Collaborative Interdisciplinary Publication Skills Education:

Implementation and implications in international science research contexts

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Abstract

This portfolio of three research projects addresses at an educational level the increasing pressure on scientists internationally to publish research in highly-ranked, peer-reviewed journals, and thus in English. Building on a tradition of collaboration between language- and content-based expertise in English for Specific/Academic Purposes, the portfolio examines the contribution of a pedagogical approach dubbed Collaborative Interdisciplinary Publication Skills Education (CIPSE) for teaching novice scientist authors who use English as a first or additional language.

Project 1 examines CIPSE development from its antecedents in content-based learning and genre analysis, culminating in the production of a teaching text/website package *Writing Scientific Research Articles: Strategy and Steps* (WSRA) by a collaborative team of the candidate, an applied linguist, and a publishing, refereeing scientist. The aim was to redress the incomplete coverage of existing approaches to produce a resource accessible to novice authors of all language backgrounds and to teachers/mentors within both science and language contexts. The research questions driving Projects 2 and 3 emerged from initial implementation of CIPSE, and were addressed by analyzing evaluative data from selected implementation sites.

Project 2 investigates interdisciplinary teams for publication skills development. Part A, framed within the constructs of interdisciplinary higher education, demonstrates that the CIPSE structure, led by an applied linguist working with interdisciplinary collaborators as appropriate/available in each presentation context, was effective at all levels of collaboration. It was important that CIPSE outcomes were 'core business' for collaborators, and a need was identified for terminology that intersects with the agendas of those with power to implement. Part B, framed within English for Specific Purposes, focuses on challenges to interdisciplinary collaboration in China. Recommended strategies for developing collaboration between Chinese scientists and English-language professionals, rather than foreign visitors, include institutional support for collaboration, and training to enhance the ability of English professionals to present themselves as bringing valuable expertise to publication skills education.

Project 3 investigates CIPSE effectiveness for Chinese scientists at different career stages. Part A, addressing academic writing instruction, highlights challenges to publication success for EFL (English as a Foreign Language) science researchers as identified by CIPSE workshop participants. Introducing the WSRA package to Chinese scientists who train/mentor students resulted in significantly increased confidence both to write/publish their own articles and to teach others, and a shift in the training methods deemed appropriate. Part B analyses a 4-cycle action research study at

the Graduate University of the Chinese Academy of Sciences, Beijing, 2006-9, to investigate use of CIPSE in an EFL university with early-candidature students from mixed disciplines. The resulting adapted, CIPSE-based course shows potential for use by Chinese teachers.

Taken together, the three projects provide a theorised basis and practical steps for building effective training regimes for publication skill development in a wide range of science research contexts. Overall findings are summarised as a matrix of descriptor scales for analysing training contexts to identify cost-effective levels of collaboration: client training goals, trainee research experience, training program type, and English language context. The portfolio findings thus contribute to knowledge of interdisciplinary collaboration in education and context-sensitive implementation of educational innovation.

Signed statement

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Signed: ……

Date: ……

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List of abbreviations

AdTAT	Adelaide Text Analysis Tool (concordancing software)
ALL	Academic Language and Learning
CAS	Chinese Academy of Sciences
CGIAR	Consultative Group for International Agricultural Research
CIPSE	Collaborative Interdisciplinary Publication Skills Education
EAL	English as an Additional Language
EAP	English for Academic Purposes
EFL	English as a Foreign Language
EL1	English as a First Language
ESL	English as a Second Language
ESP	English for Specific Purposes
FLD	Foreign Languages Department (of GUCAS)
GUCAS	Graduate University of the Chinese Academy of Sciences
NNEST	Non-Native English-Speaking Teacher (Liu, 2007)
NEST	Native English-Speaking Teacher (Liu, 2007)
OD	Other Disciplines
PWSAIP	Preparing to Write a Science Article for International Publication
SFL	Systemic Functional Linguistics
SCI	Science Citation Index (Thompson Reuters)
TESOL	Teaching English to Speakers of Other Languages

1 Introduction to the Portfolio

1.1 Scene setting: the need for publication skills education in the sciences

Publication skills, education and science are not terms commonly associated with one another, although they deserve to be in the 21st century 'publish or perish' context. Education for scientists is most often conceptualised in terms of the scientific facts and methods of investigation that need to be taught and learned, and research scientists receive a thorough and rigorous education in these for the sub-field in which they choose to specialise. Science moves forward in each field on the basis of the findings of research studies, and the 'gold standard' document for reporting these studies is the peer-reviewed research article published in an internationally[1] acknowledged journal. In the current climate of globalised science and intense competition for research funding, these research articles have become almost an item of currency for ascribing value to the outcomes of a research project. Institutions, research groups and individual scientists (as well as countries) are under strong pressure to maximise the number and the quality of the articles they publish (Qiu, 2010). However, education for getting research articles published – publication skills education – is not often a feature of research training curricula (Lindsay, 2011), unless in general terms under the heading of 'generic training' (see Bastalich, 2010, p. 3 for a critique). The specifics of the craft within a researcher's own discipline are generally learned in a piecemeal way, through reading books or articles on the topic, attending talks at conferences, or individual mentoring, especially via written feedback on (many) successive manuscript drafts provided by an academic supervisor or a more experienced co-author. However, this ad hoc process can be time-inefficient and its outcomes highly variable (Duff, 2010); many early-career researchers report experiencing severe difficulties with getting articles to the submission stage (Ferguson, Perez-Llantada, & Plo, 2011; McGrail, Rickard, & Jones, 2006).

These difficulties are compounded for the large proportion of scientists internationally for whom English, the commonly accepted language of international science publication, is an additional language (EAL) (see Lillis & Curry, 2010, Chapter 1, and Ferguson et al., 2011, for recent discussion). Much expertise has been developed within the fields of English for Specific/Academic Purposes (ESP/EAP) for assisting EAL students studying in English-speaking countries to develop

[1] The term 'international' is both problematic and contested (e.g. Canagarajah, 2002, pp. 1-6) in the field of education, often reflecting an attitude that privileges Western academic knowledge making and academic practices when used without inverted commas. However, I have used it in this thesis as a referential category only, the sense common among the scientists with whom I have worked in the projects reported.

the skills needed for writing theses and articles in English (e.g. Swales & Feak, 1994, 2000; Weissberg & Buker, 1990), but it is rare for this expertise to be systematically available in science research contexts, especially in EAL locations.

There is a clear need for an improved approach to research communication training that can effectively support the efforts of research supervisors and others engaged with the development of early-career researchers worldwide. This portfolio reports the conceptualisation, development and implementation of a candidate improved approach, based in genre analysis/pedagogy and the theory of discourse communities and language socialisation, and investigates its applicability for and contribution to addressing training needs in a range of international science research contexts. The approach is named Collaborative Interdisciplinary Publication Skills Education (CIPSE) to highlight its key innovation: the focusing into systematic training for a single high-stakes communication event – the production of publishable research articles in the sciences – of the strengths long recognised within ESP of interdisciplinary collaboration between English language professionals and expert practitioners of the target discipline, here expert authors/referees of science articles.

1.2 Education for getting science research manuscripts published

Practising science researchers worldwide face strong and increasing pressure to publish their findings in highly-rated, refereed, international journals. It is almost axiomatic that this means publishing in English (Ammon, 2001), in spite of the additional difficulties this requirement causes for the very large number of scientists from backgrounds that can be characterised as English as an Additional Language (EAL, a term that encompasses both English as a Second Language (ESL) and English as a Foreign Language (EFL) and emphasises their additive rather than deficit nature). In spite of calls for understanding of these issues from some journal editors (e.g. Benfield & Howard, 2000; Gosden, 1992) and from those who work to support EAL authors (e.g. Langdon-Neuner, 2007), language issues continue to be represented strongly among the problems identified with submitted manuscripts (Mungra & Webber, 2010). This is reflected in calls such as this one from the website of Elsevier journals: “If English is not your native language, we recommend that you use a language editing service to improve the English language quality in your paper.” (Elsevier B. V., 2010). Two main types of paid language editing services are available. The first can be characterised as online, pre-submission, fee-for-service article editing, including that linked from

journal publishers' websites (e.g. Elsevier, Springer, Wiley). These businesses generally present their credentials in terms of the science content area of the papers and the native-speaker status of the editors, rather than emphasising any language-based expertise. The focus is squarely on an improved product, with no claims made that clients will learn improved skills for producing their next paper. This emphasis on product over learning/teaching process is a common barrier to skill development for novice authors, including students enrolled in research degrees (Cadman & Cargill, 2007). The second type is service offered by the professional group known as authors' editors (Shashok, 2001), who are more likely to include a training and skill-development focus in their work, and are represented by professional groups such as the European Association of Science Editors (http://www.ease.org.uk/about/index.shtml). Some productive interaction occurs between this group and the academic field of applied linguistics, in which this research is grounded (e.g. Burrough-Boenisch, 1999, 2003, 2005), and this field was strongly represented at the inaugural 2007 conference on Publishing and Presenting Research Internationally: Issues for Speakers of English as an Additional Language (PRISEAL, http://ija.us.edu.pl/sub/prisealweb/). Here should be added translators, who can be seen to offer a time-saving solution to the challenge of writing in English, but whose output may still be far from what was envisaged by the author, as described poignantly for authors writing in European languages in Lillis and Curry (2010, Chapter 4). In addition, unpaid, informal 'language brokers' and 'academic brokers' (Lillis & Curry, 2006, 2010) can be used as part of the author's support network to improve the language of a manuscript pre-submission, if available.

However, English acceptable to the journal can only help ensure that a manuscript receives what author's editor Mary Ellen Kerans calls a 'respectful reading' (Shashok, 2001, p. 116) from the editor and referees – it is the quality and innovation of the science, and the match of these attributes to the level and remit of the journal, that determine whether the article will be accepted for publication. Early career scientists with English as a first language likewise report difficulties in writing manuscripts that meet journal requirements (McGrail, et al., 2006); the problem clearly has a number of facets. Thus the development of any theoretically-grounded educational intervention to develop the skills of novice manuscript authors/submitters is from the outset likely to be an interdisciplinary task, involving the disciplinary content of and expectations for the papers to be submitted (here, a specific area of science), as well as the disciplines concerned with enhancing understanding of the final manuscript product (applied linguistics), and with the teaching and learning of the relevant skills and knowledge (education). This portfolio is concerned with such a program, which has been named to reflect its genesis and its *modus operandi* as Collaborative Interdisciplinary Publication Skills Education (CIPSE).

1.2.1 Science research communication: a broader context than (post)graduate education

The CIPSE name does not include the word *pedagogy*, although that it is what it is. The rationale for the naming relates to the audiences who need to relate to the name: scientists and administrators within science research institutions, who are the first-line potential users of CIPSE training. This audience differs in some important respects from that addressed by the recent book 'Publishing Pedagogies for the Doctorate and Beyond' (Aitchison, Kamler, & Lee, 2010), which reports on a range of initiatives and approaches relevant to publishing by doctoral students in the social sciences and humanities. The context of that work is doctoral education in the 2000s, with publication of students' research results seen very much within that frame. I would argue that for science the frame is somewhat different, and that publication has been part of the taken-for-granted expectations of the field for longer. Evidence for this is provided by the long-standing practice of science theses being compilations of published or submitted papers, for example in Sweden (Swedish National Agency for Higher Education, 2009). The need to promote publication in peer reviewed journals and advise novices on its intricacies exists in its own right outside the doctoral education frame for science, as well as within it, as evidenced by the plethora of books (e.g. Ebel, Bliefert, & Russey, 2004; Gustavii, 2003; Katz, 2006; Lindsay, 1995; J. T. Yang, 1995), articles (e.g. Mumpton, 1990; O'Connor & Holmquist, 2009) and websites (e.g. Doumont, 2010; International Network for the Availability of Scientific Publications (INASP), 2007-2011) available on the topic authored by expert practitioners (well-published scientists) and/or journal editors. However, this advice has both strengths and weaknesses for different segments of its target audience.

1.3 Strengths and weaknesses of advice authored by expert practitioners

The strengths of advice writing authored by expert practitioners centre particularly around the specific field knowledge they bring to the task – a first-hand and in-depth understanding of problems they often see in submitted manuscripts (e.g. Luellen, 2001), and of issues related to the presentation of research in specific sub-disciplines of science; see for example Zeiger (2000) and van Rooijen-Bless and Hull (2002) on biomedical articles and Ebel, Bliefert and Russey (2004) for chemistry. Thus when the focus is on 'what to write' in specific situations or discourse communities (see Section 1.4 for elaboration of this concept), practitioner-authored advice to novices can be both

accurate and highly informative. Issues can arise, however, when advice is stated as generalist guidelines for science article writing overall, in spite of the fact that the experience on which the advice is based is restricted to a relatively limited sub-area of science. The prevalence of this issue is highlighted by a comparison of the columns headed *Author expertise* and *Disciplines/author categories addressed* in Table 1.1. In applied linguistic terms, the issue relates to the fact that "even individual genres are not homogeneous, singular, pure, or static forms of discourse; they often contain hybrid ... features and change over time and across contexts and are enacted within the constraints and contingencies of each local setting" (Duff, 2010, p. 176). Thus it is important to match the local setting – disciplinary location – of the advice receiver with that of the provider, unless a principled way of addressing the discipline differences is adopted and made explicit to the readers.

This problem is less serious for journal articles containing advice, because the reading audience is determined for the most part by the journal publishing the article. For example, Mumpton's (1990) article with the generalist (and highly attractive) title 'The Universal recipe or how to get your manuscript accepted by persnickety editors' was published in *Clays and Clay Minerals*, defining thereby the type/s of article structure and editor issues likely to be relevant and therefore included in the article. For books, however, audiences are less well defined, and publishers may be more interested in attracting the widest possible readership for their titles than ensuring accurate delineation of author expertise, in titles or even in back-cover 'blurbs'. For example, the title *Writing your Journal Article in 12 Weeks: A Guide to Academic Publishing Success* (W. L. Belcher, 2009) deals only with social sciences and humanities articles (as mentioned in a reviewer comment on the back cover). It is to be expected that novice article authors may often need to rely on recommendations from their supervisors, or book reviews in journals in their own field, to point them to the most relevant advice for their particular type of article.

In addition to the 'what to write' information, novice article authors may seek advice on 'how to write'. This phrase can be interpreted in two ways: as 'what to include', and as 'what processes to use in producing the document'. The first interpretation is more commonly seen in the content of the advice literature reviewed here, notably in the title of a book often included in bibliographies for research student access: *How to Write and Publish a Scientific Paper* (Day & Gastel, 2006). This book differs from those discussed above in that Robert Day, the first author (and sole author of the first five editions, the current co-authored edition being the sixth), was a professor of English in US universities (now retired), rather than a scientist, teaching graduate and undergraduate courses in scientific writing from 1986-1999. A distinguishing feature of this book is its encouragement to readers throughout the text to consult recent articles from the journal to which they plan to submit,

Table 1.1. Comparison of selected books advising novice authors on the writing of scientific research articles.

Reference	Author expertise	Disciplines/ author categories addressed	Aspects Covered (D = discussed, Ex = exercises included) +						
			Journal selection	Writing order	Data pres-entation	Writing impact	Sentence issues	EAL[1] issues	Response to review
(Lindsay, 1995)	Animal Science	Scientists, students of science	-	D	D	D	D	D	D
(Katz, 2006)	Anatomy, EAL author	Contributing scientists	-	D	D	D	D	D	D
(Gustavii, 2003)	Medicine, EAL author	Novice writers	D	D	D	-	D	D	D
(Luellen, 2001)	Journal editing, journalism	Scientists, engineers, physicians etc	D (indirect)	-	D	D	D	-	D
(Zeiger, 2000)	Scientific writing	Biomedical scientists	D (one sentence)	D	D	D	D	-	-
(Ebel, et al., 2004)	Chemistry, EAL & EL1[3] authors	Chemists and related scientists	D	D	D	-	Another book	-	D
(J. T. Yang, 1995)	Chemistry, EFL author	EFL[2] researchers	-	D	D	-	D (some Ex)	D	D
(Day & Gastel, 2006)	English, science editing	Beginning and experienced scientists	D	D	D	D	D (+ another book)	D	D
(Weissberg & Buker, 1990)	English for academic purposes	Students of English	-	-	-	-	D, Ex	D, Ex	-
(van Rooijen-Bless & Hull, 2002) – includes exercise CDROM	Science wtng training, biomedical science	EAL biomedical scientists,	-	D	D	D	D, Ex	D, Ex	-

[1]EAL = English as an additional (second or foreign) language [2]EFL = English as a foreign language [3]EL1 = English as a first language

the target journal, in order to check the specific requirements and conventions for the aspect under discussion. This practice stands in contrast with that of the scientist authors reviewed, who generally rely on the provision of short examples (sometimes from a wide variety of sources, e.g. Katz, 2006) to demonstrate their points. However, little specific guidance is provided by Day and Gastel about how most productively to undertake the suggested analysis of papers from the target journal, or on steps to take as a result in producing a manuscript efficiently. This can be problematic for novice authors; as Duff (2010, p. 176) points out, the most effective programs, activities and instructors "not only display, but also make explicit, the values and practices implicit in the culture and provide novices with the language, skills, support, and opportunities they need to participate with growing competence in the new culture and its core activities.

Novice article authors from EAL backgrounds appear not to be well catered for by the existing literature, except perhaps for those working in some specialisms such as biomedicine (van Rooijen-Bless & Hull, 2002). Most resources refer to this important segment of their potential readership, and give some advice about the use of English. However, although mostly relevant and potentially useful as far as it goes, this advice is usually very brief (e.g. Doumont, 2010; Gustavii, 2003), and often lacks specific guidance presented in terms relevant to the language knowledge EAL writers can be expected to bring to the task. Even Day and Gastel (2006), in their section on the complex issue of *Tense in scientific writing* (pp. 191-193), rely on examples rather than principles derived from them in describing the various usages that occur. This approach can be explained by the fact that the main audience for the book, relatively young speakers of English as a first language (EL1), are now unlikely to be at all comfortable with the use of traditional grammatical terms, leaving the book authors with a dilemma in trying to explain effectively the reasons for specific language choices. Alternatively, principles are presented as invariant rules, with limited or no consideration of alternative uses in different scientific disciplines (e.g. J. T. Yang, 1995; Zeiger, 2000). This tendency reflects a proclivity for prescriptivism which bedevils the area of English grammar and usage more broadly (Crystal, 2006), with a method having even been developed for gauging its presence in a writing handbook (Mackiewicz, 1999).

In contrast, books that come from an English language teaching perspective based on genre analysis (e.g. Weissberg & Buker, 1990) have strengths relating to their reliance on applied linguistics research, including corpus-based studies of actual usage in relevant writing contexts. They effectively demonstrate and provide practice in aspects of English grammar and usage that commonly cause problems for EAL authors in the various sections of a scientific paper, and on broad issues of genre and article structure, but often lack a focus on discipline-specific variation and the

vitally important strategic elements of paper writing related to journal selection, data presentation and response to review (Table 1.1). This may reflect the pressure felt universally in universities for programs teaching ESP/EAP to focus on the generalisable and transferable, at the expense of the discipline-specific (Ken Hyland, 2002).

The English-language perspective resources share another feature – a clear assumption that they will be used as a basis for teaching, as well as self-study resources for individuals. Thus they tend to contain exercises which provide additional practice in points presented – in the case of van Rooijen-Bless and Hull (2002), a CD-ROM of exercises was provided, although advances in computer software have now limited its usability. This assumption of a teaching use that involves student active learning and goes beyond the simple presentation of content is largely missing from the texts authored by expert practitioners and/or journal editors (Table 1.1), with the exception of Zeiger (2000) for biomedical articles. It would seem clear then that an educational approach is needed that is able to balance more effectively the science-based and the language-based aspects of the challenges involved in getting scientific research manuscripts published, while also recognising the importance of hands-on, scaffolded experience in the learning of new language skills (Cadman & Grey, 1997) and in induction into new contexts of text production for newcomers from all language backgrounds (Duff, 2010).

1.4 Theoretical framework: Genre analysis, discourse communities and communities of practice

Promising foundations for such an improved approach are offered by perspectives from applied linguistics and related socio-cultural theory: the analysis of written 'genres' and the discourse communities that create and use them (Hyon, 1996; Swales, 1990, 2004); and the concepts of communities of practice (Lave & Wenger, 1991; Wenger, 1998) and language socialisation (Duff, 2010). This cluster of concepts forms the basis of the theoretical framework for this research portfolio.

The definition of genre to be used here in relation to scientific research articles emerges from discussions by John Swales (1990, 2004) and seeks to respond to his call that for researchers in English for Research Purposes, a theoretical construct should be "manageable but respectable –

one that is sensitive without being debilitatingly complex" (Swales, 2004, p. 4). This call is even more relevant when the audiences to be addressed include those for whom the terminology can be expected to be new, as with scientists in the present study. For these reasons I quote from Swales' early (1990, p. 58) definition of genre:

> A genre comprises a class of communicative events, the members of which share some set of communicative purposes. These purposes are recognised by the expert members of the parent discourse community, and thereby constitute the rationale for the genre. This rationale shapes the schematic structure of the discourse and influences and constrains choice of content and style.

When appropriate for the audience, this definition can be simplified as follows: a written 'genre' is a type of text or document, with characteristics of structure and language recognised as appropriate by those who write and read it.

Thus the boundaries of a genre in the sense I will use it here depend on the understandings of the parent 'discourse community', a term which Swales points out has been appropriated by various writing researchers coming from a social perspective. He quotes a useful summary of the term's meaning from a talk given by Herzberg:

> Use of the term 'discourse community' testifies to the increasingly common assumption that discourse operates within conventions defined by communities, be they academic disciplines or social groups. The pedagogies associated with writing across the curriculum[2] and academic English now use the notion of 'discourse communities' to signify a cluster of ideas: that language use in a group is a form of social behaviour, that discourse is a means of maintaining and extending the group's knowledge and of initiating new members into the group, and that discourse is epistemic or constitutive of the group's knowledge. (Herzberg (1986) in Swales, 1990, p. 21)

From this perspective, disciplines within science can be seen to represent macro-level discourse communities (e.g. biology, physics, chemistry), which share to some extent a common set of understandings, terms and research methodologies, and therefore ways of seeing the world. Within each of these is a variable number of more specialised discourse communities representing research fields. Thus many of the issues described earlier about advice on article writing authored by expert

[2] Writing Across the Curriculum (WAC) is a name applied in the USA to approaches that train and encourage lecturers across the content areas to focus on and develop student writing as part of their teaching repertoire (Bizzell & Herzberg, 1985).

practitioners can be attributed to problems (for both authors and publishers) in recognising and responding to differences based in the discourse communities to which potential readers may belong, or to which they may be seeking admittance, in the case of novice manuscript writers.

Recent analysis of the science article genre and its sub-genres (see below) that are created and used by the various discourse communities has produced considerable insight into their structures and language features (e.g. Ken Hyland, 2000; Myers, 1991; Posteguillo, 1999; Samraj, 2002). Genre analysis is based on two central assumptions: "that the features of a similar group of texts depend on the social context of their creation and use and that those features can be described in a way that relates a text to others like it and to the choices and constraints acting on text producers" (Ken Hyland & Salager-Meyer, 2008, p. 303). For those interested in teaching article writing skills to novices, this work is valuable in two ways: for the findings produced in terms of fine-grained differences between the products of different discourse communities (which can be designated 'sub-genres') (e.g. M. Robinson, Stoller, Costanza-Robinson, & Jones, 2008, for chemists); and for the methods used to discover them, some of which can be modified for use in teaching contexts. These include the methodologies of corpus linguistics (e.g. Gavioli, 2005; Groom, 2005; Ken Hyland & Tse, 2005; Williams, 1998; Yoon & Hirvela, 2004), which enable computer-based examination of purpose-designed collections of text (*corpora*, singular *corpus*) such as published articles from a nominated discipline, research field or journal (Cargill & Adams, 2004; Lee & Swales, 2005). Taken together, these features allow teaching to be based more on *description* of what actually gets published than on *prescription* (or prescriptivism, as discussed earlier) based on personal and necessarily limited experience (but see Widdowson, 1991 for critical perspectives).

When using the findings of genre analysis studies in educational programs for working scientists, an issue needing careful attention is the appropriate level of analytical detail to use. What is needed is a schema of stages or moves for the various article sections that represents the genre analysis findings relatively accurately and yet is general enough to be usable by trainees without bogging them down in over-fine distinctions. Hopkins and Dudley-Evans (1988, p. 120) describe the needed framework as "comprehensible to and capable of application by practitioners and subject specialist informants" (by which he meant specialists who 'inform' linguists about language use in their fields). In the present context, we need to extend this description beyond *informants* to include *users* of the genre. An early genre-based teaching text that grappled effectively with this question is that by Weissberg and Buker (1990), designed for "students of English" (as highlighted in the title) writing research reports in all fields that collect and analyse data. Based on successful experience using this

text with international research students in the 1990s, a similar level of simplification of the genres was adopted as a starting point for the materials developed in the work reported in this portfolio.

An elaboration of the idea of genre can demonstrate its relationship to its parent community. In an extension of his original conceptualisation of genre, Swales (2004, pp. 12-25) discusses various kinds of 'constellations of genres': hierarchies, genre chains, genre sets and genre networks. Whereas a genre chain can be exemplified by the sequential documents representing the process of having a conference presentation accepted and published in proceedings (from 'Call for abstracts' to the final published paper), a genre set is rather the collection of genres that a class of individual "engages in, either or both receptively or productively, as part of his or her normal occupational or institutional practice" (Swales, 2004, p. 20). A written genre set centring on a science manuscript submitted to a journal could include the following: the researcher's lab book, the target journal's aims and scope and/or instructions to authors, notes of co-authors' meetings, slides for a lab-group presentation on the material, successive drafts of the manuscript, comments from co-authors, the covering letter (email/upload) to the journal, the editor's response letter and referee reports, and authors' rejoinder/s, as well as the final published version of the paper. The set would be expanded if spoken genres were included, such as informal discussion of the material or the spoken text of the talk. The nature and extent of this set brings us to the central importance of the concept of 'communities of practice' to the interdisciplinary undertaking that is represented by an educational intervention to develop skills for getting research articles published.

Communities such as those producing the published research articles that are the focus here fit well within the definition given by Wenger (1998, p. 45): "a kind of community created over time by the sustained pursuit of a shared enterprise". The concept of communities of practice has been widely used and elaborated, in particular within social sciences, management and education (Barton & Tusting, 2005). It has contributed to a shift in thinking about learning from an apprenticeship model to one focused on action, on participation in the relevant communities of practice. Although the original formulation of the concept was not focused on formal educational contexts, Lea (2005, p. 185) suggests that in Wenger's (1998) discussion, "the practice ... becomes the curriculum", an idea that was formative in the development of CIPSE. The crucial factor was seen to be participation in the science community undertaking the research, interpreting its results, and presenting, debating and publishing them. The academic communities or disciplines that function in this way have been described as "central to our understanding of science and science writing" by providing "a way of understanding the social practices of academics acting as group members" (Ken Hyland & Salager-Meyer, 2008, p. 311). An example is the cluster of practices around the refereeing of journal articles,

which can be expected to differ in their specifics according to the discipline of the researchers. Membership of the relevant discourse community would seem to be needed for access to these practices, as the documents produced (e.g. referee reports) remain largely an 'occluded genre' (Swales, 1996).

This focus on participation in the group or community is emphasised in the concept of language socialisation, characterised not as a passive acceptance by novices of the practices they encounter but as "a dynamic, socially and culturally situated, multimodal, and often multilingual process with unpredictable uptake, intentions, behind-the-scenes power plays, investment on the part of learners, and outcomes" (Duff, 2010, p. 186). Duff (2010, p. 186) stresses that "schools, universities, and other sites for socialization into academic discourse and into academic discourse communities need to increase the ... support made available to students and instructors to enhance the quality of language and literacy socialization in their midst and to accommodate and support newcomers—from all language backgrounds". An educational intervention designed to help develop skills to write effectively for international publication would thus involve helping prospective authors participate in such communities *in English*, even in contexts where this is not the home language of their work environment. A particular need therefore is an appropriately focused pedagogy for publication skill development in contexts where English is a Foreign Language (EFL), such as China. A relevant example is a course for undergraduate medical students (also presented in a continuing education mode) that has emerged from the community of practice of academic medicine in Croatia (Marusic & Marusic, 2003). This course has a majority focus on the design and conduct of research, with scientific writing less prominent, in response to the authors' experience of editing the *Croatian Medical Journal*. This showed that "[t]he most difficult problem was not English but lack of understanding of basic principles of data presentation and scientific writing" (Marusic & Marusic, 2003, p. 1236). The importance of this emphasis on the science and its logical presentation to an audience with clear expectations is echoed in Lindsay's (2011) expansion of his earlier (1984, 1995) work, now entitled *Scientific Writing = Thinking in Words*. Thus it is these basic principles (i.e. focus on the science itself as well as its clear presentation to a specific audience) that need to be represented in the kind of educational intervention envisaged in this portfolio and described under the CIPSE name.

One promising resource to call upon in seeking to develop such an intervention is the body of work alluded to earlier as emerging from the work of genre analysts and those researchers who have taken these findings and developed 'genre pedagogy' based on them (e.g. Clerehan & Moodie, 1997; Cope & Kalantzis, 1993; Dudly-Evans, 1997; Ken Hyland, 2007; Weissberg & Buker, 1990).

Teaching and learning genres in this way involves a cycle of analysis/discussion, modelling, joint construction and individual construction, which can be entered at any point and any stage of which can be repeated as many times as necessary (Martin, 1989). However, analysis from the language side only is acknowledged to entail limitations in terms of facilitating full access to a discourse community/ community of practice to which the analyst does not belong (Dudly-Evans, 1997; Spack, 1988; Swales, 1990). One recognised way to address this issue is by collaborative interaction across discipline boundaries, through the use of sympathetic informants who can explain puzzling language usage or interpret the reasons for the inclusion of particular information or wordings in particular places in a document (e.g. Benfield & Feak, 2006). Such interactions have been an accepted part of the fields of English for Specific Purposes (ESP) and English for Academic Purposes (EAP) in university contexts for many years (e.g. Dudley-Evans, 2001), as well as being recommended for educational contexts within science research institutions (Ramani, Chacko, Singh, & Glendinning, 1988). They also have a long and successful history within ESP courses in vocational contexts, the "corporate settings where the expertise of specialist [ESP] practitioners is actively sought and highly valued" (Ken Hyland, 2002, p. 388).

This interaction can be extended to develop interdisciplinary teams, using the term 'interdisciplinary' in the sense proposed by the OECD in 1972, as involving "the interaction among two or more different disciplines … [which] may range from simple communication of ideas to the mutual integration of organizing *concepts, methodology, procedures, epistemology, terminology, data* ..." (OECD, 1972, p. 25). The disciplines in the case of CIPSE are, on the one hand, those of the scientists being supported in manuscript writing and, on the other, those of the supporters – applied linguistics and education. Ideally, the interdisciplinary collaboration envisaged involves team members focusing their different but complementary expertises on solving a common problem, such as that represented by the need for publication skill development.

However, a limited amount is known about the practicalities, especially in international contexts, of developing effective interdisciplinary collaborations between members of disciplines with distinctly contrasting perspectives, such as applied linguistics/EAP and science. Reluctance to collaborate has been reported in one EAP context in Hong Kong (Braine, 2001). Barron (2003) also reports difficulties that occurred when EAP and science faculty staff worked together on an undergraduate science course, also in Hong Kong. The problems were based on inflexible understandings on both sides, characterised by Barron (2003) as ontological in nature and based in functionalism. His analysis finds that, for collaboration to have a good chance of success,

> [t]here has to be ... a flexible ontological background that is open to negotiation and change. The alternative to the absolutism of the realism of science and the functionalism of applied linguistics is, perhaps surprisingly, constructivism. It offers a good possibility for collaboration at both the disciplinary and intercultural levels because it relies on reciprocity (Barron, 2003, p. 312).

The seven primary constructivist values are listed as collaboration, personal autonomy, generativity, reflectivity, active engagement, personal relevance, and pluralism (Lebow, 1993, p. 5), and these sit well with the nature of the real-world problem addressed in this portfolio – the need to produce scientific articles acceptable for international publication. Neither a scientist instructor nor an ESP/EAP practitioner has all the answers to the problem posed by the publication challenge, which should encourage collaboration, and the novice author is by definition actively engaged in the enterprise. Exploration of the possibilities and pitfalls offered by collaborative interdisciplinary teams in this kind of situation could be expected to have outcomes with relevance for the future of work relationships in the range of contexts represented by the globalised science research environment of the 21st century.

An additional disciplinary perspective is relevant to the problem of developing an educational approach to improve publication outcomes for novice science authors at this time – that of business, in the sense of the practices required to interact with the 'market' for the training on offer. This aspect has not generally been part of the training or experience of ESP/EAP academics within universities in recent times – employment for most of us has revolved around responding to advertisements for positions and attending selection interviews – even if we have worked in language centres outside universities. However the shift to more corporatized models of administration within universities that has been increasing in momentum in recent years has meant an increased use of consultants rather than permanent staff to provide specialist services, including professional development services, among the "increasing proportion of flexible workers—contract, sessional and part-time" (Thornton, 2004, p. 3). Thus even within universities there is a sense in which the situation is becoming reflective of ESP programs of an earlier period, before the separate identity of ESP became perhaps eroded by the adoption of many of its innovations within general English teaching (J. Flowerdew, 1990). The paper by Boswood and Marriott (1994, p. 6) describes a training program to help English as a Second Language (ESL) teachers develop the additional skills and "professional discourse" required when they moved into the sphere of ESP, which included the notion of training courses as *product*, and the importance of *marketing* and *branding, value-added services* and *client education.* Swales (1989) used the business term 'opportunity cost' in the title of his chapter on service English

program design. Thus there is a historical tradition of entrepreneurial activity that needs to be factored into the theoretical framework for this project, as a response to specific features of the communities of practice represented by science disciplines in the early 21st century.

1.5 A reflective practitioner approach to international and intercultural implementation of educational innovation

A feature of the current educational discourse around higher education and research training is the concept of quality and its assurance. When considering what educational quality means and how it can be promoted, both purposes and contexts are important, as McGrath (2010, p. 335) emphasised in a recent editorial in the International Journal of Educational Development. Curriculum work can be productively viewed as "an intricate web of actions, apparently seamless and credible, but paradoxically subject to a plethora of opposing tensions and pressures" (Groundwater-Smith, 1988, p. 93), which constitute its context. Given the importance of (disciplinary) context in the development of CIPSE, it was always a central concern to include a careful focus on issues of context when moving to implementation, especially in sites outside the approach's Australian 'home range', which can clearly be characterised as within the Western academic tradition. Context- and culture-sensitive implementation of innovations can be promoted through a reflective research approach, framing the work in the understandings of reflective practice (Schon, 1987) that have proved so productive for educators across the sectors. For example, Walker et al. (1996) provide an account of introducing problem-based learning (PBL) into a masters level course in educational administration in Hong Kong. The culturally-aware and reflective, inquiry-based method they followed brought them to the far-reaching conclusion that "[i]f observations of group functioning, approaches to group leadership and the operation of hierarchy, are reflective of broader management practices in schools, the applicability of Western theory and practice in Chinese settings must be questioned" (p. 29). O'Sullivan (2002) used an action research methodology, which fits under the broad umbrella of reflective practice, to explore different strategies within a training program for un-qualified and under-qualified primary school teachers in Namibia, and found that it enabled a rigorous and systematic development of effective strategies.

The reflective practitioner framework was chosen as being particularly appropriate for the studies reported in this portfolio. The framework involves a strong element of critique, described by

Groundwater-Smith (1988, p. 93) as involving, in the case of curriculum work, "collaboration between enquirers, wherein they investigate in a manner which is predicated upon self-reflective and socioculturally reflexive deliberation". A number of the quality criteria for reflective practitioner research listed by Creswell (2005, p. 274) were seen to be particularly relevant to the CIPSE project. These included the researcher as the instrument of data collection, a focus on participants' views, the requirement for heightened self-awareness in the research process, extensive data collection in the field and the presentation of multiple perspectives. These conditions could be met in the international science research contexts where CIPSE was implemented, and the requirement for heightened self-awareness and socioculturally reflexive deliberation was seen as particularly important in those contexts.

There is a considerable history of problematic attempts to introduce educational innovations originating in 'developed' countries such as the USA, the UK, Australia and Canada in countries that can be described as 'developing'. Examples that are relevant to the current project include the introduction of learner-centred teaching approaches and reflective professional development approaches in Namibia post-independence from South Africa (O'Sullivan, 2002, 2004), the introduction of communicative language teaching in China (Hu, 2002; Ouyang, 2000, 2003) and of problem-based learning in Hong Kong (Stokes, 2001; Walker, et al., 1996), and the Brazilian ESP Project (Holmes & Celani, 2006; Labassi, 2010). Reflective analyses in the literature of these kinds of experiences provide clear pointers to the types of issues that need to be investigated and considered at depth when the implementation of innovations originating in a foreign context is proposed. These include the culture of the target implementation site at the levels of national culture (Law, 1996), educational system, and the culture of learning and teaching (Cortazzi & Jin, 1997). When the implementation contexts extend beyond the formal education system into the workplace, as in the present case, the range of relevant issues is likely to escalate, and may well relate quite specifically to features of the innovation being introduced.

Case-study is a well-recognised tradition of inquiry used as a procedural guide by reflective practitioners (Creswell, 2005, p. 274), and the studies reported in this portfolio of the implementation of the CIPSE approach extend the range of contexts investigated in this way. The studies presented include analysis of steps taken to address issues identified. The aim of including this element is to provide "greater utility ... [by concentrating] on *why* certain key decisions were made" (Swales, 1989, p. 81). In the implementation of CIPSE, the team was especially concerned to avoid as much as possible the pitfalls of 'one-shot' professional development programs (Cannon & Hore, 1997),

especially given that funding- and job-based constraints restricted us to short visits only to the implementation sites.

An approach commonly used by reflective practitioners in the field is action research, which involves a spiral of cycles of planning, acting, observing/researching and reflecting (McKernan, 1996). Kember's (2001) chapter in Watkins and Biggs (2001) reports that action research proved to be an effective method for transforming teaching for academics in Hong Kong, in spite of initial misgivings that the methodology would not be suitable there. The action research category *practical action research* (Creswell, 2005, p. 552) was regarded as appropriate for investigating CIPSE implementation because of its capacity to "research a specific ... situation with a view toward improving practice" (Schmuck, 1997, in Creswell, 2005, p. 552). In order for this methodology to be appropriate, there needed to be a clearly delineated 'specific situation' to be the focus of the research, which meant in practice a particular implementation site that offered the possibility of repeat visits, rather than one-off training events or courses. This was provided by the Chinese university context investigated in Project 3B, and more detail on the action research framework adopted is therefore given in Section 4.5.4.1. The reflective practitioner approach (e.g. McKernan, 1996; Schon, 1987) on which action research is based represents the encompassing frame within which the entire study was conducted.

Given the tension-filled history of attempts to implement pedagogies developed in Western academic environments in contexts with different educational traditions and values, further investigation is needed of the range of contextual factors that need to be considered when proposing such implementation. As well as those factors identified in the literature to date, these are likely to include specific factors relevant to the pedagogy in question, and it is likely to be useful for future implementations to investigate the relationship between factors identified in particular contexts and steps taken to address them.

The three Projects presented here seek to address the broad knowledge gaps and practical needs identified above by examining the development and implementation of the CIPSE approach, the structure and effectiveness of interdisciplinary teams in this process, and the relationship of a range of contextual factors to its applicability and usefulness.

1.6 Overview of portfolio design and study contexts

The work reported in this portfolio represents a longitudinal study which commenced within the context of my employment within various administrative divisions of an Australian university and moved through transitional stages to a fully consultancy-based situation from early 2009. In this situation my role within the university was as an unsalaried adjunct staff member, providing services to the university on the same basis as to other clients. This gradual shift from employee to consultant provided a valuable opportunity to step back from the specifically higher education context where the work began, to see science research as a broad international undertaking with needs that may not coincide completely with those of higher education. The trialling and implementation of CIPSE in a range of forms and contexts over the period 2000-2009 enabled the collection of extensive data in multiple forms, both quantitative and qualitative, as described in Project 1, contributing to the rigour of the research approach (Creswell, 2005, p. 274). Individual datasets were selected for analysis and comparison in the three projects reported in the portfolio, including in the papers and book chapters published and/or submitted prior to the commencement of, as well as during, my candidature from 2006-2011 (Table 1.2). Three co-authored publications are incorporated in the thesis:

- Cargill, M., & O'Connor, P. (2010). Structuring interdisciplinary collaboration to develop research students' skills for publishing research internationally: Lessons from implementation. In M. Davies, M. Devlin & M. Tight (Eds.), *Interdisciplinary Higher Education: Perspectives and Practicalities. International Perspectives on Higher Education Research Volume 5* (pp. 279-292). Bingley, UK: Emerald Group Publishing Ltd.
- Cargill, M., O'Connor, P., & Li, Y. (in press). Educating Chinese scientists to write for international journals: Addressing the divide between science and technology education and English language teaching *English for Specific Purposes*.
- Cargill, M., & O'Connor, P. (in press). Identifying and addressing challenges to international publication success for EFL science researchers: Implementing an integrated training package in China. In R. Tang (Ed.), *Academic Writing in a Second or Foreign Language: Issues and challenges facing ESL/EFL academic writers in higher education contexts*: Continuum.

Details of co-author contribution and the relationship of each to the overall concerns of the thesis are provided in the relevant sections of Parts 3 and 4.

Selections of datasets were based on the characteristics of the teaching contexts and workshop participants and their relevance to the objectives of that project. Where particular workshops are

discussed in more than one project and/or publication, the types of data used are distinct. The educational contexts for each of the three portfolio projects are described in more detail in Section 1.7.

