Gert Young (ed). Academic Development and its Practitioners: A View from the Inside. Stellenbosch: African Sun Media

Academic Development and its Practitioners

A View from the Inside

Editor
Gert Young

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Abbreviations

APQ	Academic planning and Quality Assurance
BLC	Blended learning coordinator
CHE	Council for Higher Education
CHEC	Cape Higher Education Consortium
CLT	Centre for Learning Technologies
CoP	Community of practice
CTL	Centre for Teaching and Learning
DHET	Department of Higher Education and Training
DLTE	Division for Learning and Teaching Enhancement
DRD	Division for Research Development
ECAs	Early Career Academics
FIGs	Focused Interest Groups
FIRLT	Fund for Innovation and Research in Learning and Teaching
FMF	Fees Must Fall
FYA	First-Year Academy
GAs	Graduate Attributes
HE	Higher Education
HEIs	Higher Education Institutions
HELTASA	Higher Education Learning and Teaching Association of Southern Africa
HEQC	Higher Education Quality Committee
HoD	Head of Department
ICT	Information and Communications Technology
LC	Language Centre
LCT	Legitimation Code Theory
NAA	Newly appointed academics
NRF	National Research Foundation
PASS	Professional and Administrative Support Services

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PGDip	Postgraduate Diploma in Higher Education
PL	Professional learning
PREDAC	Professional Educational Development for Academics
REEP	Recommended Engineering Education Practices
SAHEI	South African Higher Education Institution
SAS	Student Academic Support Services
SoEL	Scholarship of Educational Leadership
SOTL	Scholarship of Teaching and Learning
STEM	Science, Technology, Engineering & Mathematics
SU	Stellenbosch University
T&L	Teaching and Learning
UBC	University of British Columbia
UniEd	Division of University Education

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10

A CARE-FULL APPROACH TO PROFESSIONAL DEVELOPMENT IN A SCIENCE CONTEXT

Hanelie Adendorff, Ingrid Rewitzky & Ilse Rootman-le Grange

> Basic scientific research is scientific capital ... How do we increase this scientific capital? First, we must have plenty of men and women trained in science, for upon them depends both the creation of new knowledge and its application to practical purposes. (Bush, 1944, quoted in Weaver, 2015:22)

1 Introduction

Science education has received much attention for its critical role in meeting the technological requirements of the future (see for example Li, Schoenfeld, Graesser, Benson, English & Duschl, 2019), driving economic growth and enhancing the quality of life (Shernoff, Sinha, Bressler & Ginsburg, 2017). Students, however, often find science incomprehensible. It is often experienced as "dressed in terminology and symbols that remove it from the human world to the world of total abstraction" (Sithole, Chiyaka, McCarthy, Mupinga, Bucklein & Kibirige, 2017:48) urging calls for its 'demystification' and for rethinking how we teach Science, Technology, Engineering and Mathematics (STEM), amongst others, to respond to "a new crop of students who will soon learn science, engineering and mathematics differently from previous generations of college-going students" (Storksdieck, 2015:12).

Despite agreement that science education needs to be transformed and the availability of literature that shows how this could be done, not much has changed (Ebert-May, et. al., 2015). The reasons suggested for this include a lack of training for STEM educators, leading them to keep relying on what is familiar (Marbach-Ad, Egan & Thompson, 2015), such as drawing on personal beliefs and cultural norms in their teaching environment rather than literature on effective STEM teaching practices (Burd, et al., 2015).

In this chapter, we will explore the concept of "respectful collaboration" between science education and the field of professional development by looking at how one science faculty attempted to promote teaching and learning through a "care-full" approach.

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It has been suggested that the "development of institution-wide professional education programmes that ground the pedagogical knowledge and skills of current and future faculty in SoTL research" could be pivotal in promoting a professional and scholarly approach to science teaching (Seymore & De Welde, 2015:466). However, the two most prominent methods of professional development: Short, intensive professional development programmes and generic workshops and seminars, both "lack ongoing support for faculty members trying to develop proficiency with new teaching approaches" (Marbach-Ad, Egan & Thompson, 2015:297). The typical 'stand-alone' (Lueddeke, 2003) professional development programmes also "lack appropriate pedagogical mediation, making it difficult for lecturers to thread concepts together for practical use in their unique classroom contexts" (Mathieson, 2011:487). Behari-Leak (2017:485), for example, strongly critiques the value of generic, "one-size-fits-all" professional development approaches while others feel that there is not enough evidence of professional development resulting in changed practice, hampering the identification of professional development "best practices" and effective models for change (Ebert-May et al., 2015:1).

