviewers from a learner's perspective.

A lecturer in ESL/teacher of English (as a second and foreign language), trained in online methods but not currently teaching online, has provided extensive feedback from a language teacher's point of view, and drafted the summary of the review.

5. FINDINGS AND IMPLICATIONS

5.1.1 Summary of principal findings

The descriptive map shows that there is some empirical research, but no comparative experimental studies available to address the question of this review. Most of the available research is in the form of observational studies that look at aspects of the use of SAC in language learning, including, for example, interaction, effectiveness, technological challenges, professional development, and task design. Some of it is experimental and some naturalistic.

Unlike a lot of language learning research, and contrary to what might be anticipated, this topic does not seem to have attracted as many studies in the field of English as a foreign or second language. In fact, German is a more frequent choice as the language in studies of its use, along with less commonly taught languages including Chinese, Taiwanese and Japanese. The studies identified address school and university level language teaching in roughly equal proportions, and teachers as well as learners are the focus of the studies. Understandably, most of the research has been in Australia and the USA, but also in the UK, where, despite its relatively small size, distance education has a high profile. The number of studies appears to be increasing with more research on the topic in the years just prior to 2004. Most of the studies report some positive findings concerning the benefits of SAC, although not without reservations: SAC scores highly for interaction, practice provision, innovation, and appeal (amongst those who use it...) but not so well on technical satisfaction measures.

5.1.2 Discussion of descriptive map

From a search yield of 1,255 citations, down to a map of 14 reports of empirical research on the face of things seems dramatic. However, it is important to remember that the review question is tightly focused and narrow – only looking at language learning in formal settings *and* synchronous audiographic conferencing *and* empirical studies. As a relatively young research field, it is also understandable that many publications deal with small pilot studies, individual anecdotal examples, opinion pieces and papers on the potential rather than the actuality, of the use of SAC. Warschauer (1997) wrote

> Research to date on CMC in the language classroom has been thin and has largely consisted of innovators reporting on the outcomes of their own teaching. (p 19)

Zhao *et al.* (2004), in a meta-analysis of 51 studies looking at the factors that make the difference in distance education, makes a similar point. Although concerned with distance education in general, the study also makes the case for a pragmatic approach where new distance education technologies are involved:

> Rather than waiting for new and improved research and sound theoretical frameworks [...] which have not come out as quickly as expected and may also be deemed outdated and inadequate as soon as it becomes available

by some critics due to the rapid changes in distance education technologies, we took a pragmatic approach. (p 38)

Of the reports found, over the 11 years from 1993 to 2004, eight of the studies (57%) were carried out between 1999 and 2004 (just under a half of the period) and it is likely that growth will continue as calls are made for larger scale experimental research. There appears to be a timelag between such needs being expressed and the research happening – calls for research date back to the mid-1990s (Warschauer, 1997), yet not much has appeared to be set in motion.

Consistent with a 'landscape' of smaller scale studies, the sample sizes of the 14 mapped studies are small with one or two exceptions. As would be expected in research of educational innovation, the studies focus on teachers (N=8) and learners (N=12), with only two focusing on teachers solely. Clearly the use of such technology is not only reflected in student achievement, but also in the contribution of the instructors.

Depending on what you read, there is either too much comparative research telling us very little, or not enough. Saba (2000) in a review of the state of research on distance education writes

> So far, distance education research has been dominated by quasi-experimental research which compares the effectiveness of distance education to classroom instruction, face-to-face education, or traditional education. (p 3)

and

> Although researchers continue to conduct comparative studies, their usefulness in revealing more information has diminished over the years; invariably, they have returned a finding of 'no significant difference' between various forms of instruction. (p 7)

It would appear that from the number of meta-analyses and reviews of distance education as opposed to face-to-face that the point is valid. However, Slavin (2002) argues that it is not merely comparative studies that are needed, but rather high quality randomised controlled studies:

> This article discusses the promise and pitfalls of randomized and rigorously matched experiments as a basis for policy and practice in education. It concludes that a focus on rigorous experiments evaluating replicable programs and practices is essential to build confidence in educational research among policymakers and educators. (p 1)

If he is right, then perhaps the debate on 'no significant difference' between distance and face-to-face tuition can be advanced beyond the stalemate it has reached, despite the number of studies carried out. It would be desirable for research in this new field of SAC to avoid the imprecision that has bedevilled the distance versus face-to-face debate.

This is echoed in review by Olson and Wisher (2002) of 47 reports on web-based courses in higher educations. They caution against over interpretation:

> We would like to caution readers against drawing inappropriate cause and effect conclusions from the results presented in this paper. A goal of this

paper is to present data based on existing empirical literature. As demonstrated by our finding of only one study in which random assignment of individuals to conditions occurred, there is a tremendous need for experimental studies of web-based instruction if we are to draw any definitive conclusions about the effectiveness of web-based instruction in comparison to other methods. The conclusions that one can draw from the results of a meta-analysis are highly dependent on the research designs of the individual studies examined.

Of the 14 studies in the map, most (N=9) are experimental (although only two are comparative studies) while the rest (N=5) are descriptive, and naturalistic in their approach of observing what happened when SAC was introduced or used in the standard curriculum, or for activities that would have been the same or similar otherwise. Nine of the studies were experimental, and trialled or tested non-standard activities: for example, a theory-driven task which looked at the design of the task in the SAC environment; or another which used SAC on tasks of increasing difficulty; or another to produce some work with a specific e-learning product at the end of it.

