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# Conceptualising linguistic access to knowledge as interdisciplinary collaboration

## Abstract

Communication lecturers often find themselves in the position of having to do considerably more than teach communication practice in professional programmes, for example, they are commonly expected to provide a 'service' function to lecturers in other disciplines.

When communication lecturers are 'embedded' in science, engineering and technology-based departments, the 'service' provision role of communication lecturers can be exaggerated because of their marginal position in such departments. In this paper we argue that the lens of interdisciplinarity is a useful one for reconceptualising the role of communication lecturers in professional

programmes in science, engineering and technology-based departments.

We draw on a number of case studies to show how reconceptualising the work of communication lecturers can enhance collaboration between communication and content lectures in science, engineering and technology and, ultimately, contribute more meaningfully to the language development of students enrolled in professional programmes.

**Keywords:** interdisciplinarity, academic literacies, communication, science, engineering and technology programmes

## 1. Introduction

In this paper we analyse partnerships between university science, engineering and technology teachers (SETTs) and communication teachers (CTs). The purpose of the collaborations was to enable students' linguistic access to disciplinary knowledge. The SETTs in this study were located in applied science, health science and engineering departments; the CTs were a diverse group: some called themselves 'communication lecturers', others 'academic literacy practitioners', and yet others 'professional communication teachers'. While acknowledging the diversity of expertise and areas of practice, we simply call this group 'communication teachers' (CTs). Such lecturers are usually located in SET departments, where they teach Professional Communication, develop students' academic literacies, and assist students (particularly those for whom English is an additional language) to master the complex communication practices of applied science, engineering and technology (SET) subjects. The paper draws on four cases that illustrate the different collaborations that we found in our data.

## 2. Theoretical framework

In this section, a language of description is developed for SETT-CT interdisciplinary collaboration. This language focuses on an understanding of disciplinarity and interdisciplinarity, rather than on individual perspectives and personal or departmental contexts. While personalities, individual understandings and motivations impact the forms and processes involved (e.g., Pharo *et al.*, 2012), the focus in this paper is at the disciplinary level.

Academic disciplines inform academic practices (Neumann, Parry & Becher, 2002) and academics from different disciplines tend to operate separately (even when in the same department or faculty) because of variable practices across disciplines. Achieving educational change through interdisciplinary collaboration is unlikely to occur solely through personal development or commitment; it requires a supportive social context, which is often absent in higher education institutions (Fullan, 2001).

### 2.1 Disciplinarity

Several scholars have attempted to categorise disciplines according to the most salient differences perceived between them. Biglan (1973), for example, separates disciplines along two dimensions, identifying 'hard pure' (e.g., physics), 'soft pure' (e.g., sociology), 'hard applied' (e.g., engineering), and 'soft applied' (e.g., communication) types. Whitley (1984: 126-129) differentiates disciplines according to the degree of 'technical task uncertainty' (variability in examined problems) and 'strategic uncertainty' (amount of instability in the research methods) present in the field. Bernstein (1999) distinguishes disciplines by their knowledge structures: knowledge structures in SET fields are hierarchically organised in a 'coherent, explicit, and systematically principled' system; in

language-related fields knowledge structures are 'horizontal' and 'segmental'. Kolb (1981) characterises disciplines according to the ways in which they demand that students learn; he places disciplines along two continua which he calls 'active-reflective' and 'abstract-concrete'. Muller (2009) describes disciplinary difference in terms of epistemological, methodological, communicative, professional, and educational variables.

In SET fields, progressive mastery of techniques in a linear sequence is based on concepts developed in the pure disciplines of physics and mathematics; these pure, hard disciplines emphasise the knowledge and procedures associated with experimentation, logical proof and accuracy for legitimating knowledge claims, while communication draws on both the practices and knowledge claims of pure, soft disciplines (e.g., ethnography, qualitative enquiry) (Maton, 2007).