One model that has been shown to hold some promise for addressing these issues is that of faculty learning communities (FLCs). These "self-regulated professional development groups" (Burd et. al. 2015:92) typically meet "around knowledge that is sought by faculty members, rather than knowledge and skills that others feel faculty members should have". FLCs are designed to offer academics an opportunity for (1) long-term engagement with and learning about evidence-based teaching approaches in STEM; and (2) in-depth discussion of new ideas about teaching with colleagues (Burd et.al., 2015:92). The value of FLCs includes the ability to promote large-scale educational reform (Hogan et. al, 2015) and get buy-in at the beginning of the process of cultural change (Potter et. al., 2015) whilst providing social support and a safe space for academics to voice their concerns. The success of FLCs have been explained in terms of the "psychological sense of community" (2015: 318) they create. It has been posited that "individuals with a strong sense of community will show greater participation and that it might affect 'teaching beliefs and practices' (Marbach-Ad, Egan & Thompson, 2015:319). Herman et al also highlight the need for "care-full" and supportive environments in which academics are valued "as people and scholars in their own right, rather than as a means to an end". They suggest that such environments can act as enablers in the decision to participate in professional learning opportunities (Herman, Bitzer & Leibowitz, 2016:112).

Two other successful approaches, aimed at convincing colleagues to adopt a more scholarly teaching approach, have been suggested. Both involve individuals or "small groups of champions" (Franklin, 2015:104) sharing ideas or results with colleagues. In the first approach, strategies and plans for scholarly teaching approaches are shared whilst the second involves sharing research-based results of scholarly teaching strategies. In both these approaches, the individuals demonstrate the potential for a more scholarly and professional teaching approach within their own teaching contexts (i.e. the home department) (Franklin, 2015).

Effective change might thus require a variety of professional development approaches, amongst which a focus on long-term as well as collaborative experiences aimed at encouraging academics to "work with their colleagues to negotiate and create common understandings related to reform" (Sunal, 2001:255).

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The literature on learning to teach in STEM fields highlights another possible reason for the slow change. In a critical review about how STEM educators learn to teach, Winberg, et. al. (2018a) argue that the STEM disciplines themselves are absent in the literature on… Most of the papers they reviewed, focused on practical issues such as presentation skills and lesson plans rather than on how to enable 'epistemological access' (Morrow, 2009) to the disciplines. They suggest that this "shows how little we know about teaching STEM concepts" (Winberg, 2018a:11). Furthermore, they found that in order for academic development practitioners to be taken seriously in STEM disciplines, they "need to understand the STEM world-view" and to be more 'scientific' in terms of the science of teaching and learning" (Winberg, 2018b:281). A professional development staff member in the study found that, if he was to influence the thinking of scientists, he had to learn "to understand their world view first", because that was "the point from which their collaboration could begin" (ibid:280). Another academic developer in the same study explained that "it had taken her ten years to gain any kind of legitimacy facilitating professional learning in a STEM context". She pointed to the importance of "respecting disciplinary differences" and providing useful say what kinds of "tools" or qualify the types of tools here for STEM staff (ibid:280).

To explore the concept of "respectful collaboration" between the field of science teaching and the field of professional development, we will consider the following questions: (1) What does respectful collaboration between science lecturers and ADs look like? (2) And, how can such respectful collaboration between science and academic developers be achieved?

2 The Science Faculty Teaching and Learning hub

The Centre for Teaching and Learning's website describes the role of Teaching and Learning (T&L) hubs at Stellenbosch University (SU) as follows:

> The faculty T&L hub is an important mechanism to promote good teaching and to create a critical mass of academics with a particular focus on the issue of T&L. It has a central focus on teaching that generates interest, energy, guidance and leadership. The T&L hub takes on various forms, depending on the context of the particular faculty. The T&L hubs initiate, coordinate and promote regular activities that foster interest and faculty development in scholarly teaching.

This chapter will focus on the work of the Science Faculty's T&L hub. This hub aims to "promote good teaching" by partnering with academics around the topic of professional development. It was one of the first hubs, among about ten, to be established at Stellenbosch University. Almost a decade later, hub activities such as the *Science Teaching Event* and *Scholarship of Teaching and Learning in Science colloquium* have become part of the faculty's annual calendar. Recent years have also seen an increase in innovative and scholarly activity and output in the area of teaching and learning (see for example Mouton, 2019a; 2019b; Steenkamp, 2019; Rootman-le Grange & Blackie, 2018; Rootman-le Grange & Retief, 2018; Von der Heyden, 2018, Van der Ventel, 2016 & Blackie, 2014).

The Science Faculty (SF) Teaching and Learning Hub has a four-fold focus: (1) promoting evidence-based teaching, (2) enhancing teaching practice, (3) supporting research into teaching and learning, and (4) raising the stature of teaching in the Faculty. This is done through a series of annual events, an online resource centre-focused interest groups and various projects.

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This hub consists of three people that meet on a bi-weekly basis: The deputy dean for teaching and learning, an educational advisor and a blended learning coordinator. All three individuals have PhDs in science, and have been working in the area of professional development of science lecturers for between four and sixteen years.

The hub's calendar includes a number of annual events and regular meetings with various stakeholder groups. Key among the annual events is the Teaching Event, a facilitated, themed discussion focusing on selected teaching and learning topics, and the SoTL in Science colloquium, where science lecturers have the opportunity to share innovative teaching and learning approaches with their colleagues. Besides this, the hub drives faculty-wide initiatives of strategic institutional value, e.g. the teaching and learning programme renewal project.