There are at least two schools of thought regarding the design of tasks for online teaching: on the one hand, some claim that tasks are not really different to face-to-face activities but may need some adjustments with regard to the affordances of the SAC platform (Garrison, 2000; Ally, 2004; Le Baron, 2001; Zhao, 2004), and this includes assessment as well (Strother, 2002); others, however, suggest that a different pedagogical paradigm holds for e-learning (i.e. that its technological aspects require a different framework in order to understand it) and that tasks need to be designed accordingly (Anderson, 2004, on getting the mix right; Chou, 2001, on constructivist principles; Chapelle 1997, on interactionist and SLA theory, and NLP).

The outcomes of interest in the studies fall broadly into five categories, the most common being interaction (and practice). This is followed by effectiveness, satisfaction, professional development, attitude, and the challenges of SAC; of course these could all be constituents in effectiveness, depending on how it is defined.

Measurement of the outcomes of interest in most cases was via instruments devised by the researchers for the purpose of their study and, in most cases, this involved observation, surveys, questionnaires and interviews to seek the opinions and perceptions of the users of SAC. Analysis of recorded video and audio transcripts permitted more systematic and standardised analysis of outputs (e.g. participation, complexity of learner talk, indicators of process). One study (Erben, 1998) carried out its analyses on the basis of contextual explanation of critical incidents that occurred during the intervention, and two of the studies (Levy and Kennedy, 2004; McLoughlin, 1999) used versions of action research approaches whereby the instructors reflected on their use of SAC, and adapted it or the tasks, and redeveloped the interventions.

The introduction of Electronic Classroom in the early 1990s, and Australia's pedigree and experience are obvious reasons for which 9 of the 14 studies were in Australia. It is perhaps mildly surprising then that larger scale experimental studies of SAC, and particularly on its effectiveness in the school curriculum, have not been identified.

Broadly speaking, most of the authors report positive findings, which is to say that in most cases, they did not explicitly report findings *against* synchronous audiographic conferencing. Some study authors report no difference between SAC and face-to-face; some report that technical difficulties were a problem and had both a disruptive and negative effect. The authors of two studies, however, report what amount to negative findings: firstly, that the desired effect of greater interaction among the students did not materialise and, secondly, that institutions do not understand sufficiently the process of implementing innovation. However, it must be borne in mind that, in all these studies, the possibility of generalisation of findings to other situations is extremely limited as most of the studies are bounded by their methodological limitations – sample size, sample selection, no comparison groups, experimenter effect, and virtually no measurement of learner achievement on validated or standard instruments.

The positive outcomes reported by the authors include that SAC in most cases appears to be no different from (that is, not worse than) face-to-face tuition mode; can be effective; can support teacher training (in both language teaching and use of SAC technology). Some learners self-reported satisfaction and a sense of progress on oral skills (but others dropped out); the sense of isolation among distance learners is reduced; higher order thinking can be enhanced by use of SAC; and SAC can be beneficial to provision of oral-visual interaction.

The authors report that none of the platforms involved was ineffective or unusable, although technical difficulties were a recurrent theme. The march of time and rapid advances probably render many of the technical difficulties irrelevant already as broadband technologies, sound codecs, user-friendliness and computer specifications improve.

5.2 Strengths and limitations of this systematic review

This is the first systematic review of evaluated research to address the question of effectiveness of SAC, and it presents a baseline view of available research evidence in the area. The attempt, however problematic for some, to aggregate similar research in order to address the question has the benefit of focusing issues, including effectiveness (self-reported? quantitfiable? mechanisms involved, such as interaction, technology, democratisation, access), nomenclature (is there a common term emerging for SAC? distinctions between written and oral CMC), definitions (effectiveness?), and issues surrounding research methods (What type of research is suitable? Which outcomes, and what measurement tools to use?). The references to studies not generally cited in the mainstream academic research literature will also be of use to readers looking at the field. As a snapshot in time of a precise area, it also serves to highlight what has *not* been done yet and to inform the research field on areas of research in need of development.

There are a number of limitations of this systematic review, and consequently the map of research and the description contained in this review currently cannot do much more than lay down a baseline for the research evidence relating to the effectiveness of synchronous audiographic conferencing in language learning. However, updates are intended and we will be pleased to receive notification of

any work inadvertently missed, or inaccuracies in this review. We do not anticipate finding many major studies undertaken or completed before the end of 2005.

The time and resources have not been available to do any extensive handsearching of journals not indexed electronically, although this remains a long-term objective and the results will be incorporated into updates of the review. Efforts also need to be put into searching for reports of studies published in the non-English language research literature and the ongoing postgraduate research literature.

No studies for inclusion for in-depth review

The fact that this review found no studies to include in the in-depth analysis section may be seen by some as a limitation of this review and might appear to be due to an excessively narrow focus of the review question and inclusion criteria; if the question or criteria had been different, perhaps there would have been more available comparative experimental research. Widening the population focus away from language learners may, for example, have widened the breadth of the review sufficiently to have identified some comparative studies. However, any such findings may have been less relevant or generalisable to second language learners.

However, even with a wider population focus, a number of factors associated with SAC may still have limited the number of studies identified. There are, for example, only a few integrated synchronous audiographic conferencing platforms, and their initial creation and subsequent development have been organic and pioneering rather than conceptual and planned. In addition, the use of SAC outside gaming, internet chat, and business meetings has not been wide, which may explain the lack of studies identified in this review. With the development of educational networks, the increasing technocratisation and 'computeracy' of schools and homes, the pressure on higher education resourcing (particularly languages in the UK) perhaps the moment is only just presenting itself for its systematic testing.

Could the review question be addressed by different types of research?