## 2.2 Interdisciplinarity

There are several models of CT-SETT collaboration. The 'English for specific purposes' (ESP) tradition, pioneered by Mohan (1979), proposed a language and content integration framework comprising systematic connections linking relevant learning and the development of thinking. Soon other studies (e.g., Swales, 1988) identified the syntactic, semantic and pragmatic features of language that challenged students, and developed programmes to support students linguistically. From this strand, broadly termed Genre Studies, different models evolved, such as Rhetorical Genre Studies (Artemeva & Freedman, 2008), which focussed on writing across the disciplines (WAC) and writing in the disciplines (WID) – initiatives involving language and content collaboration (Bazerman, 1991).

Programmes increasingly focussed on students' cognitive development and academic language proficiency (e.g., Cummins, 2000; Saville-Troike, 1984). Studies of how individuals become competent members of disciplinary groups and the associated role of language began to influence teaching and learning (Ballard & Clancy 1988). The 'academic literacies' approach was seen as a special case of language socialisation since it involves how students do or do not integrate language and subject matter in identity formation across a range of domains (Gee, 1990). Critical voices questioned how disciplines structure knowledge and use academic discourse (e.g., Ivanic & Simpson, 1992), and addressed the inclusion of previously marginalised groups into academic discourse communities and the need to provide spaces for new voices (Lee, 2007).

As interdisciplinary practices emerge, there are attempts to define interdisciplinary scholarship (e.g., Klein, 1996; Lattuca, 2001). Interdisciplinary collaboration involves common ground, or potential negotiation around a 'boundary object' (Star & Griesemer, 1989) which encourages 'transgression' (Nowotny, Scott & Gibbons, 2001) into other disciplinary domains. These objects can thus cross disciplinary boundaries, can 'adapt to local needs and constraints of the several parties employing them, yet [are] robust enough to maintain a common identity across sites' (Star & Griesemer 1989: 393). Collaboration without complete consensus is possible, as different understandings can be reframed within a wider project. Interdisciplinary theorists use different metaphors

such as a ‘trading zone’ (Galison, 1997) or ‘transaction space’ (Nowotny *et al.*, 2001) to name catalysts or enabling mechanisms for interdisciplinary collaboration. While differing disciplinary perspectives could close down collaboration, ‘trading zones’ and ‘transaction spaces’ potentially enable productive collaboration, including sharing meanings and practice.

### **3. Case study methodologies**

The four interdisciplinary projects of this study shared an intention to provide linguistic access to disciplinary knowledge. Case Study 1 explores SETT-CT collaboration to enhance students’ professional presentation skills; the second involves SETT-CT collaboration to develop students’ understanding of technical terminology; the third involves a SETT and a CT co-authoring a textbook; and the fourth analyses institutional spaces and academic identity across a range of SETT-CT collaborations.

The four qualitative case studies employed observation, document studies and individual and focus-group semi-structured interviews. Interviews and observations occurred at various stages in the collaborations, although the focus was on post-collaboration reflections. Observations and interviews were video- and/or audio-recorded, transcribed and thematically analysed. The SETTs and CTs’ perceptions of enabling and constraining factors influencing their collaborative efforts provide insight into interdisciplinary work. More detail on specific research approaches is described in each case study.

### **4. Findings and discussion**

Disciplinary differences, as well as emerging possibilities for interdisciplinary collaboration, revealed themselves in the SETT-CT collaborations.

#### **4.1 Case Study 1: A capstone professional communication course**

This case study focuses on a fourth year undergraduate SET programme involving student teams developing a product prototype. A final, ‘high-stakes’ assessment project is common in many SET disciplines, often involving a demonstration of the artefact to an assessment panel. Usually such projects are simulated; the ‘brief’ is developed by SETTs who oversee the technical design and construction of product prototypes. In Case Study 1, the students’ projects were commissioned by real clients and potential student employers.