The focused interest groups in the faculty, that is, the research group, reading group and Legitimation Code Theory (LCT) groups meet monthly. The *research group* focuses on how to approach teaching and learning research in science through structured work sessions, invited inputs and reading relevant material. *The reading group* comprises programme leaders who meet to discuss teaching and learning literature on key topics such as assessment and decolonisation, as part of the initiative to promote evidence-based teaching. The *LCT group* is a vibrant community of scholars, using various dimensions of Legitimation Code Theory (LCT) to research and/or improve their teaching practice. This group meets to learn from one another, discuss new research initiatives and to collaborate on various projects.

The hub also hosts annual writing workshops and writing days in addition to offering one-on-one support for (1) teaching, e.g. new blended learning solutions, (2) teaching and learning research, e.g. project planning, proposal writing and paper writing as well as (3) programme level support, e.g. facilitation of programme design and programme renewal sessions.

These hub initiatives are supported by an online resource centre that has two focus areas. The first is a multi-tiered, online short course on learning facilitation, aimed at and open to all students involved in providing learning support during tutorial and practical sessions. The second is a set of online workshops for science teachers that include topics such as how to design and use multiple choice questions, how to structure an argument, how to apply for ethical clearance for teaching research and explanations of various LCT dimensions.

Almost all of the hub activities are designed and offered based on needs identified in the Faculty. Themes for the Teaching Event are based on issues that emerge from interactions between the three members of the hub team and academics or from institutional initiatives. For example, the learning facilitation short course was designed to address complaints about the conduct and competence of tutors, the workshops were developed based on the needs expressed by academics, and the reading and research group members indicate what topics they would prefer to engage with each year.

As part of the focus on promoting evidence-based teaching and enhancing teaching practice in the Faculty, the hub has, since 2018, also awarded a prize to the best science paper presented at the annual Scholarship of Teaching and Learning (SoTL) conference of the university. This prize is usually adjudicated by a panel consisting of one senior, non-presenting, member of the Faculty, the science librarian and one of the hub team members.

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3 Theoretical framework

In order to explore respectful collaboration between science lecturers and Academic Development practitioners, the study employed the idea of Communities of Practice (CoP) and the dimension of Specialization from Legitimation Code Theory (LCT) as it allowed us to explore how academic development was legitimised and how respectful collaboration was conceptualised in the domain of interest, practice and relationships of the hub.

In our case, the domain of shared interest is teaching and learning. The community comprises relationships amongst science lecturers and between science lecturers and academic developers engaging in "joint activities and discussions, help[ing] each other, shar[ing] information, learn[ing] together, and build[ing] relationships (Folding & Swier, 2012:195). The practice of this community includes ways of doing things such as routines, words, tools, stories, symbols or concepts that the community has produced or embraced. In the CoP framework, learning is defined as a social and participatory action that includes interaction and participation in meaningful contexts. It thus assumes that learning is about more than just the "cognitive aspects and the acquisition of knowledge but is inherent in activities that are based on participation in a specific epistemic and social context" (Eberle, et. al., 2014:217).

LCT's Specialization dimension helps us unpack the rules for legitimacy in different epistemic and social contexts by suggesting that legitimate participation is determined by both epistemic and social aspects of knowledge practices, with different knowledge fields placing different amounts of emphasis on the two. In this study, LCT offers us a way of going beneath the surface to uncover the basis for legitimacy in the domain, community and practice of the science teaching and learning CoP.

The study thus employed CoPs as organisational framework and LCT as analytical tool, both of which will be explained below.

3.1 Organisational framework: Communities of practice

The concept of communities of practice (CoP) was introduced by Lave and Wenger (1991). Literature on professional development of science lecturers commends the value of FLCs, a form of CoP. By Wenger's (1998) definition, a community of practice is a special group of people that organise themselves around a "joint enterprise", "mutual engagement" and "shared repertoire of communal resources". CoPs often form informally and develop their own understanding of what their practice is about. Participation also has some flexibility and does not require all members to participate in the same way or to the same degree. This allows for newcomers and core members to learn from one another. Newcomers learn the practice from core members who, in turn, learn from the experiences of newcomers.

CoPs are structured around shared learning and will exist as long as it serves the needs of its members in this regard. They usually focus on knowledge rather than on a task; it is this knowledge that comprises the domain of shared competence, or "joint enterprise", of the CoP. Members who engage in the joint enterprise "develop a shared repertoire of resources: Experiences, stories, tools, ways of addressing recurring problems – in short a

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shared practice" (Wenger, 2011:2) and build relationships through sustained discussions and sharing of information. CoPs thus exist for the purpose of learning and function through mutual engagement that "binds members together into a social entity" whilst producing shared repertoires "of communal resources (routines, sensibilities, artifacts, vocabulary, styles, etc.) that members have developed over time" (Wenger, 1998:4). A CoP is more than just a set of relationships; it has a focused area of interest and mutually agreed rules of practice. It has an identity that shapes the identities of its members.

3.2 Analytical Framework: Legitimation Code Theory

The Specialization dimension of LCT is concerned with what counts as legitimate knowledge claims and who are allowed to make such claims. It starts from the position that every practice is by someone and about (oriented towards) something (Maton, 2013). It thus sets up two relations – relations concerned with knowledge, called epistemic relations (ER), and relations concerned with knowers, also termed social relations (SR).