Table 1.2. CIPSE workshops conducted 2000-2009 and publications/portfolio projects analysing data from them. Columns in grey represent publications/manuscripts included in the portfolio.

CIPSE Workshop/ Publication (Portfolio Project no.)	**TinC 2002[1] (1)**	**THE 2004[2] (1)**	**JEAP 2006[3] (1)**	**Revista 2006[4] (1)**	**Interdis HE[5] (2)**	**ESP[6] (2)**	**Issues[7] (3)**	**AILA[8] (3)**
Hanoi 2000	x	x		x				
[9]CAS Beijing/Nanjing 2001	x	x	x	x				
Lanzhou 2002			x	x		x		
CAS Beijing 2003			x	x				
CAS Beijing 2004				x				
Inst. of Botany CAS 2005				x		x		
Uni of La Laguna, Spain 2005				x	x			
[10]GUCAS 2006					x	x		x
Nanjing Uni 2006						x		
Shanghai Uni 2006						x		
GUCAS 2007								x
New Phytologist-Beijing 2007					x	x	x	
One-day workshops in Australia 2001-8		x			x			
GUCAS 2008								x
GUCAS 2009								x
Changchun Institute of Applied Chemistry CAS 2009							x	
China Academy of Engineering Physics 2009							x	
New Phytologist-Kunming 2009							x	

[1](Cargill, 2002b) [2](Cargill, 2004); [3](Cargill & O'Connor, 2006a); [4](Cargill & O'Connor, 2006b); [5](Cargill & O'Connor, 2010); [6](Cargill, O'Connor, & Li, submitted); [7](Cargill & O'Connor, forthcoming); [8](Cargill, Peng, & O'Connor, 2011 in preparation);

[9]Chinese Academy of Sciences; [10]Graduate University of the Chinese Academy of Sciences.

1.7 Aims and contexts of the three research projects

1.7.1 Project 1− Developing a publishing pedagogy based on interdisciplinary collaboration: Theoretical bases and initial implementation of CIPSE

1.7.1.1 Aims

The aims of this project were

- to synthesise, from my own previously published papers, those of my University of Adelaide colleagues and the literature in the field more broadly, the main theoretical and practice-based trends within education, applied linguistics and English for Academic Purposes (EAP) that underpinned the development of CIPSE and the teaching text exemplifying the approach (*Writing scientific research articles: Strategy and steps,* Cargill & O'Connor, 2009); and
- to explicate, through commentary on published work, reports to institutional stakeholders and unpublished data, the development of the work with particular institutions in China and elsewhere and individual clients (2001-2006), and the emergence of the research questions that form the foundation for the subsequent projects.

1.7.1.2 Educational context

The institutional context for the development of CIPSE was the University of Adelaide, South Australia, and specifically the various academic homes (1994-2009) for the *Integrated Bridging Program for international postgraduate students*, a forerunner to CIPSE. These were the Advisory Centre for University Education, the Learning and Teaching Development Unit, the Centre for Learning and Professional Development (sequential restructurings of a unit within the portfolio of the Deputy Vice-Chancellor [Academic]), and the Researcher Education and Development unit of the Adelaide Graduate Centre, within the portfolio of the Deputy Vice-Chancellor (Research). The important parallel context for this development was the Faculty of Agricultural and Natural Resource Sciences, later subsumed within the Faculty of Sciences, which was the home of the science academics who contributed to the shaping and development of CIPSE from the outset, and the faculty where my adjunct position was located from early 2009.

The main context for the early implementation of CIPSE in China was the Chinese Academy of Sciences (CAS), and the work was conducted under the auspices of the International Affairs Bureau within CAS headquarters.

1.7.2 Project 2 − Examining interdisciplinary collaborations: possibilities and challenges for CIPSE implementation

1.7.2.1 Aims

The aims of this project were

- to identify relationships between contextual factors and the practicalities of structuring interdisciplinary teams, through analysis of outcome data from CIPSE workshops held in a wide range of contexts, in Australia and internationally, and based in both science-teaching and English-teaching locations; and
- to explore one instance of a barrier to interdisciplinary collaboration, the divide between science and technology education and English language education as it exists in China, and to analyse the role CIPSE might play as a tool and framework to help address it, in the interests of promoting effective practice for educating Chinese scientists to write for publication in English.

1.7.2.2 Educational context

Contexts used for Project 2A, the study of the structuring of interdisciplinary collaboration, were three science-based disciplines within the University of Adelaide (Physiology, Soil Science and Gastroenterology) and three international contexts (Department of Psychology, University of La Laguna, Tenerife, Spain; Department of Foreign Languages, GUCAS, Beijing, China (2006 course); and a workshop for plant scientists sponsored by the *New Phytologist* journal in Beijing (2007).

For Project 2B, the study of the divide between science & technology (S&T) teaching and English language teaching (ELT) in China, CIPSE data were considered separately for workshops taught in these two contexts. S&T data came from workshops taught at Lanzhou University, Gansu (2002); CAS Institute of Botany (2005); and the *New Phytologist* workshop, Beijing (2007). ELT data were collected at workshops run at GUCAS (2006), Nanjing University (2006) and Shanghai University (2006). Additional information, particularly that from texts available only in Chinese, was contributed by a highly-qualified collaborator, Dr Yongyan Li, from Hong Kong University. Her recent PhD thesis and related publications were based on a study of doctoral science students writing for publication at

a major Chinese university (John Flowerdew & Li, 2007; Li, 2002, 2006a, 2006b, 2006c; Li & Flowerdew, 2007).

1.7.3 Project 3 − Investigating contextual factors: Implementing CIPSE for Chinese science researchers at differing career stages

1.7.3.1 Aims

The aims of this project were

- for practising science researchers in China, using data gathered from CIPSE training events held for researchers in a range of science disciplines, to identify the important issues and challenges faced, both in writing for publication in English and in training others to do so, and to evaluate the contribution of the CIPSE approach to addressing these issues; and
- for early-candidature HDR students not yet conducting their own research, to work with senior Chinese academic and administrative staff and classroom teachers within the Graduate University of the Chinese Academy of Sciences (GUCAS) to teach, evaluate and improve through four iterations (2006-9) an assessed summer-school course on publication-skills development, and to develop recommendations for the implementation of relevant CIPSE elements in this and other similar university settings in China and other EFL contexts.

1.7.3.2 Educational context

The CIPSE workshops that provided the data analysed in Project 3A, the study of issues and challenges for practising researchers, were conducted in China on a consultancy basis in the period 2007-2009. Clients were

- the New Phytologist Trust, UK (http://www.newphytologist.org/), a charitable trust that publishes a highly-rated plant-science journal and devotes profits to developing the field through initiatives that have included CIPSE workshops;
- the Changchun Institute of Applied Chemistry (CAS; workshop part-funded by BHP-Billiton); and
- the Chinese Academy of Engineering Physics, Mianyang, Sichuan, China.

The teaching work reported in Project 3B, the action research study of CIPSE for EFL students not yet conducting research, was funded by BHP-Billiton (Technology) and took place during summer-

school sessions (2006-2009) of the Graduate University of the Chinese Academy of Sciences (GUCAS), Beijing.

1.8 Conclusion

The work reported in this portfolio aims to provide an educational response to the pressure on early-career scientists (including research students) of all language backgrounds to publish their findings in internationally-indexed peer-reviewed journals. In the light of gaps identified in currently available training materials and approaches, the portfolio builds on understandings and practices developed within the field of English for Specific Purposes (ESP) and investigates the efficacy of collaborative interdisciplinary teamwork by language professionals and scientists in developing such a response. An overall goal was to develop a teaching/training approach accessible to and usable by both scientists and language professionals involved with supporting early-career scientists: Collaborative Interdisciplinary Publication Skills Education (CIPSE). Using a theoretical framework based in genre analysis/pedagogy, the sociological concepts of communities of practice and language socialisation, and a business-oriented approach to implementation, the portfolio seeks to enhance understanding of the interaction of contextual and academic discipline factors in developing and implementing an effective educational response to an internationally important problem. It does this through three separate but related Projects, as described above, followed by a concluding chapter which brings together the learnings from each to propose general conclusions potentially applicable in other comparable contexts, and ways forward in both research on and application of CIPSE.

2 Project 1 – Developing a publishing pedagogy based on interdisciplinary collaboration: Theoretical bases and initial implementation of CIPSE

2.1 Introduction to Project 1

Project 1 reports the development of the publishing pedagogy entitled CIPSE as a means to address the educational needs of the clientele established in the portfolio Introduction – early-career researchers (ECRs) in science, from any language and cultural background, within a higher education context or beyond it, who need to write articles that will meet the requirements of highly-rated international journals. Both the clientele (science ECRs) and the target document (research article manuscripts for peer-reviewed international submission) are extensions of those that were in the forefront of my vision when the theoretical and practical threads that are woven into the CIPSE fabric first came to prominence in my teaching practice. At that time (1991ff) my focus was international research postgraduate students writing literature reviews and research proposals. This Project therefore begins with a retrospective personal narrative in the tradition of the reflective practitioner (McKernan, 1996). This narrative is firmly embedded in a particular research education context, named here as Academic Language and Learning (ALL), although this title was not in general use in Australia in the early 1990s when the story began; the national Association for Academic Language and Learning (AALL, see http://www.aall.org.au/) was launched in 2005 (Stevenson & Kokkinn, 2007, p. 112).

In 1991 I was recruited as a part-time Lecturer A (entry-level) to develop the English language skills of a growing number of international research students in the Faculty of Agricultural and Natural Resource Sciences (A&NRS) at the University of Adelaide, South Australia. The relevant qualifications I brought were training and experience in foreign language teaching (BA majoring in German and French, and Dip. Ed.) and 4 years of recent experience teaching English in a post-secondary agricultural training college in Tonga (South Pacific). To enhance my ability to work effectively in this new context, I enrolled in a Postgraduate Diploma in Teaching English to Speakers of Other Languages (TESOL) at the University of South Australia, subsequently rolled into a Masters of Education (TESOL). This study program introduced me to approaches and a research tradition located at the intersection of Applied Linguistics and Education, in a field identified as English for

Academic Purposes (EAP; Ken Hyland, 2002). As I searched for teaching ideas suitable for my international, postgraduate, agricultural researcher students, I encountered the broader field of English for Specific Purposes (ESP; Coffey, 1984). ESP/EAP approaches within higher education proved a fruitful source of inspiration and theoretical underpinning for the curriculum design tasks I was facing in my work with EAL scholars undertaking and writing in English about the early stages of postgraduate research. In addition to genre analysis and genre pedagogy, as described in the Introduction to the portfolio, I encountered two specific approaches to the development of course content which seemed likely to be able to address many of the issues I was facing: task- and content-based curriculum design (e.g. Brinton, Snow, & Wesche, 1989; Snow & Brinton, 1988; Spack, 1988). These approaches were important in the development of a one-on-one Concurrent English Program (CEP) for incoming international research students who had narrowly failed to meet the University's English Language requirements (Cargill, 1996; Cargill & McGowan, 1993). They were also strongly reflected in a curriculum project submitted as part of the M.Ed. program, which my lecturer, Dr Jenny Barnett, strongly encouraged me to take to the academic administrators of the A&NRS Faculty for discussion of possible implementation.

It is from this point that the project became an *interdisciplinary* undertaking, using the definition of the term proposed by Guy Michaud for the OECD in 1972:

> An adjective describing the *interaction* among two or more different disciplines. This interaction may range from simple communication of ideas to the mutual integration of organising *concepts, methodology, procedures, epistemology, terminology, data* and organisation of research and education in a fairly large field. An interdisciplinary group consists of persons trained in different fields of knowledge (disciplines) with different concepts, methods, and data and terms organised into a common effort on a common problem with continuous intercommunication among the participants from the different disciplines (OECD, 1972, pp. 25-26).

My supervisor in the Faculty was the Associate Dean (Postgraduate), Dr David Liljegren, a researcher in the field of crop protection. (I also had a joint line-manager in the Advisory Centre for University Education, ACUE.) Dr Liljegren was immediately enthusiastic about the curriculum I presented, but suggested one important change – to the task on which the course was based. Rather than the essay I had proposed, which would have been an 'extra', and not very authentic, task for students, aimed solely at language development, he suggested a research proposal for the students' actual projects, a document they were required to write for their departments as a normal

part of their studies. This move ensured that the course task was both authentic and public, two characteristics highlighted by Cadman and Grey (1997) as important for effective language learning in academic contexts. With this important change incorporated, we proceeded towards implementation across the Faculty of the course we called *Research and Presentation Skills for A&NRS*. Funding was secured through the University's 1993 round of internal teaching development grants; Cargill and Liljegren were co-applicants, with reference committee members representing five additional departments of the Faculty, who provided feedback in terms of applicability for students and staff in their own discipline areas. Notable among this group was Dr (later Professor) Sally Smith of the Soil Science Department, whose support, input and networking skills made important contributions to the development of CIPSE in the long term. From the outset, the major course assignments were assessed by both the language-based lecturer (myself) and the student's research supervisor, each bringing our respective expertises to bear on the document draft. The course became a core offering in the Faculty.

The ready uptake of the interdisciplinary approach represented by this course may have been fostered by outcomes of a series of major changes underway at the time in the Faculty, and especially on the Waite campus where I was located (Zeitz, 2010). Professor Harold Woolhouse, Dean of the Faculty of A&NRS and Director of the Waite Agricultural Research Institute at this time, had a vision of agricultural research precincts with a range of institutions collocated on key sites, one of which was the Waite campus. This dovetailed with a move made by the South Australian State Government, which had decided to sell their research sites in the suburbs of Northfield and Parafield for housing, to help pay off a large debt incurred through problems with the State Bank, and to relocate their research activities to other sites, including the Waite campus. In Woolhouse's vision, scientists were to be housed according to their research specialisations rather than their institutional homes, to facilitate collaboration and innovative approaches to problem solving (Zeitz, 2010). The more open outlook encouraged by these moves may well have played a role in the willingness of so many Waite scientists (though not all, of course) to participate actively in the development and implementation of the course. They readily included me, a person from a non-science academic background, as a colleague in achieving a desired outcome – graduate students able to interact effectively in speech and writing in their chosen discourse community (sensu Swales, 1990). They did this by making me privy to relevant aspects of the workings of their community of practice (Lave & Wenger, 1991; Wenger, 1998), both through their input to student drafts in the course and by soliciting my input towards solving related problems that arose in their lab groups, for both international students and those using English as a first language. The level of credibility ascribed to

my work at this time was likely related not only to the course itself, but also to positive outcomes generated by the CEP, described above.

In May 1994, David Liljegren was appointed Dean of Graduate Studies of the University, and subsequently proposed implementing our course across the remaining faculties of the institution, with teaching based centrally in the Advisory Centre for University Education (ACUE). The course came to be known as the Integrated Bridging Program (IBP; Cargill, 1996) and catered for coursework postgraduates as well as research students until 2001 (Cargill, Cadman, & McGowan, 2001). It was short-listed for the 1998 Australian Awards in University Teaching in the category "Support for the special needs of international students", and was still running at the time of writing as the Integrated Bridging Program-Research (http://www.adelaide.edu.au/graduatecentre/rep/ibp/).

This brief historical recount has flagged the main practical outcomes of the theoretical approaches that were important in the development of the IBP: genre theory and genre pedagogy; EAP and ESP approaches within applied linguistics and TESOL; and interdisciplinary collaboration within a framework of communities of practice and discourse communities. These approaches continued to be important in the process of developing and implementing CIPSE, and in devising the research questions that drove the remaining projects reported in this portfolio. Sections elaborating further on theoretical implications are included in each of the main sections following, in keeping with the practice-based organising principle selected as being appropriate for a professional doctorate portfolio of this type.

The remainder of this Project analyses the following stages in the development and implementation of the CIPSE methodology:

- The Integrated Bridging Program (1995-2005): theory and pedagogy
- Towards a genre-based, collaborative, paper writing course
- Evaluating CIPSE: methods and data collection
- Development of research questions from implementation dilemmas

The aims of this project are thus

- to synthesise, from my own papers published prior to commencement of candidature, those of my University of Adelaide colleagues and the literature in the field more broadly, the main theoretical and pragmatic trends within Education, Applied Linguistics and English for Academic Purposes (EAP) that underpinned the development of CIPSE and the teaching

text exemplifying the approach (*Writing scientific research articles: Strategy and steps,* Cargill & O'Connor, 2009); and

- to explicate, through commentary on published work, reports to stakeholders and unpublished data, the development of the work with particular institutions in China and elsewhere and individual stakeholders (2001-2006) and the emergence of the questions that form the foundation for the subsequent projects.

2.2 The Integrated Bridging Program (1995-2005): theory and pedagogy

In introducing, evaluating and publishing about the IBP, the starting point for all members of the teaching and development team was the needs addressed by the program: the needs of the international postgraduate students, and of their supervisory staff and host institution. The first refereed publications were a sole-authored paper in *Higher Education Research and Development (HERD)*, with a cross-disciplinary audience (Cargill, 1996) and a team-authored paper in *IEEE Transactions on Professional Communications*, targeted mainly to electrical and electronic engineers (McGowan, Seton, & Cargill, 1996). The wordings of the need being addressed were differently formulated in the first paragraphs of the introductions of these papers to meet the expectations and interests of the respective journals, representing the relevant community of practice for that manuscript.

> *HERD*: An increasing emphasis on internationalisation in Australian tertiary education has led to new demands on providers, particularly in the postgraduate area. Part of the challenge for universities involves the need to maintain traditional strengths in postgraduate education while increasing their market share through the provision of programs recognised by their international clientele as offering value-for-money. Language and learning lecturers, also referred to as academic skills lecturers, can play a key role in supporting both students and discipline-specialist academics in this situation. (Cargill, 1996, p. 177)

> *IEEE*: The central importance to engineers of good communication skills has been clearly recognised. Olsen and Huckin [1] (1991, p. 4), for example, referring to the results of a number of surveys carried out among practicing engineers in the U.S., noted that communication skills, including technical writing, public speaking and working with

> individuals and groups, ranked above all other categories of "most needed" skills. In Australia the need for communication skills among engineers has been documented in the 'The National Competency Standards for Professional Engineers' [2] (The Institution of Engineers, 1993) which devotes an entire section specifically to these skills, highlighting communication not only between engineers, but also between engineers and non-engineers. (McGowan, et al., 1996, p. 117)

Explaining our approach to others also required locating it clearly in terms of its theoretical roots. For the engineers, we used the terminology and concepts of Systemic Functional Linguistics (SFL). The extended quotation below is from McGowan et al. (1996, p. 118).

> In using an approach informed by systemic functional linguistics, the program draws on the following features: an orientation to the description of language as "a resource for meaning rather than as a system of rules"; a concern with "texts, rather than sentences, as the basic unit through which meaning is negotiated"; and a focus on "mutually predictive" relationships between texts and the "social practices they realise" (Halliday & Martin, 1993, p. 22) [3]. The term "text" is used here to denote "a complete linguistic interaction (spoken or written), preferably from beginning to end" (Eggins, 1994, p. 5).
>
> The fundamental principle that text is interpreted within a context implies that communication must be based on shared experience. Successful communication takes place when 'contextualisation' - the 'context of situation' and the 'context of culture' within which a text is interpreted - is meaningful both to the 'sender' and 'receiver' of the communication (Cook, 1989). Difficulties faced by international students are likely to be at least in part due to their unfamiliarity with the immediate Faculty context and the broader cultural context of their new research environment. Hence, on the one hand they are unable to use the context to 'make the right predictions' (Halliday & Hasan, 1985, p. 46) when reading or listening, and, on the other, they lack awareness of the available language choices for the variety of spoken and written texts which they must learn to produce independently.

[3] References have been changed from the numbered style used by IEEE to conform to the style used in the rest of the thesis.

> The IBP has adopted a genre approach (Cope & Kalantzis, 1993; Gerot, 1995; Halliday & Hasan, 1985; Swales, 1990), in order to assist engineering students and supervisors. This approach means
>
> > being explicit about the way language works and makes meaning. It means engaging students in the role of apprentice with the teacher in the role of expert on language system and function (Cope & Kalantzis, 1993, p. 1).
>
> Systemic functional linguistics provides a tool for determining the structural and linguistic features of a genre through the concept of three 'register variables': FIELD, TENOR and MODE, with the associated concepts of experiential, interpersonal and textual metafunctions (Butt, Fahey, Spinks, & Yallop, 1995; Eggins, 1994; Gerot & Wignell, 1994; Halliday, 1985).
>
> The approach to genre teaching in the IBP uses a "task and support" design. The two major tasks are the production of a limited-scope research proposal, including a literature review, and the presentation of a formal thirty minute seminar to justify the proposed research. The supervisors of individual students comment on each task in terms of its technical content, or FIELD, while the IBP lecturer provides class sessions running parallel to the tasks. In these sessions students are introduced to TENOR - the acknowledgment of the audience for each text, and MODE - the variety of written and spoken forms that these texts can take, as well as to the concepts of 'schematic structure' and associated 'language features' for the genres they need to master. In this way the program aims to provide students with the foundation and tools for continuing their own discipline-specific language development throughout the time of their PhD research.

This passage illustrates clearly the usefulness of the SFL terminology in explaining the salient features of the IBP. The IBP teaching team certainly used these terms in speaking amongst ourselves and discussing curriculum developments, and in presenting to applied linguist audiences familiar with the terms – i.e. in Australia and the UK. However, relatively early in the IBP's history, a decision was made to try to find less jargon-heavy ways of describing the key features of the approach, as we had noted some 'glazing over of the eyes' when speaking to our collaborating academics from other discipline backgrounds, especially scientists. Developing clear and effective terminology for communicating across disciplinary boundaries remains an ongoing challenge. One convention adopted is to refer to disciplines other than applied linguistics as Other Disciplines (ODs).

The structure of the IBP at its inception is summarised in Table 2.1, which highlights both the specifics of the collaboration that took place with OD academics and the genres that were the focus of the program for the two types of students. For the purposes of tracing the development of the CIPSE methodology, it is appropriate to focus here only on the IBP for research students (doctoral and Master by research). Because the IBP was institutionally mandated for all international postgraduate students and their supervisors, collaboration was an in-built part of the program. IBP classes were taught for 1.5h twice weekly in three discipline groupings (humanities and social sciences; engineering, computing and mathematical sciences; and other sciences), with maximum class sizes of 10-12. IBP tasks were designed to feed directly into the work required of the students in their departments; classes featured genre-based teaching of the required documents (see Table

Table 2.1. Summary of Integrated Bridging Program structure (redrawn from Cargill 1996, p.184)

2.1); supervisors provided content-based formative feedback on each task; and IBP lecturers returned this feedback to students in individual consultations, along with their own language-based feedback.

The features of the IBP that were of most interest to the profession at this time were its basis in genre pedagogy and the concept of 'intersecting genres' (Cargill, et al., 2001); the explicit inclusion of affect and identity issues in the pedagogy (Cadman, 1996, 1997a); its strong institutional mandate (Cargill, 1996; Cargill & Cadman, 2005); and the tri-partite relationship it established between the student, the IBP lecturer and the OD supervisor/s (Cargill, et al., 2001).

In terms of written genres, the IBP for research students focused on article summary and critique, leading to literature review, and research proposal. However the program recognised that the student's production of these was located in a much broader context, which we represented as a set of intersecting genres (Figure 2.1). This genre set recognises the role of the discourse community in establishing, enacting and teaching the ways language is used in a particular research context, and extends outwards from just the written manifestations to the formative oral/aural interactions. It is the comparative absence of these in many science contexts where English is learned and taught as a foreign language that needs to be particularly recognised when designing education programs, especially short-term programs, for these contexts. This understanding is reflected strongly in the elements of CIPSE concerned with training in language-learning strategies (e.g. Mozzon-McPherson, 1998), such as how to take best advantage of visiting scientists and attendance at international conferences for language learning as well as enhancement of content knowledge.

A point of differentiation for the IBP from other programs on offer at the time was the clear decision to teach students in discipline-specific cohorts, as much as possible within the institutional constraints that were operating (Cargill, 1996). Early in the process of expanding what had been a single-faculty program in the sciences in 1993-4 to one that covered the whole University, we advertised for a co-ordinator with the expertise to operationalise the program in social sciences and humanities, and Kate Cadman won the position. Her research had a focus in the early years of the IBP on issues of student identity and incorporating students' 'voices' into their texts (Cadman, 1997a, 1997b), and developed later towards a focus on understanding the pedagogical processes of 'connection' (Cadman, 2005; Cadman & Ha, 2001) that contributed to the IBP's success, particularly in her focus discipline areas. I developed a close working relationship with Kate and benefitted greatly from our frequent discussions around the similar and different ways the issues she was researching manifested in science contexts. We developed a shared interest in publishing

pedagogies, and latterly have taught together in contexts where participant/trainee groups span both sciences and social sciences, such as the International Rice Research Institute in the Philippines. A strong awareness of genre remains a defining feature of our work for both of us. Significantly, the contested and even conflictual relationship (Costino & Hyon, 2011) reported between the different 'schools' of genre work – SFL and the 'Sydney School', ESP and the USA-based 'New Rhetoric' – (Hyon, 1996) has not been an issue in the context of the IBP and its subsequent developments. The tensions between pragmatic and critical aspects of the pedagogical process we were (and are) engaged in were recognised early and incorporated in the practice of the IBP team (Cadman et al., 2000).

Figure 2.1. A communication network of intersecting genres for an IBP group for research post-graduates (adapted from Paltridge (1998, p. 16). Used with permission (Cargill, et al., 2001, p. 86)

The institutional mandate of the IBP also differentiated it from many comparable programs on offer at the time. The IBP was (and is) a compulsory part of the first semester for all enrolling international postgraduate students: the default position was participation, although exemption or partial participation could be negotiated by individual students if appropriate. This institutional mandate may have emerged from the historical accident of the program's antecedents, described in the Introduction, but it was the factor that made possible so much that was of value in the curriculum – in particular the requirement for supervisors to work with the IBP team, attending students' seminars and providing assessments of IBP drafts and authentic example documents for analysis. In many but not all cases, this initially mandated situation led to mutually respectful ongoing interactions, both within the IBP and beyond it, as described for the early stages of the program's development in the Faculty of A&NRS. In terms of the program aims, this relationship was described as 'tripartite collaboration', as described below for the engineering audience:

> This approach of tripartite collaboration, which resembles the 'trialogue' described by Powarn (1993) in the context of supporting students writing doctoral dissertations, is fundamental to the IBP. Collaboration is essential because, as Swales (1990, p. 212) points out, TESOL lecturers, as 'non-members of the target discourse community' may not have access to a deep understanding of how things are actually written and spoken in a particular context, even if they have strong expertise in discourse analysis and teaching.
>
> In the tripartite collaborative colleague model described here, each member contributes from a specific realm of expertise. The novice researcher has substantial background knowledge and a strong drive to pursue research in a particular direction; the supervisor has expert knowledge of the field and assists in the process of clarifying the nature and scope of the research; both student and supervisor provide access to models of successful texts for the IBP lecturer who, in turn, brings TESOL experience in the use of functional grammar as a tool for analysing texts in relation to their contexts. The IBP lecturer uses this expertise with the aim of developing the student's ability to produce independently the texts required for the research. (McGowan, et al., 1996, pp. 117-118)

This passage sets out the rationale on which the collaborative basis of CIPSE was built, and remains a compelling description of how that collaboration can work, although for the development of CIPSE the main collaboration was between the applied linguist/research communication professional (myself) and the scientist co-developer, co-presenter and co-author Patrick O'Connor. The passage also emphasises the involvement of the novice researcher in the undertaking, as much more than

just a *recipient* of training – rather, as one who brings well-developed research findings and a need to communicate them effectively to a target discourse community.

The discussion above has set out to highlight the features of the IBP that both led to and underpin CIPSE, in terms of the 'collaborative' and 'interdisciplinary' parts of its name. The move from the IBP genres of literature review and research proposal to research article manuscripts for publication is traced in the following section.

2.3 Towards a genre-based, collaborative, paper writing course

The community of practice on the Waite Campus was again instrumental in the next stage of development on the road towards CIPSE. One of the co-located agencies on the campus, as a result of the moves in the early 1990s described earlier, was the South Australian Research and Development Institute (SARDI), which also had research stations or divisions located elsewhere, including in rural areas of the state. I was approached in 2000 to run one-day workshops for each of the six SARDI divisions, prompted by the growing importance of their researchers publishing their results in the refereed literature in order to justify government research budgets. These workshops were based on material from Weissberg and Buker (1990), a text used extensively in the IBP which presents a highly teachable summary of much of the analysis done by applied linguists over the previous 10-15 years on the genre of the experimental research article, using examples from a wide range of disciplines where researchers collect and analyse data. The evaluations of these workshops showed that participants found them both relevant and useful (Cargill, 2004). At the same time, a researcher in the field of soil/plant ecology with experience living and working in Vietnam, Patrick O'Connor, was independently developing a plan to train Vietnamese researchers in writing articles for international publication. Patrick and I were brought together by Professor Sally Smith, who had been a member of the reference committee for the initial A&NRS course described in Section 2.1, and had had many students participate in the IBP since that time. Patrick and Sally had been part of a team that had previously presented a workshop in Indonesia focused on developing research communication skills, organised by ex-students who had returned home – a demonstration of the workings of the extended communities of practice that are an integral part of international research education and training.

Initial discussions between Patrick and me indicated that a collaborative workshop would have benefits over anything either of us could do alone, and we obtained funding to run a pilot 2-day workshop in Hanoi, roughly based on the SARDI outline but also incorporating material on submission and responding to referees reports. We learned an enormous amount from running this workshop, in particular about the importance of working with stakeholders' agendas and the need to research contextual factors effectively in the planning stages (Cargill, 2002b). We used these lessons to good effect when our next opportunity arose, again through the community of practice, via two convergent pathways. A short report on the Hanoi workshop in the Faculty's *Campus Link* newsletter was noticed by a visitor from the Nanjing branch of the Chinese Academy of Sciences (CAS), who approached me about running something similar in Nanjing. At the same time Dr Yongguan Zhu, a postdoctoral researcher in Professor Smith's lab with contacts in the International Affairs Bureau of the central CAS office in Beijing, approached Patrick along the same lines. Using the evaluative feedback and our recorded teacher/practitioner reflections from Hanoi, we negotiated a five-day workshop to be repeated in Nanjing and Beijing, taught by three presenters (an additional scientist[4] was recruited) to allow for 30 participants per workshop. Table 1.2 in the portfolio Introduction lists these and subsequent workshops presented in a range of locations, and indicates which are discussed in the various Projects of this portfolio and the publications that contribute to them.

The basic content elements of these early workshops are listed below, taken from Figure 1 of Cargill (2004, p. 86).

> **Workshop Components**
>
> Each participant's results: what do they say, what do they mean in context, who needs to know and why? (tell a partner who then reports to group)
> IMRAD: the logic behind the structure
> *Writing Introductions
> Readability and 'flow'
> *Writing Materials and Methods sections
> *Writing about Results
> *Writing Discussions/Conclusions
> *Writing Abstracts and Titles
> Putting the pieces together: self- and peer-editing strategies
> Decoding instructions to contributors and writing covering letters to editors
> Responding to feedback from editors and referees
> Common 'faults with manuscripts' and how to address them

[4] Professor F. A. Smith, who had a strong interest in science in China and existing networks there

*These segments feature a common process:

- introduce available results from genre analysis (GA) of relevant section;
- ask participants to analyse their sample article (provided or self-chosen)
- identify presence/absence/variations of features highlighted in GA
- participants draft or revise relevant section of own paper

The 'common process' mentioned in the dot points above is expanded on in this extract from Cargill and O'Connor (2006a, pp. 209-210):

> ***Basis in genre pedagogy*** (Cope & Kalantzis, 1993): Our aim is to provide participants with an analysis framework arising from genre analysis (GA) and EAP pedagogy, and basic skills in applying the framework to well-written published articles in their own discipline as a lifelong learning tool. One or two example articles are selected by the presenting team and sent to participants before the workshop. A diagrammatic representation of IMRaD (Introduction, Method, Results and Discussion) article structure is presented early in the workshop (Weissberg & Buker, 1990) to facilitate identification of similarities to and differences from it in the example articles. Then, as each article section is discussed, moves and steps as identified in the GA literature (e.g. (Gosden, 1992; Ken Hyland, 1996; Samraj, 2002; Swales, 1990) are presented as a descriptive exercise (rather than prescriptive teaching) and participants compare these with what they find in the example article/s. The sections are dealt with in the order Results, Methods, Introduction, Discussion, followed by Abstracts. For Results sections, the content experts also present relevant aspects of data presentation, such as preparing tables and figures that highlight the point made by the data and contribute clearly to the 'story' of the paper. We emphasise that the Results section 'drives' the paper and should therefore be written first.
>
> Class discussion follows of possible reasons for variations found between the GA outcomes and the example article/s; these are often discipline-specific issues which are pinpointed by the content-expert presenters. In-class writing time is provided for participants to draft or revise the relevant section of their own paper. The presenters are available for individual consultation on issues as they arise, calling on language and content expertise as appropriate.

A refinement that has taken place since the 2004 paper was written reflects the influence of the collaboration between the science and language perspectives. Whereas issues to do with referees appeared at Point 10 in the 2004 list, this material is now presented very early in the workshop, on the first morning. This extract form Cargill and O'Connor (2006a, pp. 209-210) elaborates:

Referee criteria as the overarching point of reference: A composite set of referee criteria is presented, constructed from relevant sets available to the content-expert presenters. These criteria are used alongside the genre analysis results, using questions such as 'Where in the article do you think a referee would expect to find evidence on this criterion?'; and 'Where in the English sentences do the authors make it clear that they are presenting evidence relevant to this criterion?'. In addition, one workshop component focuses on the process of submission and subsequent negotiation with editors around referee reports. Categories of referee comments are presented, along with strategies for responding to each and examples of possible response wordings, based on an analysis of available editorial correspondence (O'Connor, in preparation).

There is a focus on language use in all workshops, tailored to the participants' likely needs. When writing about workshops presented in China in Cargill and O'Connor (2006) we described the language focus in this way:

Developing sentence-level English and discourse strategies for expressing researchers' meanings: Our approach to English language development is presented explicitly to participants early in the workshop. Wall charts are used for vocabulary and structures identified during analysis of example articles or individual consultations. 'Sentence templates' are included (sentence structures that could usefully be reused with different noun phrases inserted). Aspects of English usage particularly relevant to specific article sections are taught or reviewed when that section is discussed: e.g. passive constructions with Methods, use of definite and indefinite articles and the placement of 'given' information before 'new' information with Introductions, modal verbs of certainty and tentativeness and hedging with Discussions. In addition, participants are introduced to a simple concordancing program (ConcApp, http://www.edict.com.hk/concordance/)[5] and the concept of constructing a corpus of articles from their own discipline to use as a source of data for ongoing language learning (Cargill & Adams, 2005).

For workshop participants with English as a first language, the language aspects are presented differently but are still received with enthusiasm, as seen in this extract (citing open-ended evaluation

[5] Because the concordancing program referred to above was no longer freely available, a new java-based program has been developed at the University of Adelaide and made freely available at http://www.adelaide.edu.au/graduatecentre/rep/adtat/index.html , along with instructions for building corpora and access to a corpus of plant science articles from a well-known journal.

responses – see Section 2.4 for methodological details) from Cargill (2004, p. 92), which compared workshops run in Australian university and research institute contexts and in China:

> The category **language use** accounts for a similarly high frequency of responses in all three contexts, and for the Australian university students it represents the most common category. This is not surprising given the neglect of formal instruction in the use of English in recent decades in Australia, but the degree of enthusiasm is noteworthy. For Australian respondents, one set of key issues related to the discourse level of language: strategies for promoting 'flow' in writing and linking ideas effectively: *What I appreciated most was the strategies for linking ideas in writing* (SARDI); *Writing smoother flowing paragraphs* (University). Another focus, about which some embarrassment was expressed, was sentence level 'nuts and bolts' issues of grammar and punctuation:
>
> > *The basic grammar (to my shame)!* (SARDI); *Use of which, that and commas*; *tense session very good* (University); *How to edit sentences which don't sound right* (SARDI); *The grammar was very enlightening! I like the emphasis on clearly expressed information* (University).
>
> The last two comments suggest that the enthusiasm may be related to the workshop's focus on teaching the language use features in the context of the target genre, showing how correct use of particular features can clarify unclear writing. Teaching examples are taken from the published papers being analysed, and the exercises in the workshop booklet have been developed from similar sources.

With the success of the workshops in the various contexts in which they were presented (Cargill, 2004; Cargill & O'Connor, 2006a), and faced with limitations in time available to present, it soon became of interest to consider how the collaborative methodology we were using could be taken advantage of in other contexts, especially where English is a foreign language (EFL). The paper published in the *Revista Canaria de Estudios Ingleses* (Cargill & O'Connor, 2006b) was an attempt to synthesise what we had learned to that point about what worked where, and why, into a model for constructing training interventions for novice authors in EFL settings. In this paper we proposed four sets of criteria to be considered by teachers in designing curriculum:

- categories of author-support-providers available in the context and how their expertise sets intersect
- categories of target audience (degrees of research experience, role in the publication development enterprise)

- content components to be included in the training and desired outcomes
- delivery options (from stand-alone materials to interactive workshops)

We had already identified the set of audience characteristics (i.e. characteristics of the people to be trained) that made it worthwhile for institutions to fund a workshop visit from the CIPSE team, but we recognised that there were many situations where the needs were great but these conditions were not met, as described below:

Salient features of target audiences for training provision: research experience, English proficiency and shared discipline base

When participants' evaluations of the workshop have been correlated with information about their backgrounds, the only significant correlation with gaining of best benefit has been that the participant has completed a research degree (Cargill & O'Connor, under review)[6]. Completion of a research degree represents a rigorous research training, including the completion of an entire project to the point of final reporting. When participants in the Chinese workshops were still enrolled in their research degrees their self-perceived benefit was likely to be lower. In addition, a desire for a more even level of research experience among the participants has been recorded in responses to open-ended evaluation questions asking about possible improvements to the workshops. We have noted that less-experienced participants have been less likely to value and benefit from the detailed teaching about strategies for engaging with referee reports, a workshop feature highly valued by many of the more experienced participants. These findings suggest that the effectiveness of training could be enhanced by providing it separately for research students without previous whole-of-project research experience and for other, more experienced researchers. This suggestion echoes that of Okamura (2006), that junior and more experienced researchers may need different guidance. Table 2.3 shows the categories of target audience we propose as being salient for designing a training intervention.

English proficiency is obviously another important consideration. It has not been practical for us to stipulate an English proficiency level that participants must have before attending our workshops, and our current approach is to describe what participants will be required to do in English during the workshop and allow self-selection on this basis. However, the requirement that PhD candidates in many Chinese institutions must have an article published in a journal listed in the Science Citation Index before award of their degree (Li,

[6] Published as (Cargill & O'Connor, 2006a)

2002) has meant that some candidates enrol in our workshops in spite of doubts about their ability to cope with the English. Some participants have reported that both their productive and receptive English skills have improved markedly over the period of the workshop, but others have indicated that the English used was too difficult for them. A more even level of English proficiency across participants has also been suggested as a possible improvement to the course. Clearly this is an element that must be considered seriously in planning for publication skill development, but it is not easy to manage.

The format of our collaborating-colleague workshops requires that participants be working in disciplines congruent with those of the content experts. However, on several occasions the local organisers have filled workshop places by recruiting participants outside the range we had indicated could be covered appropriately by the Australian content-experts in the presenting team. Where this has been the case, participants have been less satisfied and suggested a closer match as a desirable improvement (Cargill & O'Connor, under review)[7]. An example was a presenting team covering plant physiology, soil science and ecology, and a workshop cohort that included astronomers and palaeontologists. The subject matter of the latter participants could be handled satisfactorily because of similarities in methodological approach, but the astronomers were aiming to write papers of a very different structure. In contrast, the workshop in Spain in 2005 was within a single university department, with a native-speaker content expert (local) from the same discipline and department, and outcomes were highly satisfactory (Burgess, in preparation). A particular issue with discipline mix in our workshop format is selecting the example article/s to be used for in-class analysis. When we teach this type of workshop in an English-speaking context, participants each bring their own example paper from their own discipline, preferably from the journal they wish to submit to, and in some EFL contexts this may also be an appropriate strategy. In others the reading load would be impractical, and the effectiveness of class discussion overly limited by having so many variations to discuss and draw conclusions from. Participant English proficiency is a prime determinant.

Clearly the issue of discipline fit between content-expert presenters and participants must be part of the initial planning discussions when an intersecting-expertise approach is to be used. This requires some level of understanding of the basis of the training by those making the arrangements, as the fit between training type decided on, participant backgrounds and trainer team has been shown to be a crucial factor in the success of the outcomes. When

[7] Published as (Cargill & O'Connor, 2006a)

> the organisation of this kind of training is entrusted to a department such as human resources or international affairs, where understanding of the pedagogic implications of ad-hoc modifications may be limited, our experience indicates that mismatches are likely to occur. It is hoped that the model to be proposed here will help enhance the effectiveness of initial planning. (Cargill & O'Connor, 2006b, pp. 85-87)

The issue of delivery mode was constantly before us, especially for situations where the optimal conditions for workshops could not be met. A book was suggested by many workshop participants and organisers, for individual use by novice article authors and for classroom use by teachers coming from both science and the language perspectives. After several false starts, and again through the operation of the community of practice (scientists talking to scientists), we made contact with a commissioning editor in the Ecology and Evolution section of Blackwell Publishers (based in the UK and subsequently merged with John Wiley and Sons). An initial review draft (table of contents and selected content) was sent in late 2005 and reviewed by five scientists, all editors of science journals. Their suggestions were incorporated into the full manuscript; the book was published as *Writing scientific research articles: Strategy and steps* (Cargill & O'Connor, 2009). The first print run sold out in 5 months, and reviews (in science journals and those for science author editors) have been highly positive. The book has a companion website designed to serve as an extension to its usefulness and a vehicle for promoting CIPSE workshops (www.writeresearch.com.au). In particular, the website contains additional analysed articles from areas of science beyond those represented by the two articles bound with the book itself (i.e. molecular plant physiology and ecology). The site also contains training notes on the use of concordancing with discipline-specific article collections (corpora) for EAL authors, a link to the University of Adelaide's free concordancing program AdTAT, and a corpus of articles made available by the journal *New Phytologist*. We hope to increase the number of corpora available on the site in due course if our approaches to journal publishing houses prove successful.