The assessment task (the interdisciplinary ‘boundary object’ for the collaboration) required students to demonstrate their prototypes to a combined assessment panel of SETTs and clients. Data for this case study included all documentation regarding the SET students’ projects, including students’ PowerPoint slides and technical reports,

observations of students' interactions with their clients and a 'de-briefing' meeting of SETTs and CTs, plus initial, mid-project and post-presentation interviews with the SETTs, CTs, and students.

The CTs prepared students for this assessment and gave them feedback on their presentations. This included assistance with graphics and visual support. It was planned that the students would make their presentations to their SET lecturers for formative feedback before the final presentations to the assessment panel. Unfortunately, the SETTs were not able to attend the 'trail run' and an important component of interdisciplinary work, the creation of a 'transaction space' where understandings could be negotiated, was thus neglected.

Students' oral presentations to the academic and client panel provided an opportunity to showcase their honed communication skills. The students believed their presentations were successful, as this SET student explains:

*The project method of learning forced us to learn more about our subjects and enabled us to develop solutions to a specific problem ... and to communicate these ideas to [the client].*

Part of the students' enhanced practice involved students refining and correcting grammar and other errors in their oral presentations and written reports. These demonstrated a clear sense of audience, often obscure or confused in such genres (Winberg, 2007). However, the oral presentations in particular were client-focused to the extent that they conveyed a distinctly 'unprofessional' voice to the SETTs, who felt that a balance between client focus and engineering science was lacking; students had attempted to 'sell' their products to the clients (which sometimes involved rivalry amongst the student teams).

While noting the advantages of including professional communication coaching in the student teams, the SETTs expressed concerns about the absent 'engineering' style in the students' presentations:

*[The student presentations] should have been more about the principles of [the discipline] ... and less about marketing their products. (SETT 1)*

The SETTs subsequently realised the importance of their role in developing professional communication:

*In retrospect we [i.e., the SETTs] should have formatively assessed [the students' presentations] before [the student groups] went ahead with the final presentations. (SETT 2)*

Although a pre-presentation 'transaction space' had not been created, the subsequent debriefing meeting became a valuable 'transaction space' as SETTs and CTs reflected on what they had learned. CTs learned about how students should interact with clients:

*Working with the students on [their project] helped me better understand the way [SET professionals] in the private sector can and should interact with their clients. (CT 3)*

In this case study, the intended SETT-CT interdisciplinarity was not achieved. The absence of formative feedback by the SETTs was a critical factor. When there is limited collaboration time, successful interdisciplinarity depends on the CTs' ability to communicate like a SET professional (Pharo *et al.*, 2012). This is not possible when the CT has a language background and minimal exposure to the SETTs' world. The collaboration also underestimated the need for a 'transaction space' in which students' presentations to clients could be negotiated through the combined expertise of SETTs and CTs. Although the project focus was the SET discipline, the SETTs depended on the CTs' expertise in professional communication to help the students to polish their presentations. The CTs did not understand the importance of focusing on the design, experiment, prototyping, testing and analysis of results that comprise the scientific basis of product development. The collaboration was, however, marked by retrospective learning on both sides.

## 4.2 Case Study 2: Collaboration around terminology

The context of Case Study 2 was a three-year departmental collaboration between SETTs and a CT with the purpose of assisting undergraduate students to understand and master the technical terms of their discipline. The CT and four SETTs worked collaboratively to develop multilingual glossaries of commonly used terms (Wyrley-Birch, 2006). The 'boundary object' of the interdisciplinary collaboration was a multilingual glossary of technical terms used in professional contexts. The data for Case Study 2 consisted of observations at the various stages of the collaboration as well as final reflective semi-structured interviews with the four SETTs. The interviews were audio-recorded, transcribed and thematically analysed.