Different practices emphasise these relations in different ways, in other words practices may emphasise epistemic or social relations more strongly or weakly as the basis of legitimacy. Since both can vary from weaker to stronger, we can plot these two relations on a plane and analyze practices in terms of whether (and to what extent?) they emphasise one, both or neither as the basis for status and achievement.

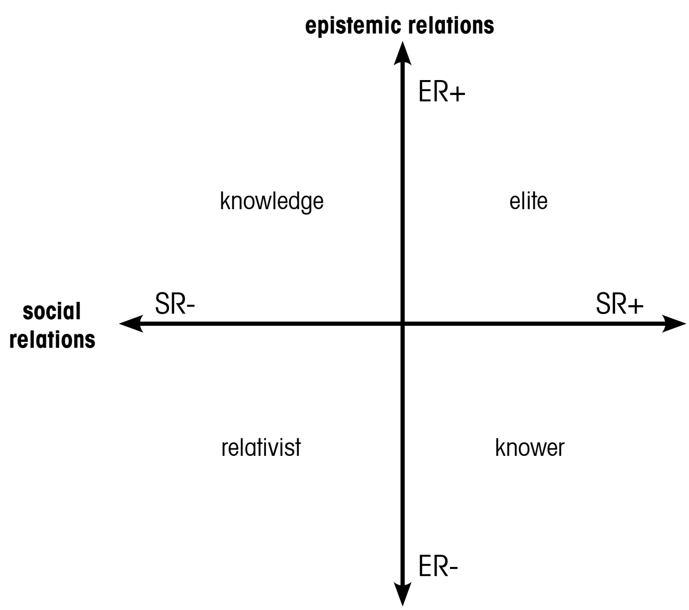

Figure 10.1 The specialisation plane

Source: Maton, 2013

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Stronger epistemic relations (ER+) coupled with weaker social relations (SR-), i.e. where practices emphasise the possession of specialised skills, knowledge or procedures as the basis for success whilst downplaying the attributes of the actor making the claim, result in a knowledge code. Conversely, weaker epistemic relations (ER-) coupled with stronger social relations (SR+), i.e. if what you are studying and how is less important and it is more important who you are and what kind of interactions you were shaped by, we have a knower code. Where both epistemic and social relations are weak, we have a relativist code and when both are strong, an elite code.

Social fields can thus be understood as knowledge-knower structures. For example, science, can be characterised as a knowledge-code field. Such fields typically exhibit hierarchical knowledge structures and horizontal knower structures, and it is the explanatory power of the axioms and theorems that is valued. The social profile of the scientist is held to be irrelevant to their scientific contribution – anyone can claim legitimate knowledge, provided they use the appropriate scientific principles and procedures. In contrast, humanities and social sciences, the fields that much of professional development literature draws on, can be characterised as having a horizontal knowledge structure and hierarchical knower structure – a systematically organised hierarchical system of knowers based on the ideal knower. In such fields, the knowledge is subservient to the knower, serving only to build more legitimate knowers, while the opposite holds for knowledge code fields, with knowers serving to build the knowledge in the field.

4 Methodology

To explore our topic of what respectful collaboration looks like in this context, the authors, who are members of the hub's core team, conducted interviews with six science lecturers who are regular participants in hub activities. The interviews were transcribed and coded with a purposively designed translation device. A translation device offers a mechanism to work between theory and data (Maton, 2015). Designing such a device is an iterative process of sense making of both data and theory. Two considerations are of importance during this process: The internal consistency of the theoretical framework and coding scheme and (2) the relationship between the theory and/or coding scheme and the empirical data.

The study thus employed repeated "shifting between data and theory, zooming between wide-angle and telephoto visions, and refocusing between soft- and hard-focus analysis" (Maton et.al., 2015:43) to sharpen the understanding of the problem and giving the "data a chance to speak" (2015:43).

In the first reading of the data, key themes were identified. This was followed by a second reading, during which comments were organised in terms for their reference to the different elements of the CoP. The next step was to bring the concept of Specialisation to bear on the data through the translation device. The device, presented below, described the external language of the study in terms of "the forms taken by epistemic relations and social relations" (ibid:43) in the analysis of the domain (or joint enterprise), community (or mutual engagement) and practice (shared repertoire) of the CoP in Science T&L. The purpose of this device is to unpack what examples of legitimation via epistemic and social relations could look like for each of the

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CoP dimensions. The third column thus shows what legitimation via each relation might focus on in each dimension, i.e. specialised skills in the case of ER legitimation of the domain. The fourth column adds what the source of legitimacy might be for each of these cases while the fifth column includes an example quote for each (where available) from the data. In separating the dimensions for analytical purposes, we hope to achieve a more fine-grained understanding of the legitimation practices and possible problems associated with entering the teaching and learning CoP in science.