As well as widening the breadth of the topic focus, the Review Group could have decided to include a broader range of research in the in-depth review, removing the criterion of experimental research, including a control group. However, it was decided that, for a question of effectiveness, well-designed comparative experimental studies would be the most direct way of providing more robust evidence. Case studies and accounts of individual examples, while interesting and valuable as illustrative examples, are likely to be less useful in providing reliable evidence to inform practice and policy on a wider scale; they will continue to provide points of comparison and contrast with analogs, but the risk of selection and experimenter bias remains high. However, observational studies looking at possible associations between mode of tuition (SAC, or face-to-face, or no tuition) and learners' performance on standard achievement and progress tests and assessments could, over time and with large enough numbers, provide good quantitative data.

With this in mind, the research identified for the purpose of addressing the current review question, plus other studies not included in the map would, undoubtedly,

be of greater use and relevance in exploring questions such as 'what does the research say about the elements of SAC that might play a part in its effectiveness?' So, rather than using different research to address the same question posed by this review, one possible course for action would have been to broaden the question in order to bring out elements of effectiveness that could then be tested on a larger scale by future experimental studies.

Were the search criteria too limited?

During the process of searching, a balance was struck between sensitivity and specificity. Searches that are sensitive pick up more references but, in doing so, also pick up more references that are irrelevant to the review question. Searches that are specific identify a larger proportion of relevant references, but are more likely to miss relevant references. The exploratory and pilot searching for the review cast the net very widely and identified large numbers of studies in the domain of computer mediated communication (CMC) in general or the use of conferencing platforms without an audio channel (e.g. were sensitive). They also identified large numbers of studies in subjects other than languages (social studies, nursing, law, mathematics) which were excluded according to the criteria adopted for this review. The final searches were more refined versions of the pilot searches (e.g. had greater specificity), but there may have been references that were not picked up. However, all the included studies picked up in the pilot searches were also picked up in the final searches, and no additional studies been identified that were not picked up by the search criteria.

The search process did, however, reveal that the term 'audiographic conferencing' can cover a variety of conferencing platforms, including telematics (video or telephone plus computer link) and videoconferencing (including webcamming) and that the term 'synchronous audiographic' has only recently, say since 1991, become more widely used. It is still somewhat 'techno-jargon' and not immediately clear to the lay person who is more likely to refer to 'online tuition' or 'webconferencing' (particularly in Canada). However, searches would not have picked up all the included mapped studies had the term not been used.

5.3 Implications

5.3.1 Policy and practice

As no experimental studies are currently available for in-depth review, research-based implications cannot be drawn regarding policy and practice at this time. However, this does not mean that synchronous audiographic conferencing should be excluded from teaching practice and policy-making but that such a decision cannot be based on experimental research evidence.

This review is the first that systematically identifies the research literature available in the topic area and is able to describe the state of the research literature, thus supporting claims that more research is needed.

5.3.3 Research

Although one of the major platforms of SAC (Electronic Classroom) was developed and introduced back in the early 1990s, the field continues to be thought of as a new and innovative area. The introduction of SAC has often been in the context of distance education and as a means of overcoming geographical isolation and course delivery. Without lengthy studies, it is clear that this primary objective is met by conferencing software (It's a 'Yes' or 'No' question really), so to a degree the 'solution' in the question of this review (that is, SAC) is the answer to a question other than that of effectiveness. Hence, until now, the question of effectiveness against criteria other than overcoming distance barriers has not been seriously addressed by the research. In addition, platforms have been developed predominantly for business meetings, and then versioned for education. This includes more recently the combination of already established elements to provide SAC, and their appearance and use seem to be dominated by technological capability rather than a need to demonstrate educational effectiveness.

Within the context of education the need for larger scale, robust studies looking at the effectiveness of SAC in relation to various outcomes (not just one definition of effectiveness) does not need labouring. However, it remains to be seen if a certain antipathy towards comparative studies and randomised trials will result in little experimental research becoming available. The USA is committed to such large scale randomised field experiments (Mosteller and Boruch, 2002; Whitehurst, 2003) with support from central government, and the UK Government remains committed in 2005 to evidence-informed policy, yet the research establishment seems slow to respond. This section considers the research implications of this review in terms of possible foci, methodologies and designs for further studies.

Study focus

Searching, as mentioned above, identified a number of studies germane to the question but in subjects other than languages. Further to this, searching also revealed considerable research in both languages and other subjects, but in *asynchronous* mode or for text rather than audio communication. It may be possible that, if the crucial consideration is face-to-face versus distance, and that if the mode is not vitally different (i.e. text or audio), then CMC research could be used as proxy for addressing effectiveness questions regardless of mode or medium. If there is no great difference between the characteristics of text and audio dialogue, then all CMC research comparing distance with face-to-face may be relevant. However, this is unlikely to take us very far as real live audio is central to language learning in terms of pronunciation and verbal communication and, if we are to address issues of effectiveness including the oral element of language, then specific studies are required to investigate it. Other research may be able to enlighten us on the effectiveness of SAC as a tool in education in general.

The framework in which the use of SAC for languages is finding itself is one of socio-constructivist and interactionist theory. Add to this elements of problem-solving and task-based learning, and the mix offers an off the shelf paradigm by which SAC may be evaluated. Until around 2000, it tended to be evaluated against technological parameters (affordances, sound quality, stability, cost) with some undefined claims surrounding added value, and again this may explain why

its pedagogical potential has not been seriously evaluated from practice and policy perspectives.