The SETTs in the project appreciated the usefulness of students' first languages for educational purposes:

*...you've got the terminology in three languages which I think is very useful ... because ... students can remember or describe things easier if they can see it in their own language ... it's in Afrikaans or Xhosa ... which is very helpful for students ... and it's easier for students to remember if they can read it in Xhosa and then apply it to English ... I think it's easier to remember that way. (SETT 3)*

The SETTs were well aware of barriers to learning that were created by the considerable number of complex technical terms used in the field:

*Initially I used to be aware of wanting students to learn the correct ... terminology ... wanting them to get it right and so on. Then we had more and more students with English as a second language ... that just fell away... and ... I tried to find easier ways of dealing with the whole terminology. Now... I think I've*

*maybe made a full circle in that I'm beginning to place more emphasis again on terminology... stressing the importance of it. (SETT 4)*

All four SETTs emphasised the need for students to start learning the formal technical terms from the beginning of their studies as a 'process of integrating appropriate use of language within the learning and [working] environment' (SETT 3). Because of the variety of technical registers (intra-professional, inter-professional and extra-professional), the SETTs felt it was important to contextualise the specialised terms, whether in written or oral form, in terms of academic or workplace practices (including jargon, where appropriate).

Interdisciplinarity was better achieved in Case Study 2 than in Case Study 1. Firstly, the three-year period over which the collaboration took place allowed for multiple 'transaction spaces' to be created in which shared understandings among the SETTs and the CT could develop. Secondly, over this period, the CT embarked on a PhD study of professional and academic discursive practices in the field (see Wright, 2011). This study enabled the CT to master significant aspects of the SET discourse. Thirdly, the SETTs' close involvement with the language intervention enabled them to become more aware of their own use of terminology and its impact on learning and teaching practices. The spaces in which the collaborative development of the multilingual glossaries happened, allowed for the SETTs and the CT to share blended, interdisciplinary perspectives about how to assist SET students to access the complex technical terminology of their discipline.

#### 4.3 Case Study 3: Co-authoring a SET Communication textbook

The third case study involved SETT and CT partners co-authoring a first year textbook intended to give students linguistic access to content knowledge in an SET discipline (Wright, 2010). Structured interviews were conducted with the two co-authors; these were audio-recorded, transcribed, coded and analysed.

The SETT and CT co-authors were both dissatisfied with the textbook that they had produced because they felt that it did not represent balanced interdisciplinarity in the sense of a blending of communication and scientific concerns; it was a 'Communication' textbook:

*CT5: It [interdisciplinarity] is not explicit enough... This book looks too much like a Communication book ... I would try to change that to reflect the integration more...I think I'd bring in more [discipline] content, because there's too little.*

*SETT 7: It's one of the problems that I have with this book [i.e. it looks like a Communication textbook] ... there's a whole lot of discipline-specific stuff that's not covered here...more technical stuff.*

The CT had been the major author; as a 'language person', it was assumed that she was the better writer, and the fact that the CT did almost all of the writing explains the communication focus. The textbook title was *Communication for [a scientific discipline]*;

and, although the introduction explicitly refers to the SET discipline and to the (mostly) discipline-specific glossary of terminology, listed outcomes focus solely on communication and academic literacy aspects; only one chapter title refers to the SET discipline.

Unsurprisingly, the interview revealed that SETT had not used the textbook in lectures. The CT had used parts of the book, particularly report writing, but not the SET-specific texts. Reflecting on the limited interdisciplinarity in their textbook, both authors cited the inaccessibility of their partner's disciplinary discourse as a constraint. CT 5, for example, said that they had chosen less 'technical' texts so she could understand them:

*...as far as that [disciplinary text] is concerned...I think anyone can do that because there's no maths involved ... I wouldn't be able to do it if there was maths involved... I'm no good at maths.*

The SET discourse in this particular field was premised on scientific logic, argumentation and formal proof. An understanding of mathematics- and scientific-based communication is therefore essential in facilitating academic literacy, or writing a joint-authored text-book, in most of the SET disciplines – but most CTs have no formal training in specialised areas of Applied Linguistics, such as mathematics-based communication (Cavanagh, 2005).