In producing the book we aimed to address as many as possible of the issues we had identified in the advice books reviewed in the portfolio Introduction, and also to address as appropriate the issues identified by Kamler and Thompson (2008) in their article 'The failure of dissertation advice books: toward alternative pedagogies for doctoral writing'. The discourse community they are addressing is within social sciences and humanities, and many of their concerns relate to a conception of doctoral writing "both as text work/identity work and as a discursive social practice" (p. 507), which may arguably be less explicitly relevant in many science contexts. In addition, they focus on the dissertation/thesis, rather than articles for publication in journals. Nevertheless, they raise points that

resonated for us as authors and we sought to take them into account as appropriate for our different audience and purposes. This process was aided by our extensive use of genre pedagogy and discourse community as our guiding theoretical approaches, as discussed earlier. I elaborate on these issues below because the ways in which they are dealt with in the book have something to say about the CIPSE methodology in general.

Kamler and Thompson (2008, p. 509) report the results of the discourse analysis they carried out of 25 'bestseller' dissertation advice books under the following headings: "(a) An expert-novice relationship is produced and reproduced, (b) the process of writing a dissertation is simplified to a series of linear steps, (c) writing advice is packaged as a set of over-generalised rules, and (d) the texts are emphatic and offer a paradox of reassurance and fear." The text features they highlight as setting up an unreflective expert-novice relationship are the unmodified use of 'you' in addressing the reader, the associated appearance of strong modals such as 'should' and 'must', and the lack of scholarly citation to claim credibility, and instead reliance on length of experience. Our own discourse analysis of the scientific articles we present and analyse in our book allowed us to be very aware of the modal verb issue, and in fact we treat it as an item of content in our chapter on writing discussion sections. We do indeed use 'you' to address the reader, along with many sentences written in the more impersonal third person and using first person 'we', but with a conscious intention to be inclusive rather than exclusive, e.g.:

> If you are going to become involved in publishing in the international literature, there are a number of questions it is useful to consider at the outset: Why publish? Why is it difficult to publish? What does participation in the international scientific community require? What do you need to know to select your target journal? How can you get the most out of publishing? We consider these questions in turn below. (Cargill & O'Connor, 2009, p. 4)

The avoidance of inappropriately strong modals seems more salient than avoiding the use of 'you' entirely in such contexts if the goal is the establishment of a more inclusive relationship between reader and authors. In terms of scholarly citations, we decided to follow the prevailing practice in advice books and limit the number we used [in contrast, for example, to Swales and Feak (2000)] because we judged that our scientist audience would be less interested in the applied linguistics literature. (The companion website provides access to our own scholarly publications on the topic.)

Kamler and Thompson's (2008, p. 510) second identified issue is the oversimplification of the writing process to a series of linear steps. On this point I would argue that the differences in genre (dissertation vs article) and in discipline area between their focus and ours mean that our suggestion

of a clear process consisting of linear steps can and does make a valuable addition to the previously available literature. Although some other advice authors have recommended that results be the first or second section written (e.g. J. T. Yang, 1995, p. 36), it is rarely made a prominent recommendation, and most advice books are structured following the traditional pattern in which the sections are presented in the published manuscript, starting with Introduction. Even Lindsay (2011) treats Title and Introduction as the first elements when considering writing, although the significance of clear hypotheses is discussed in a previous section *Thinking about your writing*. In contrast, the CIPSE approach emphasises an initial focus on results and identification of 'take-home messages' from key figures and tables, using the four questions cited earlier from Cargill (2004) as the first Workshop Component. The next step is to match these messages and the components of the 'story' that support them to the most appropriate target journal. We have received considerable anecdotal feedback from advanced-candidature PhD students who have shifted to this process after writing previous manuscripts in a different order. They report that it sped up the process of constructing a strong first draft, that this draft was received more enthusiastically by their supervisors than previous efforts that took much longer to produce, and that less revision was required to get to the final submitted version.

Kamler and Thompson (2008, p. 509) also found that dissertation writing advice was "packaged as a set of over-generalised rules", a comment echoing the idea of 'prescriptivism' raised earlier. My review of science article advice books in the Introduction came to similar conclusions. The explicit use made of genre theory as the framework for our advice in *Writing scientific research articles* provides us with a principled way to avoid this problem, and our provision of additional analysed example articles on the book's companion website shows us as 'putting our money where our mouth is' in this regard. For several issues we draw readers attention to in the book, we provide exercises which do not have a single, unequivocal answer, and the Answer Pages make that point explicit with wordings such as "We can suggest two possible reasons for this choice:" (Cargill & O'Connor, 2009, p. 149), or "Suggested answers for assigning..." (p. 163). The main body text also seeks to be very explicit, e.g. "As with all sections of your manuscript, check whether the journal has specific conventions of recommendations about the form of titles before you decide which form to use." (p. 63).

The final categorisation of unhelpful attributes in Kamler and Thompson (2008, p. 509) is that "the texts are emphatic and offer a paradox of reassurance and fear". Here we were assisted by our shared status with the readers of our book: all of us writing manuscripts for editors and referees to critique, rather than our being in an exclusively expert or even supervisory role to a solely student

readership. Reassurance about submission and review seemed important, however, and we chose to present it in relevant places throughout the book in the following ways:

- by being upfront about referee criteria from the start of the preparation process and using them as a self-check list at the end;
- by demystifying the steps in the process as much as possible;
- by acknowledging the sometimes 'political' aspects of the peer review process;
- by reinforcing the fact that everyone gets rejected, even and especially more senior or well-published authors (a point we support with published data (Cassey & Blackburn, 2003) in our workshops); and
- by presenting a set of linear steps for writing rejoinder letters and responding to the most commonly occurring reviewer comments.

These features of the book represent one very clear area where the scientist member of the collaborative team made a majority contribution – but using a methodology perhaps informed by the genre analysis methods brought by the applied linguist member in his survey of several filing cabinets' worth of correspondence between editors and submitters. The following extract from Cargill and O'Connor (2006a, p. 216) indicates how this aspect relates to the genre approach discussed previously:

> Examples analysed, alongside complete articles, were of referee guidelines, covering letters to editors, response letters from editors to submitters, referees' reports (cf. Gosden, 2003), and letters from submitters responding point by point to referees' comments and seeking to negotiate a revised version of the paper that responded to referees' criticisms while maintaining the author's main points. These represent what Swales (2001, p. 49) referred to as contingent genres, within which the standard research article is situated and by which it is influenced. They are also occluded genres, in that researchers, teachers and students usually have little access to them (Gosden, 2003). As Gosden (2003) and Canagarajah (2002) have pointed out, a lack of cross cultural awareness of review and publication procedures may contribute to the difficulties experienced by novice EAL submitters. In our workshops, insider perspectives on these contingent and occluded genres were available from the presenters who were authors, referees and editors for scientific journals, to be added to those of the EAP outsider analysis. Thus the scientists provided a closing of the genre circle; the value of this for the participants was reflected in frequent evaluation responses which coupled how to write it with what the referee will think of it: *How will the*

editors or referees think about which paper is good enough that can be published in their journals (Nanjing, 2001).

A question remains about access to the book in places such as China where western-published books are extremely expensive, and conversations are underway with the publishers about making parts of the text available electronically, glossed in Chinese. We will watch these moves with great interest.

This section has demonstrated that the evolution of CIPSE relied importantly on the intersection of the expertise sets brought by the collaborating partners from their respective disciplines, something we tried to encapsulate when deciding on the name for the approach – Collaborative Interdisciplinary Publication Skill Education. The iterative process of teaching, evaluation, refinement and teaching (reflective of an action research methodology) that went on throughout the development and early implementation led to a program that was well received by those participating in it; Section 2.4 describes the evaluation procedures used. Implementation in a range of contexts led to recognition of a range of specific questions that related to aspects of the program and to features of the contexts; these are discussed in Section 2.5.

2.4 Evaluating CIPSE: methods and data collection

From the start, evaluation was an integral part of the CIPSE development process, initially in order to gather data on which to base improvements, and subsequently to allow comparisons between workshop sites and audiences to answer broader questions that arose. I adopted a participatory style of evaluation (Waters, 1987), where an explicit part of the program was the extent to which previous students' evaluations had led to changes in what was presented and how, and the expectation that the evaluations of the current participants would be part of the same ongoing development process.

In overview, CIPSE evaluation was conducted using four data sources: 1) collection of student demographic data; 2) post-workshop numerical-scale evaluations; 3) post-workshop evaluation using open-ended questions; and pre- and post-workshop questionnaires designed to elicit participants' assessment of their confidence levels to write and deal with publishing.

Demographic data were collected on workshop commencement on age and gender, levels of education and work experience, and from 2003 number of papers submitted and published in Chinese and English.

At the end of the workshops data were collected using a 5-point Likert scale (1=strongly agree, 5=strongly disagree) on participants' responses to a range of evaluative statements about the workshops, which evolved slightly over the years as we refined our knowledge of what information was needed. The list used from 2004 (items evolved as our understanding grew of what we needed to know) is presented below:

- The teaching team (scientists plus English teacher) was effective in helping me develop writing and publishing skills.
- Analysing example journal articles was helpful for my learning.
- The balance between presenters' input and participants' doing tasks was appropriate for my learning.
- The materials (notes and hand-outs) provided were helpful for my learning.
- The level of English used in the workshop was too difficult for me.
- The workshop has increased my knowledge of the international scientific publishing process.
- I would recommend this workshop to my colleagues.

We also asked participants if too little, the right amount, or too much time had been spent on the listed aspects of the workshop content:

- Understanding the structure of sections of a scientific paper

- How to write sentences (sentence templates, grammar, flow)
- Presenting your data and writing about results
- Responding to referees and editors
- In-class exercises

Three open-ended questions were also asked:

- What were the three most useful things in the workshop for you?
- What were the three least useful things in the workshop for you?
- What could be changed or improved to make the workshop more useful for [Chinese, or relevant adjective phrase] researchers in future?

Questions about an appropriate global measure of 'success' (i.e. publication outputs or qualitative measures) arose early, especially when we were faced with the arguments put forward by McGrail, Rickard and Jones (2006). Their article 'Publish or perish: a systematic review of interventions to increase academic publication rates' was published in *Higher Education Research and Development* but used the medical methodology of systematic review with its requirement of hard outcome data, in this case evidence of an increase in publication output. Our reasons for preferring to use self-assessed confidence level as a measure of success to assess our CIPSE workshops are set out in the following extract from Cargill and O'Connor (2006a, p. 212):

> Confidence for writing a paper for submission to an English language journal is used as a surrogate measure for outcome from the workshops, because any direct measure of acceptance of manuscripts for publication will be confounded by a range of factors. These include the standard and novelty of the science being reported (Gosden, 1992), the level of the journal to which the manuscript is submitted, the post-course effort of participants to write and publish their research findings (e.g., some participants may move to career paths which do not encourage or require publication of scientific research), the amount of assistance in writing and publishing in English which is available from other sources after the course, and the level of input graduates of the training workshops actually make to multi-authored papers.

From 2003 these data on confidence levels were collected pre- and post-workshop (in the first and last sessions) using a 5-point Likert scale (1=not confident, 5=very confident), with responses matched for analysis using date of birth information. Participants were asked: 'How confident are you in your ability to write a scientific article for publication in English'. From 2004 they were also asked 'How confident are you in your ability to deal with the publishing process in English?', and a 7-point

Likert scale was used for both questions (1=not confident, 7=very confident). We also asked participants for (optional) comments about each confidence score. Self-assessed confidence for a specific named task equates to perceived capability to reach explicit academic goals, or self-efficacy (Jungert & Rosander, 2010), an important variable associated with achievement (Bandura, 1997). It was thus selected as an appropriate tool for use in the present context.

The consistent format used for data collection allowed comparison between datasets collected at different workshops over the span of CIPSE development and implementation. Datasets were selected according to the relevance of characteristics of the participants or other workshop features to the research questions being addressed. All workshops are listed in Table 1.2 in the portfolio Introduction, indicating which datasets were used in which Projects.

2.5 Development of research questions from implementation issues

2.5.1 Interdisciplinary teams in CIPSE

The first implementation issue that served as a source of project research questions related to the role and development of teamwork across disciplinary boundaries in the implementation of CIPSE

2.5.1.1 From 'informant' to collaborative team member: role options and contextual determinants

The interdisciplinary and collaborative basis of both the development and the conduct of CIPSE has been emphasised throughout this account, and fundamental to this was a shift in how the members of the science discourse communities I was engaged with worked with me. In the early days of course development within the Faculty of A&NRS we were at the initial end of the continuum described by the OECD (1972, p. 25): "the simple communication of ideas". The interaction fitted Dudley-Evans' (2001) term 'cooperation'. This way of working, where the scientist shared ideas with me and suggested alternatives to course features I had proposed, reflects the position of 'informant' often vital in genre analysis studies within applied linguistics, whereby analysts rely on an expert member of the discourse community to interpret text features that otherwise would remain opaque to them (Swales, 1990, p. 212). The operation of this kind of relationship at the level of a manuscript is exemplified in Benfield and Feak (2006), which contains a comparison of revisions to an EAL authored text by both a language professional (Feak) and an expert member of the target discourse

community (Benfield). They reported that this process confirmed the contention of Parkhurst (1990, p. 170) that "feedback given by. . . writing teachers. . . addresses. . . problems of form and/or presentation, whereas. . . the feedback of (subject) experts. . . focuses on ideas and content. . . .". However, the revisions considered in the Benfield and Feak paper are short paragraphs only, providing no scope for a discussion of issues of information structuring, newsworthiness, or targeting of the appropriate reading audience, all of which have seen significant changes in the ways they are addressed over the development of CIPSE, leading to the inclusion of the word 'strategy' in the title of the Cargill and O'Connor (2009) book. This reflects the importance for CIPSE of Eggins' (1994, p. 5) emphasis on "text" as "preferably from beginning to end".

In addition, although Benfield and Feak (2006) report that they had presented 18 interactive workshops for EAL specialist medical practitioners over the 5 years prior to the article's publication, no information is provided about workshop content, the interaction of the presenters in preparing and delivering them, or the effect of differences in the presentation contexts on the delivery or outcomes of particular workshops.

I have suggested earlier in this Project, quoting Cargill and O'Connor (2006b), that participants' level of research experience was found to be very important in determining the usefulness of some components of the training for them, and in fact less experienced participants valued less highly the input of the scientist members of the CIPSE presentation teams. Other contextual variables are also likely to affect what is practicable and achievable when a core workshop presenter/team leader collaborates with different scientists, who will have different priorities and perceptions of their own roles in the collaboration. However, little has been published about the specifics of interdisciplinary team formation and operation in educational contexts in terms of the role of contextual features. The implementation of CIPSE in a relatively wide range of contexts provided a valuable opportunity to investigate this issue.

Research questions

Thus, the following research questions were addressed in Project 2A:

- What were the effects, on interdisciplinary team structure and workshop effectiveness, of contextual factors encountered during CIPSE implementation, especially participants' level of research experience and the institutional location of the training?
- What can the implementation of CIPSE in various contexts tell us about the establishment and operation of effective interdisciplinary teams in publication skill development?

2.5.1.2 Issues for collaborative interdisciplinary science/language teams in EFL contexts: CIPSE in China as a case study

During the initial implementation of CIPSE in international contexts, the CIPSE team was recruited and workshops were negotiated via a variety of routes. Personal recommendations within the science community of practice were extremely important in China, especially that from Dr Yongguan Zhu to the Chinese Academy of Sciences, as detailed in Section 2.3. On the other hand, the introduction of the program in Spain in 2005 (University of La Laguna, Tenerife) was a direct outcome of an academic presentation on the early workshops at a congress of the Applied Linguistics Association of Australia (Cargill, 2003). Academic presentations were similarly given in China within the context of international symposia on 'EFL Writing Teaching and Research', in Guangzhou and Xi'an in 2004 (leading to a publication (Cargill, 2006)) and in Wuhan in 2005, but there was interest only in relation to applied linguists publishing their own research, not in working with scientists or science graduate students on publication skills. No follow-up was received from these initiatives other than requests to edit manuscripts for fellow applied linguists. This outcome provides further evidence of the importance of personal connections and the doing of favours in the Chinese context (Yau, 1988), which it is argued in Project 2B can be seen as an impediment to the consideration of systematic (and systemic) ways of addressing the larger issues around publication skill development. Similar lack of uptake can be reported from a conference presentation in Malaysia in 2002, in a context of university teaching and learning (Cargill, 2002a). Broad agendas (teaching and learning, EFL writing) seemed to lessen the likelihood that the very specific need addressed by CIPSE was seen as in any way pressing – only in the science world has this need been of sufficient prominence to prompt action.

This situation contrasted to some extent with emphases that were being felt in the world of English language teaching and academic literacies in the western academy. In the USA the Writing Across the Curriculum (WAC) and Writing in the Disciplines (WID) movements were fostering various ways of connecting writing instruction with the disciplines where the writing was to be done (Bazerman et al., 2005). In Australia a move was underway towards integrating skill development into undergraduate programs and across faculties, often incorporating collaboration with OD academics (Cargill, 2000; Jones, Bonnano, & Scouller, 2001; Skillen, Merten, Trivett, & Percy, 1998). An expression of this movement in a program for international research students can be recognised in the curriculum of the IBP, described earlier in this Project as a forerunner to CIPSE. I was keen to know whether these ideas had found expression within the Chinese context, and also to offer

opportunities to Chinese writing teachers to observe our CIPSE workshops and see if there were any aspects that could be applicable in their own situations.

An early attempt to incorporate such a 'train-the-trainer' approach can be seen in the workshop run in Lanzhou in 2002. A member of the English Department did indeed observe the workshop, as I had requested, and seemed quite impressed with what he saw. It was only at the final course dinner that I learned of the problems my request had caused, and the lengths to which the director of the research laboratory hosting the workshop had had to go to grant it. It seemed that the English Department had no role in working with anyone who was not an English major, and its head was very unwilling that any of his staff should waste their time with this matter. The research lab director had taken advantage of the fact that his daughter was a school classmate of the daughter of the English department head, and asked as a favour. The person who observed the workshop was a completing Masters student, who was to leave the English Department within a few weeks. When last I had contact with him, he was a journalist for the Xinhua News Agency. He managed to turn the situation to his own advantage by asking me to edit his girlfriend's Master's thesis, on Canadian literature, which was due for submission in a short time. This anecdote not only reflects the somewhat arrogant assumptions I had made in the way I had framed my request, but also highlights that there were contextual issues operating at the level of the institution that were likely to have far-reaching consequences for the implementation of CIPSE approaches in China.

Research question

Thus the research question investigated in Project 2B was this: what are the contextual challenges and possible responses for developing interdisciplinary teams utilising aspects of the CIPSE model in Chinese science research contexts, within both universities and research institutes?

2.5.2 Contextual factors influencing implementation possibilities: Career stage

One specific contextual variable that is of great importance in considering training in publication skill development is the career stage of the trainees: student or practising researcher; in candidature or beyond; focusing on their own papers or interested in mentoring/training others. In the Chinese contexts where CIPSE has been used, we have engaged with many of the categories of people listed as author-support providers in Cargill and O'Connor (2006b) – see Table 2.2. Increasingly, people principally identified in one category have sought training to be able to operate in additional

categories. This process has thrown up additional questions about the operation of contextual factors in various ways of implementing CIPSE or elements from it.

Practising science researchers who participate in CIPSE events are usually primarily concerned with developing their own individual skills for writing publishable manuscripts. They may also fit into Categories 1, 5 and 7 from Table 2.2, in some cases and to varying extents. Little has been published in English about the specific issues and challenges faced by Chinese scientists as authors, especially the aspects related to language use, and the qualitative datasets available from CIPSE workshops provide an opportunity to investigate this issue. Information about the specific aspects of the challenge scientists identify as most important would help those charged with organising training programs to make more targeted arrangements, and serve as a preliminary needs analysis. In addition, no reports are available in English on strategies or techniques used by practising researchers in China to train or mentor their junior colleagues or students in article writing and preparation. Given that some CIPSE participants carry out this role, and most would expect to in the future, the workshop datasets may have something of interest to tell us in this regard also. It would also be of interest to understand how scientists perceive the CIPSE book/website package in terms of its usefulness in helping them in their training/mentoring role. These issues were addressed in Project 3A.

Research questions

The specific research questions addressed in Project 3A were these:

- What are the issues and challenges facing EFL science researchers in China as they seek to write articles for submission to international, peer-reviewed journals?
- What issues are faced and what practices are currently used by senior Chinese researchers in guiding/mentoring their students and junior colleagues in writing articles for international submission?
- To what extent and in what ways can CIPSE training contribute to building the confidence of novice scientist authors to write manuscripts in English, and that of senior scientists to train/mentor their students and colleagues?

Table 2.2. Categories of author-support provider (ASP) able to contribute to international publication outcomes for EAL researchers in EFL contexts (Cargill & O'Connor 2006b, p.81)

NOTE:
This table is included on page 54 of the print copy of the thesis held in the University of Adelaide Library.

Workshop participants who are still enrolled in their research degrees make up another participant category – or more than one if we consider their stage of candidature. In many situations where the topic of publication skill development arises, and CIPSE training is mentioned, scientists immediately want to talk about training within universities, there being a strong understanding worldwide that these are the prime sites for skills training. Especially in research degree systems where a substantial amount of coursework is undertaken before research commences, such as the US and

Chinese systems, it seems obvious to many that training in article writing should take place as part of the coursework component. US universities were indeed the location of much of the advanced writing training that featured in the published works reviewed earlier. However, in these university contexts it is common that writing teachers working with EAL students face heterogeneous discipline mixes in their classes (Swales, 1990, 2004), and may be asked to address a wide range of target genres, including the thesis/dissertation. Even where there is a separate focus on article manuscripts for journals, writing teachers may often have limited access to informants in specific disciplines, and indeed such contact may be seen as less useful if the class contains research students from a broad range of disciplines. The discovery-based, rhetorical consciousness raising type of course advocated by Swales (1990, pp. 213-217) is well accepted in Western academic contexts as a way to work effectively with mixed-discipline classes, but may present additional challenges in EFL contexts. In locations where English at all levels is taught largely by instructors who have learned it as a foreign language themselves, anxieties around mastery of the different English-es of different discipline areas can be intense, especially for science disciplines. It may be perceived as extremely threatening to a teacher if students each bring a paper from their own field to analyse, each of which will contain vocabulary and concepts the teacher may never have met before.

Thus, even when there is a strong recognition of the need to teach writing for publication purposes in a university context (e.g. Cho, 2009), selecting methods and content (i.e. pedagogical approaches/practices and curriculum content) appropriate to the context may not be straightforward. (The prospects for using interdisciplinary teams to address this problem is a separate but related issue.)

Research questions

Therefore the following research questions were addressed in Project 3B:

- Which elements of CIPSE curriculum/pedagogy are applicable in teaching publication skills to early-candidature research degree students in China?
- What kind of team structure is suitable to deliver these elements?
- Which contextual factors are important in answering these questions, and what conclusions can be drawn for implementing similar programs in comparable EFL contexts?

2.6 Project 1 conclusion

Project 1 has located the conceptualisation and development of CIPSE within the historical context of the fields of ESP/EAP and Academic Language and Learning, and demonstrated how my adoption into a community of practice within a science faculty provided favourable conditions for its growth. A key contribution to my ability to capitalise on this situation was the methodological basis of my teaching – genre analysis and pedagogy, and content-based English teaching. The collaborative approaches built into ESP teaching of this kind then developed into interdisciplinary teamwork at a deeper level, more closely approaching a "mutual integration of organizing concepts, methodology, procedures, epistemology, terminology ..." (OECD, 1972, p. 25). As this process was formative for CIPSE, and built into its practice, it was important to pay serious attention to the questions that arose during initial implementation, within the framework of reflective practitioner research in which the whole study is grounded. One set of questions was about interdisciplinary teams and teamwork – especially issues of team structuring and teamwork possibilities in situations culturally distant from CIPSE's home base. These are the focuses of Project 2. Alongside these questions were related issues of context – and particularly that of scientists with different levels of research experience but equally in need of training in publication skill development – the key focus of Project 3. The range of contexts in which CIPSE training had been and continued to be offered, and the common methodology used for evaluating the workshops, provided an opportunity to investigate these questions by selecting and comparing datasets. The subsequent parts of the portfolio present the findings of these investigations.

3 Project 2 – Interdisciplinary collaborations: possibilities and challenges for CIPSE implementation

3.1 Introduction to Project 2

As became clear in the final part of Project 1, an issue central to the implementation of CIPSE and any discussion of its wider use is interdisciplinary collaboration. In Project 2, this issue is considered in two 'frames'. The first is the arena of interdisciplinary higher education, and theoretical perspectives from the field of interdisciplinarity have been incorporated in the analysis. CIPSE collaborations have come about in many different ways, and a comparison of outcomes and contextual factors in operation in selected workshop types, 1-day workshops in Australia and 4-5 day events overseas, can highlight some general principles of relevance to the field. In the second part of the Project the frame shifts to that of English for Specific Purposes, in which collaborative practice has long been a norm in the western academy. The main feature that distinguishes CIPSE when considering it in an ESP frame is the degree to which CIPSE focuses on a desired outcome beyond the learning of English: that the manuscripts produced as a result of the training will be able to receive a 'respectful reading' (Shashok, 2001, p. 116) from the editors and referees of the journals they are submitted to. The focus is squarely on the special purpose, with the English as a vitally necessary but not sufficient component of its achievement. For this reason, the collaborative involvement of scientist team members is particularly important. The second part of the Project takes the situation in a number of Chinese universities and research institutes as a case study, because interdisciplinary collaboration of the type meant here is generally absent from the scene. The aim was to identify factors likely to promote or hinder the development of interdisciplinary collaboration for publication skill development.

The overall aims of Project 2 were

- to identify relationships between contextual factors and the practicalities of structuring interdisciplinary teams, for publication skills development and more broadly, through analysis of outcome data from CIPSE workshops held in a wide range of contexts, in Australia and internationally and based in both science-teaching and English-teaching locations; and

- to explore one instance of a barrier to such interdisciplinary collaboration, the divide between science and technology education and English language education as it exists in China, and to analyse the role CIPSE might play as a tool and framework to help address it, in the interests of promoting effective practice for educating Chinese scientists to write for publication in English.

Project 2A was published in October 2010 as a contribution to an edited book examining a range of aspects and contexts within interdisciplinary higher education. It is included here in its pre-publication form, at the request of the publisher.

> Cargill, M., & O'Connor, P. (2010). Structuring interdisciplinary collaboration to develop research students' skills for publishing research internationally: Lessons from implementation. In M. Davies, M. Devlin & M. Tight (Eds.), Interdisciplinary Higher Education: Perspectives and Practicalities. International Perspectives on Higher Education Research Volume 5 (pp. 279-292). Bingley, UK: Emerald Group Publishing Ltd.

The format of the contribution is as one of thirteen 'vignettes' of interdisciplinary practice, which expand the more theoretical contribution made by the five preceding 'chapters'. They do this by presenting pictures of interdisciplinary activity in various higher education contexts, analysed and discussed so as to exemplify, develop and interrogate the 'perspectives' of the book's title. The target audience for this book is members of the international discourse community of higher education research. This publication site thus expanded the range of readers engaging with CIPSE beyond those focused on previously: scientists and research communication educators. This required some adjustment to the terminology and explanatory framework, a process which added to the richness of the overall analysis.

Project 2B is in the form of an article manuscript, currently under review[8]:

> Cargill, M., O'Connor, P., & Li, Y. (submitted). Educating Chinese scientists to write for international journals: addressing the divide between science and technology education and English language teaching. *English for Specific Purposes*.

The discourse community addressed here has more specialised interests, as indicated in the Aims and Scope statement of the journal:

[8] Accepted for publication after revision, before the finalisation of the thesis amendments - doi: 10.1016/j.esp.2011.05.03

> *English For Specific Purposes* is an international peer-reviewed journal that welcomes submissions from across the world. Authors are encouraged to submit articles and research/discussion notes on topics relevant to the teaching and learning of discourse for specific communities: academic, occupational, or otherwise specialized. Topics such as the following may be treated from the perspective of English for specific purposes: ... needs assessment, curriculum development and evaluation, materials preparation, discourse analysis, descriptions of specialized varieties of English, ... the effectiveness of various approaches to language learning and language teaching, and the training or retraining of teachers for the teaching of ESP. In addition, the journal welcomes articles and discussions that identify aspects of ESP needing development, areas into which the practice of ESP may be expanded, possible means of cooperation between ESP programs and learners' professional or vocational interests, and implications that findings from related disciplines can have for the profession of ESP.
> (http://www.elsevier.com/wps/find/journaldescription.cws_home/682/description#description)

Thus several facets of the CIPSE enterprise relate closely with the concerns highlighted by the journal, notably curriculum development and evaluation, the effectiveness of various approaches to teaching, the identification of aspects of ESP needing development, and means of cooperation between ESP programs and learners' professional interests. Addressing this discourse community required a more explicit location of CIPSE within the longstanding collaborative tradition of ESP, and clear acknowledgement of the debt owed to the many researchers and practitioners who have gone before. The third author of the manuscript, Yongyan Li, is one such, whose contributions to the literature in recent years have been prodigious and highly relevant to explicating the context within which CIPSE operates in China (John Flowerdew & Li, 2007; Li, 2002, 2006a, 2006b, 2006c; Li & Flowerdew, 2007). She brought to the manuscript valuable 'insider information' both from her own research and insights, and through identifying and translating relevant documents available only in Chinese.

The Project concludes with a discussion relating the conclusions of the two parts to each other and to the concerns of the portfolio as a whole.

3.2 Statement of Authorship 1

Cargill, M., & O'Connor, P. (2010). Structuring interdisciplinary collaboration to develop research students' skills for publishing research internationally: Lessons from implementation. In M. Davies, M. Devlin & M. Tight (Eds.), Interdisciplinary Higher Education: Perspectives and Practicalities. International Perspectives on Higher Education Research Volume 5 (pp. 279-292). Bingley, UK: Emerald Group Publishing Ltd.

Cargill, M. (candidate)

Margaret initiated the idea of applying the lens of interdisciplinarity to the data, led the selection, categorisation and analysis of the data included, and drafted the majority of the text.

Signed: .....

Date: .....

O'Connor, P.

Patrick revised the draft critically from the perspective of his different disciplinary location, and contributed to the data analysis, interpretation and presentation.

The signature below attests to agreement with the attribution of input as described and permission for the manuscript to appear in this portfolio.

Signed: .....

Date: .....

3.3 Project 2A

Structuring interdisciplinary collaboration to develop research students' skills for publishing research internationally: Lessons from implementation

3.3.1 Abstract

This vignette reports on a range of implementation models for an approach dubbed Collaborative Interdisciplinary Publication Skills Education (CIPSE). CIPSE aims to develop the skills of early-career researchers, including HDR (higher degree by research) students, to write about their research in ways that meet the expectations of external assessors – editors and referees of international journals. CIPSE involves expert researchers from a specific field, in this case scientists, and English language specialists with specific expertise in research communication working together on the planning, design and implementation stages of education programs adapted to fit local contextual constraints. It combines the knowledges and skills of scientists/reviewers/editors matched to the research discipline of students, and the skills of language educators experienced in genre analysis and language-based elements of English writing. The program develops skills in three interwoven components: *genre analysis*, the deconstruction of the scientific journal article genre into functional steps and learning of skills required for each identified component of the genre; *gatekeeper awareness*, understanding and anticipating the role of reviewers and developing strategies for presenting quality research and negotiating the acceptance phase of publishing; and *story development*, packaging and value-adding to data, analysis and information to present and discuss the most important and novel findings of research to the chosen audience. The vignette presents an analysis of CIPSE implementation in two types of higher education context, in order to draw out principles of general relevance to the sector: three science disciplines in a research-intensive Australian university; and three sites beyond Australia where English is used as an additional language – one in Spain and two in China. Implications are presented for curriculum design and interdisciplinary practice.

3.3.2 Introduction

Interdisciplinary practice is being developed and explored in a wide range of contexts. An understanding of the initiation and development of interdisciplinary collaborations in specific situations provides insights into the benefits and also the challenges which can arise when crossing traditional disciplinary boundaries. We focus here on an example drawn from our approach to developing the publication skills of early-career researchers (ECRs). We have dubbed the approach CIPSE (Collaborative Interdisciplinary Publication Skills Education), using the term 'interdisciplinary' in the sense proposed by the OECD in 1972, as involving "the interaction among two or more different disciplines ... ranging from simple communication of ideas to the mutual integration of organizing concepts, methodology, procedures, epistemology, terminology, data ..." (OECD, 1972, p. 25). The exact location of CIPSE interactions along this continuum has varied considerably, depending on a range of contextual variables. We have developed the CIPSE approach as one response to the international pressure to publish which is now affecting ECRs worldwide to varying degrees (Curry & Lillis, 2004), including students completing masters and doctoral degrees in universities (Li, 2006c). Having papers published is an important goal of supervising academic staff members as well as their research students (McGrail, et al., 2006), and this can translate into motivation to be open to interdisciplinary collaboration that has the potential to improve publication skills and outcomes. Nevertheless, the barriers common to many interdisciplinary approaches can still operate, including time pressure on participants, and unfamiliarity with (or mistrust of) concepts and pedagogies emanating from beyond one's own discipline. The broad area of publication skill development thus provides a valuable case study context for investigating the structuring of interdisciplinary collaboration.

We are a team of an applied linguist/research communication educator (Cargill) and a consultant ecologist active as an author and reviewer of science research articles (O'Connor). Our own collaborative relationship arose in the context of the University of Adelaide's Integrated Bridging Program-Research (IBP-R), which has operated across all disciplines since 1995. This program requires collaboration between IBP-R staff and the supervisors of HDR (higher degree by research) students from English as an Additional Language (EAL) backgrounds across 12-weeks in the students' initial semester (Cadman, 2000; Cargill, 1996; Cargill, et al., 2001). In terms of discipline, IBP-R staff generally

locate themselves within the field of English for Academic Purposes (EAP), and their own research is published in journals with a focus on EAP and/or higher education. However, the training collaboration inherent in the IBP-R has fostered the development of relationships on the ground in which the complementary nature of the expertise sets brought by each party (EAP practitioner and research supervisor in the relevant discipline) are clearly recognised. The present discussion reflects one outcome of this recognition within various disciplines of science – the CIPSE approach – which can be characterised as an EAP-led interdisciplinary approach with parallel focuses on discipline-specific content, effective language use and a strategic approach to getting published. Although the original development of CIPSE had much to do with a single set of circumstances, personalities and shared goals, subsequent implementations provide data that can throw light on more broadly relevant themes.

The discussion presented here is relevant well beyond EAP. Although the issues associated with the pressure to publish are particularly acute for researchers using EAL, regardless of where they are writing (Curry & Lillis, 2004; John Flowerdew, 2000), many ECRs for whom English is a first language (EL1) also report experiencing difficulties with writing their research as manuscripts for international submission (McGrail, et al., 2006). The CIPSE approach has been used across a wide range of language and cultural backgrounds. Two types of implementation contexts have been selected for presentation and analysis here: a research-intensive Australian university, where participants span EL1 and EAL backgrounds and 1-day workshops are a preferred model; and EAL locations in China and Spain, where workshops have been run over 4-5 days.

3.3.3 Aims

The objectives of the body of this vignette are therefore

- to outline briefly the CIPSE methodology;
- to analyse contextual data from implementation contexts where different structures were employed for establishing and operating the interdisciplinary teams, including previously unpublished data from workshops run in Australia from 2001-2008 and in China in 2006 and 2007; and
- to present conclusions on the relationships between contextual factors and interdisciplinary team structure for CIPSE (a previously unanalysed aspect of the

work), and implications that may be drawn for interdisciplinary collaboration more generally.

3.3.4 The CIPSE methodology

This outline summarises and adds to more extensive descriptions published before the advent of the CIPSE name (Cargill & O'Connor, 2006a, 2006b). In those papers we refer to 'collaborating-colleague publication skills workshops', a name which demonstrates an earlier stage in our thinking around the salient features of the approach. In the current context of investigating effective structures for interdisciplinary collaboration, in CIPSE workshops of various lengths and designs, we describe the approach under three headings, as follows.

3.3.4.1 Analysing 'genre' – examples of successful articles (led by EAP practitioner)

The CIPSE approach is grounded in genre pedagogy (Cope & Kalantzis, 1993), which involves the deconstruction/analysis of authentic successful examples of the relevant genre, followed by joint and then individual construction of students' own piece of writing. In the case of CIPSE, the text to be analysed is an article from a journal relevant to the students' field of research (see Cargill and O'Connor (2006b) for issues around the practicalities of article selection). The structure of the various types of research article is a focus of the analysis here.

The approach is task-based, with participants/students engaging in a practical task that is as relevant as possible to their ultimate goal in participating in the program. Ideally this task is the writing or revision of their own manuscript draft, but for shorter workshops it may be restricted to the production of notes and dot-points relevant to a future writing task.

The scientist collaborator's role is to make sure that the analysis of example articles and manuscript drafts is not impeded where the scientific content may be outside the EAP practitioner's expertise.

3.3.4.2 Gatekeeper awareness (led by scientist collaborator)

Authentic examples of criteria used by manuscript referees in the relevant field are presented and analysed, to help students focus on the relationship between the reviewing

process and the words they are writing on the page. An important exercise is to consider where a reviewer would expect to find evidence in the manuscript relevant to each of the listed criteria. The location of evidence in sections of the manuscript serves to reinforce the lessons of genre deconstruction, but this time the presentation is from the perspective of the scientist/reviewer not the EAP practitioner. When appropriate, this aspect is extended by presenting an analysis of the most common kinds of referee comments, and strategies for responding to each one.

The EAP practitioner's role is to highlight the way language is used to meet gatekeeper expectations at the word, sentence and section levels.

3.3.4.3 'Story' development (leadership shared)

This aspect involves two facets. The first is a focus on the key 'take-home' messages (THMs) of the paper resulting from an initial emphasis on the questions 'What do my results say?" and 'What do these findings mean in their research context?'. Data presentation is an important element here. The second is the relationship between the clarity of these THMs and the language used to express and develop them, at the levels of document and section structure, paragraph development, and sentence-level accuracy. These issues are included in different ways and at different levels for different participant groups, as appropriate.

We see the three elements as representing a mutual integration of organising concepts and terminology (cf the OECD, 1972 definition of "interdisciplinarity"), with the capacity to enable ECRs in the sciences to recognise a different way of thinking about the production of an article for publication. For more details of how these elements operate together in practice, see the recent teaching text (Cargill & O'Connor, 2009).

3.3.5 Results and Discussion: Analysis of the implementation models

This section presents in turn data from the two types of implementation context for CIPSE workshops (Australian university with participants of mixed language backgrounds, and Asian/European universities with EAL participants). Discussion then focuses on factors influencing the success of the interdisciplinary collaborations in each type of context.

3.3.5.1 Australian university, mixed EL1 and EAL participants, one-day workshops

These workshops were presented within disciplinary contexts as a result of approaches from discipline staff. The workshops were given titles that aimed to capture the thrust of the approach, such as *Writing a research article for international submission: Strategies and steps*, and were advertised as being most suitable for researchers with analysed data ready to turn into a paper. Participants were asked to bring an article from their target journal to the workshop. Details of three workshops are presented in Table 3.1, indicating a range of ways in which academic staff in different science disciplines/departments incorporated the CIPSE workshops into programs for their ECRs, including students. Evaluations of all workshops (both numerical and open-ended comments) were uniformly extremely positive, with suggestions for improvement being related to duration and timing (data not shown).

Table 3.1. Structures by which CIPSE interdisciplinary collaboration was implemented in some science disciplines at the University of Adelaide, 2001-2008

Science Discipline/ Date	**n**	**Description of Implementation**	**Interdisciplinary Collaborators**	**Medium-term Outcomes**
Physiology, 2001-6	12-14	1d of paper writing assignment spread over 2 weeks	Postgraduate coordinator (pgc) as organiser, others as reviewers of drafts	Since the program was discontinued on change of pgc, high enrolments observed from this Discipline in centrally-run generic workshop on paper writing
Soil & Land Systems, 2007	28	1d of 3d postgraduate retreat	Head and pgc in planning, plus 3 extra academics as participants on the day	One academic has set up regular Discipline paper-writing group, incorporating CIPSE materials
Gastroenterology, Royal Adelaide Hospital, 2008	15	Saturday workshop funded by pharmaceutical company	Research group head in planning, provision of model articles and participation on the day	Workshops commissioned for other local institutions and a related interstate group

Interdisciplinary collaboration models varied from involvement only in the planning, with disciplinary input structured as a separate component (Physiology), to full involvement on the day as well as input into the selection of target journals and example articles for materials production (Soil and Land Systems, and Gastroenterology). Interestingly, the contexts where fuller involvement occurred are also those where the academics subsequently took aspects of CIPSE into the practice of their disciplines. The Outcomes column in Table 3.1 indicates that these collaborating academic staff found ways to add value to the workshops, and to extend their perceived benefits to others. In all three cases, ways were found to embed the CIPSE collaboration model into existing or newly developed structures within the area, so that the benefits of newly encountered interdisciplinary perspectives could become an integral part of what was offered to researchers in training. This suggests that the collaboration fostered by the EAP-led CIPSE approach may be sustainable in the longer term in this Australian context, and may lead to impacts relevant to the learning and teaching goals of the institution in the area of researcher education.