Study methodology

As no evaluation has been carried out of the methodologies, nor of the rigour with which the studies were conducted, or of the reporting in studies, it is not possible to make more than very general comments in this area. Suffice it to say perhaps, that the field would be well-served if there could be some concerted attempt at definitions, choice of outcomes to measure, and tools and instruments to use. If quantitative measures are to be used, for example, to evaluate effectiveness against student achievement, it would be useful if studies included group mean scores with standard deviations pre- and post-intervention; this would at least permit the possibility of meta-analysis at a future date. This is not to say other measures are less important, but rather to highlight the fact that few, if any studies, have reported even simple group mean scores on tests.

More generally, it is useful to pick up a theme treated by Shachar and Neumann (2003) concerning definitions of effectiveness which are connected with its measurement. Their diagram provides a useful notional umbrella:

Quality / Effectiveness factors (Shachar and Neumann)
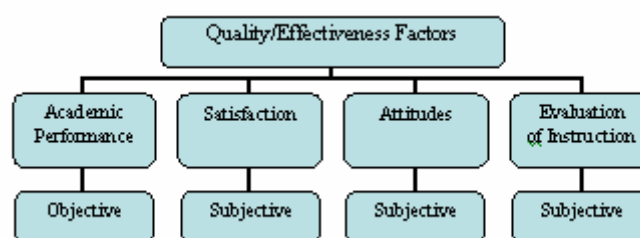
and their commentary adds useful detail:

> Research on DE effectiveness has focused on four domains: (1) student attitude and satisfaction regarding delivery of coursework; (2) interactions of students and faculty during delivery of coursework; (3) student outcomes in DE coursework; and (4) faculty satisfaction with delivery and coursework (Gallagher and McCormick, 1999). Additionally, Spooner *et al.* (1999) have analyzed many studies based on such comparative factors as: (1) cognitive factors, namely amount of learning, academic performance, achievement, and examination and assignment grades; and (2) other factors namely, student satisfaction, comfort, convenience, and communication with instructor, interaction and collaboration between students, independence, and perceptions of effectiveness.
>
> Recent meta-analysis studies have focused on specific characteristics in DE: student satisfaction (Allen, Bourhis, Burrell, and Mabry, 2002); instructional features affecting learner achievement (Machtmes and Asher, 2000); and education technologies in K-12 learning (Cavanaugh, 2001). (p 3)

The studies in the map of this review fall readily into the four categories above, with most, although not all, concerned with the subjective measurement of satisfaction and attitudes. Notably absent were objective measures of achievement. The corporate world, where SAC is used for business meetings, tends to keep an eagle eye on the bottom line, and one of the measures commonly referred to is return on investment (ROI). Strother (2003), albeit concerning the commercial world, makes the point about the need for 'solid research measures':

> While there is no doubt that we see an increasing number of case studies showing success with e-learning, it is still difficult to find solid research measures of learner achievement in the specialized setting of a corporate training program. (p 2)

Research design

The need for large scale experimental trials in education is probably only gradually being accepted in the research community, partly in response to the increasing profile of evidence-informed education initiatives. An understanding that trials are necessary and desirable and should be complemented with descriptive and qualitative studies may be improving, but the area of online tuition has not yet adopted such an integrated research approach and this is also a factor in explaining the absence of studies to respond to this review's question. However, it still leaves relatively unaddressed the question of mechanism of why and how SAC is or is not effective. Even with extensive experimental studies, it would not be straightforward to define what the essential elements of the causal link might be. Randomised studies would provide more robust evidence on the *existence* of a causative link, but issues of process and mechanism are better explored by descriptive research.

Given the above, and given the '*no significant difference'* finding in many of the studies comparing face-to-face with distance education (see sections 1.4 and 1.5, Phipps and Merisotis, 1999; Moore *et al.*, 2000; Shachar and Neumann, 2003; Bernard *et al.*, 2004; De Freitas and Roberts, 2004; Zhao 2004) and the fact that SAC is subsumed under DE, it may be desirable to problematise the issue differently. Rather than looking directly at SAC effectiveness, one could consider instead how best to design tasks for SAC within the CMC interactionist paradigm. It does of course happen already, as the Levy (2004), Kotter (2001), Felix (2004) and McLoughlin (1999) studies show. As is often the case, swings may swing and roundabouts turn, but the fulcrum is probably somewhere in the middle. Le Baron (2001), decrying the preponderance of experimental studies in the USA, appeals for more qualitative studies:

> Research on the effectiveness of online learning is typically described as shallow. Kenneth Green (1998, 1999) observes that transmissive pedagogy continues to dominate American collegiate teaching, and that research on the instructional efficacy of distance learning is ambiguous at best. Ehrmann (1997) suggests that existing research fails to address the appropriate questions about distance education. Countless methodological variations exist in the classroom and in online learning environments, making 'this or that' value judgments between two poles questionable at best and pernicious at worst. Of the 'meta research' conducted for the Institute for Higher Education Policy (IHEP, 1999) on the effectiveness of distance learning in higher education (1999), more than half of the studies

selected for analysis were experimental or correlational. Very few qualitative, naturalistic accounts are available. (p 15)

An EPPI-Centre systematic review (Andrews *et al.*, 2002) came to similar conclusions that the research evidence was not robust enough concerning the impact of networked ICT on literacy for 5- to 16-year-olds. It was also noted:

[...] Given the paucity of experimental data, more randomised trials are needed.

We also need more research with qualitative outcomes. Small-scale studies (e.g. evaluated case studies) are needed as they are able to provide multifactor analyses of the use of ICT in literacy teaching and learning. Because the field of research in ICT applications is young, there is also a need for more process evaluations. There is a need for a large-scale longitudinal study, focused on literacy development, to complement the work currently being undertaken by the ImpaCT2 project, mentioned in Chapter 1. Furthermore, more work needs to be done on the compatibility of results from quantitative and qualitative research in education. (p 10)

Until there are high quality comparative controlled studies, with strong qualitative studies to provide detail and situated explanations of events and mechanisms, and the effects of interventions on individuals rather than populations, the picture cannot be fully understood. Without such research, there will always remain more doubt than is necessary: were the outcomes achieved because of SAC, or would they have been achieved in a traditional face-to-face situation in any case?