SETT 7 found the CT's discourse similarly impenetrable:

*I remember how horrified I was... all these theories... I was absolutely intimidated... I wasn't in my context.*

The SETT's comments convey an understanding that her disciplinary knowledge comprises what she called the 'technical stuff' (by which she meant core disciplinary knowledge) while that of the CT's comprised 'theories' (i.e., educational theories) and 'language' (as in grammar and disciplinary genres).

In case study 3 there were regular meetings between the SETT and CT – which were planned as a 'transaction space' for work around the textbook as 'boundary object'. However, this interdisciplinarity was constrained by the challenges experienced by the partners in acquiring each other's disciplinary discourse. The CT's lack of knowledge of the SET discipline was a constraint, while the SETT was intimidated by the CT's theoretical discourse. Provision of 'transaction spaces' and a 'boundary object' alone, then, were insufficient to ensure interdisciplinarity.

Case Study 3 illustrates that interdisciplinarity collaboration may encounter an insurmountable obstacle. As in Case Study 2 above, the CT would, firstly, need to raise her own awareness of discursive practices within the SET discipline, and, secondly, help to clarify the value of the linguistic access to content knowledge for her SETT partner; while the SETT, in her role as a university *teacher*, would need to acknowledge that facilitating the learning of the SET students includes their language development. Achieving interdisciplinarity is thus contingent on the extent to which each partner is able to appreciate each other's expertise.



#### 4.4 Case Study 4: Institutional spaces and academic identity in SETT-CT collaboration

This case is derived from a larger retrospective study (Jacobs, 2010) conducted on a three-year institutional project at a South African University of Technology. This project aimed to provide linguistic access to disciplinary knowledge through interdisciplinary collaboration involving pairs of CTs and SETTs across predominantly SET disciplines. Collaboration occurred at two levels: within individual partnerships, and across the group of twenty lecturers. Collaboration entailed dovetailing curricula, developing shared classroom materials, team teaching, and designing and co-assessing tasks that served as 'boundary objects' for interdisciplinary collaboration. Individual partnership plus group project meetings and workshops provided 'transaction spaces'.

Narrative methodology was used to trace CTs and SETTs' perceptions of their changing roles and identities during interdisciplinary work. Data were derived from transcripts of 18 narrative interviews, three focus group sessions, and 14 pieces of reflective writing by participants. Themes and patterns emerging from the data set were categorised through open coding and systematic comparative analysis across transcripts, then developed regarding properties and dimensions.

All data sources indicate two key issues affecting the achievement of interdisciplinarity: institutional spaces and academic identity.

Strongly structured disciplinary academic departments do not always provide the kinds of institutional spaces that facilitate interdisciplinary work. CT6 blames the lack of 'vision' on the part of faculties and departments that can result in trivialising a collaborative academic literacy intervention:

*... within departments and faculties you don't have that vision ... because I've got my class, I teach my course and my discipline...and only I know about [the SET discipline]...and I'm out of there. (CT6)*

In Case Study 4 it was found that when academics from different disciplines gathered outside the traditional disciplinary academic structures in 'transaction spaces', change was enabled as they discussed cross-disciplinary matters, such as teaching:

*... we were all from different disciplines, ... we didn't know each other, but once we started talking about the problems, the experiences and we started sharing, we found some common ground ... you start thinking about teaching again and that to me was the trigger. I was starting to think about teaching, and I think for a lot of people it happened. That was the eye-opener, we thought about how we were doing things. (SETT 8).*

SETTs seldom regard themselves as teachers within their disciplinary contexts, but outside the disciplinary home, SETT 8 engaged with issues of teaching and learning, precipitating an academic identity shift:

*There's still one or two [referring to SETTs] who think that language is not their problem... it should get dealt with by the language people... my thinking was totally different ...from that [initial] meeting ...I never thought about my method of teaching...and ... about the problems that the students have, that they are not English first language people...and that it doesn't mean to say because they didn't understand that they're poor students... I never thought about that, that they've got a barrier that I wasn't making it easier for them to get over... now I was starting to think about that... at that stage already... I've developed that thing now of, language is part of my...of what I do...although I'm a content subject lecturer.*

SETT 8 thus distances himself from his colleagues' view that language is *not their problem* and takes on some of the responsibility of students' language development within his discipline, while retaining his primary identity of content lecturer. He later ascribed this shift to collaborative interaction with the CT, but there is clearly more involved, since not all SETTs underwent such identity shifts.

With their strong educator identities, most CTs envisaged enabling their SETT partners to develop more learning-centred pedagogies; but the student-centred, discovery-learning, constructivist, personal development and process-oriented approaches to teaching and learning that most CTs were advocating, were not always in alignment with the more subject-centred, practical, problem-based, project-based and product-oriented learning practices that are typical of SET disciplines. As SETT 9 explains:

*...the language people in a sense also ignored that the content individuals also...in their right...are knowledgeable. (SETT 9)*

As SETTs expanded their educator identities, some CTs felt similarly threatened:

*...all I remember is feeling that I'm not in control of my stuff...it was very intense to begin with (CT 7). I didn't agree with language and content integration in the beginning because I thought my own position ...that I will lose my own status ... that was very scary ...when we started this project we discussed this...won't we lose? ... won't they [i.e., SETTs] not need us anymore? ...because we're actually teaching the content people language awareness...won't they tell us to get lost? (CT 9)*

One CT describes this perception of threat as short-lived, as she realised how teaching the SETT's discursive disciplinary practices might be similarly perceived:

*I encroach on other people's space because I have to ... and I think they also have felt what I felt then...very threatened'. (CT 10)*

Becoming part of the SETT discipline and department changed the CT's role and identity:

*Before it used to be, 'Oh, she's not part of [the SET discipline]'. Now when people*

*ask they [SETTs] say, 'Oh no...no...she [the CT] was also there' or, 'She also did that'...so I think that how we see things...it has to change...if we want change... then we have to change...and yes...people do feel threatened. (CT 10)*

Here, CT 10 underlines how beginning to feel like an insider amongst her SET colleagues enabled the construction of a new identity. However, she also recognises she needed to change her understandings of her role as a CT in order to change SET colleagues' view of her as an outsider. As her confidence developed, CT 10's feelings of threat changed to new understandings of her role and identity:

*You can either feel threatened because someone else can take over, and there's no need for you anymore, or ...you see your role as changing, as being more enhanced and becoming different ... I've moved on. I don't know how to see myself as only that language lecturer any longer. (CT 10)*

Facilitated by 'boundary objects' and 'transaction spaces', some partnerships achieved the intended interdisciplinarity. The dual levels of collaboration (partnerships and larger group) were beneficial, particularly in creating non-hierarchical 'transaction spaces'. Through larger group interactions, academics moved outside customary institutional spaces, allowing cross-pollination of ideas on cross-disciplinary issues such as teaching and learning. As both partners explored their teacher roles and identities and tried to understand the discursive practices of their partners' disciplines, this led to identity shifts in some participants.

## **5. Conclusion: Models and mechanisms for SETT-CT interdisciplinary collaboration**

The four case studies suggest various possible models of interdisciplinary collaboration, both in form and in depth and detail.