Table 10.1 Translation device designed for analysing the interviews in terms of CoP and LCT specialisation

CoP theory elements	Relations	LCT Concept manifested as an emphasis on	Legitimacy comes from	Example from the data
Domain (Joint enterprise)	ER	Specialised skills	What I know and can make sense of	"I think one should look for papers that are written by people like yourself, for instance, you have a scientific background …"
	SR	Attributes, shaped by interaction	Who I am and what I bring	" … and you have a deep appreciation for the pedagogy and you really want to make science understandable"
Community (Mutual engagement)	ER	Skills and mastery in specialised areas	Use of explanatory frameworks	"And because it [LCT] is accessible to scientists we now have a group that can work together"
	SR	Personal experience professional identity	Their standing	"in the faculty, I think, that [teaching] has a better standing, if I can use the word, because there is a bit of a community in the faculty, and also some other people that are in it but are still really strong in their own field of disciplinary research"

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Table 10.1 Translation device designed for analyzing the interviews in terms of CoP and LCT specialisation (continued)

Practice (Shared repertoire)	ER	Methodsor approaches that can explain	The ability to analyze and explain T&L issues with some objectivity	"So the first year we did it we did it really very systematically. We sat down with each test and exam paper in the first semester, three of us, and we asked 'what are the different levels of these questions?'"
	SR	Valuesand attributes	Caring for students and/or colleagues	"And what also happened is that we started thinking about whether students from their cultural background would be able to answer our questions."

5 Discussion

There is mutual agreement in the LCT community that science is best described by a knowledge code (Maton, 2007; Lucket, 2010; Winberg, et al., 2018a; Adendorff & Blackie, in press). That does not imply that knowers play no role in science, but that the legitimation of knowers is based on the knowledge they bring, rather than who they are. In their paper about professional development in STEM disciplines, Winberg, et al. (2018b:282) argue that professional development can generally be described by a knower code, because it draws on the social sciences and humanities, which both tend to have strong social relations. The knowledge practice in science and that in the academic or professional development environment are thus legitimised in directly opposing ways. This difference between the two fields is tangibly experienced by science lecturers who venture into the teaching and learning field (Adendorff, 2011). In the words of one of the participants in this study: "I mean, you try to backtrack and figure out how these theories will work, and then you realise how completely different the way of working is. And how much bigger the world is than just science. So, for me it is this completely new field, which really intrigues me, but it's hard for me to get a foothold in, in terms of getting something published which is meaningful and with the right legitimacy, if I can use the word. In other words, if you're making the right claims, and if you are making legitimate claims and to know."

In his analysis of the "two cultures" debate that concerned science and humanities in the early sixties, Maton (2007) argues that the bitter and ferocious interaction that defined it, was the result of a code clash between the legitimation practices in science and humanities.

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Code clashes typically arise between knowledge practices that use directly opposing bases for legitimation, e.g. the knowledge and knower code. In this study, these clashes result in an inability to make sense of the legitimation rules in the field of interest. In their research, Winberg, Adendorff, Bozalek, Conana, Pallitt, Wolff, Olsson and Roxå, (2018b:282) found that a similar code clash, between science and the academic or professional development environment, played itself out as "'war stories' and general feelings of alienation and discomfort in one another's disciplinary spaces".

As indicated above, one of the academic developers in the Winberg study felt that his own legitimacy in science came from learning "to understand [the scientists'] world view first". Science lecturers in the study agreed, but added that "academic developers should be more 'scientific' in terms of the science of teaching and learning". The authors further argue that academic developers might need to translate educational discourse into the discourse of STEM in order to give science lecturers access to this field of work. Respectful collaboration with professional development (PD) in science contexts, they suggest, require that academic developers strengthen their epistemic relations, while science lecturers need to strengthen their social relations by "taking on some of the values of practices of pedagogies of well-being, even experimenting more creatively". Considering these arguments, it can thus be concluded that successful or legitimate PD in science is best legitimised through an elite code where both epistemic and social relations are strong.

With this in mind, we will now look at how professional development work was approached and legitimised in the domain, community and practice of the CoP associated with the work of the science T&L hub. Our interest is in how CoP members legitimised the domain, community and practice of the CoP.

5.1 Joint enterprise

We can define the joint enterprise in PD work in science as teaching and learning in science; this is the knowledge this CoP is interested in and focused on. Winberg, et al. (2018b) have already argued that teaching and learning knowledge is situated in a knower (stronger social relations) code. In our study, we see this setting up a code clash for science lecturers, coming from practices with strong epistemic relations, when they attempt to participate in the domain of interest (Fig 10.2). The science lecturers pointed to various issues with accessing teaching and learning literature. A key challenge is struggling to make sense of concepts such as the theoretical framework: "[In] a Social Science paper, everything is important from – right through – and then they get to a framework and then I have to try and understand what do you mean by a framework, what is a framework …"

Science, with its hierarchical knowledge structure, has been described as the true "common culture" in which people "respond alike" even without thinking about it (Maton quoting Snow, 2007:10). Kuhn (1962) explains that paradigms, which he describes as "models from which spring particular coherent traditions for scientific research" (p. 10), in science serve the purpose of homogenising and simplifying the scientific process by allowing a way to distinguish between the relevance of different observations. Given that "acquisition of a paradigm and of the more esoteric type of research it permits is a sign of maturity in the development of any given scientific

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field" and that most scientific works originate in such generally accepted paradigms, scientific works don't usually make their theoretical framing explicit. Knower-code environments, such as those from which teaching and learning research draw, lack the "specialized principles and procedures" (Maton, quoting Gellner, 2013:78) that are so typical of scientific paradigms. It is thus understandable that science lecturers might feel incompetent or unprepared to engage with literature stemming from knower code fields, such as those that typically underpin teaching and learning research.