In reflecting on these outcomes, it seems to us that a key factor in the establishment of the successful collaborations described here related to the ways in which CIPSE has been both publicised and presented to inquirers. This is done via a two-pronged approach, incorporating a focus on the research-based credentials of the program on the one hand (through research seminars, conference presentations (Cargill, 2002c) and the production of academic publications on the work (Cargill & O'Connor, 2006a, 2006b) and a more pragmatic, training outcome based approach on the other (through distribution of flyers, brochures and email communication linked to a website [www.writeresearch.com.au]). These approaches have enabled the development of parallel discourses for audiences with different backgrounds, disciplinary understandings and motivations, and opened up fruitful possibilities across otherwise impermeable lines of communication. For example, the research leader of the Gastroenterology group referred to in Table 3.1 approached us following a recommendation from a student who had attended a research seminar we presented in the Psychology discipline of the Health Sciences faculty. This intentional diversification of communication modes/styles reflects aspects of Wood's reworking of Byram's model of intercultural competence as a way of conceptualising communication in interdisciplinary contexts – in particular her element 3: "Competence in interdisciplinary text production: the ability to recognise diversity in styles of spoken and written discourse

between disciplines and to negotiate styles of oral/written presentation accessible to an interdisciplinary audience" (Byram, 1997; Woods, 2007, p. 860).

3.3.5.2 Spanish and Chinese universities, EAL participants, 4-5 day workshops

If local contextual features proved important in optimising communication and establishing effective collaboration patterns in the Australian situation where CIPSE was developed, then they were even more important in seeking to implement the CIPSE approach in EAL contexts. We have previously demonstrated the value of collaborative interdisciplinary teaching teams for developing the confidence of EAL scientists to write papers for publication and deal with the international publishing process (Cargill, 2004; Cargill & O'Connor, 2006a), and here we extend our discussions of the collaborative process to consider the structure of the interdisciplinary teams. Details of the three implementation contexts we have selected for analysis in this regard are provided in Table 3.2: one in Spain and two in P.R. China. In both these contexts considerable barriers exist to interdisciplinary collaboration in teaching, and it was recognised at the outset that this situation would constitute a challenge, particularly to the training components that were included in the programs.

Interdisciplinary collaboration occurred in all three contexts, and in two cases (La Laguna and *New Phytologist)* at least one collaborator agreed to participate on the strength of descriptions of the program, rather than prior personal experience. Both participated to a high degree and engaged fully with the CIPSE teaching processes, suggesting that the descriptions they had received, via email and through course outlines and published papers, had been both compelling and accurate. This fact provides further support for the importance of promotional/ informational material written in language that is accessible to its target audience in both conceptual and practical terms (Woods, 2007).

The La Laguna workshop had the most far-reaching outcomes, with subsequent workshops run by the trainees and an ongoing relationship between the two departments established and maintained, in spite of the historical complete isolation of teaching disciplines from one another (S. Burgess, pers. comm. 2006). Possible explanatory factors include the following. All participants were working on a manuscript during the workshop, and so

experienced it as directly relevant. In addition, both individual and institutional benefits were recognised. One workshop participant (senior academic staff member) commented: *This kind of workshop should be incorporated in all doctoral course formation,* and we understand that the recommendation is being pursued actively within the university. The openness and level of engagement of the collaborator was an additional factor - she commented as follows in the workshop evaluation: *All of it was useful. As a psychologist, I found it useful, and as a teacher, fascinating.* This attitude seems to reflect Wood's model element 7: "Attitudes: of curiosity and openness, readiness to suspend disbelief about other disciplinary cultures and belief about one's own" (Woods, 2007, p. 862).

The *New Phytologist* workshop in 2007 demonstrated interdisciplinary collaboration initiated in the opposite direction to that commonly seen. The journal had a plan to run a workshop for potential Chinese contributors, with the aim of addressing the discrepancy between rejection rates for papers from China and those from the rest of the world (Ian Alexander, Chair, *New Phytologist* Trust, pers. comm. 2007). They approached the CIPSE team to run the workshop, thus seeking our pedagogy- and interdisciplinary practice-based expertise to add to theirs. Once again, the availability of information about CIPSE in accessible forms was very important – including published papers.

The GUCAS workshop represents a very different type of situation, and one where it is the post-course reflections of the teaching team on the limitations experienced that have most to contribute to the current discussion. The CIPSE visit to GUCAS was organised by the funding body (BHP-Billiton) and senior staff of the Chinese Academy of Sciences (CAS), for whom increased publication output is an important goal. However, the GUCAS Department of Foreign Languages (DFL), with whom we actually worked, was involved only at a later stage of planning, and there were considerable structural impediments to the successful implementation of the CIPSE approach. In effect, the interdisciplinary collaboration at the Chinese end was with scientists outside the teaching context altogether, who delivered a directive to the teaching department (DFL) to work with the CIPSE team. As indicated in Table 3.2, the interdisciplinary collaboration in terms of the actual teaching was provided by the CIPSE team members, but their disciplinary expertise could match that of only a small proportion of the workshop participants, as explained below.

Table 3.2. CIPSE interdisciplinary collaboration in International *EAL contexts

EAL Context/ Date	n	Description of Implementation	Interdisciplinary Collaborator/s	Medium-term Outcomes
Department of Psychology, University of La Laguna, Tenerife, Spain, 2005	19	4d x 5h(20h) workshop for staff and research students, incorporating train-the-trainer program for staff of Department of Applied Linguistics (AL)	English as first language member of Psychology Department academic staff; specialisation closely aligned with those of participants	Subsequent workshops run by those trained; ongoing close collaboration between AL and Psych Depts. re paper writing
Department of Foreign Languages, Graduate University of Chinese Academy of Sciences (GUCAS), Beijing, 2006	109 (71 + 38)	5d x 4h (20h) summer-school course, open to graduate students across all disciplines of science and technology (S&T), taught on 2 campuses; training component for FL staff to investigate feasibility of incorporating CIPSE elements in future teaching	Two scientist members of the CIPSE team from Adelaide (including Author 2); specialisations aligned with those of only a small proportion of course participants	Two further iterations of summer-school program by CIPSE team, seeking optimal fit with student level (beginning Masters), discipline mix (all S&T), research experience (low), and university structures
Workshop for potential submitters sponsored by the *New Phytologist* journal in Beijing, 2007	33	5d x 6h (30h) workshop, participants targeted by journal from their submission records and invited to attend (30% without completed PhD)	Two scientist members of CIPSE team (incl. Author 2) plus an editor of the journal from the UK; specialisations closely aligned with those of participants	Second workshop funded in 2009 to train senior Chinese scientists to use CIPSE in their home contexts

* EAL – English as an Additional Language

The Graduate University of CAS (GUCAS) operates a US-style program where commencing research students from all fields come to central campuses to complete one year of coursework before returning to their sponsoring CAS Institute to conduct their research project. Our workshop was scheduled in the summer-school period at the end of the academic year; classes were relatively large (Table 3.2) and contained students from a wide range of science and technology (S&T) disciplines. Level of participants' research

experience was another confounding factor, as students had not yet begun their research. In addition, the GUCAS procedures required a course of a certain length, formally assessed and delivered within the scheduling conventions of the university. Our need for two 2-hour blocks per day was problematic for students wanting to attend other courses on offer during the summer school.

These administrative-type requirements influenced the students' responses to the CIPSE material, as indicated in their open-ended evaluation comments. Requests were received for more homework, for homework to be checked more carefully, and for exercises with single correct answers. Elements of the workshop commonly highly valued by more experienced participants were less valued by this participant group, including notably ways to present experimental data effectively and write about results (38% of GUCAS participants thought too much time was spent on this element, in contrast to 4% of participants at the CAS Institute of Botany in 2005, a comparable experienced group). This can be explained by the lack of experience of the GUCAS cohort with trying to do this task in the context of an English-language article, and the relatively great distance at which they were situated from the time when they would need to grapple with it.

It is significant that, from the perspective of team structure, the scientist collaborators in the CIPSE team take the lead in teaching this data presentation element. We therefore suggest that the degree of interdisciplinary collaboration built into the CIPSE approach needs to be modified when presenting in a context where the conditions that make it valuable cannot be met. As we have previously described, these conditions include that the participants' research fields are closely aligned with those of the scientist presenter/s; that they have some experience in conducting and writing research; that their English proficiency level allows them to operate comfortably with the CIPSE team approach; and preferably that they have analysed data or a first draft of a paper to work on during the workshop (Cargill & O'Connor, 2006a). Thus, for the GUCAS situation, it may well be appropriate to pursue approaches in the future that call on the knowledge gained from working collaboratively with scientists in the CIPSE approach, but that do not require full participation from scientist collaborators in the teaching. This approach could be described as cross-disciplinary – "one discipline peering into another" (Davies and Devlin, 2007, p.3), rather than interdisciplinary. The extension of the current CIPSE model likely to be most useful to GUCAS students may be collaboration between EAP practitioners and

scientist collaborators to train scientists who will supervise them later in their candidatures. Considerable further work is needed to investigate what options may be feasible for incorporating actual interdisciplinary collaboration into the teaching of publication skills in the Chinese university sector, as opposed to the research institutes. Fortunately, a firm foundation for this investigation has been laid in the form of warm and respectful relationships between the CIPSE team and the GUCAS DFL, and this investigative work can proceed as funding becomes available.

3.3.6 Conclusions and implications

The analysis presented above leads us to the following conclusions.

1. The structure of the CIPSE approach, led by applied linguists/research communication educators and incorporating collaboration from colleagues in other disciplines, can allow for appropriate implementation in a wide range of contexts where publication skill development is a priority. The range of contexts includes those where conditions support a fuller integration of perspectives, and those where such integration is not (yet) feasible.
2. A key factor relevant to the success of the interdisciplinary collaborations analysed here is the degree to which the outcome of the joint activity (here, the CIPSE workshop or similar) is seen to be embedded in the core business of the collaborator's discipline. Although getting published is supposed to be core to the academic enterprise for us all, the degree to which the need is operationalised, and the career stage at which this happens, vary in practice. At GUCAS, the need to provide training in publication skills exists more in theory than in practice, in the distance rather than in the present, and thus the immediate structural difficulties and disciplinary boundaries act strongly against uptake of an interdisciplinary approach, where change is anticipated on both sides. At the level of a research group, however (e.g. Gastroenterology within a single hospital setting), the need is much more immediate and the potential benefits of collaboration can be clearer once the relevance of the approach has been demonstrated. However, it remains the case that most research institutions consider training from an EAP practitioner as appropriate for post-graduate students and presentations from experienced publishing

scientists/reviewers/editors as appropriate for researchers who have completed an HDR. The value of a collaborative interdisciplinary approach requires 'selling', in terms of "the creative synthesis and new understandings that become possible when two ….. disciplines become integrated" (Manathunga et al. 2006, p. 367) in the context of a common goal such as the production of a publishable article.

3. Development of optimal structures for interdisciplinary collaboration in a given context may require experiential learning for all participants and therefore need both pilot and review processes. This may be the only way to overcome mutual lack of comprehension about what is needed and what is possible in a given educational context. It may be important to include time and funding for these elements when proposing new interdisciplinary collaboration activities.
4. To enhance the uptake of interdisciplinary collaboration approaches more widely, especially in contexts that are also international and intercultural, work is needed to develop a variety of ways to conceptualise and describe needs, rationales, practices, intended outcomes, and prospective benefits, so that they are immediately accessible to stakeholders with different ways of viewing the world. This process could be conceptualised through applying Embedded Intergroup Relations Theory (Alderfer, 1987), as developed by Botterill and de la Harpe (this volume, Botterill & de la Harpe, 2010). A similar objective could be served by further developing the dual communication approaches referred to in this vignette—characterised as academic and pragmatic—within the framework of Woods' model of intercultural competence (Woods, 2007). The analysis we have presented here suggests that a varied range of communication styles can indeed assist in the task of encouraging participation in interdisciplinary collaboration, and further work to conceptualise this process would be a valuable contribution to the field of interdisciplinary practice.

3.4 Shifting the focus: a case study of an EFL context

Enhancing the potential for uptake of interdisciplinary collaboration in the context of CIPSE also requires detailed consideration of the specific characteristics of particular teaching contexts. These are likely to include historical, institutional, and cultural aspects, and may remain opaque to academic visitors even after many visits. Because of a strong interest in the CIPSE approach expressed by a large number of Chinese scientists who encountered it, China became a particular focus of the development and implementation work. The strong emphasis on science and technology (S&T) across the country, the rapidly increasing funding base for this work and the large numbers of research students being educated for careers in S&T research (Bai & Cao, 2008; Zhu, O'Connor, & Cao, 2006) all contribute to making China an interesting and challenging site for this work.

In terms of challenges, there has been a considerable amount of research conducted to help visitors from non-Chinese academic contexts understand elements of the learning and teaching culture that may differ from the assumptions brought from home (e.g. Biggs, 1996; Cortazzi & Jin, 1997, 2001; Watkins & Biggs, 1996), and this forms a useful base for considering adaptations that might be needed to an innovative educational approach before it is introduced in a Chinese context. However, issues around interdisciplinary collaboration have not been a strong focus of this work, although some published studies from Hong Kong have reported difficulties encountered by language professionals seeking to work collaboratively with academics from 'content' disciplines (Barron, 2003; Braine, 2001). Given the centrality of interdisciplinary collaboration to the CIPSE approach, it was important to investigate factors that might influence its potential uptake in as much depth as possible, for their own sake and to contribute to the interpretation of findings from analysing relevant CIPSE data. I felt that the topic warranted a manuscript for a journal in the field of ESP.

This investigation was greatly assisted by the collaborative input of a highly regarded Chinese scholar who agreed to join the manuscript author team. Yongyan Li completed her PhD at about the time I commenced my candidature, and studied Chinese doctoral students of science who were writing for publication in English (John Flowerdew & Li, 2007; Li, 2002, 2006a, 2006b, 2006c; Li & Flowerdew, 2007). Her more ethnographic approach and her ability to source relevant publications in Chinese contributed significantly to the manuscript and its argument (see the Statement of Authorship for details).

Thus Project 2B takes China as a case study of an EFL location where publication skill development for scientists is a high priority, and investigates the potential for interdisciplinary collaboration in this undertaking.

3.5 Statement of Authorship 2

Cargill, M., O'Connor, P., & Li, Y. (submitted). Educating Chinese scientists to write for international journals: addressing the divide between science and technology education and English language teaching. *English for Specific Purposes*.

Cargill, M. (candidate)

Margaret initiated the idea of a paper on this topic and led the conceptualisation, led the CIPSE data selection and analysis, drafted the sections related to CIPSE, and critically revised the manuscript at all stages. Margaret solicited the collaboration of Yongyan in the writing project on the basis of her specific expertise and experience in the area.

Signed: .....

Date: .....

O'Connor, P.

Patrick contributed to the development of the conceptual basis of the article, revised the draft critically from the perspective of his involvement in science in China as well as the CIPSE teaching, and contributed to the data analysis, interpretation and presentation.

The signature below attests to agreement with the attribution of input as described and permission for the manuscript to appear in this portfolio.

Signed: .....

Date: .....

Li, Y.

Yongyan researched the history of and recent developments in the situation from the Chinese sources; selected and analysed relevant data from her previous study which contributed to the arguments being developed; contributed to the drafting of Sections 3.6.3, 3.6.4, 3.6.7 and 3.6.8 and 3.6.10; and critically amended the manuscript several times.

The signature below attests to agreement with the attribution of input as described and permission for the manuscript to appear in this portfolio.

3.6 Project 2B

Educating Chinese scientists to write for international journals: addressing the divide between science and technology education and English language teaching

3.6.1 Abstract

As is the worldwide trend, scientists in China face strong and increasing pressure to publish their research in international peer-reviewed journals written in English. There is an acute need for graduate students to develop the required language skills alongside their scientific expertise, in spite of the distinct division currently existing between English teaching and the other disciplines. Researchers in the workplace also need ongoing training, presenting a complex challenge for the sector. We present an analysis of data gathered as we have introduced, in Chinese science- and English teaching-based contexts, an approach to the development of international publishing capacity entitled CIPSE – Collaborative Interdisciplinary Publication Skills Education. This approach involves scientists and English language specialists working together on education programs adapted to fit local contextual constraints, and builds on collaborative approaches used extensively in ESP contexts elsewhere. Our analysis suggests some possible components of the multi-faceted strategy set that will clearly be required to address the challenges. We argue in conclusion for changes to the teaching of English to research students in the sciences, including the development of a strong research base incorporating corpus linguistics, English for Specific Purposes pedagogy and interdisciplinary collaborative practice.

3.6.2 Introduction

Chinese scientists constitute an important sub-set of the worldwide profession, with an R&D workforce estimated at 32 million in 2006 (Zhu, et al., 2006), whose members are under increasing pressure to publish their results internationally in the most prestigious

journals possible (Qiu, 2010). It is almost axiomatic that this now means writing the manuscripts in English (Ammon, 2001; D. D. Belcher, 2007), and English that meets the requirements of the journals concerned (Burrough-Boenisch, 2003; Langdon-Neuner, 2007). The number of successful manuscripts from China is growing fast (Bai & Cao, 2008). According to the China Science and Technology Information Research Institute (2009), between 1999 and August 2009 Chinese scientists had a total of 649,700 papers indexed in influential international citation indices[9], ranking 5th in the world. The growth is not spread evenly across the country, however, with institutions on the east coast likely to be more strongly represented, as demonstrated recently for environmental science and technology (Zhu, et al., 2006). Nor is the rapid growth unproblematic, with concerns mounting about fraud and plagiarism as a result of the high pressure (Qiu, 2010). This situation suggests that a rapidly increasing number of Chinese scientists need to develop effective skills for writing scientific articles in English, a process which will include interacting with 'literacy brokers' (Lillis & Curry, 2010) and negotiating the publishing process in English. However, little has been published (in English or Chinese) to date on the specifically English-language related aspects of the pressure on Chinese scientists to publish internationally. We seek to address this gap by exploring an interrelated series of issues.

We first discuss the policies driving the growth in publication output, the current capacity of authors in both university and research-institute contexts to publish in English, and the English language provision currently available to prepare and support authors. We then discuss an approach to teaching publication skills in contexts where English is an additional language (EAL) – Collaborative Interdisciplinary Publication Skills Education (CIPSE, Cargill & O'Connor, 2010). We present an analysis of evaluative data from a range of CIPSE implementation sites in China, located within both science and English teaching contexts, that demonstrates benefits of such a collaborative approach for this particular ESP teaching task. The possibilities of this kind of collaborative work in Chinese contexts are affected by a strong separation of the disciplines in Chinese universities, and we then review the historical basis for the division between science and technology (S&T) teaching and English language teaching (ELT). We finally present potential directions for

[9] The report was based on the Science Citation Index (SCI), Engineering Index (EI), Index to Scientific & Technical Proceedings (ISTP), MEDLINE, and Social Science Citation Index (SSCI).

the future and advocate some specific steps that could facilitate the collaboration between science and ELT 'worlds' that we believe will be needed to address the current issues.

3.6.3 Mismatches between writing competence and the publishing task

The increasing number of internationally indexed papers has been catalysed by the establishment of international publication as a graduation requirement in many Chinese universities (Li, 2006c). This requirement means that a primary goal of Chinese doctoral (and some masters level) science students is to publish papers in English in international journals. It can therefore be assumed that much of the work reported in the internationally indexed papers by Chinese scientists has been carried out by doctoral science students. However, it has been questioned what proportion of this cohort is able to write publishable papers with any degree of independence (e.g. Li & Flowerdew, 2007). Students entering a doctoral program, if they have had any particular practice in writing (either in class or by self-study), will have basically learned to write short compositions for various English tests, perhaps by following templates or model essays (You, 2004). They generally feel a lack of confidence in their ability to write in English and are anxious about the prospect of having to publish in English to get their degree. The following is a typical comment (with language errors retained), from a science student in the first year of a doctoral program at a major university:[10]

> I didn't pay special attention on English study ago, and so far my most writing in English may be the compositions in English test or homework. Maybe this essay is also one. Frankly to speak, I'm not very confident in my ability to write in English. I often feel that my vocabulary is so poor during my English writing, and sometimes I don't know how to express my opinion exactly. I'm afraid that I'll also have the above difficulties when I try to write my research paper in English in future. (English in the original)

The students typically also have a critical attitude toward their previous test-driven approach to English learning. Another student said:

[10] The extracts provided here (the students' online discussion of the question whether they feel ready to write publication in English) were taken from the data collected at a major university in China by one of us in a recent project that investigated how Chinese doctoral science students write for international publication.

> I always ask myself the same question: what is the goal of studying English at all? To pass the exam, or to gain the enough scores? I don't know. I just know that up to now, I cannot use English to communicate with foreigner and I absolutely know it must be changed. Maybe modern high school education system would make great progress in enhancing students' abilities to use English just like a tool to do what they want to do. It is the real aim to study a language laboriously. Since I am a student in Physics Department, and have to read and write English paper frequently, I hope I can use English during my work smoothly. (English in the original)

This student was pointing to a problem in the contemporary Chinese "high school education system" (by which he meant "higher education"), i.e., the students have not been oriented to learning "to use English just like a tool to do what they want to do", which, the quoted student believed, should be "the real aim to study a language laboriously". In other words, the student felt their need would be better met through English for some "specific" purposes, rather than the kind of general English they have been learning for the sake of tests.

How does the situation in universities compare to that in post-education research workplaces, where the pressure to publish in English is also felt strongly? Assessments for job tenure and promotion require high publication outputs, as do competitive applications for research grant funding. In addition, as in the situation described in Li (2006c) for a science faculty in a high-ranking university, financial rewards are often available to researchers whose papers are accepted in high impact journals (Cargill & O'Connor, 2006a; Qiu, 2010). Our experience suggests that the English levels, especially of older researchers, may not always be strong enough to meet the demands placed on them, which include not only submitting high-level papers themselves but also developing their students' drafts. Even where senior scientists have well-developed skills themselves for writing and publishing in English and are interested in imparting them to younger colleagues and students, their efforts are often hampered by the combined burdens of very large workloads, including large numbers of students, and an absence of effective teaching materials. These issues can be addressed in a variety of ways, but not all of them are without problems, often unintended.

3.6.4 Problematic issues with current policy initiatives

The recent policy initiatives designed to increase China's output of science articles in well-regarded international journals have clearly been effective, but they have also led in some cases to problematic issues on the ground (Qiu, 2010). We discuss here two such issues that have come to our notice through our research and teaching over recent years. The first concerns recommendations from journal editors to Chinese (and other EAL) submitters on drafts returned for revision, which can sometimes include, as well as a recommendation to get editing assistance from a native-speaker of English, the suggestion to offer this person authorship in return. There are several issues here. Giving authorship to someone who has only done editorial work may well be seen as too large a price to pay by the EAL author (Li & Flowerdew, 2007), and in terms of ethical practice it may not meet Vancouver Protocol criteria for authorship (International Committee of Medical Journal Editors, 2009). In addition, the practice discriminates against EAL scientists without ongoing collaborations with English-speaking scientists – the networks identified by Lillis and Curry (2010, p. 69) as "highly desirable, if not essential" for getting published are not easy to establish. Although these editors' actions may be understandable as the best available response to a complex set of issues, a sustainable solution clearly requires *inter alia* improved training for Chinese scientists as research communicators in English.

The second situation concerns the process of producing manuscripts in English within a university research context. A study conducted recently at a major Chinese university showed that in some research groups, students write little, because of their limited abilities. All the writing is done by the supervisor or an experienced writer in the group (e.g., a post-doctoral fellow), whose primary job may be to write papers based on the data provided by the students (Li & Flowerdew, 2007). A supervisor often decides which student's name will be listed as the first author of a paper, and when. The supervisor's right of allocating first authorship for a student to fulfill the graduation requirement has in some (not rare) cases unfortunately led to tension in the relationship between the supervisor and the students. Such "corruptive" practices have been reported as a student being given first-authorship for some research that he had not contributed to, because the supervisor distributed the first-authorship according to his own plan of letting the students graduate in

a particular order. Where students do try to write, they do so with hardship by imitating the journal articles they read. Although this learning by imitation is a universal strategy of learning to write, in the case of Chinese doctoral science students a notable problem is language re-use to the extent of serious textual plagiarism (John Flowerdew & Li, 2007). This situation suggests a potentially important role for EAP teachers in providing instruction in the skills of re-using language in acceptable ways.

3.6.5 Current approaches for helping scientist authors get their papers accepted

A range of strategies has been adopted to help scientists publish in English. For example, talks on 'how to get published in (named journal)' are often requested of visiting editors, and slides made available on websites. These are often useful at the level of strategy and content selection ('what to write') for the content area being addressed, but may be much less so at the level of 'how to write it in English' in ways that will meet the referees' expectations. Another prevalent strategy we have observed is the recruitment of honorary professors or visiting scholars from among well qualified English-native-speaker visitors or colleagues. These people have dual value: they contribute to the research profile of the department, as well as mentoring novice authors and/or editing draft manuscripts. This can be a valuable contribution, helping individual students reach their goal of graduation and relieving the pressure on supervisors. However, the degree to which these honorary academics contribute to developing transferable skills for future article writing is unclear, and must be expected to vary with individual skill and interest. When it comes to polishing the final manuscript before submission, fee-for-service authors' editors are increasingly being promoted, as can be seen on the websites of major publishers. However, these services are too expensive for many Chinese scientists, especially students. Local English experts do not seem to be often used systematically for this language polishing work, largely due (anecdotally) to difficulties in dealing effectively with the specific language features and discourses of the science and technology content.

Thus the need is clear for new approaches to developing the skills needed by Chinese scientists to publish internationally in English. Such approaches must be responsive to the

range of demands operating and to the range of expertise available (Cargill & O'Connor, 2006b). The next section reports on an approach that has been trialed in both science and ELT contexts in China, and considers its contribution to meeting the needs identified above.

3.6.6 An imported pedagogy: how useful in Chinese contexts?

Collaborative Interdisciplinary Publication Skills Education (CIPSE) is an approach which incorporates, on an equal partnership basis, the contributions of experienced editors, referees and authors of scientific articles in English (scientists) and of research communication teachers/applied linguists (English teachers). It is comparable to the 'team teaching' level of collaboration described by Dudley-Evans (2001), but extended beyond a focus on the requirements of a particular university course to the larger task of writing publishable articles. Its distinguishing features can be described as follows. Within a training framework designed to optimise the long-term publication outcomes of participants, CIPSE aims to develop skills in three interwoven components: *genre analysis* of published example articles from participants' target journals (presentation led by English teachers); *gatekeeper awareness*, understanding and anticipating the role of reviewers and developing strategies for presenting quality research and negotiating the acceptance phase of publishing (presentation led by scientists); and *story development*, packaging and value-adding to data, analysis and information to present and discuss the most important and novel findings of research to the chosen audience (presentation shared) (Cargill & O'Connor, 2010).

CIPSE workshops were initially designed to be run over ~5 days in 'science' contexts: research institute settings with around 30 EAL scientists from closely related fields of science. However, shorter CIPSE variants have also been presented by invitation on Chinese university campuses under the auspices of English departments or Graduate Schools – designated here 'English language teaching' (ELT) contexts. These participants (students) have come from a wide range of science disciplines and had lower levels of research experience. As similar evaluation processes were employed, data from the two types of context can be analysed to investigate the perceived effectiveness of CIPSE in

science and ELT contexts. Here we present data from presentations in three science contexts, taught by teams of scientists plus language professionals; and in three ELT contexts, taught by language professionals either with or without support from scientists (see Table 3.3 for details).

Data were collected as follows. In the first session of CIPSE programs conducted post 2004, participants were asked to indicate their level of confidence, both to write a paper in English for international submission and to deal with the publishing process in English, on a 7-point Likert scale (1=not confident, 7=very confident). The confidence questions were presented again in the last CIPSE session, with responses matched for analysis through birthdates. In the final session of all workshops, participants completed evaluation questionnaires asking for their level of agreement with evaluative sentences about the program, and their assessment of the time allocation to different components.

Table 3.3. Comparison of selected CIPSE workshops in China 2002-7

Location/sponsor	**CIPSE course type**	**Hours**	**Presenters**	**n**
Science contexts				
Lanzhou University, Gansu 2002	For participants in 5 Australian-funded research projects	48 (8d)	1 EAP, 3 scientists	20
Institute of Botany, -CAS[3], Beijing 2005	For early career researchers and journal editorial staff	30 (5d)	1 EAP, 3 scientists	28
New Phytologist Journal, Beijing 2007	For prospective submitters to the journal	30 (5d)	1 EAP, 3 scientists	33
English teaching/Graduate School contexts				
Graduate University of CAS[1], Beijing 2006 (Foreign Lang. Dept)	Assessed summer- school course on 2 campuses	20 (5d)	2 teams of 1 EAP plus 1 scientist	110
Nanjing University 2006 (Graduate School /English Dept)	Lecture series, voluntary attendance, evening repeat lectures	10 (5d)	1 EAP	128
Shanghai University 2006 (Graduate School)	Lecture series, enrolment required	10 (5d)	1 EAP	33

[1] Chinese Academy of Sciences

Participants in both types of context evaluated the workshops positively. All reported increased post-workshop confidence, both to write a paper in English and to deal with the

publishing process (Table 3.4). (Although confidence was not assessed in the same way at the 2002 workshop in Gansu, an evaluative statement 'This workshop has increased my confidence to submit a paper to an international journal' received a mean response equivalent to 4.5 on a 5-point Likert-scale where 1=strongly disagree, 5=strongly agree.) However, the ELT context participants showed greater increases for both measures than those in science contexts, and in two cases finished the workshop with confidence levels higher than any reported by science-context participants (Table 3.4). This can be explained by a lack of first-hand familiarity with the rigors of the refereeing process, as these students were still engaged in the coursework component of their programs and had in most cases not yet commenced their own research. Nevertheless, even the most experienced cohort (*New Phytologist*), who had been recruited as likely future contributors to this high-impact journal, reported strong increases in their confidence to write the manuscript (0.9 increase on the 7-point scale) and to deal with the publishing process (0.6 increase, calculated as repeated measures on the same individual, data not shown). Thus confidence increased for all participant cohorts, but, as could be expected, higher levels of research experience moderated the increase.

Responses to evaluative statements about the CIPSE workshops were also highly positive in all contexts (Table 3.5). Participants appeared able to manage the spoken English used by the presenters (all EL1 speakers). The most difficulty with the English level was reported at the 2002 Gansu workshop; this is likely related both to the site, in western China and therefore more remote from opportunities to interact with English speakers, and to the date, as we have observed a considerable change in participant profile over the years. It seems then that the CIPSE workshops were perceived as very effective by Chinese participants in both science and ELT contexts. Examination of the data on the various workshop components reveals some interesting differences (Table 3.6).

More time on sentence writing was a consistent theme, and was requested by more participants in the ELT contexts (48-58%) than in the science contexts (26-42%). The university students could perhaps be expected to have a strong focus on improving sentence writing. What is at least equally noteworthy is that, for two science contexts, more than a third of participants wanted more help with sentence writing, and the most experienced cohort (*New Phytologist*) registered 42% in this category. (The lower response

for Gansu can be explained by the fact that this was an 8-day workshop, and extra time had been spent on this aspect.) Thus, even after participating in a 5-day workshop which they

Table 3.4. Mean responses of participants before and after CIPSE workshops in 2* science and 3 ELT contexts when asked 'How confident are you to write a paper in English for international submission?', and 'How confident are you to deal with the international publishing process?' (1=not confident, 7=very confident) *Data not available for Gansu 2002.

Context/sponsor	**n**	**Writing confidence**			**Publishing confidence**		
		Before	After	Change	Before	After	Change
Science contexts							
Institute of Botany	30	3.9	4.7	+0.8	3.8	4.8	+1.0
New Phytologist	33	3.6	4.5	+0.9	4.1	4.5	+0.4
English teaching/Graduate School contexts							
GUCAS[1]	109	3.8	5.1	+1.3	3.4	4.9	+1.5
Nanjing University	85	3.2	4.6	+1.4	3.0	4.7	+1.7
Shanghai University	31	3.4	5.0	+1.6	3.2	5.1	+1.9

[1] Graduate University of the Chinese Academy of Sciences

have rated as extremely useful and confidence-boosting, many scientists saw improving their English sentence writing as an under-addressed need. Overall, the finding would indicate an important role for English language teachers (either Chinese or visiting from overseas, as in the current report) in the ongoing push to improve the output of scientific publications of high standard from Chinese institutions, through their ability to help students develop their English at the sentence level.

An equally striking difference is to be seen in the percentage of participants in the two contexts who thought that too little of the available time had been spent on data presentation and writing about results: 42-58% for the science-context participants, compared to 5-22% for the graduate students participating in ELT contexts (Table 3.6). Within the ELT category, between 12 and 39% of participants actually thought that too much time had been spent on these elements (data not shown), even though the proportion was already less than for the science contexts. These results indicate the difficulty in presenting a realistic picture of the challenges of preparing effective manuscripts in a context where the full task cannot yet be entered upon because the participants are at too

Table 3.5. Mean response range of participants in 3 science and 3 ELT contexts to evaluative statements about CIPSE workshops on 'Writing a scientific article in English for international publication' (1=strongly agree, 5=strongly disagree).

Statement	Science contexts	ELT contexts
a. Analysing example journal articles was helpful to my learning	1.2 – 2.0	1.1 – 1.5
b. The balance between presenters' input and participants' doing tasks was appropriate for my learning	1.5 – 2.1	1.6 – 1.9
c. The materials (handouts) provided were helpful for my learning	1.2 – 2.0	1.3 – 1.6
d. The level of English used in the workshop was too difficult for me	3.0[1] – 4.2	3.9 – 4.3
e. The workshop has increased my knowledge of the international scientific publishing process	1.3 – 1.8	1.2 – 1.5
f. I would recommend this workshop to my colleagues	1.1 – 2.4[2]	1.2 – 1.3

[1] 3.9-4.2 excluding Gansu 2002

[2] 1.1-1.8 excluding IB-CAS, where the questionnaire statement included the words '…who had to pay for it themselves', which could be expected to moderate the willingness to recommend.

early a stage of their candidature. Correct sentences alone are obviously not enough to ensure acceptance of an article for publication (Wood, 2001), and the relationship between the strength of the language in the sentences, the strength of the data and the clarity of their presentation is an important factor. This can best be understood by people who have already struggled to present their own data effectively, i.e., who have had some research experience. If English language teachers, following what was said above about their potentially instrumental role in enhancing students' sentence-level skills, were asked to teach the full range of CIPSE components to early candidature graduate students, this aspect of the teaching is likely to be especially difficult for them, and collaboration from science academics would be especially valuable.

In summary, the results presented here indicate that the CIPSE approach was perceived as highly effective in a range of Chinese research and research education contexts. Participants consistently scored the combined presenter team of scientists plus English teacher as highly effective in helping them develop their skills to write and publish in English (1.2-1.5 on 5-point Likert scale, 1=strongly agree, 5=strongly disagree). Analysis of the evaluation data shows that English language professionals have an important role,

Table 3.6. Percentages of participants in CIPSE workshops in 3 science and 3 ELT contexts who reported **too little time** spent on 5 listed workshop elements

CIPSE element	**Science contexts**			**ELT contexts**		
	Gansu[1]	IB-CAS[2]	NPhyt[3]	GUCAS[4]	NJU[5]	SHU[6]
Structure of scientific article and its sections	32-53[7]	14	15	15	14	18
Writing sentences/grammar	26	36	42	48	48	58
Data presentation/writing about results	42-58[7]	57	42	5	22	22
Responding to editors and referees	47	4	12	20	22	21
In class exercises/writing time	16	32	12	17	27	42

[1] Lanzhou University, Gansu 2002 [2] Institute of Botany Chinese Academy of Sciences 2005
[3] *New Phytologist* Journal 2007 [4] Graduate University of Chinese Academy of Sciences 2006
[5] Nanjing University 2006 [6] Shanghai University 2006
[7] Range represents responses to several sub-questions

especially around writing correct sentences, and scientist input is also crucial, especially around issues of data presentation. However, CIPSE presenter teams to date have been composed entirely of native-speakers, and as Li and Flowerdew (2007, p. 114) recommend, a future goal is "systemized partnerships between Chinese-native EAP professionals and Chinese-native scientists who are experienced EAL authors". A recent teaching text on the CIPSE approach (Cargill & O'Connor, 2009) may be a useful support to such partnerships. An issue that now arises concerns the practicalities of establishing the collaborative partnerships needed. There are several features of the current scene that suggest barriers to be overcome.

3.6.7 Compartmentalization of disciplines in Chinese higher education

As in other systems, English and science teaching in China are traditionally separate subjects, and exchange and collaboration between them have not been part of the tradition. In the early 1930s, when four distinguished European educators conducted a review of Chinese higher education at the invitation of the then Nationalist government, the fragmentation of knowledge was among the major areas of weakness they identified

(Hayhoe, 1989). The fragmentation was exacerbated in the 1950s as a result of mimicking the Soviet model. Meanwhile, educational institutions were nationalized on the basis of a "centralized" model, with narrow specializations organized to serve the needs of manpower planning in the centrally planned economy (Mok, 2006, p. 102). Thus at local levels, "[w]ithin each higher institution it was the specialization, rather than the department, which was the most important academic unit …Very little cooperation existed even among specializations within the same department." (Hayhoe, 1989, p. 46). This situation was ameliorated somewhat in the early 1980s, when university enrollments rose sharply and departmental and cross-departmental cooperation was officially encouraged (Hayhoe 1989). However, in our experience interchange between disciplinary departments (for instance, students attending courses in another department, or exchange between staff of different departments) remains extremely limited up to this day. English teaching in comprehensive universities in China is normally separated into two streams: that for English majors (in the Department of English) and that for undergraduate and graduate students across the other disciplines (in the Department of College English). Neither of the two English departments traditionally engages in joint academic endeavors with departments teaching other subjects (hereafter referred to as other discipline departments [ODD]). The kind of collaboration between the English teaching departments and ODDs that is required in programs such as Writing Across the Curriculum in the USA (Bazerman, et al., 2005), the collaborative ESP approaches at Birmingham in the UK (Dudley-Evans, 2001) or embedded and integrated language development in Australia (Arkoudis & Starfield, 2007; Jones, et al., 2001) has not been a feature in Chinese universities (see for example, Townsend's (2005) field investigation at a major university in Northern China).

An initiative that has gained considerable attention, aimed to help develop the discipline-specific English skills of students studying within ODDs, is termed *bilingual teaching*. It is being increasingly implemented as a result of policy encouragement from the national Ministry of Education and hence the university level (Feng, 2009). The teaching occurs within the ODD, typically taking the form of adopting imported English-language textbooks, with the subject academics teaching in Chinese or English and sometimes with English-based powerpoint slides (Pan, 2007). However, it seems to us that to date there are no reports of bilingual teaching involving *substantial* collaboration between language professionals and disciplinary specialists, especially in science. This is in spite of the fact

that the requirement for bilingual teaching has added considerably to the workloads of ODD teaching staff (Pan, 2007). A recent report that was critical of the bilingual education 'juggernaut' referred to collaboration between discipline specialists and English teachers in the context of "measures of expediency, to cope with teacher shortages" (Hu, 2007, p. 102), suggesting that work is needed to demonstrate the value of collaborative approaches. However, if bilingual instruction is relatively recent in China, it should be recognized that English for Specific Purposes (ESP), in the form of English for Science & Technology (EST), had an early start in China, as shown below.

3.6.8 ESP/EAP in China

After the turmoil of the Cultural Revolution (1966-1976) was over, rapid development occurred in English language education in China, which paralleled an all-round adjustment of S&T policies in the 1980s as the country started its modernization efforts (van Naerssen, 1988). By the mid-1980s, the English education that students of science and technology received was characteristically "general English with an emphasis on reading materials in English for science and technology" (H. Yang, 1990, p. 232), while teacher practitioners were starting to debate whether general English or ESP/EST should be taught to these students. From the mid-1980s, an emphasis on "common core" became increasingly clear, along with a declared primary goal of College English education as the enhancement of reading competence (Cai, 2007; Feng, 2009). In the past two decades, ESP teaching/training in China has gone beyond the more traditional EST, and Business English instruction in particular has become an important enterprise (e.g. Zhang, 2007). However, ESP-based research, in the sense of EST or beyond, has been surprisingly rare in China, and often focused at a theoretical level (e.g. Chen, 2001; Wen, 2001) and based on generalist texts (e.g. Hutchinson & Waters, 1987; P. Robinson, 1991), rather than more recent and focused contributions.

At a more specific level, EAP – English for Academic Purposes – seems to be a rather new term in Chinese ELT circles. Introductions of overseas EAP programs started only recently, along with a call for the necessity of incorporating EAP as a specialized area in the current ELT curriculum and research program (e.g. Luo, 2006; Yao, 2000). Of course,

the general absence of the term EAP from the ELT scene to date does not mean that there has not been pedagogy in China specifically oriented to English for academic purposes. However, it seems clear that specific instruction on *academic writing within specialist disciplines* has in general been lacking. When Chinese English teachers and curriculum planners seek to address the needs of science and technology major graduate students needing to write for publication, one issue they face is a lack of training in techniques to allow ELT academics to deal effectively with the very specialist 'Englishes' used to convey the discipline-specific concepts within the ODDs – a common dilemma for ESP (Bhatia, 1991). In line with the historic focus on specializations within disciplines alluded to above, almost all English language specialists in Chinese universities have themselves specialized in some facet of literature, or theoretical or applied linguistics (in the sense of second language acquisition). When this fact is combined with a teaching approach focused on content delivery (Gao, 2007) and where the teacher is expected to be able to answer all the students' questions about texts studied in class – which has been recognized as a long-standing mode of teaching in the English language class in China (e.g. Yu, 2001) – it is understandable that science texts are seldom seen as manageable sources for English class materials. Collaborative approaches across disciplines are often used by ESP/EAP teachers in other contexts to address such difficulties, but these require willingness on both sides.