Pleas to the research community to row together in the same direction generally do not get very far, but doubt about the relevance of research (Foster, 1999; Hammersley, 1999) could be much assuaged with greater harmonisaton and complementarity of approach (Gorard, 2002). An evidence-based approach need not be anathema to approximately half the research community (Pring, 2000), if a shared agenda in setting up new research could be found. It would help address the question and give equal prominence to small and large scale research, whether qualitative or quantitative. There is a need to be able to put together, either in contrast or commonality, diverse findings.

A concerted approach in education, if accepted as desirable, that may be possible could restrict itself to principles, such as those expressed by Morrison (1999, (p 890):

1. Is there a clear question which the study seeks to answer?

2. Is there a clear learning need which the intervention seeks to address?

3. Is there a clear description of the educational context for the intervention?

4. Is the precise nature of the intervention clear?

5. Is the study design able to answer the question posed by the study?

6. Are the methods within the design capable of appropriately measuring the phenomena which the intervention ought to produce?

7. Are the outcomes chosen to evaluate the intervention appropriate?

8. Are there any other explanations of the results explored in the study?

9. Are any unanticipated outcomes explained?

While research can rarely provide definitive answers to education questions, the more it can be assembled together, the more likely it will serve to focus the issues, highlight the gaps, test theories and contribute to an increase in the probability that desired outcomes may be reached.

5.4 User perspectives

5.4.1 A language learner

Feedback from a learner of German who used SAC was sought, and this is summarised and paraphrased as follows:

As a language learner, I am interested in practical results. From the study, I would want to know:

1. What is synchronous audiographic conferencing?

2. Why would I want to use it?

3. What were the experiences of those who have used it?

4. How does it compare with other modes?

I think the review answers the first question quite comprehensively, but it is harder to tease out the answers to 2, 3 and 4. The overall impression is that there are more advantages than disadvantages, but problems with the technology are fundamental and perhaps are not emphasised enough. There is very little comparison of the effectiveness of SAC to face-to-face and this is something that would be of great interest to students trying to make a decision. I think, from a student point of view, there is not enough research to make an informed decision about the advantages of using SAC over some other form of communication. We want some comparative studies, don't we? It would be interesting to know the proportion of students who pass the course on each strand (SAC or face-to-face) and what grades they received. It would be useful to have some research on students' experiences of using the technology and it would be nice to know why they chose SAC or FF. Do you get more dropouts from SAC than face-to-face?

5.4.2 A language teacher

The feedback received has been incorporated in the writing of the review and in the drafting of the summary particularly. The main points raised include the following.

The research evidence is interesting but a lot more needs to be done. Looking at the strength of the research evidence, more research is obviously needed,

especially over a longer period of time. It is recognised that teachers have little time to spend in researching new methods and thus a review of the available research in the field of SAC can only be welcomed. The review offers teachers the chance to become acquainted with the different research and be more informed as to whether SAC may be appropriate to their particular situation.

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Appendix 1.1: Use of SAC in language teaching and learning

Following feedback from a consultative adviser to the review (JS, an ELT lecturer), this section has been added in order to give a brief description of how synchronous audiographic conferencing can be used in language learning. It is illustrative rather than comprehensive or definitive in any way.

Imagine you're wearing headphones with a built-in microphone, or you may have a microphone in your PC with speakers so that you are not encumbered by headphones. Visualise the computer screen divided into three or four sections. One window that has some buttons you press via your computer keyboard to speak to the other 15 people in your language session (your tutor is one of those people as well). One button allows you to signal your wish to speak and it adds your screen-name to a list of all those wishing to speak at that time, and another button allows you to 'take the floor'. You can hear others as they speak, and everyone can hear you when you press the speak button.

Another window on the screen allows you to write and receive text messages while everything else is going on. Everybody can see them, and it shows your screen name when you send it to the group. But you can still address individuals in the group if you want to, including the teacher, and so you can check or clarify things without interrupting the conversation that's going on. You can also include emoticons and *smileys* in the text in order to back up your text with some extra-linguistic features.

Also on the screen is a bigger window than the others where documents, or a Powerpoint file, or an image, or a website can be posted. A button on the screen allows you to control this screen and others see what you're doing. Then colleagues can do the same and add some comments, make an amendment, change something, move to another website and the whole group can follow.

Then the teacher asks you to press a button that takes to a Breakout Room menu. You and three others go to a separate room together where you then work on a dialogue that the teacher has loaded on the screen there. You have to fill some gaps by reading a text that you each have a part of, then you have to check your answers together and discuss the spellings, vocabulary, grammar and style of your choices. You also read it out loud to each other and check intonation and pronunciation features (some of which you had to check on some websites at the same time).

The teacher has asked you to record the final version and to save the document as well. So you do this, and save the files which you then reload once you move back to the whole group to discuss what you have each done.

The next stage is to complete a short individual assessment of one or two linguistic points that you've covered. For this, you go individually to a private room that you create on the screen, and you fill in a multiple-choice test and make a short recording of your oral answers to some questions you find there. These are uploaded to a website where the tutor will mark and comment on them later.

Finally after the 30-minute exercise, the teacher asks you to fill in a website questionnaire on the activity you've done, and complete your learning diary on the session. The teacher has of course prepared these materials in advance and posted them to a website where you access them or load them into the SAC programme during the session.