Science lecturers also had difficulty accessing the language in the papers: "that is the other thing, they are semantically very dense – is that the right word?" They sensed that the words in these papers had different meanings, that it used a "jargon-ridden form of everyday language" (Maton, 2013:74), which they were not necessarily familiar with:

> You advised me on some papers that I could read and I found that those were very useful and, to look at things in a much more pedagogical way, but I find in general, those kind of education, literature papers, very, very difficult to understand. They use words that are … my understanding of the same word is very different to the context that they are using it in and, to try and make sense of what they are trying to say, using these words, which I would not use in that way, I find very difficult.

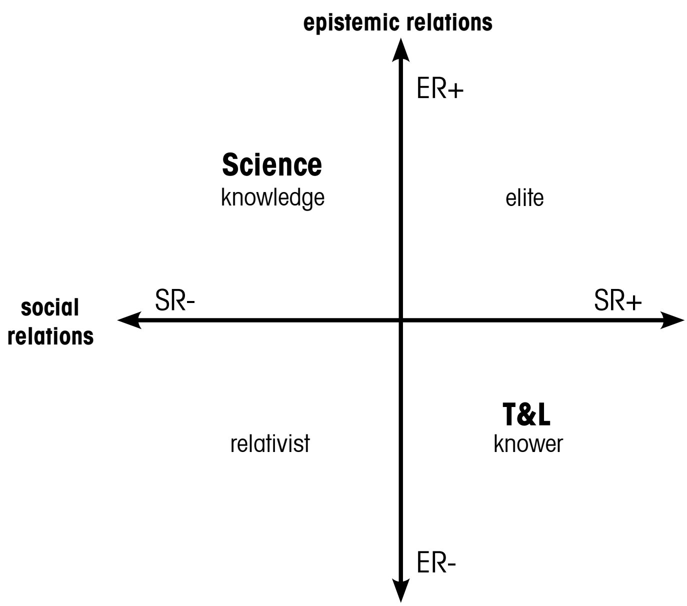

Figure 10.2 The code clash between science and the teaching and learning knowledge

As a result, they preferred teaching and learning papers written by scientists:

> So, the papers that I find most useful in terms of this kind of much broader educational, pedagogical background, have been those that have been written by Scientists because they just use words that I understand. Most of the other papers, as I say, tend to be scientific papers, by scientists for scientists. I find that it's easier to read that kind of literature than this really highly pedagogical sort of literature.

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Winberg, et al. (2018b), referring to signature pedagogies such as inquiry-based instruction in science, explain that it is often not the approach to teaching and learning suggested in literature that is foreign to scientists, but rather the discourse of the field of teaching and learning. They suggest that academic developers in science can help science lecturers "understand the kinds of complex pedagogical processes needed to understand student learning and their roles as facilitators of that learning" by using disciplinary ideas to translate these concepts into something more familiar. This again strengthens the notion that scientists suggest academic developers should strengthen their epistemic relations in order to operate in an elite code.

Reflecting on how the science T&L hub, used as a case study in this paper, has managed to promote successful collaboration, this quote from one of the participants confirms that the scientific backgrounds of the hub members, along with their positioning in the academic development environment enabled them to informally fulfil this role: "I think one should look for papers that are written by people like yourself, for instance, you have a scientific background and you have a deep appreciation for the pedagogy and you really want to make science understandable and so on. I think that those kinds of papers would be very, very useful to read."

Legitimate participation in the domain of the CoP requires stronger social relations. Legitimising PD work in science, however, rests on increasing the epistemic relations of such work, and translating it to the practices most familiar in science. The study suggests that the domain of the CoP in the T&L hub is legitimised through an elite code. Respectful collaboration in the domain would require of academic developers to strengthen the epistemic relations of the T&L field and help with translation between the T&L and science fields (Fig. 10.3).