3.6.9 Issues for moving towards collaborative training approaches

Scientists' perceptions may need broadening also. At the *New Phytologist* CIPSE workshop, interviews were conducted with two experienced Chinese scientists who have demonstrated sustained interest in educating scientists for their role as publishers in English (Cargill, unpublished data). Both stated unequivocally that development programs should be located within science departments, not English departments. These scientists were in a position to conduct effective training themselves from both language and science perspectives, having spent many years working in research environments in English-speaking countries. They also had a commitment to the task, as demonstrated by their attendance at the workshop and strong publication records. This combination of skills,

experience and commitment is far from common. Our concern is how the necessary range of skills could be brought together in other circumstances. A start is provided by Cargill and O'Connor (2006b) in terms of the components required, but bringing together the personnel is likely to present a significant challenge. Even when scientists in a recent study expressed keenness to implement the CIPSE approach in their research groups following exposure to it in a workshop, they did not include collaboration with a local English teacher as one of the steps they would take in doing so (Cargill & O'Connor, forthcoming), suggesting that work is needed to highlight the relevance of appropriately trained ELT staff to addressing the publication skills challenge.

One possible option is for science research institutes to employ an English-language expert to assist the researchers with their publications. Interestingly, when this was proposed to an institute director in this study, he replied that he would have no way to promote such a non-scientist specialist, and this would make the approach non-sustainable and even exploitative (Prof. Nan Zhibiao, pers. comm. 2002). This recognition points to an important, and common, dilemma worldwide – without institutional commitment to sustainable structures and career paths for those teaching publication skills and research communication, developments can only be local, ad hoc and short-term. The growing recognition of such system-based issues is reflected in their inclusion in the mandate of the Education and Human Resources Directorate of the US National Science Foundation (Ramaley, Olds, & Earle, 2005).

Another possibility is for scientists and English teaching staff within a single university to collaborate on a course, which could use any of Dudley-Evans' (2001) levels of interaction: cooperation (EAP teachers seeking information about what is needed from scientist informants); collaboration (EAP teachers and scientists working together outside the classroom on preparing the course); or team teaching. Conditions that could encourage such a break with tradition include a strongly expressed need among science academics for their graduate students to learn skills and language for writing for publication in English; encouragement/ incentives from the university level to try innovative approaches; and staff in both English and science areas willing to work together as equal partners, respecting each other's "expertise and professionalism" (Dudley-Evans, 2001, p. 228).

3.6.10 Building bridges from both sides of the divide?

Directions for the future seem to us to focus on the need for collaboration between science and ELT academics within a framework of strong institutional support for the development of collaborative methodologies. The bilingual teaching initiative already in place could be an important motivation for English teacher-disciplinary specialist coalition. Another impetus should be the reforms that have been called for in ELT in China – in both teaching and research. On the teaching front, there has been extensive discussion (and to some extent, practice) in the past decade of the cultivation of "talents with mixed abilities", i.e. talents who possess skills in other disciplines apart from proficiency in English and who fit into the needs of the society upon graduation (Rushi yu waiyu jiaoyu ketizu [Joining WTO and foreign language specialization education project team], 2001-2002). Although this concept has usually been discussed in the context of business and commerce fields, its expansion to include science and technology would be an obvious avenue to follow in seeking to address the issues we have been considering in this paper. On the front of ELT research in China, very recently there has been a call for a shift toward "an interdisciplinary research paradigm" (Nan & Fan, 2007). As this call is taken up, it will be important to include not only the disciplines that are more closely related, such as Education and Applied Linguistics, but also those that are at a greater distance.

Efforts can be made to facilitate productive collaborative interchanges, and to encourage ELT academics to recognize and present themselves as being on an equal footing with science and technology colleagues, acknowledging the contribution they bring to the exchange as different but equivalent, and working to overcome reluctance to collaborate such as that identified by Braine (2001) in Hong Kong. Corpus linguistics, for example, offers a tool for producing research findings that can be highly relevant to researchers in other disciplinary fields seeking to publish in English (e.g. Hancioglu, Neufeld, & Eldridge, 2008; Ken Hyland, 2000). Small-scale corpus studies can also be usefully conducted by EAL authors themselves in writing their manuscripts (e.g. Cargill & Adams, 2005; Lee & Swales, 2005). In addition, when ELT specialists introduce this tool to academics in other disciplines, they demonstrate a data-driven approach to language development that often sits very comfortably with the methods used in scientific research, enhancing the communication possibilities at a professional level. The discovery-based approach that is at the heart of corpus linguistics is also evident in genre analysis (e.g.

Swales, 1990, 2004). Training in genre analysis could enable Chinese ELT professionals to adopt a more discovery-based approach when working with advanced students from science and technology fields, reducing the need for teacher mastery of the details of the content (Bhatia, 1991; Sengupta, Forey, & Hamp-Lyons, 1999; Zeng, 2001)

Courses of action taken in all the above directions could facilitate coalitions and collaborations between English teachers and specialists in other disciplines. However, the challenge for such a development is also clear: that those on the two sides of the divide realize the necessity and benefits of the collaboration and make the effort to collaborate. Scientists would need to recognize a role for appropriately trained ELT professionals in developing publication skills, and be prepared to collaborate in developing effective approaches. For ELT academics, a shift would be needed so that core goals of teaching extend beyond general English, to developing competence for the real-world writing tasks their students will face, meaning journal articles in the case of science research students. This shift would have significant staff training implications, as noted by Berkenkotter and Huckin (1995, p. 163) for a shift to genre-based teaching in the USA. Institutions, including at the system level, would have to play their part, by providing resources in time and money, and incentives in pay or promotion, to support the development of the needed collaborative approaches. This collaboration cannot happen unsupported, but the potential rewards of providing support are great – progress towards addressing a serious bottleneck holding back the development of Chinese scientific publication in English.

3.7 Project 2 conclusion: Interdisciplinary collaboration in CIPSE

Taken together and considered through the overarching lens of reflective practitioner research, these studies suggest that it is not a straightforward matter to promote and develop interdisciplinary collaborations between scientists and language professionals, wherever one is located. Nevertheless, such collaborations have been shown to be highly effective, in the contexts investigated here, in developing novice authors' confidence and skills for writing publishable science research articles, an important goal of science education worldwide. The research questions posed in Section 2.5.1 to guide Project 2 were these:

- What were the effects, on interdisciplinary team structure and workshop effectiveness, of contextual factors encountered during CIPSE implementation, especially participants' level of research experience and the institutional location of the training?
- What can the implementation of CIPSE in various contexts tell us about the establishment and operation of effective interdisciplinary teams in publication skill development?
- What are the contextual challenges and possible responses for developing interdisciplinary teams utilising aspects of the CIPSE model in Chinese science research contexts, within both universities and research institutes?

Based on the analyses presented in this Project, a collated list is presented below of factors that contribute to answering these questions, and may need to be considered or pursued in seeking to develop interdisciplinary collaborations in a particular context where publication skill development is a priority.

- The chances of collaboration working successfully are enhanced when the outcome sought (enhanced skills for writing a publishable manuscript in English) is 'core business' for both collaborators – so there may be a need to broaden the perspective of those in English-teaching contexts, and/or those who teach or administer science programs.
- It seems that many people need to experience a demonstration of CIPSE before they understand what it is and can do – so it may be beneficial to include trials or pilot programs when seeking to introduce CIPSE, with subsequent review of implementation options. It can be important to ensure that people with the power to make the needed decisions are part of the trial or pilot.

- There is an ongoing need to discover and develop language to enable better communication between the worldviews and concerns of science-based and language-based professionals – addressing the 'scare words' (Costino & Hyon, 2011) that run the risk of hindering effective communication. It seems to be highly worthwhile to spend effort on trialling promotional material or project proposals with samples of the target audience before use.
- Potential collaborators need to enter the arena with an attitude of respect for the expertise and professionalism of the other; as is reported to often occur in corporate settings (Ken Hyland, 2002). Finding ways of self-presentation that appear relevant to the other group can be a useful strategy to help this happen.
- System-based and institution-based changes may be needed to facilitate interdisciplinary collaboration of the kind needed for CIPSE – another reason to include those with relevant power as participants or observers in pilot workshops.
- The training implications for developing effective interdisciplinary collaboration for publication skill development are considerable – in both teacher education and professional development contexts – and need to be included in planning from the start.
- On the positive end of the issue spectrum - CIPSE can be used effectively even where full collaboration is not (yet) possible: by language professionals, as demonstrated in the contexts examined in Project 2; and by scientists, as will be indicated in the first part of Project 3.

Implementation of CIPSE in two very different types of context in China is the concern of Project 3, with a primary focus on its use with scientists at different stages of their careers.

4 Project 3 - Investigating contextual factors: Implementing CIPSE for Chinese science researchers at differing career stages

4.1 Introduction to Project 3

Project 3 takes the People's Republic of China as a case study of an English as a Foreign Language (EFL) location where science is an important and growing enterprise, and where international publication of research findings in the refereed literature is both highly valued and expanding rapidly. The total number of Chinese papers listed in the Thompson-Reuters ISI database (http://isiwebofknowledge.com) for 2008 is 94,766, and the country's research intensity (number of papers per 1 million population) has been increasing at about 20% per annum in recent years (Hien, 2010). One driver of this growth is likely to be the requirement that students enrolled in research degrees in top-tier universities must publish one or more first-authored papers in ISI-listed journals before award of their degree (Li, 2006c), a policy which has seen steep increases in the number of papers from China submitted to international journals. As discussed in Project 2B, there has not been a concomitant emphasis on helping these research students develop the skills needed to write manuscripts in English that can meet the requirements of the journals they are targeting. Neither are systematic initiatives in place to support researchers in institutes in their publishing activities. Thus it seemed important to investigate the applicability and effectiveness of CIPSE for use with Chinese science researchers wanting to write in English for publication across both these contexts.

However, China also has a strong and long-standing tradition of formal education, and a culture of learning and teaching that has been documented to differ in clear ways from that which has developed in the western academy (Biggs, 1996; Cortazzi & Jin, 1997). There have been several recent reports of challenges for both teachers and learners when innovative education practices developed in the west have been introduced in China, especially when language learning is involved as with communicative methodologies (Hu, 2002; Ouyang, 2003), but also with problem-based learning (Stokes, 2001). Therefore it was judged important to operate on a principle of small steps and as much negotiation and consultation as possible in each teaching site, in order to identify and adapt for issues of the context at both macro and micro levels that were relevant to achieving optimal

outcomes. A goal from the beginning was to enhance the chances that local staff would identify aspects of the CIPSE approach as useful for their context, and be interested in adapting them to their own needs and capabilities. Given the issues that exist around the formation of collaborative teams, however, as discussed in Project 2B, it seemed also important to investigate how useful CIPSE can be when implemented by either scientists or language professionals alone, perhaps as a first step towards a collaborative implementation.

Project 3 is presented as two parts, each focusing on Chinese scientists at a different career stage. The aims of the project were

- for practising science researchers in China, using data gathered from CIPSE training events held for researchers in a range of science disciplines, to identify the important issues and challenges faced, both in writing for publication in English and in training others to do so, and to evaluate the contribution of the CIPSE approach to addressing these issues; and
- for early-candidature HDR students not yet conducting their own research, to work with senior Chinese academic and administrative staff and classroom teachers within the Graduate University of the Chinese Academy of Sciences (GUCAS) to teach, evaluate and improve through four iterations (2006-9) an assessed summer-school course on publication-skills development, and to develop recommendations for the implementation of relevant CIPSE elements in this and other similar university settings in China and other EFL contexts.

Project 3A, which focuses on practising researchers, addressed the following research questions:

- What are the issues and challenges facing EFL science researchers in China as they seek to write articles for submission to international, peer-reviewed journals?
- What issues are faced and what practices are currently used by senior Chinese researchers in guiding/mentoring their students and junior colleagues in writing articles for international submission?
- To what extent and in what ways can CIPSE training contribute to building the confidence of novice scientist authors to write manuscripts in English, and that of senior scientists to train/mentor their students and colleagues?

The text as presents has been accepted for publication in a book edited by an applied linguist and English teacher trainer from the Singapore National Institute of Education:

Cargill, M., & O'Connor, P. (forthcoming). Identifying and addressing challenges to international publication success for EFL science researchers: Implementing an integrated training package in China. In R. Tang (Ed.), *Academic Writing in a Second or Foreign Language: Issues and challenges facing ESL/EFL academic writers in higher education contexts*: Continuum.

It thus has as its disciplinary focus teachers and graduate students of academic writing in English, an important segment of the English teaching profession, members of which may recognise relevance to their own work in aspects of the collaborative CIPSE approach, or develop an interest in undertaking this type of specialised teaching in their home contexts.

Project 3B reports the outcomes of the four-year action research project conducted at GUCAS to adapt CIPSE for use with research students who are

- in the early stages of candidature (i.e. not yet conducting research),
- from mixed science and technology disciplines,
- studying in large classes, and
- taught by teachers using English as a foreign language.

The research questions addressed in Project 3B were these:

- Which elements of CIPSE curriculum/pedagogy are applicable in teaching publication skills to early-candidature research degree students in China?
- What kind of team structure is suitable to deliver these elements?
- Which contextual factors are important in answering these questions, and what conclusions can be drawn for implementing similar programs in comparable EFL contexts?

The final iteration of the course, taught in 2009, is shown to have potential for further development for more general use in China and EFL contexts sharing similar contextual features.

Project 3 concludes by summarising the role of career stage as a contextual variable in CIPSE implementation, and the learning from the two parts of the Project in terms of the original research questions and broader application.

4.3 Project 3A – “Identifying and addressing challenges to international publication success for EFL science researchers: Implementing an integrated training package in China”

4.2 Statement of Authorship 3

Cargill, M., & O'Connor, P. (forthcoming). Identifying and addressing challenges to international publication success for EFL science researchers: Implementing an integrated training package in China. In R. Tang (Ed.), *Academic Writing in a Second or Foreign Language: Issues and challenges facing ESL/EFL academic writers in higher education contexts*: Continuum.

Cargill, M. (candidate)

Margaret negotiated the invitation to submit to this edited volume, conceptualised the argument in terms of the expectations and interests of the target audience, conducted the selection, categorisation and analysis of the data included, drafted the text and led the responses to the editor during the review process.

Signed: .....

Date: .....

O'Connor, P.

Patrick revised the draft critically from the perspective of his different disciplinary location, and contributed to refinement of the data analysis, interpretation and presentation.

The signature below attests to agreement with the attribution of input as described and permission for the manuscript to appear in this portfolio.

Signed: .....

Date: .....

4.3 Project 3A

Identifying and addressing challenges to international publication success for EFL science researchers: Implementing an integrated training package in China

4.3.1 Introduction

One group of EFL/ESL academic writers intimately involved with the challenges of learning to write effectively in English is science researchers. For them, successful submission to international journals of article manuscripts written in English forms an essential requirement for both establishing their career and progressing in it. This chapter is concerned in particular with the part of this group working in China; these scientists are increasingly represented in statistics for both submitted and accepted papers (pers. comm., Prof. I. Alexander, Chair, New Phytologist Trust, 21 November 2009; Li & Flowerdew, 2007), an increase driven in part by the requirement of many Chinese universities that candidates must publish a paper in a journal listed in the international Science Citation Index before they are eligible for the award of their PhD or Master by research degree (Li, 2006c). Training of novice authors for this publication task is not often available in any systematic form (Li & Flowerdew, 2007), and the work of ensuring that manuscripts are ready for submission often falls to the researchers' academic supervisor or thesis advisor, adding to an already very heavy workload (Cho, 2009; Li, 2006a; Li & Flowerdew, 2007). This work, however, is most likely to concentrate on preparing a high-quality final product, and the amount of training the novice member of the author team actually receives during the process can be variable, to say the least. On the one hand, little is known about the practices of senior authors of science papers in terms of training their junior colleagues or students in paper writing. On the other, calls are increasing for a more systematic approach to this training, both in China and other EFL contexts (Cho, 2009; Li & Flowerdew, 2007), and an understanding of the issues and challenges faced is an important prerequisite. This chapter aims to contribute in all these areas.

Training for writing science articles for publication is often envisaged by English language professionals to focus mainly on language and discourse features (e.g. Cho, 2009), and by scientists to focus mainly on meeting the audience's expectations of the content – what to write, at the expense of how to do so (e.g. Day & Gastel, 2006). However, Li and Flowerdew (2007, p. 100) suggest a need on the ground for 'systemized partnerships between language professionals and subject professionals', in order that EFL authors may have access to assistance with the full range of issues likely to affect the decision of the journal editor and referees regarding acceptance for publication. We represent such a partnership, being an applied linguist/research communication consultant (Margaret) and a research ecologist/environmental consultant/science educator (Patrick). Since 2000 we have been working together to develop a practical approach to publication skill training for scientists that effectively integrates relevant concerns from the domains of language, science and pedagogy (Cargill, 2004; Cargill & O'Connor, 2006a, 2006b).

In pursuing this aim we have built on the understandings of many others in the fields of ESP and EAP that collaborative work between language specialists and subject specialists can have very positive outcomes for learners in a range of educational contexts. Models for designing such interactions are usefully summarised for an Australian context by Jones, Bonanno and Scouller (2001), who explain the conceptual differences among several different models. Dudley-Evans (2001) in the UK has also usefully distinguished three levels of partnership between language specialists and subject specialists. The first involves language specialists running language courses which they design based on 'cooperation' from subject specialists who provide prior input about their students' specific language needs and target tasks. The next level is termed 'collaboration', and involves language and subject specialists working together outside the classroom to design classroom tasks for the language course, such that specifically-tailored and timely language support can be provided to students to help them in their subject course. The third level in this taxonomy is 'team teaching', where both specialists work together in the same classroom. We use elements of both 'collaboration' and 'team teaching' in our approach.

In the USA and elsewhere, approaches involving various degrees of shared work across discipline boundaries are named Writing Across the Curriculum (e.g. Bazerman, et al., 2005) and Content-based Instruction (e.g. Brinton, et al., 1989). In all cases and continents, the programs and models have been developed in response to local contextual

constraints, and the levels of collaboration and integration of the language and subject components vary accordingly. In the Jones et al. (2001) model, the two approaches most connected to our approach are called integrated (taught by language specialists, but often with subject specialists present) and embedded (which describes "the collaborative design of a curriculum in which the development of generic skills and academic literacy is the organising principle for the course and which is ultimately taught by subject staff" (Jones, et al., 2001, p. 11). Both these types of collaboration are relevant in the discussion that follows of the approach we have developed for training novice article authors.

For all these approaches the literature reports challenges with initial establishment, and also with maintenance of teaching programs as staff change and training and commitment are lost through attrition. A notable issue is the need for a common set of vocabulary to communicate clearly between the disciplinary world views, with Jones et al. (2001, p. 8) citing a call by Threadgold et al. (1997) for "translation and retraining on both sides". This issue has also arisen for us in developing and using our collaborative approach. The titles of our early papers included terms such as 'collaborating-colleague' and 'genre-based' as we struggled to find a name that would carry the appropriate messages for scientists as well as language professionals. We have now settled on Collaborative Interdisciplinary Publication Skills Education (CIPSE: Cargill & O'Connor, 2010) as the name of the approach, taking advantage of the growing interest in interdisciplinary teaching and research in higher education (Davies, Devlin, & Tight, 2010). Explaining it to scientists has been made easier through the publication of a teaching text *Writing scientific research articles: Strategy and steps* (Cargill & O'Connor, 2009) and the establishment of a companion website at www.writeresearch.com.au, where information can be provided with both 'academic' and 'pragmatic' focuses (Cargill & O'Connor, 2010), including on the training programs we offer in both EL1 and EFL/ESL situations.

It is important here to be specific about the complementary contributions made by the different expertise sets that we each bring to the task of teaching and researching publication skill development through CIPSE. In particular, how is a CIPSE training event different from a course designed and taught by an experienced EAP teacher alone? Without wishing to repeat previously published descriptions of the workshops (Cargill & O'Connor, 2006a, 2006b) in detail, we can highlight the following three features that represent contributions from Patrick to the pedagogical process we use. First, the

organising ‘frame’ for the workshops is a collated set of criteria representative of those used by referees of science articles in preparing their reports for journal editors about the acceptability of submitted manuscripts for publication. The synthesised set of referee criteria is further reinforced by examples of author-referee correspondence and invitation to participants to share their own experiences of the refereeing process used by journals. The interpretation of examples of referee comments occurs within the context of the research sub-discipline where possible. Workshop participants are also encouraged to look at their own manuscript drafts as a referee would, in search of the evidence needed to respond to the questions asked of them: e.g. Is the contribution new? Is it significant? Is it suitable for publication in this journal? (Cargill & O'Connor, 2009, p. 16). Referees are presented as real working scientists, overworked and reviewing papers late at night, with the baby crying in the next room. The need for manuscripts to present their main messages clearly and emphatically is thus reinforced through a peer-to-peer conversation between working scientists, and the structural and language features that help such a presentation then take on new relevance. The authority of a working/publishing scientist as teacher cannot be overestimated and may in part explain why interdisciplinary teaching of science writing has not become the norm – scientists tend not to recognise, until it is demonstrated to them, the extra value that can be added by a complementary language-based component.

The second scientist-driven difference relates to the order in which article sections are dealt with in the workshops. Unlike most teaching or advice books on the topic (e.g. Weissberg & Buker, 1990), we begin not with the introduction but with the results, and the need to identify a coherent ‘story’ told by the results package selected as the basis for the article. Tables and figures must be refined so that each presents clear evidence for one or more components of the paper’s ‘take-home message’. The construction of packages of results is a process which generates questions about the novelty, importance and limitations of the research. The questions generated are best understood from within the framework of scientific research, preferably from within the discipline or sub-discipline of the research field. Practised understanding of how scientists read and interpret the results of other researchers’ work is an essential capability of the scientist as CIPSE trainer, and underpins traditional approaches of mentoring early career researchers. It is only after the packaging of results that we talk about language challenges such as the use of English verb tenses in writing about results, or the construction of figure legends.

The third feature we will highlight here is the emphasis placed on early selection of the most appropriate target journal for submission of each manuscript – a step taken after the results story is clear and its significance for the relevant field of science thought through, but ideally before the full draft is written. Steps for analysing prospective target journals are presented, with a range of possible criteria for consideration by each author: e.g. How important is impact factor in your current situation? Who do you really want to read this paper once it is published? Which journals do you cite most in your reference list? Are your findings of more local/applied/incremental significance, or more theoretical/global in application? (Cargill & O'Connor, 2009, pp. 69-72). Once these questions are answered and a short-list of journals prepared, participants find it very straightforward to engage with language related questions of how to begin the introduction, or how to justify the research effectively (using the relevant 'stage' or 'move' identified by applied linguistics research). Thus the scientist team member provides the specific information needed to create the 'context of situation' (Halliday & Hasan, 1985) that surrounds the genre being analysed and written in the workshops. (Participants bring a published research paper from a prospective target journal for analysis, as well as analysed data to form the basis of a manuscript they will write or revise during the workshop, section by section.) Furthermore, now that an effective pedagogical structure has been developed for the workshops (see the table of contents for Cargill & O'Connor (2009) at Appendix 1 [www.writeresearch.com.au]), other scientists can (and do) substitute for Patrick in the teaching team, when workshop participants come from fields of science that match their expertise.

Presenting CIPSE workshops in various training contexts in China has provided valuable research opportunities, enabling insights into the issues and challenges faced by writers in these locations. The data collected highlight both what participants most wanted to achieve before the training, and what they most valued in the training after they had received it. These results are presented in the second part of this chapter for four contexts: three 4-5 day workshops, each for 30-40 participants from a different discipline background (plant science for the Beijing workshop, applied chemistry for Changchun, and fields within engineering physics for Mianyang); and an event focused on helping Chinese supervising academics develop their skills for training others (Table 4.1). This final event was a three-day workshop in Kunming sponsored by the highly-ranked plant science journal *New*

Phytologist with the aim of enhancing the skills of experienced scientists to train and mentor their students and junior colleagues to write manuscripts suitable for submission to that journal.

Table 4.1. Details of four CIPSE training events presented in China 2007-2009

Sponsor/site	**Date**	**No. of days**	**Trainers[1]**	**n**	**Matched pairs[2]**	**% enrolled students**	**% submitted ms to SCI-listed[3] journal**
New Phytologist Kunming	Nov 2009	3	4	24	24	8	100
New Phytologist Beijing	Nov 2007	5	4	33	29	30	94
China Academy of Engineering Physics, Mianyang	Dec 2009	5	2	40	35	25	62
Changchun Inst. of Applied Chemistry	July 2009	4	2	32	22	80	76

[1]Trainers always included MC and PO'C, and in the Kunming and Beijing workshops also two senior scientists with extensive experience as journal editors
[2]Number of participants who completed both pre- and post-workshop questionnaires
[3]SCI (Science Citation Index) provides bibliographic and citation information on popular journals

Readers of this volume are also likely to have an interest in both the effectiveness and the practical applicability of any approach suggested for addressing the specific challenges encountered by writers in a particular context. For science researchers, we consider that the key context of application is the department or institute where they work. (We do not include here university-wide applications where trainees necessarily come from a wide range of home disciplines; these present another highly complex set of issues and will be the subject of a forthcoming report.[11]) In the third part of the chapter, we consider the effectiveness of the CIPSE approach in enhancing participants' confidence to both write and publish science articles in English, by analysing data collected during the training events. Section 4.3.4 concentrates on the Kunming workshop alone; this analysis provides insights into the types of strategies Chinese scientists use to address the issues they face in mentoring/training juniors, and their views of the applicability of the CIPSE book/website package in their own situations. The final part of the chapter draws preliminary

[11] Portfolio Project 3B

conclusions about ways in which the CIPSE approach can be used in EFL/ESL contexts to help address the issues and challenges experienced by scientist authors.

4.3.2 Issues and challenges identified by Chinese workshop participants 2007-2009

4.3.2.1 Data collection and analysis

The qualitative data analysed here were collected via questionnaires administered in the first and final sessions of the workshops described in Table 4.1. Data on participants' initial goals were in response to the question 'What are the most important things that you want to achieve from this workshop?'. We take these responses as reflecting the issues participants wanted addressed, and therefore issues that they had found challenging in their past writing experience or their anticipation of future writing activities. As a second data source we analysed responses to a post-workshop evaluation question: 'What were the three most useful things in the workshop for you?'. We take these as indicating issues of concern that participants recognised as having been addressed in the workshops, even if they had not been identified before the workshop took place. Taken together, these two datasets provide rich insights into scientist writers' views of the issues and challenges they face.

The data were first analysed using thematic analysis, by grouping keywords and phrases under salient categories until all could be represented appropriately (Cargill, 2004). The final analysis categories that emerged are listed in Table 4.2, with representative key-words used to identify instances. Combined datasets for all four workshops, for both Goals and Most Useful Features, were also analysed using Wordle software (http://www.wordle.net/advanced) to produce visual representations ('word clouds') of the frequency with which terms appeared.

4.3.2.2 Issues and challenges highlighted in participants' pre-workshop goals

When asked what they wanted to achieve in these workshops, which were presented under titles such as 'Writing a scientific article for international submission', a large proportion of participants responded in very general terms, such as 'how to write a science article' or 'improve scientific writing skills in English'. For analysis purposes, this very general language was placed in a category of its own (General Article Writing, GAW) exactly because it was not possible to distinguish whether it primarily related to writing processes, structuring of the document, or aspects of language use (Table 4.2). The highest percentage of these unclear responses came from the most experienced group (Kunming, 26.3%), but the category scored above 18% for all workshops (Table 4.3). Article/segment Structure (AS) accounted for between 8 and 24% of responses, mostly in inverse proportion to the percentage of GAW responses received. It was clear overall that writing and structuring an article is an important issue for scientist writers, but the details required further analysis.

Table 4.2. Category names used in the analysis of the open-ended data and examples of key-words and phrases used to identify instances of each.

Category name	**Identifying key-words**
English & logical flow	Grammar, tense, modal verbs, vocabulary, expression, native-like, express ideas clearly, speaking/listening, write sentences, AdTAT software[12], corpus, sentence templates, noun phrases, connection, old information before new, conjunctions, logic
Article/segment structure	AIMRAD, sand-clock, abstract, introduction, methods, results, discussion, stages, organisation, structure
General article writing	[used when wording does not allow distinction between AS, WP, SD and E&LF] how to write a scientific article, improve writing ability
Submission/review	Cover letter, respond to editors/referees, publishing process, review reports
Strategic decisions	Choosing journals, target audience in writing, organise data, highlight data story, identify novelty, nominate referees
Writing process	Where to start, starting with results, checklists, editing/revising own draft, how to develop own skills, efficient ms production
Other	Difference between Chinese and English papers, cooperate with overseas researchers, improve confidence, workshop conduct and interaction

[12] AdTAT: Adelaide Text Analysis Tool; see Section 4.3.2.3

The percentages of goals related to English and Logical Flow (E&LF) ranged between 13 and 27 and were consistently higher for workshops with higher proportions of enrolled students participating; it was the most frequent category for both the Mianyang and Changchun workshops (Table 4.3). This may indicate that students are more likely to conceive of their problems in terms of language when they first focus on the article writing task. Representative responses include these: 'How to express my ideas clearly and efficiently.' (Changchun); 'Using English language more native and concise.' (Mianyang); 'How to avoid the most common English mistakes.' (Kunming).

Issues beyond language also featured consistently, and the pattern of occurrence was instructive. Combined percentages allocated to the categories of Submission/review (S/R) and Strategic Decisions (SD) ranged between 25.0 and 34.2 (Table 4.3), and increased with level of participant experience (Table 4.1), rising in the order Changchun <Mianyang <Beijing <Kunming . This result suggests the increasing priority given to these issues once some experience of the publishing process had been obtained. Example responses from the S/R category include these: 'Learn how to address comments and critics from editor and reviewers.' (Kunming); 'How to deal with manuscript rejections.' (Mianyang); 'Some methods of cover letter.' (Beijing).

Table 4.3. Participant goals by category for four CIPSE training workshops in China, as percentages of responses received.

Category	**Workshop**			
	Kunming*	**Beijing**	**Mianyang**	**Changchun**
English & logical flow	13.2	16.3	27.0	25.0
Article/segment structure	7.9	23.6	12.7	20.0
General article writing	26.3	23.6	17.5	18.3
Submission/review	10.5	7.2	14.3	10.0
Strategic decisions	23.7	23.6	14.3	15.0
Writing process	5.3	3.6	1.6	6.6
Other	13.2	1.8	12.7	5.0

* This workshop had an up-front aim of training supervisors to better mentor/train their students and colleagues.

The SD category covered higher proportions of responses (approx. 23%) for the two workshops sponsored by the international journal, as would be expected: participants were already focused on getting submissions accepted by this high-ranking publication.

However the category was not the lowest ranking among goals for the more student-heavy workshops and covered between 14 and 15% of responses, indicating that the concerns in this category were salient for groups with many less experienced writers as well. Example responses include these: ‘How to find the novel point about the results.’ (Beijing); ‘How to emphasise my scientific opinion.’ (Changchun).

An overall picture of the issues Chinese scientists identified as important before they undertook training was obtained by analysing the combined dataset of goal responses (Figure 4.1). The overarching importance ascribed to English issues is clear, as is the high frequency of general, rather than specifically targeted, terms. More nuanced information was revealed when these goal issues were compared to those identified in post-workshop evaluations.

Figure 4.1. Visual representation of a frequency analysis of terms appearing in **participant goals** for four CIPSE training workshops (n=129), prepared using Wordle software following merging of singular and plural versions of nouns.

4.3.2.3 Issues and challenges highlighted in post-workshop evaluations

Article/segment Structure was the category mentioned most frequently by participants after all four workshops, covering between 29.9 and 35.8% of the features given (Table 4.4). The GAW category covered much smaller percentages of the responses after the workshops (2-11%) than before (18-30%), suggesting that the workshops may also have given participants access to an improved metalanguage to describe their issues and challenges overall. This result may also indicate that many of the concerns labelled as GAW under 'goals' had been addressed by the material presented on the structure of articles and their segments. Representative responses falling in the AS category are quoted below:

> The class helped me to know the structure of an article clearly. (Changchun)
>
> Before came to the workshop it is ambiguous in my brain of each section of the paper, in other words I don't know the aim, and don't know how to write them. (Beijing)
>
> Many details were got about introduction and discussion. I always think these two parts are the most important parts. (Kunming)

Table 4.4. Most useful features by category for four CIPSE training workshops in China, as percentages of responses received.

Category	**Workshop**			
	Kunming*	**Beijing**	**Mianyang**	**Changchun**
English & logical flow	19.6	21.8	24.1	26.8
Article/segment structure	32.1	35.8	35.7	29.9
General article writing	10.7	4.3	2.7	2.1
Submission/review	19.6	22.8	16.1	19.6
Strategic decisions	3.6	8.7	9.8	8.2
Writing process	7.2	3.3	10.7	7.2
Other	7.2	3.3	0.9	6.2

* This workshop had an up-front aim of training supervisors to better mentor/train their students and colleagues

The next most frequently mentioned categories were E&LF (20-27%) and S/R (16-23%), with the former predominating in the workshops with higher student cohorts and the two having almost equal status in those with more experienced participants, where increases for

E&LF were noted (Table 4.4) over the position in the 'goals' analysis (Table 4.3). This result indicates that the more experienced researchers had found the teaching involving E&LF more relevant and useful than they might have expected, suggesting that these aspects may play a greater part in the challenges they face than they were at first aware of. This is not surprising given that some at least of the specific issues taught may not have been part of their experience of English teaching previously, as indicated by these responses: 'Verb usage to claim author's opinion.' (Kunming); 'The usage of AdTAT to helping English writing.' (Mianyang; This comment refers to concordancing software introduced, which is freely available on the University of Adelaide website at http://www.adelaide.edu.au/graduatecentre/rep/adtat/index.html)

The percentage of responses fitting into the S/R category increased for all cohorts after the workshops (7-15% pre-workshop goals, 16-23% post-workshop useful features, Tables 4.3 and 4.4), indicating that the training provided had addressed issues of importance to participants in this regard, even if they had not been identified as high-priority concerns beforehand. Representative examples include these:

> Dealing with editorial decisions and referee comments. (Changchun)
>
> Know how to do communication with editor and referee. (Mianyang)
>
> The workshop is really helpful especially the discussion of response to editors. It's far as I know there is no book or lesson dealing with this topic up to now. It is necessary training for successful publication of paper to Chinese authors. (Kunming)

It is the inclusion of an emphasis on the specific S/R and SD aspects for a particular science context, and their relevance to the process and product of manuscript writing, that most clearly characterises the CIPSE package. The appearance of these categories in participants' goals indicate that they form an important component of the issues and challenges Chinese scientists feel they face in writing manuscripts in English. The increasing frequency with which specific S/R and SD aspects feature as useful elements after the workshops reinforces the benefits of the interdisciplinary collaboration of the CIPSE approach as these aspects are dealt with as both issues for decision within the context of the scientific discipline and for action using the tools from applied linguistics.

This finding is reinforced by the analysis of the combined dataset for Most Useful Features from all workshops (Figure 4.2). The terms ‘referees’ and ‘editors’, ‘response’ and ‘comments’ appear with much enhanced prominence compared to the goals analysis in Figure 4.1, as does ‘structure’. ‘English’ is much diminished in relative frequency, and ‘introduction’ and ‘discussion’ feature strongly. Overall, frequent terms are more specific than before the training, suggesting that a clearer view of issues, challenges and solutions has been developed post training.

4.3.3 Effectiveness of CIPSE workshops in enhancing confidence in scientist authors

Evaluating the effectiveness of training interventions such as the workshops discussed in this chapter is an exercise of considerable complexity. Although some researchers maintain that increase in publication output is the only valid measure (McGrail, et al., 2006), our view is that the relationship between a training workshop and an accepted manuscript is confounded by several important factors, including the quality of the research being reported and the input of a range of co-authors and other contributors (Burrough-Boenisch, 2003). We have therefore preferred to evaluate effectiveness through self-assessed confidence to write an article in English for international submission, and to deal with the publishing process in English. This domain-specific self-assessment reflects Bandura’s concept of self-efficacy, which he supports as being a better predictor of intellectual performance than skills alone (Bandura, 1997). This has been measured using a 7-point Likert scale before and after attendance at the workshops (Cargill & O'Connor, 2006a). Questionnaires were administered anonymously but identified by participants’ date of birth to enable matching of pre- and post-workshop responses.

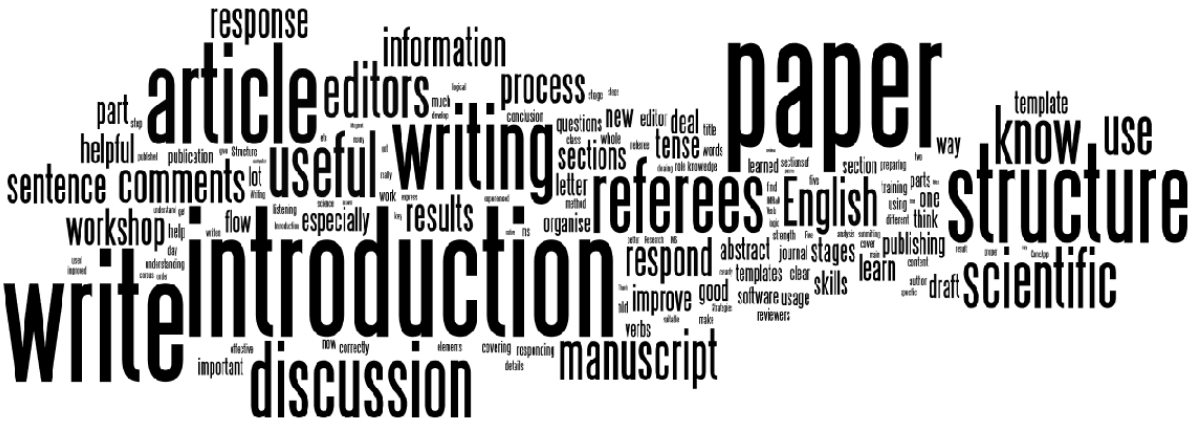

Figure 4.2. Visual representation of a frequency analysis of terms appearing in participant responses as **most useful features** of four CIPSE training workshops (n=129), prepared using Wordle software following merging of singular and plural versions of nouns.

Participants' mean level of confidence to write a scientific article in English increased significantly after all four workshops, with increases ranging from 0.9 to 1.5 points on the 7-point scale (Table 4.5). Participants' mean level of confidence to deal with the publishing process in English increased by between 0.6 and 1.8 points on the 7-point scale after the four workshops, with the differences being highly statistically significant for all but the Beijing workshop. Several participants in each workshop recorded a lower level of confidence to deal with the writing or publishing process in English after the workshop than before. It is likely that these individual decreases reflect a fuller understanding of the publishing process and the challenges it presents after participation in the workshop than before. This interpretation is borne out by some (optional) comments provided by participants when reporting their post-workshop confidence levels: 'Not very confident. Many times we fear about our language may offend the editor unconsciously. We are seldom taught in how to appropriately show your respect.' (Changchun); 'Can't effectively communicate with editor.' (Mianyang). This may represent justified conservatism on the part of novice scientists and students who have not yet encountered the complete set of challenges associated with writing and publishing in an international journal.

Table 4.5. Mean increases in self-assessed confidence to **write a manuscript in English for international submission**, and to **deal with the publishing process in English**, measured before and after four CIPSE workshops in China (repeated measures on the same individual using a 7-point Likert scale: 1= not confident, 7=very confident).

	Workshop			
	Kunming	**Beijing**	**Mianyang**	**Changchun**
Increase in confidence to write	0.9*	0.9*	1.1*	1.5*
Increase in confidence to deal with publishing	1.0*	0.6	1.8*	1.5*
n	24	36	35	22

*indicates a significant difference at $p<0.01$ (2-tailed student's t-test on repeated measures)

Nevertheless, the strong increases observed in confidence overall indicate that the workshops were perceived as very successful by the scientist writers who participated, and these results are similar to those obtained in other international and Australian contexts (Cargill, 2004; Cargill & O'Connor, 2006a). It is clear that the CIPSE approach can enhance the confidence of EFL scientist authors to write research articles in English, and deal with the publishing process. Can it also help train mentors/supervisors to support their students and junior colleagues?

4.3.4 Senior scientists assisting others: the Kunming workshop

The 3-day Kunming workshop was specifically designed to support more senior Chinese scientists as they work with their junior colleagues and students to improve the likelihood that manuscripts will be suitable for publication in *New Phytologist*. This journal is a popular target for plant scientists as it had a 2008 impact factor of 5.178 and was ranked 9/155 journals in Plant Sciences (ISI Journal Citation Reports® http://www.newphytologist.com/view/0/index.html). Participants were recruited from research groups that had previously published in the journal, and ranged in experience level from late-candidature students to a senior researcher with a PhD completed 16 years previously. Twenty-five researchers attended most of the workshop, but respondent numbers vary slightly for the different sets of data presented due to restricted international email access in some regions pre-workshop, and absences from some sessions due to local work pressures.

In spite of the avowed purpose of the workshop, helping others to write better manuscripts was not the only, and not the primary, focus for the attendees. There were only six mentions (13.6%) of helping others among the goals listed pre-workshop by participants (n=23), and only four mentions among the most useful things after the workshop (6.7% of total responses, n=24). Thus participants clearly had an additional, and very strong, concern to improve their own manuscript writing ability. However, all but two participants had assisted others (up to seven per scientist) with manuscripts during the previous 12 months.

Interestingly, strong increases were seen in the mean confidence of these more senior participants to train/mentor students and junior colleagues to both write an article (1.33 points on the 7-point scale, repeated measures on a mean of 24 individuals) and deal with the publishing process in English (1.63 points). These figures are higher than the increases in their mean confidence to do these tasks themselves (Table 4.5). The greater increases recorded for training/mentoring confidence also reflect lower starting confidence than for doing the tasks themselves (Table 4.6).