And so on. Of course, this sort of activity can be modified and adapted in many ways. The screen might also incorporate a small webcam image of the teacher so you can follow mouth movements and some visual clues during spoken conversations. The screen editing tools may allow different levels of interaction and participation, and different softwares will have different degrees of sophistication and complexity.

Prior to the course, the tutors have worked together in similar ways to prepare the materials, test the procedures and validate the tests and assessments. The materials were mainly found through internet searching, on news, entertainment and documentary websites in the country of the language being studied. So all the materials were up to date, although their quality could not be guaranteed! Multimedia tools were used to create the language exercises based on the materials. The tutors discussed the approach in their training sessions and have based the activities on the following understandings:

- Maximise but balance interaction between learners, between learner and materials, and between learner and tutor.

- Create tasks and 'problems' to solve, as learners will probably engage more intensively with both the content and language,

- Discuss with the learners the strategies they might use (for example, working together, collaboratively, sharing their knowledge) and also make it clear that the agreed protocol (whatever they are) for online sessions are followed.

- Encourage learners to meet between themselves with some pre-session tasks.

- Give immediate feedback and model the appropriate forms of language for the learners.

- Keep an eye and ear out for the quieter learners and make sure they are not anxious about participating.

Feedback (fictitious but examples drawn from reality) from the learners showed that most of them enjoyed the sessions and improved their language ability in line with the outcomes of the course, including writing and speaking. They were motivated to meet between themselves for follow-up discussions; some of them did some extra website research as a result of the session; all of them appreciated the group and individual feedback they received from the tutor (who corresponded by email); and three of the learners have made email pen friends via websites and now correspond in the language they are learning with e-friends in those countries. Two of the learners, however, had technical problems: one of them had a computer crash and the other with special learning needs, was not able to manipulate the buttons quickly and sometimes felt at a disadvantage; one other student was a little bit unhappy with one of the group members who seemed to want to talk all the time, and he also didn't like some of the images on the websites they looked at.

Appendix 2.1: Outline of search strategy

Final searches

The databases searched were as follows:

1. Academic search premier
2. ArticleFirst
3. Australian Education Index
4. British Education Index
5. Dissertation Abstracts
6. Education-line
7. ERIC
8. Index to theses
9. ISI Web of knowledge
10. Linguistics Abstracts online
11. MLA international bibliography
12. PapersFirst
13. ProceedingsFirst
14. ScienceDirect
15. WorldCat
16. Zetoc Electronic Table of Contents

The following terms were used for searching:

1. computer mediated communication
2. language learning or language-learning
3. audio-graphic or audiographic

Search sets were combined to find reports containing at least one term from each of sets 1 to 3, using the precise terms as above either as free-text searches or as thesaurus or descriptors where available in the database involved. Searching was carried out between May and August 2004.

Pilot searches

Pilot search terms were far more extensive than those finally used but yielded an excessive number of irrelevant hits. In pilot searches, the same references were being retrieved with wide and narrow search terms, and so it was decided to use the minimal set above. The pilot search terms included *e-learning, online tuition, internet learning, distance education, open learning, CALL, CAI* [*names of individual platforms Lyceum, Blackboard, ACEWEB*].

The term 'synchronous audiographic conferencing' is not yet common enough to use as a search term. It is increasingly appearing as a keyword and the terms for various aspects of e-learning are stabilising. For this review, the keyword term 'audio graphic' was picked up in all the studies that are included in the map except for one which was identified by searching for individual SAC platforms. (The report by Kotter was found with the keyword *Lyceum.*)

Appendix 2.4: EPPI-Centre keyword sheet, including review-specific keywords

V0.9.7 *Bibliographic details and/or unique identifier*

A1. Identification of report	A6. What is/are the topic focus/foci of the study?	A8. Programme name (Please specify.)	A12. What is/are the educational setting(s) of the study?
Citation	Assessment		Community centre
Contact	Classroom management	....	Correctional institution
Handsearch	Curriculum*		Government department
Unknown	Equal opportunities		Higher education institution
Electronic database	Methodology	**A9. What is/are the population**	Home
(Please specify.)	Organisation and management	**focus/foci of the study?**	Independent school
	Policy	Learners	Local education authority
A2. Status	Teacher careers	Senior management	Nursery school
Published	Teaching and learning	Teaching staff	Post-compulsory education institution
In press	Other (Please specify.)........................	Non-teaching staff	Primary school
Unpublished		Other education practitioners	Pupil referral unit
	A7. Curriculum	Government	Residential school
A3. Linked reports	Art	Local education authority officers	Secondary school
Is this report linked to one or more other	Business studies	Parents	Special needs school
reports in such a way that they also	Citizenship	Governors	Workplace
report the same study?	Cross-curricular	Other (Please specify.)............................	Other educational setting (Please
	Design and technology		specify.)..
Not linked	Environment	**A10. Age of learners** (years)	
Linked (Please provide bibliographical	General	0–4	
details and/or unique identifier.)	Geography	5–10	**A13. Which type(s) of study does this**
....	Hidden	11–16	**report describe?**
....	History	17–20	A. Description
....	ICT	21 and over	B. Exploration of relationships
....	Literacy – first language		C. Evaluation
	Literacy further languages	**A11. Sex of learners**	a. naturally-occurring
A4. Language (Please specify.)	Literature	Female only	b. researcher-manipulated
....	Maths	Male only	D. Development of methodology
	Music	Mixed sex	E. Review
A5. In which country/countries was	PSE		a. Systematic review
the study carried out? (Please	Physical education		b. Other review
specify.)	Religious education		
....	Science		
....	Vocational		
....	Other (Please specify.)........................		