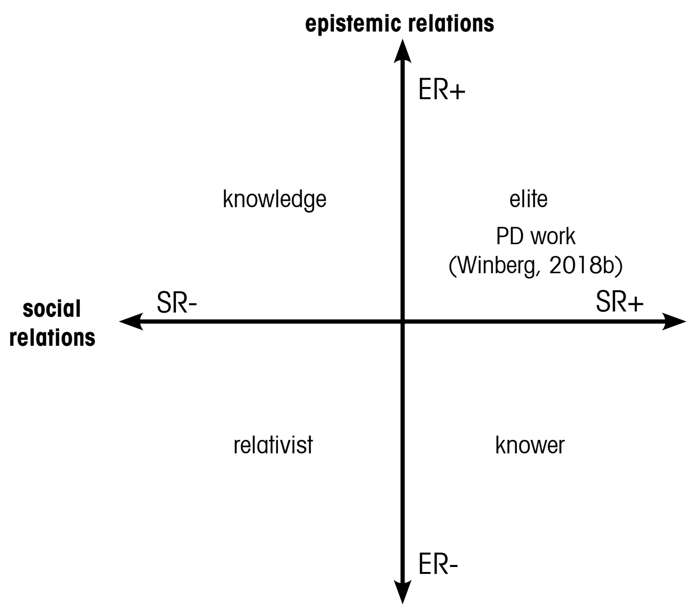

Figure 10.3 Legitimation of the joint enterprise

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5.2 Mutual engagement

Mutual engagement in the science T&L hub promotes sharing and learning from one another, through encouraging interaction with other science lecturers who are interested in teaching as well as between science lecturers and academic developers. "The learning process of newcomers [in a CoP] is characterised as the path from being an outsider to becoming a full member during which they acquire their unique CoP knowledge, undertake more complex activities within the community, use more advanced practices, communicate in a more community-specific way with other members, take over functions that are more relevant and central for the community, and adopt roles that require a deeper understanding and are more constructive for the goals of the community" (Eberle, et. al., 2014:2018). This is what Lave and Wenger (1991) call legitimate peripheral participation (Lave & Wenger, 1991). As newcomers to CoPs gain more useful knowledge and start to form stronger relationships with other members, their participation should generally increase "in engagement and complexity" (Floding & Swier, 2012:196).

In the science CoP, participation typically starts with attending Faculty-specific T&L events or the university's SoTL conference where participants can choose the extent to which they are prepared to engage. Eventually, participants move closer to the centre, participating in a selection of ongoing activities such as the programme renewal task teams or LCT research group. In the following explanation, a science lecturer details this journey, from cautious participation at one of the events to joint paper writing in the field of teaching and learning: "I think there are many opportunities to learn about these things; [the T&L hub] creates those opportunities. The SoTL conference is a very good thing, I think. The encouragement, and that anybody can go and hear what is being done. But the personal support of [a specific academic developer in the faculty] has been very important to me; I would not have been able to write a paper if I didn't have that. That person is very important. And, it wouldn't have helped if she was from education, then we wouldn't have understood each other. People like you and her who have a leg in both worlds, who have learned to understand both worlds, and who can help me to do that translation."

Legitimate participation in communities requires newcomers to learn (1) the way in which CoPs legitimise participation in order to (2) move from more passive to more active participation (Eberle, Stegmann & Fischer, 2014). We can see the latter in the words in the previous quote, moving from "hearing about" to writing a paper based on empirical work in the area of T&L.

CoPs generally legitimate newcomers' participation through more or less strict entry criteria or barriers to participation. Only legitimate newcomers get access to the CoP activities and resources. The design and purpose of the hub activities, such as the Teaching Event, the SoTL in science colloquium and the reading and research groups tend to valorise collaboration and how we position ourselves in terms of teaching and learning, rather than specialised knowledge and skills, i.e. using specific theories or approaches, as a basis for legitimate participation. Participants do not have to be well versed in educational methods and theory, but they do need to have an interest in and, preferably, a passion for teaching and learning, thus leaning towards stronger social relations or a knower code.

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Participants also seem to legitimise these interactions through social relations, assigning legitimacy based on (1) what the "significant others" bring in terms of their knowledge or the fields, such as in the paper writing example above as well as (2) their status as disciplinary researchers: "in the faculty, I think, that [teaching] has a better standing, if I can use the word, because there is a bit of a community in the faculty, and also some other people that are in it but are really still really strong in their own field of disciplinary research. "The following elaboration on the joint paper writing example, however, illustrates that the legitimacy of the PD work here also includes stronger epistemic relations, in the form of the specialised skills and knowledge of the academic developer: "that part in the beginning, where you explain how it fits into the whole philosophy of things. She could do that. Now, next time I'll be able to be better at it. But, just to get started and do it: I wouldn't have been able to. So, I wrote technical part."

Though conceptualised as having stronger social relations, and mostly realised as such in our study, engagement in the community is also legitimised through the T&L knowledge that the academic developers bring. Legitimacy in the community thus seems to stem from both who you are and what knowledge you bring, especially for academic developers (see Fig. 10.4).