Table 4.6. Participants were asked at the beginning and end of the Kunming workshop how confident they were in their ability to **write a scientific article** for publication in English, to **deal with the publishing process** (referees, editors, etc.) for publishing a scientific article in English, to **teach others to write** such an article, and to **teach others to deal with publishing** (1 = not at all confident; 7 = very confident, n=24).

Measure	**Doing**				**Teaching**			
	Write an article		**Deal with publishing**		**Teach others to write an article**		**Teach others to deal with publishing**	
	Before	After	Before	After	Before	After	Before	After
Median	5	5	5	6	4	5	4	5
Mean	4.5	5.5	4.7	5.7	3.9	5.3	3.9	5.6
SD	1.1	0.8	1.0	1.0	1.1	0.9	1.1	0.9

4.3.4.1 Issues and challenges for senior scientists assisting others

To ensure that the workshop focused appropriately on participants' perceived issues in terms of training others, we included a structured brainstorm activity early in the workshop. Participants listed in small groups the training/mentoring issues they faced and

selected the three most important. Collated responses are listed in Table 4.7, along with the relevant categories from the analysis of writer issues presented earlier (Table 4.2). The points listed cover all issues raised in the workshop session but with no indication of frequency of mention or priority ascribed.

Contextual issues of workload and program structure are the focus of two of the 12 issues listed, and these ring true for parallel situations both within and beyond China in our experience of discussing, with workshop participants and managing academics, options for improving publication outputs. Of the remaining 10, Article/segment Structure is the focus of four, Strategic Decision issues cover five, and English and Logical Flow covers four (three issues were allocated to dual categories in this analysis). This outcome indicates a tight match between the concerns of mentor/trainers and those of writers (and with the coverage of the book/website package as represented in the training workshops – it was not necessary to adjust the planned content of the Kunming workshop to cover these issues effectively).

The explicit naming of issues related to logical flow is a key difference between the concerns of mentor/trainers in Table 4.7 and those of writers themselves, where language concerns are more likely to be named in general terms (English) or in terms of sentence-level grammar and vocabulary issues (Figures 4.1 and 4.2). This emphasis on the importance of logical flow and connectedness also reflects comments of mentor informants in the study of Li and Flowerdew (2007, p. 109). However, it should be noted that the Logical Flow component of the E&LF category was more of a focus post-workshop that beforehand in three of the four workshops studied (data not shown), including very noticeably so in this workshop (Kunming). This suggests that, post-workshop, participants were more likely to recognise and articulate the importance of flow and connection to the creation of a ‘story’ and the meeting of editor/referee requirements in this regard.

For comparison purposes, we presented in the workshop a list of issues prepared by the presenting team, indicating the most important issues we see regularly in manuscripts we are asked to read in our various capacities (here followed by initials of the relevant analysis categories from Table 4.2):

- Consistency – all parts telling the same story (SD/AS)
- Conclusions drawn not all or not clearly related to the data presented (AS)

- Not clear why the study was done, or why/ how it is important (SD/AS)
- Unclear what is from the literature and what is from the present study (E&LF)
- Careful preparation and editing not done (WP/ E&LF)

Table 4.7. Major mentoring/training issues faced by 25 Chinese scientists in helping students and junior colleagues write manuscripts suitable for international publication, categorised using results from a previous analysis of issues identified by manuscript writers themselves.

Mentoring/training issue	**Relevant analysis categories**
Students are not familiar with the structure of a scientific paper – organisation	Article/segment structure
Introductions using the literature	Article/segment structure
Difficulty moving from Results to Discussion	Article/segment structure; Strategic decisions
Challenging to tell a story and to 'identify significance'	Strategic decisions
Controlling the data to tell the story	Strategic decisions
Putting their own work in the big picture	Strategic decisions; Article/segment structure
Writing in their own words – author's voice	English and logical flow; Strategic decisions
Difficulty constructing the logic of ideas	English and logical flow
Flow of language to advance the logic – sentence cohesion	English and logical flow
ENGLISH	English and logical flow
Masters students are time-pressured – educational structural constraints	Contextual issue*
Time constraints on research leaders/supervisors	Contextual issue*

*Additional issue not mentioned by writers

Issues of 'story' and structure were again prominent in this list. The third dot-point relates clearly to the points raised by the trainers/mentors regarding Introductions using the literature, Difficulty moving from the Results to Discussion, and Challenging to tell a story and 'identify significance', and fits into two of the earlier analysis categories: SD (in relation to story construction) and AS (in terms of how the Introduction and Discussion are written). The issue about uncertainty of the source of information, literature or the study itself, has been categorised as E&LF because it most often relates to problems with English tense usage. Overall, there is a notable consistency among the issues identified by the presenting team and the EFL scientists as writers and as mentors/trainers.

The final point in this set, Careful preparation and editing not done, is one of the few overall that relates to the practice of article writing and preparation, and has been categorised as Writing Process (WP). This category covers only few of the responses received as 'goals' from writers (Table 4.3), and not many more of those received as 'useful features' from writers, except for the Mianyang workshop where it rated more highly at 10.7% of responses (Table 4.4). Examples of wordings of responses falling into this category are given below:

> It's very useful to follow the order of drafting a whole manuscript you told us (Changchun)
>
> How to turn our results into knowledge (how to begin a draft with the results); The use of pre-review checklists that can help our paper more complete (Mianyang)
>
> I think the suggestions for developing my publishing skills are also very useful (Kunming)
>
> I think the most useful things for me are to learn how to prepare a science manuscript … (Beijing)

We now move from identifying issues to addressing them, and discuss our survey data on practices Chinese scientists use to train or mentor others in article writing and publishing.

4.3.5 Strategies and practices of scientists for assisting novice authors

The pre-workshop information provided by 23 Kunming participants showed that Track Changes within a word-processing program was the most frequently used technique, followed by Meeting (Table 4.8). Both Track Changes and Meeting were scored as 'always' by 5 senior researchers (10-16 years since PhD completion), 4 mid-career researchers (5-9 years), 4 early-career researchers (1-3 years) and 1 student. Running classes was the least frequently used technique (Table 4.8). There were no notable differences in strategy use between career stages, indicating that experience level did not seem to influence choice of strategy in the small number of respondents we surveyed.

As part of the final workshop session, participants were asked to provide an Action Plan for implementing in their own context the training they had received. All but one of the 24 action plans submitted[1] referred to some kind of teaching input in participants' home department/institute based on the workshop material. This result suggests some shift, in intention at least, from participants' positions before the workshop. The actions envisaged ranged from initial single seminar presentations given as part of an existing series, to two or three half-day sessions, to regular annual programs of varying length. Two mid-career and one senior researcher indicated they would begin by training their own students and evaluate the improvement seen before making recommendations for more general adoption of a training program based on the workshop materials. Thirty percent of senior and 40% of mid-career researchers stated that they intended to use the workshop textbook (Cargill & O'Connor, 2009) as the basis for planned training. None, however, mentioned seeking input from local English teachers.

The most commonly mentioned content elements for inclusion in the proposed training were teaching on the structure of articles and their various component sections (mentioned by 56% of participants) and the use of the AdTAT software in conjunction with discipline-specific collections of journal articles (44%). Early-career researchers were more likely to identify specific article sections as a focus for teaching (e.g. Introductions, Abstracts), whereas senior researchers tended to give more detail and include both delivery methods and content to be taught. Elements of writing process that had been presented were mentioned in only three plans, and a suggestion was even made that it would have been better to follow the conventional order of article sections in our teaching, rather than starting with the results, a key feature of our approach (Cargill & O'Connor 2009, p. 21), as noted previously. This suggests that there may have been a limited willingness to move beyond conventional understandings and teaching methods, especially in the light of heavy workloads, and that it was the content rather than the methods of the approach that had resonated most strongly with these more senior researchers.

Table 4.8. Mean frequency of use by 23 Chinese scientists of five strategies for assisting students/colleagues with manuscript writing (1=never, 5=always), reported pre-attendance at a CIPSE training workshop, November 2009.

Strategy for assistance	**Mean frequency of use**
Track changes	4.5
Meeting	4.0
Annotations	3.0
Written Report	2.6
Run classes	2.4

A notable change was recorded for one senior researcher, who had reported in the pre-workshop questionnaire that he did not help others; his only strategy was to write the manuscripts himself. His Action Plan following the workshop included the following points:

> This training is very important for a Chinese scientist to write articles in English, usually this kind of training is very few. The training will improve the quality of the manuscripts of mine in the future.
>
> I am going to train the students in my group in writing each year.
>
> The book 'Writing scientific research articles' will be the basic textbook, plus what the lecturers directed.
>
> Introduction and Discussion are two sections difficult to write for students. I learnt a lot in this training program, and will teach the skills to my students and even my colleagues.

At the other end of the experience scale, one of the early-career researcher participants reported in her action plan that she would give a 1.5 day workshop for colleagues and students at her home institute immediately following the Kunming workshop. She was assisted in this by a late-candidature student who had also attended. The first author, from the original presentation team, was also in attendance to support the presenters and contribute as requested. This workshop was entitled 'Be a more successful scientific author', and was presented largely in Chinese (except for input by Margaret) based on selected and adapted slides from the Kunming workshop. Thirty-four people attended the

first half-day session, and 29 evaluation questionnaires (from 24 research students and 5 staff) were collected after the third session. Participants were asked which parts of the workshop they found most useful. Eight indicated that all the parts were useful; others highlighted aspects that reflected those mentioned by participants in the full CIPSE workshops, including the structure of the article and its component sections, language issues, responding to editors and referees, and, interestingly, the writing process. Typical responses are quoted below:

> The organisation of the paper is helpful to me. Before listening this lecture, I never paid more attention on the analysis of the results in experiments. I didn't know the result is the core of the story.
>
> I think the order of which part of articles should be written first is very useful. I'm very interesting in the verb, including tense, it is also very helpful.
>
> Referee's comments are most useful for me; and the differences verbs, such as demonstrate, are also important. I want to learn more about it.

Participants were also asked for specific suggestions of the aspects on which they needed more input. The two most commonly mentioned aspects were the Discussion section, and preparing and discussing tables and figures. This information is valuable for planning future training at the institute, as well as contributing to our understanding of priority issues facing novice scientist authors in China.

4.3.6 Conclusions

Chinese scientists writing manuscripts for international journals clearly face a wide range of issues and challenges, as reflected in their goals for and learning outcomes from training using the integrated CIPSE approach. However, trainees reported strongly increased confidence after all CIPSE workshops, both to write articles and to deal with the publishing process in English, suggesting that the training had successfully addressed many issues of concern. When directed towards assisting more senior scientists to train and mentor others in paper writing and publishing, the training also had positive outcomes; participants reported strongly increased confidence to provide such training in their home

contexts, and identified both content for inclusion and delivery methods they planned to use.

The issues and challenges identified were found to cluster under five categories: Article/segment Structure, English and Logical Flow, Submission/review, Strategic Decisions and, to a lower degree, Writing Process. A less meaningful category of General Article Writing was strongly represented among the goals reported, but diminished in importance after the workshops, suggesting that the workshops had helped trainees to develop a more nuanced ability to name the issues they face. Organisation and structuring of the article and its sections was the most frequently mentioned issue after the training regardless of the experience level of the trainees, and seemed to be the category most likely to have been intended by the more general terms that featured in the pre-workshop goals.

Issues to do with English and Logical Flow featured more strongly among goals when participants had lower prior experience levels, suggesting that less experienced writers were more likely to perceive their difficulties in terms of language. However, more experienced researchers recorded a higher proportion of issues in this category after the training than before, perhaps because the language-related training they had received in the workshops had been extremely specific to their needs, including the use of concordancing software with corpora of discipline-specific articles. This combination was recognised as a valuable tool by all trainee groups and has a clear place in training for EFL/ESL research writers. Overall, the prominence of 'English' as a named issue decreased after the training, as more specific terms became more prominent.

The second important set of issues and challenges identified was those clustering under the categories of Submission/review and Strategic Decisions related to targeting the audience effectively in terms of both content and writing. Among goals, these were more strongly present for more experienced than less experienced researchers, but Submission/review issues increased in importance for all groups after the training. Clearly these issues need to feature strongly in approaches designed to assist scientist authors in manuscript writing, along with language- and structure-related issues. The CIPSE approach provides one model for integrating these areas, and one that has been effective in a range of contexts in China, as discussed in this chapter. A question then arises as to the future prospects of this approach being taken up more widely, both in China and other comparable contexts.

The data from the Kunming workshop suggest that the approach has strong possibilities for use by scientists in their own research institutes or groups – training using the approach and the book can enhance scientists' confidence to move beyond a one-on-one track changes approach to something more systematic, time-effective and tailored to the needs and opportunities existing in particular institutes or departments. The wide range of scientific disciplines covered by the workshops analysed in this chapter (plant science, applied chemistry, engineering physics) suggests broad applicability for the approach, and this potential is enhanced by the growing range of 'extra examples' on the companion website (currently featuring analysed articles from gastroenterology, geology, remote sensing and applied chemistry). We now consider that the best and most cost-effective use of our time as presenters is to conduct training for senior scientists and research managers, or in a train-the-trainer mode, so that the CIPSE approach can be adapted for use in ways that suit prevailing contextual constraints. Once the CIPSE approach is experienced by people fully aware of the breadth of challenge presented by international publication of research in English, then local possibilities can be canvassed for partnerships between language and subject specialists; some suggestions for guiding this process are presented in Cargill and O'Connor (2006b).

Thus, until the wider establishment in EFL science contexts of the systematised interdisciplinary partnerships advocated by Li and Flowerdew (2007), the CIPSE book/website package seems to represent a workable and effective entry point and resource bank for scientists wanting to address the full range of issues and challenges they face in writing articles in English for international submission. In addition, it may also represent an effective entry point or training manual for English professionals in China and other EFL/ESL contexts who are unfamiliar with science articles but nevertheless need to teach or support scientists writing in English for publication. In this situation it could be used by EAP teachers using any of the three levels of interaction described by Dudley-Evans (2001), depending on local conditions and possibilities. These are EAP teachers teaching alone using a 'cooperation' model, with the book providing resources and information; teaching by EAP teachers with local scientists providing specific input into planning and materials to supplement those in the book (a 'collaboration' model); or 'team teaching' by EAP teachers and local scientists along the lines suggested in Cargill and O'Connor (2006a) but adapted to suit local constraints and possibilities. We hope that this integrated

book-website package may make a contribution to fostering collaboration between EAP professionals and scientists in EFL and ESL contexts, as the data analysed in this chapter indicate the added value provided by such collaboration in helping scientist authors meet the challenges they face in getting their research published in English. It is also our hope that the analysis presented here may encourage the exploration of collaborative interdisciplinary approaches by teachers and curriculum designers in ESL/EFL contexts more broadly. The range of approaches summarised above offers options which can be adapted for contexts where different levels of cooperation or collaboration are possible, and which can be used to support the achievement of many of the academic purposes for which English is learned and taught.

4.3.7 Acknowledgements

We thank Professors Ian Alexander and F. Andrew Smith and Dr Airong Li for their support for and input to the workshops, the *New Phytologist*, the China Academy of Engineering Physics and BHP-Billiton for funding support, and all the workshop participants for their enthusiasm and insights.

4.3.8 Endnote

[1]One SR seemed to have misunderstood the task and provided requests for additional support he would find useful.

4.4 Shifting the focus from scientists' work environments to university training contexts

Project 3A had as its focus the use of CIPSE with and by senior scientists in EFL contexts, and by collaborative teams with language- and science-based expertise working within scientists' primary work environment – their institute or research group setting. However, when issues of training in scientific writing are raised in Chinese research contexts, in my experience the conversation soon turns to delivery within the higher education institutions: the universities or designated training centres associated with clusters of research institutes (see Section 4.5.3 for an explanation of one such institutional arrangement). It seems logical at first glance that these educational institutions should carry out the training required to enable research students to write papers for international publication. After all, universities in the west also teach writing through courses for graduate students, and in fact are the sites of much of the research on the teaching of scientific writing cited in this portfolio. They allow economies of scale as a result of high numbers of students with common needs, and they can be expected to have both trained staff and appropriate course structures. However, the introduction of CIPSE into university contexts in China could not be expected to be straightforward, with issues to be expected on at least two fronts.

First, the introduction in Chinese educational contexts of innovative pedagogical methods developed in the west has been reported to lead to significant problems, especially for teaching staff, as reviewed in the portfolio Introduction. In particular, issues around the culture of learning and teaching (Cortazzi & Jin, 1997) could be expected to be important. Secondly, in the light of the strong existing divide between English teaching and the teaching of science and technology elaborated in Project 2B, the interdisciplinary teams incorporated in the CIPSE approach might be difficult to develop. Research was needed that would allow structured investigation of these issues.

An invitation to teach CIPSE workshops at the Graduate University of the Chinese Academy of Sciences (GUCAS) in Beijing in 2006-2009 provided an ideal opportunity for such an investigation. Project 3B therefore reports a 4-cycle action research process of planning, teaching, evaluation and reflection, conducted collaboratively with staff of the GUCAS Department of Foreign Languages, led by the Dean, Professor Gong Peng. It is presented here as an extended analysis which will form the basis of a jointly authored manuscript for future submission to an open-access EAP journal, with the goal of encouraging potential uptake of the project outcomes in China and other EFL contexts in Asia. The abstract has been accepted for presentation as a joint-authored full presentation (Cargill,

Peng and O'Connor) at the 16th Congress of AILA (Association Internationale de Linguistique Appliquée, International Association of Applied Linguistics) in Beijing in August 2011.

4.5 Project 3B − Preparing EFL science graduate students to publish research articles internationally: How much can applied linguists do prior to research experience?

4.5.1 Abstract

Applied linguists are increasingly required to help researchers in other disciplines meet the challenges they face in getting their research articles accepted by high-ranking journals published in English. The challenges are particularly acute for science researchers in China, where such international publication is a graduation requirement for many Masters and PhD programs, but where many English teachers are under-prepared for dealing with the specific languages of science. This paper reports outcomes of a four-year action research project conducted in a graduate-only science university in China with the aims 1) of testing the applicability of a Western pedagogy, Collaborative Interdisciplinary Publication Skills Education (CIPSE), to this specific context, and 2) if appropriate, of developing a version of the pedagogy that would be sustainable in this and other Asian university contexts. CIPSE incorporates insights from sociolinguistics, genre analysis/ pedagogy and corpus linguistics within an English for Academic Purposes framework, and requires substantial collaboration between applied linguists and expert practitioners of the target discipline, in this case science. Analysis of both quantitative and qualitative data from the four teaching cycles highlights contextual characteristics that influenced learning outcomes, including student research experience and the perceived incentives or impediments to collaborative teaching across discipline divides. The final version of the program, taught in 2009, provides a broad set of principles, strategies and techniques that are both manageable by English teachers and grounded in contemporary science practice, and should be applicable by students across the sciences in their later careers.

4.5.2 Introduction

One of the major emphases within Applied Linguistics worldwide has been the conduct and application of research into language teaching (Liddicoat, 2010), with the teaching of English as an additional (second or foreign) language forming a major component of this work. The teaching of

writing has been a particular focus, unsurprisingly due to its role in student assessment in higher education contexts. Within this focus, however, little attention has been paid to date in the international literature to the teaching of academic English writing to non-English major research students in Chinese universities who have passed the examination required for graduation (Liu, 2007, p. 115). The need for additional work in this area is thrown into stark relief by the current needs of Chinese science and technology research students, who face the urgent challenge of writing their research findings as articles that will be deemed acceptable by the editors and referees of international journals in their field (Li, 2002, 2006a, 2006b; Li & Flowerdew, 2007). Although the teaching of skills and practices for this kind of English writing has been the focus of considerable work in the west in recent years (e.g. Swales & Feak, 1994, 2000; Weissberg & Buker, 1990), there has been little explicit emphasis in the internationally available literature published in English on particular issues that may arise when those teaching such courses use English as an additional language, particularly in an English as a foreign language (EFL) context such as China. Similarly, a search of the China National Knowledge Infrastructure (CNKI) database located only six papers on the topic of writing for publication (pers. comm. Gong Peng, March 2011). Uptake of appropriate elements by local staff has always been a goal of the implementation in international contexts of the approach dubbed Collaborative Interdisciplinary Publication Skills Education (CIPSE) (Cargill & O'Connor, 2006b), but here again little investigation has yet been done of specific issues that may be encountered with the CIPSE approach in particular learning and teaching contexts.

Such investigations can be usefully informed by the perspectives represented by the non-native speaker (NNS) movement (Braine, 2010, pp. 1-7), given that the English teachers charged with developing the required skills in Kachru's (1992) 'expanding circle' countries, such as China, will most often not be 'native speakers' of English. The relevance and accuracy of this term have been topics of some debate, even within the NNS movement itself (Braine, 2010, p. 9), but I use it here because it is still current within the vocabulary of Teachers of English to Speakers of Other Languages, Inc. (TESOL), the largest international association of English teachers worldwide, and reflects a strong concern amongst members of this group about their status vis-a-vis 'native speakers' (Liu, 2007). Thus the introduction of an approach such as CIPSE, taught by native speakers, could be expected to raise a range of issues for local teaching staff, over and above the issues already flagged in Project 2 surrounding the use of interdisciplinary teams.

An important parallel to the implementation of CIPSE, although on a very much broader scale, is the attempted introduction of communicative language teaching (CLT) in the Chinese context; this led to

the identification of major incompatibilities between the underlying assumptions of CLT and those of the Chinese culture of learning and teaching (Hu, 2002; Ouyang, 2003). This outcome has a number of lessons to teach in respect to any subsequent attempts to implement a pedagogical approach developed and identified as useful in a non-Chinese context. Hu (2002, p. 103) recommends that "it is important for educational policymakers and teachers to take a cautiously eclectic approach and make well-informed pedagogical choices that are grounded in an understanding of sociocultural influences". This suggests that the lack of interest the Adelaide team had previously encountered in implementing the concepts underlying CIPSE in the contexts where we had taught it might reflect mismatches either with specific aspects of the culture of learning and teaching, with specific contextual factors of the implementation sites, or both. Investigating these issues required an opportunity to work over an extended time in a single teaching context, and this was provided by an invitation in 2006 to teach publication skills development short courses in the summer-school program of the Graduate University of the Chinese Academy of Sciences (GUCAS) in Beijing.

The research questions addressed in this investigation were these:

- To what extent is CIPSE useful and applicable for GUCAS students needing to learn skills for writing and publishing scientific articles in the international literature?
- Which elements of CIPSE, if any, are suitable for use in the GUCAS context?
- What adaptations can be made to identified elements of the CIPSE approach to allow them to meet the needs of GUCAS students and teachers more effectively?

To investigate these questions, an action research approach was adopted and carried through over four iterations or cycles in 2006-2009. In each cycle a teaching program was planned, action was taken by implementing the program, observations were made of outcomes by collecting relevant data, and reflection was carried out in order to make "sense of the processes, problems, issues, and constraints of action and develop perspectives and comprehension of the issues and circumstances in which it arises" (Burns, 2007, p. 988). The remainder of this Part is organised as follows. After a detailed description of the study context, the action research framework and the data collection and analysis procedures that supported the observation stages, the cycle for each of the four years is presented separately, in order to show the sequential adaptations made to the teaching program and the rationales on which they were based. The section concludes with a discussion of the factors that were found to most clearly differentiate the GUCAS students from the practising researchers we had taught previously, and the specific ways in which CIPSE was adapted over the four-year project to accommodate each one. Prospects are then discussed for the resulting CIPSE-based course to be

appropriate for use by teachers in EFL contexts, including China, where commencing research students need to develop language competence and skills for publishing research findings internationally in English.

4.5.3 Study context: an externally funded project in a Chinese graduate university

The context for the study was the 2006-2009 summer-school programs run in June-July by the Graduate University of the Chinese Academy of Sciences (GUCAS), Beijing. The courses presented by the Adelaide team were supported by funding from the Australian-based mining company BHP-Billiton (BHP-B) through their Innovation (subsequently Technology) section, as part of the ongoing program of support they provide to CAS/GUCAS. Funding was provided for an initial three-year period subject to annual review of outcomes, and subsequently extended for a second three-year term.

GUCAS is made up of two teaching campuses, Yu Quan Lu and Zhong Guan Cun[13], linked by a bus service (approx. 45 mins depending on traffic). It serves many of the institutes of the Chinese Academy of Sciences (CAS); students enrolled in PhD or Master by Research degrees attend for the first year of candidature and take the coursework component of their programs, as in the model of research training used in the USA. At the conclusion of this year, students return to their home institutes across China and undertake the research component of their degree program, which must yield at least one and up to three first-authored articles in an SCI-listed journal for award of the degree. The number of students resident on the Beijing campuses in a given year is approximately 8,000: 6,000 masters students and 2,000 PhD students – it is common to undertake a Masters on the way to a PhD. There are no undergraduate programs taught at GUCAS, so all students have completed their undergraduate work in another institution.

The type and level of English training the students have received during their undergraduate study varies considerably; the language pre-requisite for award of a Bachelor degree is a pass in the College English Test at Band 4 level (CET4) (Zhou, 2004). The writing component of this test is a short piece of around 150 words (You, 2004, p. 103). For entrance to GUCAS, students must achieve a pass in the National Postgraduate Entrance English Examination, which requires a piece

[13] Descriptions are an amalgamation of my personal observations and information provided by staff of the GUCAS Foreign Languages Department. The resulting text was amended for accuracy by the Dean of the FLD.

of practical writing (80-100 words of a letter, report, memo, etc.) and an essay of 160-200 words on a given topic or situation. This is well short of what is needed for a research article in both length and complexity. Students then sit an entrance examination in English, and must attend English courses if they do not obtain a satisfactory score. Academic writing is offered as one of the English courses available to students each semester at GUCAS, but it is not compulsory. This course is often taught by a visitor from an English-speaking country, a first-language speaker of English (EL1) but not necessarily trained as a teacher or a language teacher. There is always a number of these visitors temporarily on the staff, and their classes are generally very popular with students. The EL1 teacher of the academic writing class is generally given considerable autonomy in the course design and materials to be used. However, there had been no particular focus on writing research articles for international publication in the regular semester course list before this project commenced. The Adelaide team was invited to address this need by teaching a course in the summer school, the final teaching period before the students return to their home Institutes to commence their research.

The summer-school period lasts for five weeks, and all departments offer courses during this time for students to select. The duration and intensity of the courses on offer differ, so clashes can occur for students between the scheduled hours of different courses they have selected. In the final week students are preparing for graduation ceremonies and moving out of their dormitories. Summer school courses are assessed, and the host department for the publication skills teaching, the Foreign Languages Department (FLD), each year nominated members of staff designated Teaching Assistants (TAs) to help ensure that appropriate attendance and assessment records were maintained, as well as to assist with translation of vocabulary or concepts as necessary. The input of GUCAS staff to the courses is summarised in Table 4.9, along with other course details.

Table 4.9. Details of summer-school courses on publication skill development run at GUCAS 2006-9

Year	**2006**	**2007**	**2008**	**2009**
Total participants[1]	77 (Y[2]=59, Z[3]=18)	68 (Y[2]=36, Z[3]=32)	121 (Y[2]=72, Z[3]=49)	94 (Y[2]=45, Z[3]=49)
% in Masters prog's	81.5	98.5	96.5	100
Adelaide team size	4	4	1	2
Course hours/wks	20/1	20/2	10/1	24/3
GUCAS staff input	4 TAs[4] assisting Adelaide lecturers	First week taught by GUCAS staff (FLD[5] & scientists)	2 TAs[4] assisting Adelaide lecturer	3 TAs[4] assisting Adelaide lecturers 1/week

[1] Students who completed questionnaires on both the first and last days of courses (higher numbers attended only some sessions)
[2]Y=Yu Quan Lu campus, [3]Z= Zhong Guan Cun campus [4]TA = teaching assistant
[5] Foreign Languages Department

4.5.4 Methodology

4.5.4.1 Action research framework

As mentioned in the portfolio introduction, this study was conceived as a *practical* action research project, in distinction to *participatory* action research (Creswell, 2005, p. 552), because the focus of the research was to use a systematic approach to reflect on a specific practice in a specific context in order to improve it, rather than having the emancipatory or empowering goals generally associated with participatory action research (Kemmis & McTaggart, 2000). Burns (2007, p. 991) summarises the features of such action research in the context of English language teaching as follows:

1. Action research is localized and commonly small-scale. It investigates problems of direct relevance to the researchers in their social contexts, that is, it is based on specific issues of practice.
2. Action research involves a combination of action and research that means collecting data systematically about actions, ideas, and practices as they occur naturally in daily life.
3. Action research is a reflective process aimed at changes and improvements in practice. Changes come from systematically and (self-) critically evaluating the evidence from the data.
4. Action research is participatory, as the actor is also the researcher and the research is done most effectively through collaboration with others.

Points 1-3 capture the rationale for using action research for the study reported here. The 'social context' and 'specific issues of practice' referred to in Point 1 should be understood to include both the local context where the teaching took place and the broader contextual factors alluded to earlier in the portfolio, including the global pressure to publish and the responses to that pressure in the context of Chinese science. Burns' (2007) fourth point highlights effectively the extent to which this project can be described as having a participatory focus. The principal actor (team leader) in the teaching was certainly the researcher, and it was recognised from the outset that the effectiveness of the research would be enhanced by integrating as much collaboration as possible into the design of the study. The extent to which the desired level of collaboration was achieved was constrained in the event by several features of the project; these are analysed as part of the findings section for each of the four action research cycles.

The action research self-reflective spiral of cycles was used: planning, acting, observing, and reflecting (e.g. Kemmis & McTaggart, 2000), leading to the next round of planning and action. Four cycles are reported here, representing courses taught in the GUCAS summer schools of 2006, 2007, 2008 and 2009. The diagram in Figure 4.5 demonstrates the process used for each cycle, incorporating both the action and research components highlighted by Burns (2007). These cycle components of planning, acting, observing, and reflecting also inform the main headings under which the findings are presented and discussed:

- *teaching process* includes the outcomes of previous planning steps and the action implemented as a result;
- *student evaluation and perspectives* and *staff evaluation and perspectives* present a summary of the quantitative and qualitative data collected; and
- *key issues identified and proposed ways forward* presents the analysis of these data and the decisions taken as a result, as well as the researcher's reflective response from the perspective of the completed project at the time of writing.

Figure 4.5: The action research cycle (Tripp, 2003, in Bretag, 2005, p. 45 [original URL not accessible])

4.5.4.2 Data collection and analysis

Data collected in each action research cycle as part of the observing step, to inform the reflection and subsequent planning processes, comprised the following:

- quantitative and qualitative data from questionnaires with Likert-scale and open-ended items, as detailed below;
- formal (through interviews and questionnaires) and informal (through discussion and email) feedback by GUCAS English-teaching staff who had worked as teaching assistants in the courses, and by collaborating GUCAS scientists in 2007; and
- reflections by the presenter team members on contextual issues as our knowledge of the situation and its features increased, including formal debriefing meetings after each cycle of teaching was completed.

I was a member of the presenting team in all years and other members were Patrick O'Connor (co-author with me of the 2009 book *Writing scientific research articles: Strategy and steps* and an experienced researcher, author and referee specialising in natural resource management) in 2006, 2007 and 2009; and Karen Adams (a research communication academic like myself) and Prof. F. Andrew Smith (an experienced researcher, author, referee and editor specialising in plant physiology) in 2006 and 2007.

On the first day of each course, students provided demographic information and used a 7-point Likert scale (1=not confident, 7=very confident) to self-evaluate their levels of confidence to write a scientific journal article in English and to deal with the publishing process in English. Confidence questionnaires were identified by the students' date of birth, to allow matching with responses provided via similar questionnaires on the last day of the course. At that time they also evaluated the course anonymously, responding to evaluative statements on a 5-point Likert scale; assessing the amount of time spent on different components of the course (too little, right amount, too much); and providing open-ended comments about the most and least useful aspects of the course, and suggestions for improvement. These methods were used to maintain consistency with those used when CIPSE workshops had been taught previously in research institutes (Cargill & O'Connor, 2006a), to allow relevant comparisons to be made.

The students were asked to assess the appropriateness of time allocation to five components of the course: 1) Understanding the structure of sections of a scientific paper; 2) How to write sentences (sentence templates, grammar, flow); 3) Presenting your data and writing about results; 4)

Responding to referees and editors; and 5) In-class exercises. These components reflect the key features of the full CIPSE approach, and represent the collaborative nature of the course; teaching of items 1 and 2 is led by the language professionals in the team, and of items 3 and 4 by the scientist members, when present. Responses to this part of the questionnaire were expected to be particularly useful in indicating the fit of CIPSE with the needs of early candidature students.

Quantitative data for evaluative statements were analysed by comparing calculated median and mean values and standard deviations of the mean, and for time allocation by comparing the percentage of respondents selecting each level of appropriateness. Changes in confidence levels pre- and post-workshop were analysed using a two-tailed Student's t-test.

Qualitative data were analysed as follows. For the 2006 course, initial analysis of responses to a given item were conducted using *Wordle Advanced* software (http://www.wordle.net/advanced) to produce visual representations ('word clouds') of the frequency with which terms appear in the dataset.Terms appearing with high frequency but having low information value for the questions of interest were then removed from the dataset in a principled fashion and the exclusions and supporting rationales recorded. (The Wordle software automatically deletes a set of 'common English words' – this facility can be switched off, resulting in the largest words in the output being words such as *the, a, to,* and *with.*) The optimally informative word cloud produced for each item through this process then informed the selection of individual responses, which are quoted and discussed in the final text to illustrate the key issues identified by the frequency analysis. For subsequent years, issues identified by students under each of the three questions were compared with those found for 2006, and similarities and differences reported in the text.

Reports were prepared for GUCAS and for the funding body after each cycle, as continued funding required an assessment that the outcomes had been satisfactory. These reports inform the sections below, and also allow hindsight reflection on interpretations made at the time which have subsequently been rethought.

4.5.5 Findings and analysis

For each cycle, the key features of the teaching process used are first reported, followed by the findings of the evaluative observation/reflection stage of the cycle, and the decisions taken and the

recommendations to the funding body and the university which informed the teaching process for the next cycle.

4.5.5.1 2006: Sticking close to what worked before

Teaching process

For the 2006 summer school the team negotiated a set-up that was as close as possible to the one we had used previously in the CAS institutes, while still fitting within GUCAS requirements. To fit 20 hours of teaching into one week on each of two separated campuses, we took two teaching teams, each composed of an applied linguist/research communication teacher and a scientist active as an author and reviewer, in line with the requirements of the CIPSE approach. Two-hour teaching sessions were scheduled in lecture rooms before and after the lunch break on each campus. A common set of materials was used by both teams, and two example research articles were selected for supply to the participants and use in the in-class analysis exercises: one from mechanical engineering and one from soil science. We were aware that a very wide spread of disciplines would be represented in the classes, but did not know ahead of time which they would be. Participants were also asked to bring to the classes a research article from an SCI journal in their own field, to be used for comparison with the provided articles. The course title was 'Writing a scientific article in English for submission to an international refereed journal: a 5-day course for GUCAS PhD students', which reflects our expectation of the students we would be working with. However, as shown in Table 4.9, fewer than 20% were in fact enrolled in PhD programs.

Student evaluation: quantitative data

The report to the funding body from this course noted that as this was the first time a full course had been presented to early-candidature research students, it was pleasing that the (adapted) content and delivery were again evaluated very positively by participants. All components of the workshop organization and content were assessed as suitable by participants (Table 4.10). Participants indicated strong agreement that the teaching team (scientist plus English teacher) and teaching materials were suitable and that the course had increased their knowledge of the international scientific publishing process. The participants did not consider the level of English used in the workshop too difficult and there was strong agreement that individuals would recommend the workshop to their colleagues.

Table 4.10. Student responses to evaluative statements on publishing skills courses 2006-2009. Scores are means (and standard deviations, SD) of responses provided on a 5-point Likert scale (1=strongly agree, 5=strongly disagree).

Item	2006 n=111		2007 n=79		2008 n=140		2009 n=120	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
The teaching team was suitable to help me develop publishing skills.	1.4	0.6	1.6	0.6	1.5	0.6	1.4	0.6
Analysing example journal articles was helpful for my learning	1.5	0.7	1.6	0.7	1.4	0.7	1.4	0.6
The balance between presenters' input and participants' doing tasks was appropriate for my learning.	1.9	0.8	1.8	0.6	1.8	0.8	1.7	0.7
The materials provided were helpful for my learning.	1.6	0.8	1.7	0.7	1.5	0.6	1.4	0.6
The level of English used in the workshop was too difficult for me.	3.9	1.0	3.6	1.0	4.0	1.1	4.0	1.0
The workshop has increased my knowledge of the international scientific publishing process.	1.5	0.6	1.8	0.8	1.6	0.7	1.5	0.7
I would recommend this workshop to my colleagues.	1.3	0.5	1.7	0.7	1.4	0.7	1.4	0.6

Most participants indicated that the right amount of time was spent on understanding the structure of sections of a scientific paper, responding to referees and in-class exercises (Table 4.11). Almost half the participants indicated that insufficient time was spent on sections of the course dealing with sentence writing, an issue that was noted as needing serious attention in future planning. Approximately 40% of participants indicated that less time could be spent on data presentation and writing about results (Table 4.11). This was interpreted to reflect the level of experience of graduate students early in their candidatures and not yet faced with the challenges of preparing and explaining the results of their research. However, the report written at the time noted that "future courses for PhD students might be modified to further emphasize the importance of careful presentation and explanation of results, or this section of the course could be shortened if students are already capable in this area".

The confidence of participants to write a scientific article for publication in English and to deal with the publishing process in English increased significantly after attendance at the training course (Table 4.12). The mean increases in confidence were approximately 1 point and 1.3 points, respectively, on the 7-point scale used. The confidence of 26% and 24% of participants in their ability to write a scientific article for publication in English and deal with the publishing process did not change during the course, and 10% of participants indicated slightly reduced confidence as a consequence of attending. Reduced confidence may be explained if participants developed a greater understanding of the complexity and challenges of writing for this type of publication and therefore made more realistic assessments of their ability at the end of the course.

Table 4.11: Percentage of participants indicating that the amount of time spent on listed aspects of the publication skills course in 2006-2009 was too little (L), right (R), or too much (M).

Content aspect	2006 n=111			2007 n=79			2008 n=140			2009 n=120		
	L	R	M	L	R	M	L	R	M	L	R	M
Understanding the structure of sections of a scientific paper	15	80	5	5	81	14	19	73	8	10	83	7
How to write sentences (sentence templates, grammar, flow)	48	40	12	54	36	10	47	39	14	39	51	10
Presenting your data and writing about results	4	57	39	36	60	4	32	56	12	47	46	7
Responding to referees and editors	20	73	7	36	58	6	23	69	8	32	64	4
In-class exercises	16	69	15	25	65	10	39	56	5	10	78	12

Table 4.12: Mean changes in self-assessed confidence before and after attending a publication skill development course at GUCAS 2006-9. Confidence was assessed on a 7-point Likert scale (1=not confident, 7=very confident) and changes represent repeated measures on the same individual.

Measure	2006	2007	2008	2009
Change in confidence to write a manuscript in English	+1.20*	+0.50	+1.13*	+0.69*
Change in confidence to deal with the publishing process in English	+1.51*	+0.46	+1.23*	+1.47*

* $p<0.05$, two-tailed t-test

Student evaluation: qualitative data

The learning that made the strongest impression on the students was related to structure (Figure 4.3), both of whole articles and of individual sections: *Analysing the structure of results, Introduction is useful for me; Understanding the structure of sections of a paper; How to understand the structure when reading and how to organize the structure when writing.* Two other clusters of terms can be discerned from Figure 4.3. The first relates to the publishing process, including terms such as *editors, referees, publishing,* and *respond/responding*. The second relates to language development, with terms such as *English, sentence/sentences, template* and *software* (referring to the concordancing program that was introduced during the course). This outcome reflects results obtained when using the CIPSE methodology in CAS institutes previously (Cargill & O'Connor, 2006a), and indicates the value of the collaborative approach using the expertise of both scientists and language teachers for this context as well.

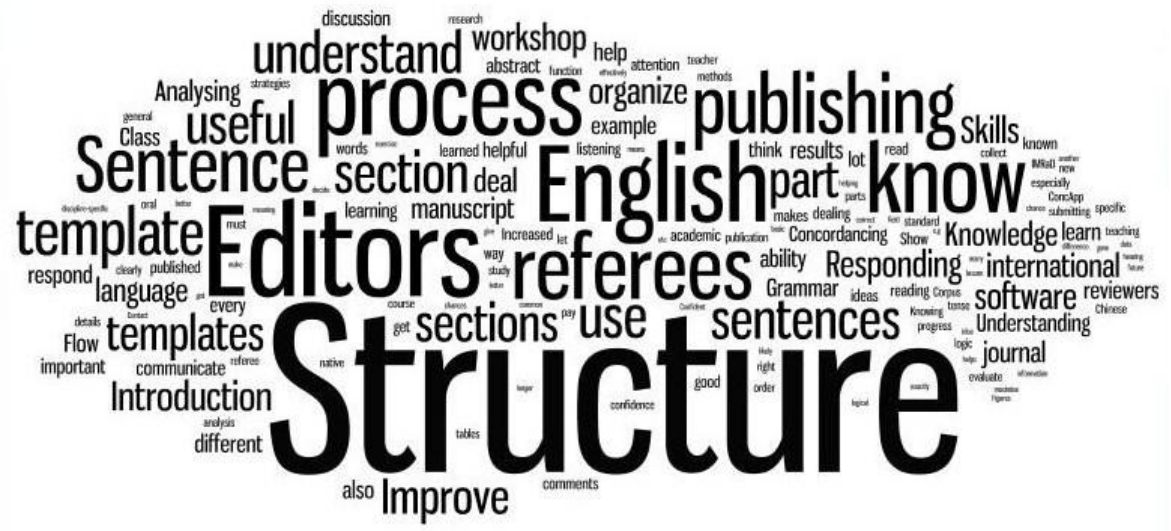

Figure 4.3. Visual representation of 2006 responses: 'What were the three most useful things in the course for you?' A frequency analysis of terms appearing in student open-ended responses (n=77) prepared using Advanced Wordle software following exclusion of terms judged less informative: paper (71 instances), article (49), scientific (52) and write/writing (47/32).