Case Study 1 illustrates minimal collaboration between the partnership, as the SETTs delegated communication teaching to CTs. This suggests that SETTs and CTs believed that the students' developing communication practices could be 'synchronised' with SET needs. This position derives from an understanding of language and content as separate, and that communication knowledge is an autonomous set of generic skills, transferable to any discipline. This can only result in superficial collaboration. The likely pitfalls when SETTs relegate responsibility for students' language development in the SET discipline to CTs (especially those who are unfamiliar with the discipline and context) are evident. Retrospective concerns expressed by the SETTs and CTs revealed the different aims, practices and structures of SET communication and generic 'good communication'; the blurring of these distinctions caused difficulties. This points to the SETTs' role in clarifying distinctive disciplinary features of academic and professional communication; also, that that competent communication practice within a discipline requires an extended process, not merely input following a programme – a frequent criticism of 'capstone'

professional communication programmes (e.g., Kennedy, 1989). Cook (2002) proposes an integrated 'layered literacies' framework across all levels of study: developing from an introduction to 'typical document formats' to 'the most contemporary of technologies', and from language support for conceptual development to 'ethical and critical situational analyses'. At advanced levels of study, SETT-CT collaboration should help students use texts that advance key SET information (Bonk, Imhoff & Cheng 2002) and develop what Garnett and Vanderlinden (2011) call 'disciplinary metaphors' to understand the role of texts in SET practice.

In Case Study 2 the SETT-CT collaboration involved the construction of multilingual glossaries of technical terms. The role of the CT was to facilitate the translation and terminology production process, while the SETTs' role was to verify the terms and the examples of their use in context. As part of the process, both the CT and the SETTs gained awareness of the complexity of the terminology involved and the barriers that this posed for learning.

Discussion and debate concerned how, when and why students should be introduced to specialist technical vocabulary. The SETTs took the main responsibility for guiding students' technical vocabulary development. Their understanding was that students needed to develop proficiency in the technical language of the discipline (duly considering appropriateness of formality of language used in relation to context) right from the start. The SETTs understood that the technical language used in their discipline and profession was a major barrier to students' success. The somewhat surface level focus (i.e., on terminology, rather than on discursive practice more broadly) was therefore unsurprising. This is not to underestimate the difficulties of the technical terminology. Case Study 2 highlights these difficulties in technical contexts where technical terminology, abbreviations and technical jargon are commonly used.

Both Case Studies 1 and 2 raised issues of contextual appropriateness. In Case Study 1, the appropriateness had to do with the degree of 'rivalry' and 'salesmanship' permitted in SET academic and professional discourse; in Case Study 2, it is the appropriateness of formal terminology versus jargon in particular contexts that was a concern. These case studies indicate the need for CTs to be aware of the different registers of SET communication practices and varieties.

Case Study 3 involved CT and SETT co-authors who sought to understand what makes technical texts accessible. The case study illustrates an important aspect of SETT-CT collaboration, namely making SET disciplinary discourse accessible to students. Clearly, before the CT can address this, she has to understand it herself. This also suggests that students' access to disciplinary content involves more than grasping its technical vocabulary; it entails making evident the genre and textual organisation of SET texts.

Students' language and conceptual development are interlinked; this development requires awareness of disciplinary discourses and their academic and professional function. In Case Study 3, the reflections of the SETT and CT indicate that, initially at least, they perceived achieving interdisciplinarity less in terms of what they could accomplish for the students and more in terms of how to overcome their own disciplinary barriers. Choosing 'non-technical' texts (that were accessible to the CT) to act as a 'boundary object' was not conducive to interdisciplinarity. This case suggests that raising SETTs' and CTs' awareness of the different ways in which knowledge is understood in the different disciplines, as well as recognising the varied literacy practices of their disciplines, would be an appropriate starting point for evolving true interdisciplinarity.

In their concern to make teaching and learning meaningful to students in Case Study 4, the SETTs and CTs found common ground for focused collaboration, with disciplinary dimensions of identity and power increasingly evident. Findings suggest the importance of sustained SETT-CT collaboration in discipline-free institutional spaces in reshaping roles, academic identities and teaching practice. In higher education most disciplinary specialists do not enter the field with knowledge of, or experience in, matters of teaching. Their customary discipline-based identity in many ways militates against the incorporation of a teacher identity. Bringing CTs and SETTs into dialogue with each other facilitated the development of expanded academic and professional identities for both partners.