Review-specific keywords

A.1 Name of conferencing tool/software/platform	A.1.1 Details
A.2 Language of interest in study	A.2.1 Details
A.3 First language of learners	A.3.1 Details
A.4 Intervention (what, when, who, aim, sessions, duration, focus)	A.4.1 Details
A.5 Outcomes of study (e.g. effectiveness, motivation, confidence, other)	A.5.1 Details
A.6 Outcome measures (questionnaire, marks, special tests,etc.)	A.6.1 Details
A.7 Reported findings	A.7.1 Details

Appendix 3.1: SAC platforms found

(**Note:** Information was obtained in March 2005 in most cases from websites for the platform; it may not be up to date.)

Name and version	System and version	COST	AUDIO	WhBd	Txt Cht	Use in LL	Aimed at	Video	Data send	Graphics	Other
Blackboard	LS		?	✓	✓		HEd		✓		
BuddySpace 2.5.2	IM	free									
Centra 7	ILS		✓	✓	✓		Busn	✓	✓	✓	FL versions. Recordable
CentraOne 6											
ClicktoMeet 4.1			✓	✓		✓		✓	✓	✓	First Virtual
CometCam 4	VP	free beta	✓		✓		pt2pt	✓			
CommunityZero	IW	free			✓		MultiPt				
Conversay	VCS						Busn		✓		Works with other programs. Recordable
CUSeeMe 6.2	IM, VC		✓		✓		Ed, Busn	✓			First Virtual
DelphiForums	IM	free			✓?						Web board
Dwyco	VOI	free?	✓		✓			✓			
Electronic Classroom 2.5.9	SAC		✓	✓	✓	✓	Ed		✓	✓	No longer available Apple Mac
EyeballChat 2.2		free	✓		✓			✓			
FarSite 3 (DataBeam)			✓		✓						
FocusFocus											No longer available
Groove	FS							✓	✓		
Horizon Wimba (WebLab, LiveClassroom, EduVoice)	ILS		✓	✓	✓	✓	Ed	✓	✓	✓	Recordable
ICQ	IM	free	✓ multi		✓			✓	✓		I seek you
InterWise	SAC		✓	✓	✓	✓	Ed	✓		✓	HebrewOnline
IntraLearn	IMS		✓?	✓	✓		Ed	✓?	✓		
I-phone	IP		✓								
ITalk	VOI										
iVisit 2.8b11			✓	✓	✓		Ed	✓	✓	✓	

Name and version	System and version	COST	AUDIO	WhBd	Txt Cht	Use in LL	Aimed at	Video	Data send	Graphics	Other
Ivocalise	SAC		✓	✓	✓				✓	✓	Recordable. Live hyperlinks
Learning Community (ALPS)	IW	free?	n	n			Ed				Harvard
LearnLinc 6 ILink	AS		✓	✓	✓		Ed+	✓			Recordable. Synch web browser
LiveMeeting	WMS		✓	✓	✓		Busn				
Lyceum 3.6	SAC	✓	✓	✓	✓	✓	Ed			✓	
MediaRing	IP		✓				Busn				
MIRC	IRC	free	n		✓						
NetLearn Languages	WMS					✓					
NetMeeting 3.0.1	IM	free	✓	✓	✓		Busn	✓	✓		AS
Ofek	VC										
Optel	VC		✓					✓	✓		
PalTalk 7	IM	free	✓		✓	✓		✓	✓		
ReLaTe											
Roger Wilco	VOI		✓				Games				Works with other programmes
Skype	IP	free	✓								
Speak2Me			✓			✓					Japanese
Talk City	IRC				✓		Chat				
TeamSpace	IMS						Busn				
VoiceNet	ISP	n?			✓		Schools				
WebClassroom	IMS						Ed				
WebCT	IMS			n			Ed				
WisLine Web			✓	✓	✓		Ed	✓	✓	✓	Recordable
WisView											
Yahoo Groups	IM	free	n	n	✓	✓	Chat	n	n	n	
Yahoo Messenger 5.5.0	IM and VOI	free	✓		✓			✓			

KEY: **AS** – Applications Sharing; **FS** – File Sharing; **ILS** – Integrated Learning System; **IM** – Internet Messaging; **IMS** – Integrated Management System; **IP** – Internet Phone; **IRC** – Internet Relay Chat; **W** – Interactive Website; **LS** – Learning System; **SAC** – Synchronous Audiographic Conferencing; **VC** – Video Conferencing; **VOI** – Voice Over Internet ; **VCS** – Voice Commands System; **VP** – Video Phone; **WMS** – Web Meeting System

Appendix 3.2: Synchronous audiographic conferencing (SAC): mapped studies – summary characteristics

Study	Language studied	Re-search method	SAC platform	Intervention	Pop'n and educational sector	Sample size, sex, L1	Time	Aim	What measured	How measured	Findings as reported by the study authors
Batt 2003 PhD Aus	Japanese	Desc.	PC+tel	Use of SAC	Teachers and their classes Primary and secondary	3 teachers and their classes M & F English?	Not given	Does the interaction in these telematics promote L2 acquisition?	Discourse features, interactions	AV recordings, analysis by COLT - compare discourse features	Teacher-centredness of platform influenced communicative orientation. No strong evidence of use of TL, interaction, or use of extended text
Boyd 1995 PhD USA	French German Spanish Latin? (part of study)	Desc. Case study	Tele learning and Optel	Introduction of new technology (SAC)	Teachers Secondary and tertiary	21 M & F English	Not given	To observe the influence of time, experience, administrative support on instructional change	Use, professional growth, institutional change, student impact	interview, discussion, observation	'Disappointing effect on learning outcomes' and 'process of implementing innovation is poorly understood'
Cifuentes 2000 Article USA	not stated (included language teachers as part of study)	Comp study	QuickCams + CU-SeeMee	Interactive videoconf. *vs* desktop videoconf *vs* F2F in teacher training discussions	Trainee teachers Secondary	102 M & F English mainly	Not given	Can virtual meetings be as rewarding as F2F meetings?	Factors contributing to sense of reward	Naire survey after meetings	No differences between groups re goal clarity, satisfaction of goals, perspective gained, interest, positive effect, desire to continue partnership, benefit to participants or sense of reward
Ellis *et al.* 1996 Conf paper Aus	French, German, Japanese (part of study)	Desc, Case studies	Electronic Classroom	Use of SAC for DL school curriculum	School learners Secondary	Not given M & F English?	Not given	Evaluates deployment of SAC over time	Effectiveness	Not reported	Effective in wide variety of educational environments from primary to tertiary and in different curriculum areas including languages