As highlighted by the Word Cloud shown in Figure 4.4, suggestions for improvement focused on time, course content and pedagogical practice, which are discussed below in that order. A key suggestion for improvement by students was more time for the course, and 23 students (21%) requested that the course be made longer:

> *I recommend it should take more time; One week is two short; More time is needed for this; More time to do more practice; Prolong the duration.*

Some comments were more specific, requesting a different structure to the course as well:

> *What we want to know is can it be a year course or semester course in the future; spend more time in result writing; If teacher have enough time, I hope this course will be longer. maybe we can change the beginning and ending time of class such as we can start from 8:00-11:30 am or 1:30-4:30 pm.*

These suggestions immediately bring the focus of discussion back to the contextual constraints operating: visiting lecturers have limited time availability, and the summer-school structure itself makes longer classes difficult. One avenue open to development was the idea of a year- or

semester-long course, and this idea was raised in the report to the host department and the funding body.

Figure 4.4. Visual representation of 2006 responses: 'What could be changed or improved to make the course more useful to Chinese research students in future?'. A frequency analysis of terms appearing in student open-ended responses (n=77), prepared using Advanced Wordle software following exclusion of terms judged less informative: students (27 instances), maybe (17), think (30), paper (20), one (9) and class/workshop/course (29/14/16).

Content-related comments emphasised two themes: selection of examples used, and needs related to language. Students requested example articles from a wider range of fields: *Because of the differences among different fields, more [articles]should be sampled in different fields. (I major in Computer Science).* The other prominent request was for specifically Chinese examples, both of articles and of errors:

> *Take some examples or sections of a paper which write by a Chinese PhD and tell us where she or he write good … where she or he makes mistakes; . I suggest that you could use some materials like articles written by Chinese PhD student in English so we could find out what is the problems that we met when we are writing our papers; Compare some English paper with Chinese.*

This request extended also to teaching personnel: *include some Chinese-background colleges [colleagues]*, a suggestion the team was keen to take up.

Needs related to English language development were highlighted by the frequent use of terms including *English, writing, sentence* and *template* (Figure 4.4). Although some students highlighted the connection we had emphasised between language choices and the needs of their reading audience *(Specific training for language barrier and writing logic, which will make our writing easier to follow and understand by foreign reviewers and readers),* it was very clear that for many students more sentence-level language was a priority need: *Do more about how to write sentences properly; The sentence templates and grammar or how to organize our language is the most common problem for Chinese; More information about the use of certain words; I need more exercise with template and grammar.*

The third element in this cluster related to pedagogical practice, and the strength and frequency of the comments were notable. One concern related to opportunities for some application of what was being taught, as highlighted by the terms *exercise/s* and *practice* in the frequency analysis (Figure 4.4). Students wrote about both amount and type of exercises:

> *Do more examples, learn from them, we Chinese students used to be that way; I think more assignment and in-class practice may help; Some exercise don't have an answer, so I don't [know] if it's right or not. … it's impossible to check everyone, I don't know how to fix it; You can teach in the morning, and let students do the corresponding exercise in the afternoon, and do some corrections in the next day; It will be better if we add to more practises, just like to write one complete article as the final score; A exercise for writing a whole articles is needed.*

Suggestions thus focused both on wanting a more structured, right-answer approach, and on recognising a need for extended writing practice – and feedback: *Quick feedback of students' assignment is preferred*. Students also requested a more interactive teaching style, and reflected on our attempts to make it happen in the large classes we had:

> *Chinese students usually expect international teachers to be 'informal' meaning more energetic than Chinese professors. Instead of lecturing all the time, you may think of a way you get students involved, I mean 'Interaction'; I think the lesson should be more active; The interaction between the teachers and students needs strengthen; Maybe we can have a discussion section; Please consider our difference in tradition, sometime we feel shy to ask questions, because there are so many 'should' and 'shouldn't' in our education, to ask*

questions may be recognised as 'lack of knowledge' or even bad manners, I don't know how to improve this situation, but I will try my best, thank you!;

Issues related to the timing of the course in students' candidatures were also recognised by some students: *It's better to have this lesson when we have started our research work; It must be very useful if you could give this lesson on the second or third summer of Chinese PhD because then we will have done some experiment and have some results, we can use the skill as soon as possible.* Online provision was recommended by some as a solution to timing issues: *Maybe you should consider an online teaching site, we can find things useful any time, anywhere; Make it available online; Maybe you can organize some association, that we can change message each other.*

Staff perspectives

TAs and other staff who observed the classes completed the same questionnaire as the students at the end of the course but identified themselves as staff. Their responses were very similar in range and content to those of the students, both for numerical and open-ended responses. The staff expressed strong approval of the course, and in terms of future improvements focused in the open-ended data on more time, more example articles and more exercises, although their numerical responses indicated that an appropriate balance had been maintained between presentation and student tasks, with three of the nine staff indicating a 'neutral' response and the others agreement or strong agreement. The only clear difference from the student responses was a more explicit valuing of the concordancing package introduced during the course. One respondent listed among the most useful aspects *data-driven language learning*, and another *the idea of organizing a 'corpus' of one's study field.* This outcome may reflect both the strong respect for imported expertise that is a feature of many Asian contexts, and the greater level of familiarity of the FLD staff with language-related concepts and procedures than with those relating to the scientific content of the journal articles that were being studied.

Key issues identified and proposed ways forward

In October of 2006 I was able to visit GUCAS again and discuss with the Dean of the FLD and other staff the evaluation outcomes and plans for 2007. It was clear from these discussions that the summer-school program remained the preferred option for teaching the publication skills course, but that various opportunities existed to adapt the original course design to respond to the evaluations received. As a result of these discussions, the following proposal was put to BHP-Billiton for funding in 2007.

1. Objectives: to fit the requirements of the summer school teaching schedule, and to develop the skills of the GUCAS staff to teach components of the program themselves in the future (capacity-building focus).

Proposal: to run a 20-hour course as one 2-hour lecture daily over 2 weeks, taught at the same time on the 2 GUCAS campuses, with GUCAS staff teaching the first week and two 2-person Adelaide teams joining for the second week. Teaching materials will be re-written by Ms Cargill as detailed teaching notes to support the teaching to be undertaken by the GUCAS staff.

2. Objectives: to allow for appropriate assessment by GUCAS of students attending the summer-school course; and to respond to the request by students and staff for more interaction between teachers and students, and more hands-on activities and exercises to practise what is taught

Proposal: to adapt the teaching program to require students to conduct a small survey-based research project during Week 1 of the course, and then to use the data obtained as the basis of a short research article to be written by the students as a group project during Week 2 and assessed by the Chinese teachers.

In addition, in order to address the issues of timing within candidature that had been identified in the 2006 evaluations, an additional course was prepared to deliver advanced-level training to late-candidature research students and early-career researchers within a GUCAS science department who were ready to write a paper based on their own data, in parallel with the basic training provided for early-candidature research students as above. However a discussion of the outcomes of this part of the program is beyond the scope of the present study.

4.5.5.2 2007: Trying to fix everything at once

Teaching procedures

In the event, three main changes were instituted:

- one class was held daily over 2 weeks;
- Chinese teacher teams made up of staff from both the FLD and the College of Resources and Environment (CRE) taught the program in Week 1, and the Australian teams in Week 2; and

- the new, more rigorous assessment task was used: students wrote a paper manuscript in groups, based on survey data they collected themselves during the first week of the course.

In the negotiated planning stage, course outline drafts were prepared in Adelaide, emailed for comment, and revised in accordance with the feedback received. The agreed course outline is summarised in Table 4.13. Powerpoint teaching slides were then prepared for Week 1 and emailed; these contained many questions in the 'notes' section and were incomplete in places, in the expectation that they would be completed and revised as appropriate at the GUCAS end.

Table 4.13: 2007 course structure leading to production of a group-written research article based on survey data collected during the course.

Element	Content	Notes
Materials	2 provided science articles (from biology and mechanical engineering)	Discipline-based student groups select one for use in comparative analysis and as format model for their group article
	Survey-based applied linguistics article (Burrough-Boenisch, J. (1999). International reading strategies for IMRD articles. Written Communication, 16(3), 296-317)	Provides background to survey that students conduct in order to produce data on which to base their group article
	Survey form adapted from Burrough-Boenisch (1999)	Each student administers to 3 respondents not enrolled in the course during Week 1; results collated in a spreadsheet
	Powerpoint slides based on previous CIPSE presentations in CAS research institutes	Assessment task for course is a group-authored article based on analysis of the survey data collected by the group
Week 1 coverage	IMRaD structures, comparative analysis of papers Survey: Introduction and running Article Introductions, Methods & materials, Abstracts: comparative analysis and initial drafting Sentence templates; concordancing and corpus use	Taught by two GUCAS staff teams
Week 2 coverage	Publication strategy, targeting journals; referee criteria Presenting and writing about results; analysis and drafting of group article Writing complete Introductions; Discussions; Titles: analysis and drafting of group article	Taught by two Adelaide teams

In the event, the revisions were extensive, especially to the parts that were presented by the CRE team members. The versions presented on the two campuses differed considerably, to the extent

that slides presented for some sessions on one campus were in Chinese, and focused on analysing (and correcting) articles in the research field of the presenter, rather than the ones provided by the Adelaide team. Survey results had also not been collected from all participants by the end of Week 1. It was therefore necessary to revise the Week 2 teaching materials somewhat after the Adelaide team arrived in Beijing so that the group paper writing task could be accomplished by the end of the course.

Student perspectives

It is clear from Table 4.10 that scores on all parameters were lower for the 2007 course than for any other year. More than 50% of students thought that too little time had been spent on sentence writing, with more than one third reporting the same view for presenting/writing about results and responding to editors/referees (Table 4.11). It seems that our efforts to increase interactivity and task engagement had led to a decreased perception of relevance for many students. Nevertheless, the evaluation scores are high taken as stand-alone data, with the item 'I would recommend this course to my colleagues' scoring a mean of 1.7 on the 5-point Likert scale (1= strongly agree, 5=strongly disagree, Table 4.10). This indicates that the course was perceived as useful and relevant overall by the students who participated in it. The number of these students, however, was markedly lower (79) than in 2006 (111, Table 4.9). This could perhaps be attributed to a less-than-specific naming of the course in the publicity material designed to recruit students (*Academic Writing*, a title chosen by a staff member not previously associated with the course and unaware of its focus and desired client group), and the existence of another course on paper writing in the same summer school program, run by one of the science colleges, about which we had no prior knowledge.

In contrast to 2006, few students reported that too much time had been spent on sections dealing with data presentation and writing about results (Table 4.11). This was likely related to the requirement to actually write a paper using data the students had collected themselves.

Similar to the 2006 results, many students included among the 'most useful things' in the course article structure, learning about the publishing process and referee expectations, and grammar issues relevant to particular article sections, such as tense usage. Both positive and negative comments were received about the requirement to write a group manuscript. There were very positive comments from both campuses on the valuable experience gained through writing a manuscript as part of a group, but other students complained about group members not always attending or not doing their share of the work, and about the relevance of the survey to their own

disciplines, and the time taken to complete it. [This range agrees with that found in published research on student group projects worldwide (Aggarwal & O'Brien, 2008; Leung, 1998).]

The example articles provided for analysis were again judged as problematic by some students: too 'professional', too complex, or not the right discipline area. At the time our report noted that it was difficult to know how this problem can be avoided, given the range of student majors; we suggested that perhaps one option was to advertise the course as being suitable only for students in a particular set of majors.

There were 13 requests for a longer course and 3 for a less intensive course (semester length, or over a month); 54% of participants requested more time on writing sentences (Table 4.11), and many students also wrote about this issue in their 'suggested improvements'. Some students commented that the Australian presenters spoke too fast, although the mean score on the questionnaire about the level of English used indicated slightly less difficulty than in 2006 (Table 4.10).

There were 13 comments made (under both Three Least Useful Things and Suggested Improvements) suggesting less or different input from various members of the Chinese teaching team. For example, listed under Least Useful Things were the following: *Correction of an immature paper (first week), talking on the principle of writing in Chinese (too much - not practical); the classes of the first week and those of the second week are partly the same.* Under suggested improvements, the following points were made: *I think too much time was spent in courses taught by Chinese teachers. I prefer more time with foreign teachers and wish them to cover more detailed information and slow down the teaching process; Chinese teachers course in the first week are not necessary. It's more like just repeating what the English teachers are going to say.* These comments alerted the Adelaide team usefully to the extent of the variations that had been introduced into the Week 1 program, which had led to the perceptions of overlap reported.

Staff perspectives

Informal discussions were conducted with a participating staff member from the College of Resources and Environment, and the following summary feedback was received by email after the Australian team returned home (pers. comm. X. Cui 1/7/2007).

> We have exchanged our thoughts on the course in Beijing. Based on my experience in the course and discussion with some students, I think the course is a success in total and it needs to be refined in future.

Merits:

1. A clear theme and well organization.
2. Novelty in teaching style.
3. Enthusiasm in teaching.
4. Combination of academic and linguistic aspects in writing.
5. Careful consideration of the wide difference in disciplines of the students.
6. Well preparation of teaching materials.

Points to be improved:

1. Course name needs to be more specific and attractive.
2. Balance the distribution of time between theory and practice. Theory may be mentioned but not as an emphasis.
3. Interaction is necessary. Yet it is better to keep oral practice to a low proportion.
4. More attention may be given to grammar. It is better to be more specific to Chinese students.
5. Students need more time to collect data for writing. It is better to give the questionnaire to them on the first day.
6. Students are not familiar with literature searching. This section needs more time.
7. More examples in each section are helpful.

This feedback from a Chinese science academic was particularly important, especially in view of the limited contact that traditionally occurs between science- and English-teaching staff. In particular, Point 4 under 'to be improved' emphasises both grammar as a desired content focus and specificity as a lack in how this area had been presented in the 2007 course. This was important information to discuss further with the FLD staff.

Five participating staff from the FLD were interviewed in a group in December 2007, to obtain their post-hoc reflection responses to participating in the two-part course structure, their views of the outcomes and their suggestions for future developments. The group preferred not to have the conversation tape-recorded, and the report below is based on my notes taken during the discussion. The major issue identified by all staff was their difficulty in understanding the vocabulary and concepts used in the scientific articles provided to the students as the basis for analysis exercises in the course. It was explained that without this detailed understanding they felt unable to explain the

text to the students, as was their usual practice in an English class, leading to uncertainty about how to conduct the classes confidently. Several teachers in the group indicated that genre analysis approaches were therefore not suitable for them to use with the graduate students they teach. The discussion was then broadened to consider what type of course would be suitable for use by FLD staff at GUCAS. A focus on reviewing literature was rejected as also involving too many difficulties with technical content. It was agreed that a good option would be a reading/writing course based on writing a critical review of a single article; tentative plans were discussed for writing a funding proposal to develop such a course. On the more general issue of professional development needed for teaching article writing, it was agreed that FLD staff would email me with issues or problems that arose for them with the teaching of scientific writing, and that I would design training workshops to help address the issues identified in this way. Sending some staff to Adelaide for training was also proposed. No follow up on these suggestions was subsequently received, perhaps indicating the non-central place of this area of teaching for the FLD teachers.

The student group articles: An additional data source

The student groups submitted their articles to the TAs for marking after the Adelaide team had departed. Assessment was carried out using a set of criteria that had been agreed by all team members during Week 2 and made available to the students on the final day of the course so they could use them as a checklist in revising their drafts before submission. All submitted manuscripts were assessed as having satisfactorily met the task requirements (pers. comm., Yu Peng, July 2007). Seven of the final articles were emailed to the Adelaide team subsequently, and these form an additional set of data for consideration in reflection on the course. Although a detailed textual analysis of the manuscripts is beyond the scope of the present investigation, my reading of the texts in this partial sample of the course outputs indicates that they had all responded to varying degrees to most of the criteria provided. As an example, Figure 4.5 shows the abstract of one group manuscript, with my annotations indicating how the authors had responded to the relevant requirements: to write a title that captured the key message and attracted the interest of the target readers; to follow the format and tense usage of their example article, in this case from the field of mechanical engineering; and to use the information elements that had been taught for the abstract: Background, Principal activity, Method, Results, Conclusion/ Recommendation.

Thus in spite of the difficulties experienced in coordinating the activities of the two sets of teams, and in designing a set of tasks that was manageable for the students in the timeframe available, written

texts were produced that demonstrated ability to apply the strategies taught. Clearly there were some features of this course design that would be worth recycling in future versions.

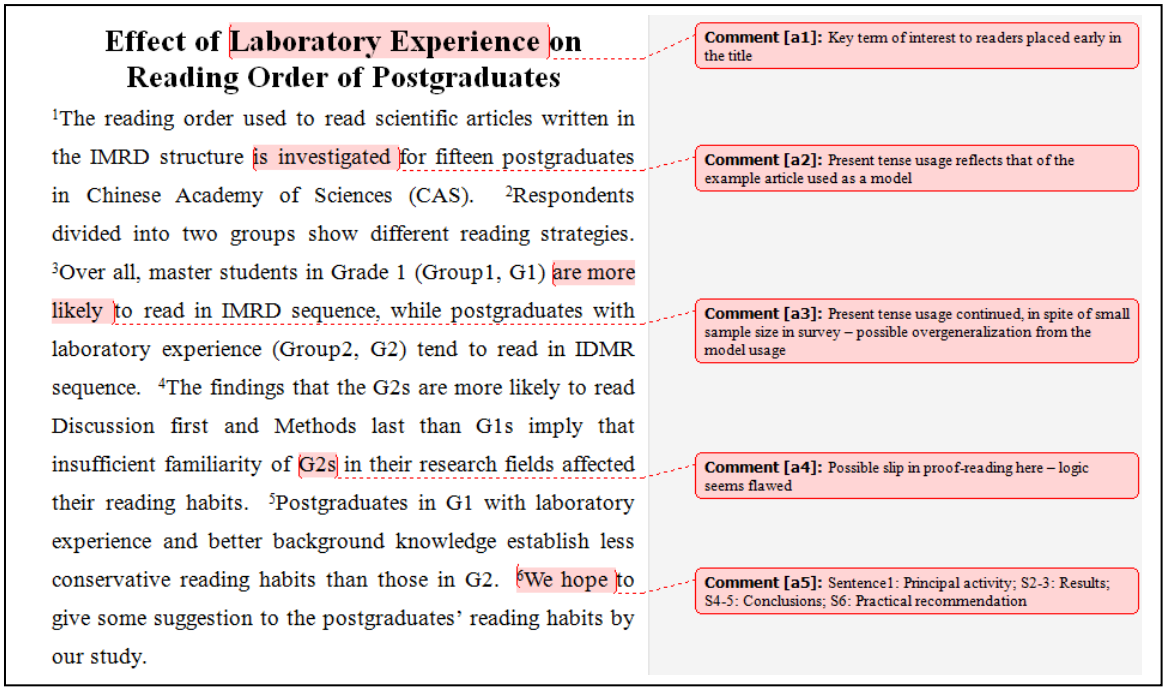

Figure 4.5. Abstract of a group manuscript submitted at end of 2007 course showing features responding to task requirements.

Key issues identified and proposed ways forward

A conclusion that can be drawn from the evaluation data is that I had made a number of inappropriate assumptions in designing the materials and communicating with the staff in China, and that the resulting issues had been magnified as a result of the limited amount of feedback I had received about the materials prior to the Week 1 teaching taking place. It seemed that there may have been little time available for further communication once the GUCAS teams were established. Some staff from both the English and the science sides had not been comfortable with the provided materials and taught instead using techniques and materials with which they were more comfortable or which they felt were more relevant to the students. For some of the scientist team members, these actions may have been taken without understanding what materials and activities were to be included in Week 2 of the course. I had made an assumption that the FLD staff would provide the necessary briefing for the scientists, but had not made this expectation explicit in my communications.

Key issues identified as needing a response were these:

- Team teaching by local teams: if this was to be incorporated into future courses, pre-course training would be needed to as well as a re-design of the content to allow scientists to teach the elements that make most sense to them in terms of the students needs they recognise. A solution to the discipline mix problem for the science input would need to be found. Alternatively, a trial could be conducted using only language-based teachers, incorporating the materials developed by the scientist collaborators but not requiring their presence in the teaching team.
- Course length/intensity: students continued to request a longer and less intensive course.
- Training: there seemed to be a willingness among the FLD staff to identify training needs and seek ways to address them.
- Example articles for analysis: I decided to ask each participant to bring an article from their own field to the course, rather than providing examples for everyone to use.
- Literature searching: this element was too time-consuming for inclusion in the required depth in this course and was therefore omitted from the design.

Recommendations presented to GUCAS and BHP-B for 2008 included the following sections relevant to this study. (Other sections focused on alternative sites for delivering training, in order to recruit participants further advanced in their research candidatures and therefore likely to benefit optimally from having scientists as part of the presenting team.)

> If it is decided to deliver training at GUCAS again, Margaret Cargill and Karen Adams lead 2 teaching teams of Chinese English teachers and Chinese scientists from disciplines relevant to the students' majors, for a 2-week summer school course as before. The focus would be on training of both the English teachers and the scientists, which would require attendance at additional professional development sessions as well as all the classes themselves.
>
> As an alternative option for GUCAS Masters students, Margaret (and Karen if available) could be funded to come at the beginning of fall semester to train teams and set up the teaching of a full semester course covering both article analysis and manuscript writing, perhaps based on the existing survey data.

No response was received to these ideas from GUCAS in time for incorporation into a proposal for 2008 within the timeline required by the funding provider. In addition, analysis of data from 10-hour courses run in late 2006 by me alone for student groups of mixed disciplines and candidature stages

at Nanjing and Shanghai Universities (NJU and SHU) had shown very satisfactory student evaluations (see Project 2B, Section 3.6.6, Table 3.4). It thus seemed probable that providing scientist team-members was likely to give significant added value only when participants had reached a higher research experience level than was typically the case for the GUCAS students. To investigate this issue, it was decided to propose a course taught by me alone for the GUCAS summer school.

4.5.5.3 2008: Pulling back to a minimalist approach

Teaching procedures

A 10-hr summer-school course was presented over 1 week on the two campuses of GUCAS, Beijing, for 140 Masters students (121 attending both first and last sessions, Table 4.10) in the first year of candidature. The course was under the auspices of the Foreign Languages Department (FLD), and taught by me alone, assisted by two TAs. Assessment was based on attendance. No example papers were provided and students were asked on the first day to identify a suitable research article (not a review) from a journal they would like to submit to in the future (but not *Nature* or *Science*) and bring a hard copy to each class to use for analysis tasks. The version of the CIPSE materials used was that previously prepared for the 10-hour NJU and SHU presentations in 2006.

Student perspectives

Content and delivery were again evaluated very positively by participants (Table 4.10). Confidence to write for submission and deal with the publication process increased significantly, with gains of over 1 point on the 7-point scale (Table 4.12). The teacher suitability (language teacher alone) was rated slightly higher than the interdisciplinary teams were in 2007 (Table 4.10). Approximately half the students requested more time be spent on writing appropriate sentences, and in-class exercises was the other area where more time was requested (Table 4.11). These results were reinforced by a large number of comments in the open-ended responses requesting more time for the course, and suggesting it be run in Spring or Autumn semester. The other major suggestion for improvement related, as ever, to the use of examples more specifically related to each student's discipline area, and a request that common errors made by Chinese student authors be addressed. There was also an emphasis in the comments on more class exercises, homework, and a generally more structured approach to teaching, suggesting that the participants were more oriented to a classroom situation than the real-world practice of actually writing an article for external review. This reinforces the

appropriateness of the move to a different teaching configuration and approach for these early-candidature students, to the one recommended for late-candidature students and early-career researchers and post-docs. Several students also noted that it would be preferable to have this teaching closer to the time when they would be actually writing their own papers, and in a more discipline-specific context.

Staff perspectives

Informal discussion with the TAs assisting with the course confirmed its suitability for the GUCAS Masters students. An additional point they noted in confirmation was that the student numbers were strongly maintained on both campuses, in spite of the fact that the course was taught in the final week of the summer school period, when students were moving out of their dormitories.

Key issues identified and proposed ways forward

The following recommendations were presented to BHP-Billiton Technology for future consideration, on the basis of the outcomes achieved and the lessons learned from three years of workshop presentation at CAS universities:

The 2008 results indicate that very satisfactory results can be achieved with early-candidature students when a well-designed course is taught by English teachers alone, using materials prepared in collaboration with scientists. Students have consistently requested more time for this course, as well as more exercises and in-class interaction. It could therefore be an efficient and cost-effective approach for BHP-Billiton to fund a project to prepare and trial a full semester-length course at GUCAS, including the production of a course textbook which could subsequently be made available for sale in China. A suitable project team could be based around GUCAS Foreign Language Department staff members who have been involved in the 2006-8 workshops, with Ms Cargill and Ms Adams contributing specific expertise on a visiting scholar basis.

As before, no response was received to the substantive recommendations, but BHP-Billiton funding for teaching publication skills for CAS was received for a further three years, subject to satisfactory annual outcomes as before. A training program was therefore designed for 2009 that responded to the needs identified and proposals made in the 2008 report, within the constraints of the amount of funding available.

4.5.5.4 2009: Aiming for sustainability and student engagement

Teaching process

The aim of the 2009 program was a course that met the needs and engaged the interest of early-candidature Masters students, contained as much as possible of the material previously found to be successful for these students, and could potentially be taught by Chinese teachers in future. Two parallel classes were presented on the two GUCAS campuses, each for 2 hrs daily Mondays through Thursdays for 3 weeks (24hr course). I taught the course, assisted by three FLD teaching assistants (a different one each week), and by Patrick O'Connor in the third week, contributing specific expertise in the final sessions when students were most likely to benefit. The course adapted material from our then newly published book *Writing Scientific Research Articles: Strategy and Steps* (Cargill & O'Connor, 2009), and included additional segments and material developed on the basis of feedback and evaluations of the previous summer school courses, as per the action research methodology employed. The redesigned course centred on four components, as described in Table 4.14 along with the assessment tasks for the course. These components represent the outcome of an attempt to balance relevance/importance against practical implementability. As in 2008, students identified their own discipline-specific article for the analysis exercises.

Student perspectives

The GUCAS student evaluations from both campuses confirmed that students found the redeveloped course effective, with satisfaction levels comparable to those in previous years, and markedly higher for in-class activities and the course homework (Table 4.11). The level of student engagement with the group and individual homework tasks set as part of the redesigned course was notable, and this included work on developing electronic article collections on a discipline-specific basis and using them with the concordancing software program provided (personal observation). A new feature among the most useful aspects noted in 2009 was the frequent mention of the concordancing software that had been introduced at some depth during the course, and the concept of sentence templates to improve sentence structure. Teaching about effective tables and figures was also mentioned as useful, and this was in contrast to early years of the project when this area had been rated as having too much time spent on it. Pleasingly, several students emphasised that they had learned how to improve their skills on their own after the course was over.

Table 4.14: The four focuses of the 2009 course 'Preparing to write a science article for international publication'.

Focus	Topics covered	Source materials	Assessment tasks
1	international publishing; article structures; referee criteria; communicating with editors	own-discipline (OD) published example paper; Instructions to authors from target journal, both self-provided	Structure analysis of OD article; covering letter to target journal editor to accompany future submission
2	sentence templates for acceptable re-use of language; using concordancing software and discipline-specific article collections to improve vocabulary knowledge and sentence writing	Freeware concordancing program AdTAT; additional published articles in .txt format for the searchable collection, provided by students	--
3	writing effective article introductions	OD articles, as above	a partial draft Introduction to an article following on from the student's OD article
4	constructing effective data display and results analysis text based on a provided dataset	Survey data collected by 2007 course participants on reading strategies for scientific articles	1 table or figure plus title/legend; one paragraph of results/ discussion text based on the table/figure

In spite of the extended length of the 2009 course (24h compared to 10h in 2008), there were numerous requests among suggested improvements for a longer course, including more hours per day, and several for a less intensive course (semester length, or over more weeks). Many participants requested more time on writing sentences, although the numerical results in Table 4.10 show improved satisfaction over 2008 with the amount of time spent on this aspect, suggesting that the issue had been addressed to some extent at least. There were divergent views expressed about the value of the group-work and in-class exercises, not surprising given the class sizes, and several students recommended a more discipline-specific approach, with the class divided according to field of study and the structure of article students will need to write. These comments in themselves demonstrate considerable learning from the course, as students were able to recognise and respond to the discipline-specific nature of the task and the diversity of article types within the sciences.

Staff perspectives

The three GUCAS FLD staff who acted as teaching assistants during the course were unanimous in the view that this extended course was more effective than previous versions in engaging the

GUCAS masters students and addressing their limited levels of research experience and need for sentence-level English development. They also expressed the view that most aspects of the course could be taught in future by GUCAS English teaching staff, with appropriate training and professional development. It would seem that, if some collaborative input could be obtained from staff in science departments, the whole course could be taught by GUCAS staff in future, with the expertise of visiting international academics (if available) most usefully employed in training of local staff, materials development, and guest appearances in the course at strategic points. However, the marking load of the course was considerable (all done by myself in this instance) and would need to be addressed in future revisions.

Key issues identified and proposed ways forward

On the basis of the positive evaluation received from students and the cautious optimism expressed by the FLD staff who had been TAs, the recommendations made to GUCAS and BHB-Billiton after the 2009 course were as follows:

- That the 24-hour course taught at GUCAS in 2009 be developed into a full semester course with substantial parts being taught by GUCAS FLD staff, supported by training and 'guest' course input provided by the Adelaide team as funding is available.

- That a project be initiated to develop a full course book for this course, tentatively named Preparing to Write an Article for International Publication (PWAIP), incorporating input from the Adelaide team as funding allows.

A report summarising the CIPSE teaching and evaluation cycles over the four year period 2006-9 was also prepared for the Vice-president of GUCAS, focusing on the rationale for adopting this proposal as an effective step in increasing the skill base of young scientists in CAS institutes for publishing their research in international journals. At the time of writing (early 2011), the proposal is being revisited by senior CAS officials.

4.5.6 Discussion and conclusions

Context-responsive implementation of educational innovation requires an in-depth understanding of the target context that can be difficult to obtain in advance. As a result of the four action research cycles of planning, teaching and evaluation/reflection reported here, factors have been identified that

most clearly differentiated research students studying at GUCAS from researchers working in CAS institutes, along with the issues these differences created for implementing CIPSE at GUCAS (Table 4.15). To the extent that the factors listed for GUCAS students apply to students in other university settings, the issues could be expected to apply more broadly as well.

Sequential adaptations to CIPSE aimed to address the issues listed in Table 4.15 as they were identified, and a comparison of the numerical data in Tables 4.10-4.12 provides a snapshot of the outcomes. It is clear that participants in the 2007 version of the course made lower mean gains in confidence to write and deal with publishing than participants in the other years (Table 4.12). In addition, a higher proportion of 2007 students recorded lower confidence on the two items after the course than before (25-30%, compared to 6-13% in the other years [data not shown]). Student open-ended responses also indicated issues with smooth integration of perspectives in the first week of the team-taught program. These outcomes indicate that it had likely been premature to ask GUCAS teams to undertake CIPSE teaching at that stage, and/or that using a combination of Adelaide and GUCAS teams to teach a single course, in order to meet scheduling constraints, had introduced an unmanageable level of complexity to the situation. It was clear that more work was needed to understand the context in which both students and staff were operating and to adapt the program to suit. The figures for the other three years (2006, 2008, 2009) show significant levels of gain in

Table 4.15: Factors differentiating CAS research institute-based and GUCAS participants in publication skill training programs

Institute-based researchers	**GUCAS students**	**Issues**
are from closely related disciplines within science	come from a very wide range of majors	selecting examples and article structures relevant to all
are already actively engaged in research	have not yet begun their research	creating adequate recognition of problems to be overcome
have their own data to use as the basis of an article	lack experience in manipulating their own data	providing hands-on experience of relevant writing tasks
voluntarily dedicate extended blocks of training time	must fit training into other summer-school commitments	time lacking for extended work on course tasks and concepts
take advantage of self-directed learning opportunities provided	expect a more traditional teacher/student relationship	need to reduce open-ended nature of tasks

confidence, both to write and deal with publishing (p<0.05), suggesting that the curriculum changes made cumulatively over the four-year action research project maintained strong learning outcomes overall, while incrementally adapting the course to the specific features of the GUCAS context.

The discussion that follows focuses on the five issues listed in Table 4.15 in turn, indicating how they have been addressed in the final 2009 course, Preparing to Write a Science Article for International Publication (PWSAIP), and what further refinements are recommended for the potential future development of a course textbook.

Wide range of student disciplines within science: Ensuring example articles analysed are relevant

The PWSAIP course did not provide example science articles for students to analyse, as a result of previous feedback from students that those we had selected in earlier years were not sufficiently specific to their disciplines, and from staff that they were too technically complex[14]. Instead, students were asked to identify and bring to classes a research article (not a review) relevant to their own future research topic, published in a discipline-specific SCI journal (i.e. not *Science* or *Nature*, because their format and requirements differ from those for the journals that will be most relevant to students at the early stages of their careers). This is also the approach used in a similar context by Martinez (2002), who reported that it freed her from the problem of content, while simultaneously increasing student interest and motivation. These articles were first used as the basis of the structure analysis exercises in Focus 1 of the course (Table 4.14). The journals the articles were published in became the sources from which Instructions to Contributors were obtained (downloaded) by the students, and it was the editors of these journals to whom covering letters were written as the final exercise in Focus 1, demonstrating how a future study proposed by the student, following from the one reported in their selected article, was relevant to the concerns of the journal as set out in its Aims and Scope/Instructions to Contributors.

In addition, the partial Introduction draft written by the students in Focus 3 of the course used this same article as the foundation for the research 'gap' to be addressed by the student's envisaged

[14] This change, also instituted in other CIPSE contexts for reasons similar to those operating here, has been identified as having significant disadvantages, as well as practical benefits, by Patrick O'Connor, the most experienced scientist CIPSE presenter to date. He notes that "the step in the model of theory to application which we used previously was to analyse a known article structure within content that should be accessible if not exactly on the money for these S&T students. I think the ability to decipher the genre using a common paper had real value." It will be important to regain this value in future course iterations if possible.

study. Because the exercises themselves required students to recycle language used in the article and on the journal webpage (documents which were submitted with the exercises), marking them did not require a detailed understanding of the science behind the articles. It is hoped that this adaptation will enable Chinese teachers to manage the teaching and marking confidently, if the proposal to develop the course further is taken up. Careful grading of the complexity of the exercises included in these Focuses would be needed, as well as specific training materials with detailed examples to be used in preparing teachers for this new type of challenge. This represents the type of systematic professional development recommend by Stewart, Sagliano and Sagliano (2002) for language experts asked to teach content-based courses.

Students' lack of research experience: alerting them to the real problems to be overcome

A two-pronged approach was taken to this problem in the PWSAIP course: using authentic referee criteria for evaluating an article as a crucial component of the article analysis exercises in Focus 1; and selecting this aspect as the one to be stressed by the collaborating scientist in Focus 4. It was important that, even though the physical involvement of the scientist (Patrick O'Connor) in the teaching took place in the last two days of the course, he was fully conversant with the goals, content and structure of the entire course, so that he could refer back to previous sections and revisit points made earlier by me, the language professional. These points included items from the referee criteria list used in Focus 1 (Cargill & O'Connor, 2009, p. 16), as well as the role of the Introduction 'gap' stage in Focus 3. If the proposal to develop and trial a textbook is pursued, this element will need particular emphasis, in order to avoid problems such as those that were encountered with involving science academics in the 2007 program. Professional development is equally important for content-specialist staff as for language specialists (Stewart, et al., 2002).

Providing relevant hands-on writing experience: the problem of data

A vital component of alerting students to the real problems they will encounter in writing a manuscript for international submission involves enabling them to grapple with the issues of analysing 'messy' data, revising research questions in the light of this process, and developing a coherent 'take-home' message that connects with the interests of a particular set of readers, represented by a journal, and makes a contribution to knowledge. To give students hands-on experience of elements of this task, the PWSAIP course provided them with a dataset that had clear relevance to their concerns, even

though it was not methodologically relevant to their disciplines in most cases. The dataset provided was that created by the participants in the 2007 course, who surveyed their classmates about how they read journal articles in their own fields. Unlike the 2007 course, PWSAIP did not expect students to first conduct the survey, as this had proved too time consuming. The version of the dataset provided to the students in 2009 was sufficiently large to allow different student groups to select different subsets of the data to answer the research questions they created, and this experience proved to be both engaging and profitable in terms of learning outcomes. In order to address student expectations about relevance to their individual disciplines, it will be important to foreground the reasons for the use of this dataset in the course materials, if the proposed further development goes ahead.

Need to fit with established scheduling constraints

It is clear from feedback throughout the four years that GUCAS students found even semi-intensive teaching (4 x 2-h classes per week for 3 weeks in 2009) of this material to be somewhat problematic. Thus the need for visiting teachers to restrict their stay to a limited timeframe can come into conflict with the expectations and preferences of the graduate students, who are simultaneously participating in several other courses. If the proposed further development of the course proceeds, the plan will be to write it as a 20-h course extending over 10 weeks (one 2-h class weekly), to fit with a common pattern in Chinese universities. This will have the additional advantage of allowing more extensive homework assignments to be set and marked, as well as fitting better into the learning patterns of the students. If desired, it could also be taught over a shorter period of two weeks, the mode preferred by the Argentinian graduate students in Martinez (2002).

This scheduling constraint also helps explain some of the specific features of the practice referred to in Section 4.5.3 of employing native English speakers to teach English to graduate students who have passed the minimum requirements of the system. The salaries offered for this work are not high by western standards, leading to the frequent employment of staff with little or no training in teaching or/and teaching English – but the number of teaching hours is also low, to fit with the course schedule, making the positions attractive to travellers. If the further developed PWSAIP course will be likely taught by such staff, as well as by Chinese English-language professionals, then the level of detail provided in the course book will need to be designed accordingly.

Expectations of traditional student-teacher relationships

The course design issue related to this expectation is identified in Table 4.15 as a need to reduce the open-ended nature of the tasks students are asked to perform. This identification relates both to expressed student preferences and comments from the Chinese teaching staff who have been associated with the course in 2006-9. Our initial expectations that students would freely raise any questions about their homework tasks with us on invitation were soon shown to be inappropriate, likely because the students were not comfortable with contributing publicly in class in this way, a feature well-documented as common in Chinese classrooms (e.g. Cortazzi & Jin, 1997). This is in spite of the desire for interaction expressed in student open-ended feedback and notably also in the comments of the Chinese science academic involved in the 2007 course. Reducing the open-endedness of the tasks would have required setting homework tasks that had one correct answer, and this was not a feasible option for many aspects of the original CIPSE workshops, which had been originally designed for practising scientists in institutes. The resulting mismatch with expectations was regularly noted by students in their open-ended feedback.

The 2009 PWSAIP course addressed this issue by designing reduced analysis and writing tasks that represented parts of the macro paper-writing/submitting task and were small enough to lend themselves to a more structured marking approach. In addition, the extended focus on sentence writing, using the concept of sentence templates and the introduction of concordancing software with self-constructed collections of text, did not contain any assessment tasks beyond the preparation of an article for a text corpus. If the textbook proposal goes ahead, we will need to pay further attention to the issue of balancing students' (and teachers') preferences for single correct answers with the use of the exploration-based methodologies on which CIPSE is based, in which 'it depends' (on discipline, on the article structure being used, on journal preferences, etc.) is often the most appropriate answer.

One benefit provided by the extended gestation of the proposed course-book is that we have on hand, as potential materials sources, a set of manuscript drafts written by groups of Chinese students on the survey data collected in 2007 (see Section 4.5.5.2). These drafts should enable us to prepare materials that respond in a practical, although admittedly limited, way to the frequent requests by course participants to explicitly address common errors made by Chinese manuscript authors.

A further aspect of expectations that needs to be discussed here involves the role of foreign teachers in Chinese university contexts and expectations of whether and/or how their contributions can or should influence teaching practice or curriculum/program design in the host environment. In a book chapter entitled 'Empowering non-native English-speaking teachers through collaboration with their native English-speaking colleagues in EFL settings', Liu (2007) describes a program at Shantou University, Guangdong Province, China, where such collaboration has been made an explicit aim and focus. He concludes his chapter as follows (p. 120):

> Collaboration, despite the growing popularity of the concept, can sometimes be difficult to foster. There are so many factors working against it in the real world: time and energy constraints, 'turf wars', feelings of inadequacy or superiority with language or pragmatics, and general inexperience with the idea of collaboration. I have to admit that we also encountered some suspicion and resistance at the beginning. NNESTs[15] felt inferior working with NESTs[16], while the latter felt constrained not to impose native superiority on their NNEST counterparts. But we pulled it together. We stepped outside the box, and we reached consensus through numerous professional development activities and opportunities through arguments, debates, persuasion, professional training, peer mentoring, and project management training. Educating the existing faculty and helping them grow, bringing in more competent faculty members and helping them mingle, empowering NNESTs and NESTs through ample opportunities for collaboration, have all proved effective. This has resulted in more co-operation, collaboration, professional growth and internal reward, and increased investment in the implementation of the new curriculum and programme.