Case Study 4 suggests that understanding professional communication as embedded in disciplinary practices, reduces feelings of threat and a need to control that often emanate from understandings of the teaching of professional communication as separate from the mainstream SET curriculum (where there is a perceived need to protect the SET domain). Such an understanding led some CTs and SETTs in this case study to assert their perceived disciplinary expertise over the 'other'. In other partnerships, sustained collaboration had value for both parties and was important in reshaping some CTs and SETTs' roles and academic identities, a necessary process in shifting mindsets regarding teaching communication in SET contexts.

## 5.1 Enabling mechanisms for effective SETT-CT collaboration

Across all case studies, the data suggest the need for SETTs and CTs to actively seek out potential 'boundary objects' to facilitate collaboration, such as departmental or institutional projects involving the collaborative development of teaching materials, team teaching programmes, integrated tasks and joint assessment approaches. The data also suggest the importance of a 'transaction space', a non-threatening environment free from the hierarchical disciplinary lines of power in academic departments. In such a space, SETTs and CTs can engage around emerging 'boundary objects'. Table 1 summarises the emerging enabling and constraining factors in interdisciplinary collaboration:

**Table 1: Enabling mechanisms for interdisciplinary collaboration** \*The *italics* represents the possibilities for interdisciplinary, not what was actually achieved in the case studies.

Examples of inter-disciplinary collaboration	Tendencies towards disciplinary	Possibilities of interdisciplinary	Enabling mechanisms
'Capstone' professional communication course.	Competing discourses: scientific reporting vs. 'selling'	<i>Professional (and appropriate) communication*</i>	<b>Boundary Object:</b> Student presentations. <b>Transaction space:</b> Planning and formative feedback meetings with both SETTs and CTs.
Terminology lists Glossaries	Competing discourses: formal terminology, 'Plain English' and multilingual translations	<i>Scaffolding contextually appropriate use of technical/professional terminology</i>	<b>Boundary Object:</b> Trilingual glossary. <b>Transaction spaces:</b> Collaborative materials development sessions, where SETTs and CTs negotiated how, when and why formal terms should be introduced.
Co-authoring of textbook.	Competing discourses: foregrounding communication vs. foregrounding SET	<i>Demystifying the SET disciplinary discourse.</i>	<b>Boundary Object:</b> SET Communication textbook. <b>Transaction spaces:</b> Regular meetings between SETT and CT co-authors
Team teaching	Competing discourses: pedagogy for language learning vs. pedagogy for SET learning.	<i>Shifts in teacher identities, mutual appreciation of language and SET disciplines and their associated pedagogical and discursive practices.</i>	<b>Boundary Object:</b> An institutional project – curricula, co-teaching materials development, lessons, assessment tasks. <b>Transaction spaces:</b> Series of sessions between CT/SETT partnerships and project meetings/ workshops where academic spaces and identities were negotiated.

\*The italics represents the possibilities for interdisciplinary, not what was actually achieved in the case studies.

From Table 1 we can identify a range of types and levels of interdisciplinary collaboration, and related enabling mechanisms. It is not enough simply to create objects and spaces to bring SETTs and CTs into dialogue. Such spaces need to be structured to provide the context and rationale for interdisciplinary collaboration. SETTs and CTs tend to be divided and insulated by their allegiances to their disciplinary life-worlds, and by subject and faculty hierarchies.

Collaboration at the disciplinary level needs to focus on a common concern to bring about change through shared expertise and collaborative educational innovation. 'Transaction spaces' can create the conditions for SETTs and CTs to reflect on, and theorise, what they need to do differently and conceptualise why they need this different approach. Such understandings and the resultant academic identity shifts evolve over time and take on different forms as they develop through the practice of interdisciplinary collaboration.

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