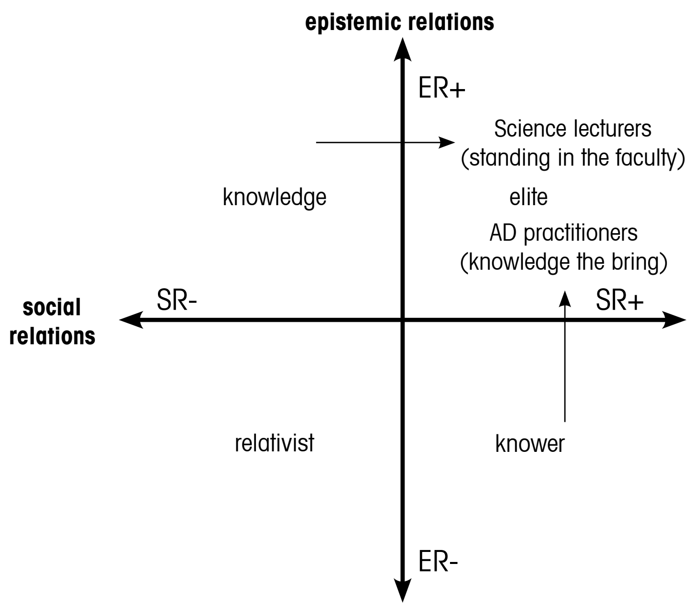

Figure 10.4 Legitimation of the mutual engagement

5.3 Shared repertoire

Through their collaboration, members of a CoP develop a common repertoire of artefacts, practices, knowledge, and methods which eventually also acts as "a source of cohesion among members and differentiation from non-members" (Nicolini, 2016:n.p). In CoPs the focus is on "the relationships and exchanges of those who are brought together by the desire or need to improve their practice" (n.p.). The shared repertoire in the science T&L hub is, among other things, exemplified in the choice of theoretical frameworks through which teaching and learning

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Gert Young (ed). Academic Development and its Practitioners: A View from the Inside. Stellenbosch: African Sun Media

is studied, the set of online hub resources and a number of scholarly outputs on teaching and learning by faculty members. The outputs include papers in Chemistry (Rootman-le Grange & Retief, L., 2018; Rootman-le Grange & Blackie, 2018; Blackie, 2014), Physics (Van der Ventel, 2016; Steenkamp, in press), Biology (Mouton, 2019a; 2019b) and Earth Sciences (Von der Heyden, 2018). The online resources were developed based on interaction with and requests from academics and include references to, or are aligned with work done by science lecturers in the faculty.

An earlier analysis of the T&L Hub's set of online resources, also using LCT's Specialization dimension, revealed that these resources mostly emphasise epistemic relations (Adendorff & Le Grange, 2019), which is congruent with their aim of providing information on useful approaches rather than developing specific attributes or values. The same is true for the scholarly outputs mentioned earlier, with four of the eight papers listed here, using LCT, and the fifth using Laurillard's conversational framework (Von der Heyden, 2018). Both these frameworks have stronger epistemic relations, with less of an emphasis on social relations. The stronger epistemic relations in LCT is highlighted in this quote from one of the participants, who was part of a study that adopted the framework as a means of blueprinting assessment practices in a large module offered by multiple lecturers.

"So the first year we did it, we did it really very systematically. We sat down with each test and exam paper in the first semester, three of us, and we asked 'what are the different levels of these questions?' Just on a semantic gravity basis, but for the first time we had a language to talk about how difficult or easy a question is. And it was simple enough that my colleagues could also immediately get it and they could apply it, and we could reason with one another over it."

Another participant corroborates this idea by referring to LCT as "a route into this world" of teaching and learning.

Winberg, et al. (2018b) found that STEM educators started to take on "some of the values of practices of pedagogies of well-being, even experimenting more creatively (thus strengthening the social relation)" (2018:283) through their interaction with academic development practitioners. We see a similar result in the shared repertoire in one department: "And what also happened is that we started thinking about whether students from their cultural background would be able to answer our questions. For example, in physics we often ask questions about satellites, now there are students who think that satellites are the dishes that we find on our houses. So, when we ask questions about satellites, we add a picture of the earth and something that is moving around the earth so that they can understand that a satellite is not the dish, but the thing orbiting around the earth." Though this is not yet a basis for legitimacy in the field, it is a change in approach that resulted from deeper engagement with teaching and learning practice in this departmental group.

It is probably no surprise that science lecturers would legitimise the repertoire they use through epistemic relations, since this is what is most familiar to them.

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6 Conclusion

A "care-full" approach to respectful collaboration between science lecturers and academic developers requires that academic developers care enough about the scientists, as scholars and individuals, to help them gain access to and become legitimate members of the teaching and learning domain. This assumes a willingness of academic developers to engage with the world view of science, and to act as mediatory agents, bringing the two practices into conversation. Respectful PD work in science thus rests on contextual awareness, considering the rules for legitimation in science and PD practices, rather than offering generic solutions to generic problems. PD in science already asks of science lecturers to adopt a new way of interacting with knowledge; a "care-full" PD approach would imply an understanding of this and might thus go a long way towards realising the goals of PD work in science. Participants in the study described such a "care-full" approach as one that strengthens the epistemic relations of PD work through, for example, frameworks such as LCT.

Looking at professional development through the lens of communities of practice helps us to see the challenges in the different aspects, for example, the difficulty with accessing the literature on teaching and learning, how social relations is used to set up legitimate participation in the mutual engagement and the extent to which the shared repertoire draws on stronger epistemic relations.

Finally, this study highlights the complexity of PD work in science contexts. The strong epistemic relations of Science and the strong social relations of PD requires a very specific approach to avoid critical misunderstandings, misalignments and mistrust. Taking PD work into science environments implies a code clash, asking a knowledge code environment to engage with a knower code practice. A "care-full" approach to PD work in science thus needs to pay attention to the worldview of scientists (Winberg, et. al., 2018b) and offer approaches that keep the complexities of PD work in this context in focus. It needs to engage with contextual concerns through approaches with sufficient explanatory power (strong epistemic relations).

Future work also might include a deeper study of PD approaches that have gained some legitimacy in science, e.g. the value and success of frameworks such as LCT.

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