The program at Shantou differs in a number of important ways from the more limited, academic writing-based GUCAS program that is the subject of this Part; it focuses on all the (undergraduate) students in the university, has a strong emphasis on aural and oral skill development (speaking and listening), and employs 15-20 trained NEST staff per year, 50% of the total staff numbers (Liu, 2007). Nevertheless, several of the difficulties highlighted in the paragraph quoted above in relation to fostering collaboration seem relevant to aspects of the outcomes of the 4-year project reported here. For example, time and energy constraints may well help to explain why no follow-up took place after verbal intimations in 2007 that the GUCAS and Adelaide teaching teams would maintain email contact and discuss questions and issues that arose in teaching related to publication skills (Section 4.5.2). In addition, I know that I certainly felt constrained, in writing my reports and deciding how to

[15] Non-native English-Speaking Teachers
[16] Native English-Speaking Teachers

follow them up, by a desire not to be seen as wanting to impose native-speaker and western-based pedagogical ideas in an EFL situation that I understood imperfectly to say the least. My repeated inclusion in the reports of suggestions that the Adelaide team could provide training to the GUCAS FLD staff in the methods used within CIPSE and the theoretical approaches underpinning them was my way of showing that I felt this to be an important aspect but wanted to leave the uptake of the suggestions open, rather than imposing them. The fact that these offers have not been taken up or in fact commented on by anyone at the GUCAS end indicates that no imposition has occurred, which I take as a successful outcome. However, this lack of comment leaves me unsure of exactly how to proceed. Liu's (2007, p. 120) concept of "general inexperience with the idea of collaboration" may be a reason that no responses were received – or it may be that formal reports of this kind were not an appropriate way to request the type of feedback I was wanting. The structure of the project itself was a further complicating factor which may have inhibited direct communication, with the funding body and the international affairs department making the decisions about the program going ahead but the FLD and the Adelaide team negotiating the actual teaching program.

The findings of another recent study also make a contribution to this aspect of the discussion. In a doctoral thesis entitled *The changing context of tertiary English teaching in China and teachers' responses to the challenges*, Gao (2007, p. 191) finds that a "lack of specialist knowledge on the part of policy developers, administrators and teachers results in impoverished policy and practice and prevents the uptake of autonomy" (i.e. the freedom to adapt curriculum and pedagogy to address students' actual learning needs), as offered in the recent policy reforms. She further concluded that two things needed to address the problem are for the universities themselves to be "willing to take on their responsibilities for curriculum development" and for teachers to "have access to greatly increased professional development" (Gao, 2007, pp. 191-192). Thus in the context of real-world student learning needs that include skills for writing internationally publishable science articles, this may be an appropriate time to pursue development of a curriculum and an associated textbook that may be useful both at GUCAS and more widely in Chinese graduate schools and those in other EFL contexts. It would also be important to consider at the same time the professional development needs of teachers who will be asked to teach the curriculum.

4.6 Project 3 conclusions

The two studies reported in Project 3 were both conducted in Chinese contexts, and contextual factors played a crucial role in analysis and interpretation of findings, as is appropriate for the reflective practitioner research framework adopted for the study. The findings combine to underline the vital role of career stage in decision-making on which CIPSE elements to present in a given EFL context, and on the relative importance of including scientists in the teaching team. CIPSE workshop outcomes were positive in all contexts and at all career stages, with significant increases in confidence to write and publish being recorded overall, and in confidence to teach publishing skills to others in the case of senior scientists. Potential was demonstrated for the WSRA book/website package to be useful as a training resource for Chinese scientists to use with their students and junior colleagues. For large mixed classes of early-candidature Chinese research students from mixed S&T disciplines, however, considerable adaptations were found to be advisable to the full CIPSE program to facilitate teaching by Chinese English teachers. The end-product of the four-year action research process was a course with an innovative balance of elements that maintains in some form all the features identified as important by the collaborating scientists who were part of CIPSE development. It is extremely discipline specific in its focus on analysing each student's target journal for important characteristics at the level of journal requirements and article structures. However, in keeping with the expectations of the culture of learning and teaching, a more generic approach is taken to issues of research question development, data analysis and presentation, and article 'story' writing, so that English teachers in this EFL context are not faced with unmanageably complex advanced science content. Collaboration from scientists is desirable for some elements, but the adapted course could be taught by English teachers alone if necessary. Thus this study of contextual factors and their influence has been able to point to strong potential for the overall CIPSE approach in China and other comparable EFL situations, and to highlight career stage as an important determining factor in program design.

A further important learning generated by this Project relates to reflections on institutional barriers to the uptake of educational innovation in the context of 21st century Chinese science. Innovation has been an overarching theme in the interactions of the CIPSE team with the Chinese Academy of Sciences (CAS). From our first workshop for CAS in Beijing in 2001 (Table 1.2), a feature of CIPSE that was commented on as being particularly important and relevant was the way introduction writing was taught, with an emphasis on the need for an incisive summary of recent research in the field and an explicit indication of the gap in knowledge/ research niche to be addressed, so that the innovation

of the work being reported could be highlighted effectively to meet the referee criteria of both newness and significance (pers. comm. Jinghua Cao, CAS Bureau of International Cooperation, 2001). The pre-eminent emphasis placed on innovation in Chinese science is reflected both in the academic literature and the online environment directed at broader reading audiences. For example, Bai and Cao (2008, p. 1101) relate progress in Chinese science over the preceding decade to a series of policy developments: "The investment in bricks-and-mortar research and development facilities and the human capital *necessary to undertake innovative research* has been further supported by international collaboration and communication" (emphasis added). Similarly, in reporting the history of CAS, its English-language website entitles the segment focusing on the period from 1987 to the present 'Reform and innovation' (Chinese Academy of Sciences, 2002-2011). In the context of innovation, emphasis is placed on "institutional reform of the existing science and technology infrastructure" (Bai & Cao, 2008, p. 1101), "in order to break the closed system and to be open, mobile and cooperative" (Chinese Academy of Sciences, 2002-2011).

In terms of the educational side of the science enterprise, there seems to be some evidence that this attitude is being increasingly taken up by CAS graduate students. In its reflections during the action research project (2006-9), the CIPSE team certainly noted that the level of critique present in the open-ended questionnaire responses was, pleasingly, much stronger than we had been used to receiving in the early days of our work in China (2001ff). To illustrate this trend, I quote a participant suggestion for improvement received after another 5-day workshop taught at GUCAS in 2010:

> *If possible, I strongly recommend that the teacher has a long time cooperation with the teachers and students in GUCAS in order to provide a standard course last for one semester maybe all the students here. Such a fantastic course should not be limited to a workshop which only lasts for five days and 20 students or so.*

However, at an institutional level, the same level of uptake was not evident to us. Although the reasons for the lack of response to the course reports provided over the four years of the action research project at GUCAS remained unknown, it seems likely that they may relate at least in part to institutional constraints. One interpretation could be that the institutional priority strategy decided on for addressing the needs of graduate students who had passed the minimum proficiency requirement was to use native-speaker teachers. Using CIPSE as taught by the Adelaide team within the summer-school structure fitted well within that strategy, and the institution remained keen for this contribution to continue. However, innovative features of CIPSE that require structural change, such as curriculum redesign or staff professional development, seemed to be slow to be considered for

implementation within prevailing institutional settings. Perhaps 'innovation' is a key concept for science, but science communication in China is still struggling with conservative approaches to meeting the international norm; innovation in the secondary tier of education seems still in its infancy.

5 Contribution to the field and prospects for future development

5.1 Addressing the problem of publication skills development in the sciences

The educational problem addressed in this portfolio is the need for effective approaches to developing the range of skills required to publish scientific research articles in the peer-reviewed international literature, which currently means 'in English', regardless of what we may think of the justice of this requirement. The problem is situated in the field of science research education, but runs parallel to and is impacted by understandings and approaches located within the fields of applied linguistics and English language teaching, especially for the many scientists who use English as an additional language (EAL). Many science research workplaces, worldwide, are now both multicultural and multilingual, and this trend will only intensify as globalising tendencies take increased effect. Users of English as a first language (EL1) are already probably a minority among users of the language worldwide (Graddol, 1999). Increasingly, supervisors and mentors helping junior scientists write manuscripts in English will themselves be from EAL backgrounds, as will journal editors and referees. To use a concept adopted for the theoretical framework of this portfolio, the discourse communities that novice authors are seeking to join are changing rapidly in terms of their composition. An additional factor here is the general decrease in the amount and effectiveness of instruction in English grammar and writing more generally provided to EL1 students in schools in many places (e.g. Grow, 2006). This means that the metalanguage needed to discuss why particular language choices are appropriate in a given situation may not be shared by mentors and mentees, even if they share a similar language background. In locations where English is a foreign language (EFL), such as China, effective teaching of the discipline-specific English needed by scientists is often hampered by the problems posed for English teachers by advanced scientific content. When this situation is combined with the limited and generally prescriptivist coverage of many of the available training texts for scientists, as reviewed in the Introduction, it is clear that previous approaches to addressing the problem can be characterised as somewhat ad hoc and piecemeal.

At the same time, the 'context of situation' (Halliday & Hasan, 1985) in which scientific articles are being submitted is becoming more stringent, with rejection rates for highly-ranked journals of around 75% in plant sciences (pers. comm. Ian Alexander Dec. 2009) and 68% for atmospheric sciences

(Schultz, 2010). In parallel, the pressure is increasing to publish, and to publish within candidature in many cases (Cargill & O'Connor, 2006a). Thus the pressure on supervisors/advisors, as well as their graduate students, can be extreme, as exemplified for Chinese contexts in Cargill, O'Connor and Li (submitted, Project 2B).

This portfolio has reported and analysed the development (Project 1) and implementation in various contexts (Projects 2 and 3) of a potentially improved approach to addressing the problem described above, based in interdisciplinary collaboration across sciences, education and applied linguistics and named Collaborative Interdisciplinary Publication Skills Education (CIPSE). The approach is demonstrated in the book/website package *Writing scientific research articles: Strategy and steps* (WSRA, Cargill & O'Connor, 2009, www.writeresearch.com.au), as described in Project 1. It builds on the interdisciplinary teaching approaches traditionally used within English for Specific Purposes (ESP), and extends their use. ESP has as its goal the teaching of the English needed for a particular specific purpose. CIPSE takes this one step further and focuses on achieving the purpose: the writing and submission of a manuscript and negotiation of its publication. It thus requires, in its 'strong' form, hands-on input from expert members of the target discourse community – publishing, refereeing scientists in the relevant field of science. However, scientists can, and do, provide advice to their junior colleagues and students without recognising a need for a framework such as CIPSE. What CIPSE provides in this situation is the means to harness the insights of genre analysis and ESP pedagogy to give a principled and accessible way to overcome the teaching issues commonly faced by mentoring scientists, which often lead them to simply rewrite their mentee's draft, as reported in Project 3A, rather than try to show how it can be improved by the student herself. Project 3A indicates that the WSRA book/website package has the potential to be useful in this way for Chinese scientists. Additional, though anecdotal, evidence of CIPSE's usefulness to scientists is provided by emailed communications received from international researchers interested in training their students to write articles, such as this one (emphasis in the original):

> Thank you for your WONDERFUL BOOK on writing scientific research articles. For years I have been lamenting 'if only there was a book out there that would help my students to write their articles', as all the other books I'd seen were more focused towards thesis writing or writing in too general terms. Last year I found the 2009 edition of your book, and it was a God Send!
>
> Over the years I have written a lot of articles and I now 'know what it takes', but I never quite knew how to transmit this knowledge to my students, and I would end up re-writing their

> articles for them, which is neither helpful for them nor to me. However, now that I have your book, which articulates all that I have seen in successful journal articles over the years, I can simply refer my students to specific chapters of your book. We have 2 copies in the lab, and they are always 'on loan' so I think we need one copy per student!
>
> The results have been phenomenal. With much less work on my part, my students are now LEARNING how to write themselves, and this is ultimately increasing our lab's productivity because now they can write their papers on their own. So a huge THANK YOU from the bottom of my heart, for all of your hard work in putting together such a comprehensive and applicable book. Please may I ask if you run writing workshops in Sydney? I know that our institute would greatly benefit from your expertise, and I would like to propose this to our H.R. department. (pers. comm., Amanda Sainsbury-Salis, Garvan Institute of Medical Research, Sydney, 5 September 2010)

In addition, scientists at The University of Adelaide not previously connected with CIPSE have taken up the WSRA package as the basis for teaching programs of their own. Dr Ron Smernik runs a monthly workshop based on the book for all interested members of the School of Agriculture, Food and Wine, and Dr Ian Riley is teaching a program called Publish Biology (http://publishbiology.net/) in China based in part on the WSRA materials. Beyond its 'home' university, a short course has been run by a scientist at Southern Cross University, NSW, based on the package, as a result of a report from a graduate student who attended CIPSE training run for her scholarship provider, the Australian Centre for International Agricultural Research (ACIAR). Reviews of the book in science journals have also been positive (Crissman, 2009; Jobling, 2009; Opie, 2009). Thus there is a modest amount of evidence that the approach exemplified in the WSRA package is accessible to and usable by scientists.

It was also our aim that the book could serve as a resource on the science side for ESP teachers who may not have easy access to effective collaborative relationships with 'broadly English-proficient' (Swales, 2004) scientists in their teaching contexts. It may, for example, allow a course such as that in Argentina described by Martinez (2002) to move a little deeper into the reasons for different language choices, perhaps by relating them to referee criteria. However, evidence is not (yet) available of this kind of use of the material.

A contribution that can be demonstrated on the English teaching side is the work reported in Project 3B, the outcome of which is a modified, CIPSE-based course that could potentially be used by university English teachers in China. The aim of such a course would be to introduce early-candidature students to those elements of the CIPSE approach that can be taught effectively prior to the completion of their own research project. They should thus be ready to use the WSRA package later in their candidatures, when they need to write their own papers – either as a self-study guide or as a text for a seminar or workshop, perhaps taught by a scientist. The sequential changes made to the course over the four year action research project have together aimed to address the problems identified by the Chinese teachers who participated, in particular in terms of dealing effectively with complex science content. This issue is a recurring one for ESP teachers worldwide, and especially in EFL contexts (e.g. Martinez, 2002). It remains to be seen whether the proposal currently under consideration will be taken up, to develop this prototype course into a textbook and teacher training package for the Chinese Academy of Sciences. However, the prototype materials as they stand should also be adaptable for other EFL contexts where an increase in international science publication is desired and teaching of the necessary skills thus a priority undertaking.

5.2 Collaborative teams in CIPSE

A key component of the CIPSE approach is its use of collaborative interdisciplinary teams for presentation of training. The co-authored WSRA package represents a (relatively) static outcome of the work of such a team, the results of which are proving to be useful in the field, as discussed above. The workshop presentations analysed in Projects 2 and 3 represent practical applications of the interdisciplinary collaboration principle in a variety of contexts and ways. A conclusion of Project 2A was that

> [t]he structure of the CIPSE approach, led by applied linguists/research communication educators and incorporating collaboration from colleagues in other disciplines, can allow for appropriate implementation in a wide range of contexts where publication skill development is a priority. The range of contexts includes those where conditions support a fuller integration of perspectives, and those where such integration is not (yet) feasible. (Cargill & O'Connor, 2010, Project 2A)

Thus an important contribution to the success of the approach seems to be the leadership of the teaching by the applied linguist/research communication educator (also referred to as an ESP/EAP

practitioner when addressing other discipline contexts). A variety of points have been highlighted in the portfolio that need consideration in seeking to work effectively in the kind of teams needed for CIPSE. A productive way to analyse them is through Embedded Intergroup Relations Theory (Alderfer, 1987; Botterill & de la Harpe, 2010), as recommended in the Conclusion of Project 2A. Elements of this theory are also helpful in analysing the success of the CIPSE team structure. According to this theory, the relationships between people working in interdisciplinary teams or groups will be affected by "their group memberships, parallel processes and the five interdependent properties of intergroup relations: namely, group boundaries, power differences, affective patterns, cognitive formations and leadership behaviours" (Botterill & de la Harpe, 2010, p. 68). For example, the outcome of the parallel processes effect would be seen if the groups to which the collaborating academics belong were valued differently by the university management (e.g. English teaching seen as a service role), and if this affected the way the group members interacted. The group boundary factor relates to how permeable the boundaries are – an issue canvassed in Project 2B, with boundaries found to be somewhat impermeable in the Chinese university context, but with a shared need to contribute to improved publication outcomes perhaps offering an opportunity to increase the permeability. In the context where CIPSE developed, group boundaries in the community of practice represented by the Waite Campus were somewhat permeable in the face of a shared agenda – to develop skills for effective communication of research findings – and became more permeable as the development proceeded, as described in Project 1. It is possible that boundary permeability can similarly be increased in other contexts, driven by the current strong need to produce publishable science articles and the benefits demonstrated in this portfolio and elsewhere of collaborative interdisciplinary approaches to skill development for this task.

The next element in Alderfer's list, affective patterns, refers to the tendency of group members to overgeneralise their views of others in terms of 'us' and 'them', affecting the ways they relate to one another. The building of a community of practice with shared goals is likely also to mitigate the action of this tendency. The penultimate element of cognitive formations is likely to be particularly important for collaborations between language and science specialists; the concept is explained by Botterill and de la Harpe (2010, p. 72) as follows:

> Cognitive formations determine group membership and boundaries. These reflect the views, values and orientations of group members and are represented through primary and secondary discourses, including their conscious and unconscious perceptions, ideologies,

thoughts and behaviours. The ability or not of team members to develop shared cognitive formations will influence the relationships of members both within and between teams.

Difficulties in this area when working with scientists were reported by Barron (2003), with both groups adhering to inflexible cognitive formations, and the issue is likely to need particular attention in establishing CIPSE-type collaborations. A cognitive formation that seems to have contributed to the success of the CIPSE approach is that represented by the discovery-based methodologies of genre analysis and corpus linguistics. These can sit particularly comfortably with the scientific method and its emphasis on empirical investigation, an advantage that should be strongly and explicitly emphasised in seeking to promote the further uptake of CIPSE.

Leadership behaviour, the final element in the list, exerts either positive or negative influence on interdisciplinary team dynamics, and is critical to team functioning (Botterill & de la Harpe, 2010). If teams are intercultural as well as interdisciplinary, as in the work at GUCAS reported in Project 3B, there is a strengthened likelihood of taken-for-granted behaviours having unexpected effects, and thus particular care needs to be taken in negotiating leadership and expected outcomes of team activities. Overall, the formulation of the salient issues provided by Embedded Intergroup Relations Theory could serve as a valuable framework to support the design of professional development activities to prepare academics for CIPSE programs.

In order to encourage extended implementation of CIPSE, especially in EFL contexts, several changes to current institutional arrangements seem to be needed. Firstly, administrators of universities and research institutes would need to recognise the added value brought to the publication skills training process by the use of a collaborative interdisciplinary approach – this could be assisted *inter alia* by word-of-mouth recommendation by senior scientists who have experienced the benefits, who could be resourced for the task by a stronger and more explicit emphasis in CIPSE workshops on the necessary contributions of both partner disciplines to the success of the outcomes. Then it will be important to strengthen the ability of English teachers in EFL contexts to present themselves to their scientist colleagues as clearly bringing valuable expertise to the shared enterprise of publication skills development, as concluded in Project 2B for the Chinese context. Professional development (Braine, 2010; Liu, 2007; Stewart, et al., 2002), including the use of reflective teaching practices such as action research, will be an important requirement. There may also be a role here for teacher preparation courses in English speaking contexts, which could usefully include an optional focus on science publication skills and the understandings needed to support effective collaboration with science academics.

5.3 CIPSE implementation in science contexts: the challenge of marketing

As alluded to above, an ongoing focus of my work is to continue to provide and promote the uptake of rigorously evaluated best-practice support for publication skills development, shown here to be CIPSE, as a means for addressing the problem of skill development for publishing high quality science manuscripts. In universities in EL1 contexts, CIPSE implementation challenges currently appear in a somewhat different guise to that they have in EFL contexts, where they are commonly 'lumped in' with English teaching. In EL1 Universities, units charged with developing skills in research communication and/or English language are generally centrally located, rather than attached to the disciplines where the skills and language will be used. This trend can also be seen in EFL contexts where broader 'professional skills' development may be located centrally and separate from English teaching. Thus, in the face of tight budgets and a focus on ticking boxes rather than ensuring quality outcomes, such programs are generally required to target transferable generic skills rather than discipline-specific needs (Bastalich, 2010). This trend seems to fly in the face of accepted ESP wisdom for advanced academic literacies; Ken Hyland (2002) in an article entitled 'Specificity revisited: how far should we go now?' came to the conclusion: "as far as possible". It is thus an ongoing challenge to convince training providers of the benefits of a discipline-specific approach to training.

In order to be able to teach CIPSE workshops to the discipline-specific groups that obtain best benefit from them (Cargill & O'Connor, 2006b, p. 87), I left the constraints of being a university employee in 2009 and adopted a fully consultancy-based business model. This model requires a different approach than I had been used to when employed by a university, with one of the most challenging aspects being the need to market my services. Although this model was common for ESP practitioners in the recent past (Swales, 1989), my situation differs from theirs by virtue of a focus on the purpose in ESP rather than only the English for it, and the need to 'sell' an interdisciplinary approach to 'clients' largely unfamiliar with its potential 'added-value' benefits. The scare quotes around the terms in the previous sentence indicate that here I am entering a discourse community that is new to me, and whose genres and terminology need the same sort of study I have previously applied to science research articles.

On the principle that audience analysis is an important first step in beginning to engage with a new discourse community and set of genres, I list below administrative sections and/or position names with which I have corresponded over the past several years to negotiate CIPSE training:

- International affairs departments of universities and science academies in EFL contexts
- Deans of foreign languages departments in Chinese universities
- Training centre director of a CGIAR (Consultative Group on International Agricultural Research) institute
- Organising committees of international scientific conferences
- Associate Deans (Research) of university science faculties, schools or research centres
- Staff of university graduate schools
- Human resources departments of research organisations

These are the people who have decided if the training will go ahead, and have been in charge of negotiating the details of its delivery. This list represents a range of discipline backgrounds, and therefore discourse communities and world-views, some of which can be known or guessed at and others of which remain unknown throughout the interaction. However, all can be expected to be currently operating within a management perspective, by virtue of their organizational position. Therefore, a focus on value for money may be an effective framework to guide negotiations about training in a consultancy-based context. Insights gained from using this framework may also be relevant to promoting measures for effective and sustainable educational initiatives in the competitive industry that is modern higher education, irrespective of the status of the provider.

In seeking to develop such a framework, I have used the findings of the analyses presented in the portfolio to propose a series of descriptor scales for analysis of trainee populations and client training goals. This work builds in part on the broader 'model' concept presented in Cargill and O'Connor (2006b), but is more tightly focused, aiming to provide a tool for use in negotiations with clients that will enable the salient educational aspects of the situation to be taken appropriately into consideration. It therefore seeks to follow the recommendation made at the end of Project 2A to develop ways of talking about CIPSE and its potential contributions that will resonate with the concerns of different audiences.

5.3.1 A descriptor scale matrix

Training is clearly needed in many contexts that will contribute to an increase in the output of articles published in highly-rated international journals, but identifying who to train, when to train them, and what type of training will be most effective can be a complex challenge. The outcomes of the three projects reported in this portfolio, taken together, provide information that can contribute to effective decision making. The following set of four descriptor scales is proposed for analysing populations to be trained, in order to decide on the most cost-effective use of available training budgets. The scales are labelled as follows: Client goals for training; Trainee research experience; Training program type (Fig. 5.1); and English language context (Fig. 5.2). The following sections describe three points on each scale, and the justification for each point based on the findings of the analyses presented in the portfolio.

5.3.1.1 Client training goals

At the first PRISEAL conference (Publishing and presenting research internationally: Issues for speakers of English as an additional language) in Tenerife in 2007, John Swales presented, in a talk entitled *Junior researchers and publishing internationally,* the following list to represent the changes that have taken place in researchers' lives in the recent past; the slide title was 'The new genre hierarchy':

a. It's nice if you publish something
b. Please try and publish
c. Publish mainly in journals
d. Publish in journals, especially international ones
e. Publish in peer-viewed international journals
f. Publish in ISI* journals
g. Publish in ISI journals with a high Impact Factor

*ISI (now Thomson Reuters) Web of Knowledge (http://www.isiwebofknowledge.com/)

Building from this point, I characterise the right-hand end of the *Client training goal* descriptor scale (see Fig. 5.1) as 'an increase in the number of SCI (Science Citation Index, Thomson Reuters) papers produced', or, in some situations, 'an increase in the Impact Factor of journals publishing the papers produced'. Such a goal picks up the perspective of McGrail et al. (2006), that only published

papers should count as an outcome of an intervention to improve publishing rates. However, as argued earlier, this does not take into account the overriding importance for journal acceptance of scientific quality and novelty, as well as match with the journal's desired position in the field. Nevertheless, using this wording for the scale end-point is an effective way to get the issue 'on the table' when negotiating training options with a prospective client. If this is their desired outcome from an intervention, then a much more comprehensive program would need to be implemented – the components of which could be clarified using the remaining scales within the matrix.

An intermediate point on this scale would be 'an increase in self-assessed confidence to write manuscripts for SCI submission and deal with the publishing process'. As demonstrated by the evaluation outcomes from all full workshops analysed in this portfolio, this outcome can be anticipated from running CIPSE workshops, and relevant evidence can readily be provided to prospective clients using the published papers.

The left-hand end-point I propose is 'development of the full range of pre-requisite skills for writing a manuscript for submission to an SCI journal'. This wording is aimed to capture the learning from Project 3B in particular, and to address as far as practicable the issues and challenges highlighted in Project 3A. The pre-requisite skills list that has emerged from the analysis in this portfolio is represented in Table 5.1. Demonstrating their embeddedness in the concerns of the community of practice of science research, the list items are presented in relation to relevant aspects of the referee criteria list (Cargill & O'Connor, 2009, p. 16) that forms a basic jumping-off point for CIPSE teaching. Table 5.1 also indicates the items for which teaching input from members of the discourse community/ies relevant to the students' fields is of high value. Thus it could serve as a basis for curriculum planning conversations, using as it does terminology that is meaningful across a range of areas with an interest in publication skill development.

Table 5.1. Pre-requisite skills for the production of a potentially publishable article in English, in relation to the collated list of referee criteria for science articles published in Cargill and O'Connor (2009, p. 16). Highlights indicate items requiring/benefitting from input from experts in the relevant science discipline/s.

Referee criterion	**Pre-requisite skills for writing submittable manuscripts**
Is the contribution new? Is the contribution significant? Is it suitable for publication in the Journal?	Library/database/internet use to find relevant literature; analysis of literature to identify gaps and justify a study; writing in own 'voice' using literature; understanding role of audience analysis for effective writing
Is the organisation acceptable?	Knowledge of all article structures relevant to the discipline area, and content of the sections in each
Do the methods and treatment of results conform to acceptable scientific standards? Are all conclusions firmly based in the data presented?	Research methodology, research question development and statistics/data presentation relevant to the discipline; discipline-specific use of structure, tense and modal verbs to write about results and conclusions
Is the length of the paper satisfactory?	Meticulous attention to detail
Are all illustrations required? Are all the tables and figures necessary? Are figure legends and table titles adequate?	Ability to analyse and formulate 'take-home messages' from datasets; data presentation and summary skills relevant to the discipline
Do the title and the abstract clearly indicate the content of the paper?	Ability to highlight key messages for an intended audience
Are the references up-to-date, complete, and the journal titles correctly abbreviated?	Understanding of/skills in citation practice relevant to the discipline and avoidance of plagiarism; use of bibliographic software or manual systems for storage/ retrieval of references and preparation of reference lists
Is the paper excellent, good or poor?	Appropriate proficiency in discipline-specific English at the levels of vocabulary choice and use, accurate sentence structure for clear meaning, argument construction and linking, and information ordering to meet audience expectations; skills in self-editing and responding to feedback[1]

[1]As pointed out by a scientist reader, this criterion can be expected to relate more, for the journal and the referees, to issues of newness and significance than to the issues listed here. However, in terms of teaching pre-requisite skills, the intention is to incorporate this journal focus within the issue of 'information ordering to meet audience expectations'. I would argue that the language features listed here affect judgements made about this criterion, perhaps at a sub-conscious level.

5.3.1.2 Trainee research experience

This scale relates to Swales (2004, p. 56) notion of Senior and Junior Researchers, but with somewhat finer distinctions. The right-hand end is represented by the cohort discussed in Project 3A,

more senior researchers who are responsible for overseeing and mentoring the publishing of junior staff and students, as well as for publishing their own papers – characterized here as Mentoring Researchers (MR). The intermediate position on the scale for our purposes begins with senior research students in the process of drafting an article on their own results, through to employed/ post-doctoral researchers who may have published several papers internationally but are looking to improve their efficiency and polish their skills. This group is characterized as Early-career researchers (ER). I would argue that the results of Project 3B indicate a need for a further subdivision within Swales' *Junior* category for the left-hand endpoint of this scale. That is because in several of the EFL contexts I have experienced, notably GUCAS but also other CAS training centres, beginning research students are gathered together, sometimes from sites at quite some distance, and taught as a cohort in the very early stages of their research degree candidature. The discipline areas within science of the cohort may be very disparate (or could even extend beyond science to all fields where primary data are collected and analysed, as for centrally run paper-writing workshops in my own university in Australia). The outcomes of Project 3B demonstrate that where trainees have not yet conducted a research project to its completion and struggled to present the data analysis and conclusions to a critical public audience in writing, they are less likely to benefit from training that includes the full range of content covered in the CIPSE approach. In such cases, the cost of including a collaborating scientist member in the training team is likely not to be warranted. Thus the left-hand end of the scale is a commencing HDR (higher degree by research) candidate, with no/little experience of designing and conducting research and/or no/little formal research training. This group is characterized as Commencing Researchers (CR).

Aspects to be considered in defining the position of a cohort on this scale need to include their level of research training, as well as their levels of experience in reading research articles in English, designing and conducting research studies independently, and writing up the research. It is important to note here that, in relation to the last-mentioned point, the actual level of input to writing a paper needs to be considered – the appearance of a person's name in the author list should not be accepted uncritically as evidence of substantial input to the English writing in all cases, the widely accepted Vancouver Protocol notwithstanding (International Committee of Medical Journal Editors, 2009).

5.3.1.3 Training program type

The right-hand end of this descriptor scale represents an embedded or integrated approach to developing publication skills within a research workplace. Its defining feature is that the research workplace/s of the participants form an integral part of the planning and organisation of the program, including their discipline locations, their practical agendas and the constraints affecting them. If external CIPSE presenters are used, local implementation options and professional development for local staff are part of the program planning. If graduate students are the trainees, then supervisors/advisors participate in order to be able to carry on the educational process after the training event. If an academic support course or similar is wanted, then a full context analysis can be included to identify the feasibility of various embedding options. In practice, as represented by the implementations analysed in this portfolio, this degree of integration has not often been on the horizon. However, where repeat training events are arranged, perhaps annually, this point can be a useful reference point for indicating what may be possible. This formulation responds to the conclusions of Project 2, which identified that targeted terminology was needed, along with opportunities for experiential learning of what the issues and needs are, and what can be achieved in a given context using the CIPSE approach.

The mid-area on this descriptor scale represents situations where a program (course or training event) is requested for a group of trainees taken out of their workplaces, but where the details of the workplace/s can form part of the event planning: discipline locations are known, at least some relevant details of the research context can be provided, and local uptake options can be considered in the planning, including train-the-trainer options. Examples of this point on this scale are the Mianyang workshop reported in Project 3B, and the New Phytologist workshops in 2007 and 2009.

The left-hand end of the scale is a stand-alone one-off training event, external to participants' working environment, where issues of discipline mix are not taken into consideration. I have not included the issue of program length in this scale because programs of any length can be requested and run at any point of the scale, and because it is much more straightforward to negotiate around questions of length that around the other aspects considered here.

These three scales can usefully be considered together as a base point for negotiations (Figure 5.1). The closer to the right-hand end of each scale the training context is, the more likely it is that significant value will be added to the training by including a scientist in the CIPSE presentation team – preferably one whose research interests match those of the trainees, at least in terms of general

field and approach/ methodology. If the trainees' context falls to the left of the mid-point on any scale, it is likely that the additional cost of including a scientist presenter will not be warranted, and that very satisfactory outcomes will be achieved with a CIPSE program taught by an applied linguist/ESP teacher alone. For example, the program run by me alone for CRs at GUCAS in 2008 received comparably high evaluations to those run by scientist/linguist teams in 2006 (Project 3B), and the courses I ran alone at Nanjing and Shanghai Universities in 2006 for mixed CR/ER groups, organized without taking discipline/workplace into consideration, showed strong increases in participant confidence to write and deal with the publishing process (Project 2B). It should be noted that the level of value added by the inclusion of a scientist in the team, in those situations where it is appropriate, is very high, not least in terms of the enhanced credibility it affords the training course.

	Less added value	**Significant added value**	**Very high degree of added value**
Training context descriptor	←		→
Client training goals	Prerequisite skills for ms writing	Increased trainee confidence to write/publish	Increased output/level of published articles
Trainee research experience	Commencing researchers	Early-career researchers	Mentoring researchers
Training program type	Stand-alone, workplace contexts not considered	External but workplace contexts considered	Embedded in workplace

Figure 5.1: Variation in degree of value added by including scientist presenters in CIPSE training, in relation to three training context descriptor scales.

5.3.1.4 English language context

The fourth descriptor scale, English language context, operates alongside the first three in terms of determining presentation style and methodology and the amount of content that can be covered in a given time; however, it is not a determinant of the team structure. Current practice for CIPSE training in EFL contexts is to stipulate that participants must have a level of English proficiency that will enable them to follow a presentation given exclusively in English and based on articles in English, and to interact appropriately with the presenters. I rely on self-assessment of this level, as previous attempts to stipulate test scores or the equivalent did not lead to more homogeneous proficiency in trainee groups.

The descriptor scale for English language context takes into account Swales (2004, pp. 56-57) concepts of “Broadly English Proficient” (BEP) and “Narrowly English Proficient” (NEP), and the fact that users of English as a first language (EL1) experience many of the same difficulties in writing science English at this advanced level as do academics from other language backgrounds (p. 52). I propose that this scale focus not on the individuals to be trained, but the context in which the training takes place and the research workplace is located. This is because the resources and strategies that trainees will need to learn about and practise relate more directly to these contextual features than to their individual proficiency in many cases, and this formulation of the scale points makes this fact explicit to those making decisions. Thus the right-hand end-point is an EL1 context where all novice authors, including EAL authors, have readily available opportunities for interaction in English about their science and their developing manuscript, and where the working language of the laboratory or group is English. The intermediate point would be an ESL science context, where such opportunities are available or can be sought out, although the primary working language of the laboratory or group is not English. Such a context could be in an EFL location, but one where collaboration with EL1 scientists is an ongoing part of the program, with frequent visits from scientists who do not speak the home language of the lab, requiring in-depth communication in English on a regular basis. The left-hand end-point of the descriptor scale is an EFL context, characterised here as being one where opportunities to interact outside the training event with fluent English speakers conversant with the discipline content of the research being conducted range from non-existent to rare and in need of careful structuring. This is the kind of context described by Martinez (2002) in an Argentinian university setting, where the ‘collaboration’ she describes in her content-based course was between herself and her students, who provided the strong content knowledge to pair with her knowledge of genre and language form.

Rather than relating to the added value provided by including a scientist in the CIPSE presenter team, this descriptor scale relates to the value of including an appropriately trained ESP teacher in the team (Figure 5.2). The added value continuum runs in the opposite direction in Figure 5.2 from Figure 5.1, with the greatest degree of added value occurring at the left-hand end of the descriptor scale, in science contexts where interaction in English about the science being conducted is not available outside the training event or program, i.e. the type of EFL science contexts described above.

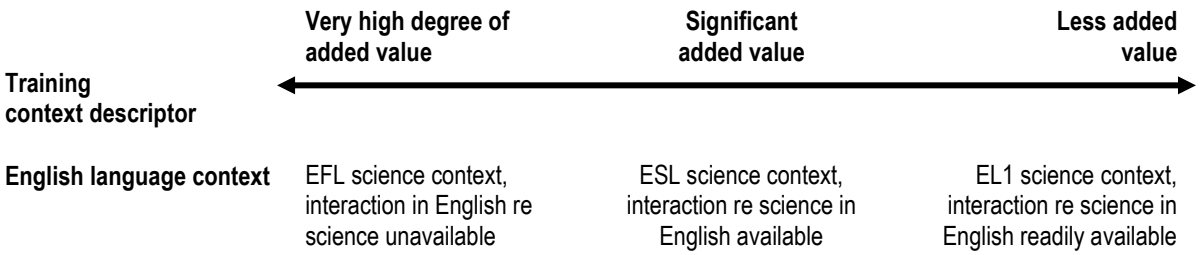

Figure 5.2: Variation in the added value of including an appropriately trained ESP teacher in CIPSE training, in relation to a descriptor scale for the English language context of the training

This depiction reflects the situation on the ground, as reported in this portfolio, at both ends of the scale. The high value of including ESP-trained presenters for CIPSE in EFL contexts has been demonstrated in Spain and a range of contexts in China. There is also a sense in which this value can be seen to be partly recognised in Chinese teaching contexts such as GUCAS and the CAS Training Centre in Lanzhou (Allan Grey, pers. comm. December 2010), but with 'native English-speaker' substituted for ESP-trained teacher, perhaps due to greater availability of the former alongside a lack of teachers with the type of training that would make them willing and able to adopt CIPSE or manage complex science content. At the other end of the scale, the anecdotal evidence presented earlier of EL1 scientists successfully using the CIPSE approach as set out in the WSRA package indicates that including ESP expertise in the teaching team is less essential in an EL1 context, although value is certainly added, especially if the participant group includes EAL scientists. It is important to remember that CIPSE is highly appropriate for use with EL1 novice authors, as well as the EAL novices that have been a major focus of the portfolio.

5.4 Conclusion

Thus, taken in sum, the learning generated from the three projects of this portfolio has allowed the articulation of a theorised approach and practical steps for developing and implementing effective training programs for publication skills development in a range of science research contexts. Starting from the real-world problem of extreme pressure on scientists worldwide to both publish their own research and assist their students to do so, I applied the theoretical constructs of genre, discourse communities, community of practice and language socialisation to understand the benefits of interdisciplinary collaborative practice by scientists and English language professionals in developing

and delivering training likely to develop both skills and confidence in novice authors of science research articles. The analysis has extended the emphasis traditionally placed on collaborative work in ESP teaching, and demonstrated to scientists involved in supporting novice authors the value that can be added to their efforts by including the insights and techniques emerging from genre analysis and ESP teaching methodology. The portfolio has also provided evidence on factors in the training context that determine the level of value added by use of collaborative presentation teams, in addition to the collaboratively developed content and approach represented by CIPSE and exemplified in the WSRA package. These factors are the goals or desired outcomes of the training; the trainees' levels of research experience; and the extent to which the training program is embedded in the trainees' workplace situations and takes into consideration their specific discipline areas and opportunities to extend the training focus after the program is completed. The English language context of the training site is a fourth factor, which operates alongside the first three and helps determine aspects of how the training can best be presented and the strategies taught.

It is important to acknowledge the limitations of the study presented, which can point to ways in which the research could be developed in future. The present study relies extensively on survey data as the basis for the reflective practitioner research approach adopted. This type of data can provide only one, limited lens on the impact of the CIPSE model or of specific programs on writers' practices and learning. The use of interviews and text-based investigations could expand the range of questions that could be addressed in future. In addition, it is important to recognise that an interventionist approach such as CIPSE, advocating explicit teaching of a pre-determined curriculum, is not the only and may not necessarily be the best way for authors to develop successfully as published writers. Individual competence, as a writer and manager of the publication process, may be related to publication success in different ways in the current situation of collaborative research teams that share expertise and cross national and linguistic borders. More work is needed on the complex interrelationships between individual agency, explicit teaching, mentoring/coaching, co-authorship practices, and interaction with literacy brokers of various kinds, especially in the context of science in China and other Asian countries. This context needs to be seen to include the political and economic features of the 21st century scientific landscape, discussed in the portfolio Introduction, which create intense pressure to publish for individual scientists, research groups, institutions and countries. It is this pressure in turn that creates the situation in which CIPSE has been developed, a situation conceptualised here as representing both a problem and an opportunity.

Future avenues for practical application of the portfolio findings have been addressed throughout the study. One avenue is to promote the current model of consultancy-based training workshops in science workplaces and associated with international science conferences, supported by improved marketing approaches emerging from the portfolio findings highlighted above. A second avenue is to pursue the introduction, in EFL training institutions such as universities, of curriculum-based strategies such as credit-bearing courses and short-course professional development modules based on the WSRA package and the modified materials developed during the action research project in China. Consideration is currently being given to such a development by the Chinese Academy of Sciences (see Project 3b), work is already well underway at a CGIAR institute in the Philippines, initial interest has recently been expressed by three institutions in Indonesia, and the need has also been flagged in the literature (Hien, 2010). A third avenue, and one on which the sustainability of the others may well depend, is the development of appropriate training structures and materials for academic staff interested in using the CIPSE approach in their home contexts.

The most urgent future research directions would seem to relate to the third of the practical applications above. Research questions include the following: Can scientists and language professionals be taught the underlying tenets of CIPSE together, or are separate courses needed? How can science departments and education academics best collaborate to provide the training needed? Additional research directions include investigating the longer-term outcomes of CIPSE training in China. A comparative study could be conducted of matched cohorts of CIPSE graduates and those who did not receive this training, with data collected relating to publishing history in their first language and in English, and career trajectories.

The portfolio of research presented here has thus established an educationally-motivated foundation on which others may be able to build in the context of the ongoing need to support novice authors of science research articles from all language backgrounds in the pressured research environment of the 21st century.

6 Appendix: Table of contents of *Writing scientific research articles: Strategy and steps* (Cargill & O'Connor 2009)

Section 1 A framework for success

1 How the book is organised, and why

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Section 4 Developing your publication skills further

Section 5 Provided example articles

Answer pages

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