Study	Language studied	Re-search method	SAC platform	Intervention	Pop'n and educational sector	Sample size, sex, L1	Time	Aim	What measured	How measured	Findings as reported by the study authors
Erben 1998 Conf paper Aus	Japanese (part of study)	Desc. case study	Electronic Classroom	Unit from regular teacher training course materials	Learners, Elementary, secondary and tertiary	1 class M & F English	4 x 30 mins x 4 weeks	Effect of SAC as an influence on interaction	Critical incidents – observation and description of events with explanation in context	Observation, interview and analysis of recorded data	SAC facilitates instructional practice for immersion and technoliteracy
Felix 2004 Conf paper Aus and UK	German	Desc. – ongoing?	Lyceum	Task using SAC – produce a piece of work at course end	Learners Tertiary	Not stated M & F English?	12 weeks but SS use as and when they want	Not stated	Not stated	Not stated	Multimodality of Lyceum appeals to learners
Hampel 2003 Article UK	German	Desc.	Lyceum	Use of SAC for teaching German course	Learners and tutors Tertiary	12 learners and 6 tutors M & F English?	10 tutor-ials, Feb – July 2002	To consider challenges of teaching online		Logbooks, question-naires, observation	Oral communication skills improved for most Overcomes distance, multimodal tools useful, improves electronic literacy, 66% Ts and SS believed technical difficulties have affect learning experience
Kotter 2001 Article UK	German, French	Desc.	VoxChat, email and website	Groups of learners collaborated on 3 tasks of increasing complexity	Distance Education learners of French and German Tertiary	Phase 1 -36, Phase 2 N=45 M & F English?	weekly, 3 months in 1998–9	To investigate relationship between use of SAC, opportunities for communicating interactive competence and confidence	Learner confidence Interactive competence Support requirements	Post-activity question-naires	Learners with limited oral competence productive; initial reluctance; environment reduced isolation; 20% dropout for technical problems
Levy 2004 Article Aus	Italian	Desc	NetMeeting	Theory-driven task, learners negotiate a project	Learners Tertiary	4 F only English and Spanish	not given	To provide means for students to practice speaking TL outside class time, and develop confidence to continue independently	Reflections on project, recall of process, focus on form, pronunciation, vocabulary, accuracy	Recorded on video and analysed	'Action through the task and reflection through the recordings can be supported.'

The use and effectiveness of synchronous audiographic conferencing in modern language teaching and learning (online language tuition): a systematic review of available research

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Study	Language studied	Re-search method	SAC platform	Intervention	Pop'n and educational sector	Sample size, sex, L1	Time	Aim	What measured	How measured	Findings as reported by the study authors
McGreal 1994 Article Canada	French as L2	Desc. and Comp.	Not stated	Use of SAC in school curriculum	School learners Second-ary	2 (but 62 in study)	2	To investigate attitude of learners to online learning	Attitude	SSATCC question-naire	No difference from F2F
McLoughlin 1999 Article Aus	Italian (and other subjects)	Desc, Action research	Electronic Classroom	Regular curriculum, classroom lessons, use technology, reflection and further use	Teachers and learners Secondary	N=30 in 5 groups M & F English?	3 x 10 wk terms	To enhance higher order thinking outcomes by use of technology to improve communication	Learner discourse Higher-order thinking	Observation, analysis of videos, discussion and reflection	Positive effect all subject areas including Italian. >use of technology led to >interaction, changes in learner dialogue and >higher order thinking
Oliver and McLoughlin 1997 Article Aus	Jap and French	Desc	Not stated	Use of SAC in school curriculum	School learners Primary (upper) Teachers	N=29 in 6 groups	Whole year	To investigate interaction between teachers and students	Interaction	Analysis of videotaped observation of 1 lesson	Positive. Interactive technologies played a critical role in lesson delivery and resulting learning environments were engaging and motivating for the learners.
Oliver and Reeves 1994 Conf paper Aus	Jap	Desc	Electronic Classroom	Use of SAC in standard curriculum in remote areas	School learners Secondary	Not stated	Several times a week	To increase access to education, improve achievement, reduce gender bias	Unclear, but access, equity	No details	Positive findings – good technology, many factors influence successful delivery.
Wang 2004 Article Aus	Chinese	Desc	NetMeeting	Use of NetMeeting to teach Chinese speaking skills	Learners of Chinese Tertiary	4 (8 started) M & F English?	5 x 60-90 mins, 29 sessions attempt-ed?	To evaluate the technical suitability of NetMeeting to support oral and visual interaction	User-friendliness of NM, audio and video quality, reliability, cost	Post-trial survey question-naire	Data support use of videoconferencing in DLE for the provision of oral-visual interaction