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Rusznyak, L.

2011

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Rusznyak, L. (2011). Learning to Explain: How student teachers organize and present content knowledge in lessons they teach. Education as Change, 15(Suppl. 1), 95-109.

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Education As Change, Volume 15 Supplement Number S1, 2011, pp. S95–S109

Learning to explain: How student teachers organise and present content knowledge in lessons they teach

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Abstract

The ability to organise content knowledge around key concepts is an essential part of what student teachers need to learn in order to teach effectively. This is particularly significant as South Africa's education system emerges from policies which undervalued the role of content knowledge in teaching and teacher education. During sessions of practical teaching, university tutors have opportunities to observe how students understand content knowledge in ways that differ from their university coursework. Students' understanding of content knowledge manifests in how they select and organise concepts, conduct explanations and respond to learners' contributions. Lesson observation reports written by university tutors, as they observed student teaching, were scrutinised for comments that prompted student teachers to think about their understanding of content knowledge. A qualitative analysis of these comments shows how opportunities for learning are diminished when student teachers' grasp of their lesson topic is disjointed, when their understanding of the concepts they teach is merely algorithmic, and when their concept of the ordering principles of the content knowledge is muddled. By considering these aspects of teaching explicitly, university tutors prompt student teachers to consider the epistemological merit of their lessons, thereby contributing to the construction of their pedagogical content knowledge.

Key words: Content knowledge, direct instruction, explanations, learning to teach, pedagogical content knowledge (PCK), student teacher, teacher education

Introduction

Learning to organise and present content knowledge is often assumed to be a straightforward competence, easily learnt. However, following a session of practical teaching, several university tutors expressed concerns that in many of the lessons they had observed, student teachers had demonstrated what the tutors considered to be an inadequate knowledge of their lesson topics. For example, while observing a students' lesson, a university tutor commented: '*You are competent enough to keep learners quiet and busy, but I want more! I want to see well though-out, conceptually strong teaching. Don't waffle on about common-sense stuff.*' Several of these lessons were 'learner-centred'; student teachers related well to learners, who in turn were attentive and actively involved in tasks. Despite these obvious strengths, university tutors were concerned that some of these lessons offered inadequate content knowledge, the *sine qua non* of teaching for learners to progress in their understanding of the topic.

ISSN: Print 1682-3206, Online 1947-9417
© 2011 Centre for Education Practice Research (CEPR)
http://dx.doi.org/10.1080/16823206.2011.643632

Learning to teach: The development of pedagogical content knowledge

A fundamental goal of teacher education is to enable student teachers to develop a knowledge base that allows them to make concepts understandable to their learners (Grossman, Schoenfeld & Lee 2005; Morrow 2007). This 'subject knowledge for teaching' was termed pedagogical content knowledge (PCK) by Lee Shulman (1987:93), who describes it as a 'blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organised, represented, and adapted to the diverse interests and abilities of learners and presented for instruction'. However, student teachers often enter pre-service teacher education programmes assuming that they need to master nothing more than classroom organisation techniques, and a repertoire of generic teaching strategies. Thus, they often underestimate the cognitive reasoning that underpins effective teaching (Hammerness, Darling-Hammond & Bransford et al. 2005; Joram & Gabriele 1998; Lochran, Mulhall & Berry 2008). In this they illustrate the observation of Darling-Hammond, Banks and Zumwalt et al. (2005:176) that the ability to teach in a way that 'meets the needs of students and the demands of content, so that it is purposeful and "adds up" to important, well-developed abilities for students, is not something that most people know how to do intuitively, or that they learn from unguided classroom experience'. Pre-service teacher education programmes, therefore, need to provide student teachers with sufficient opportunity to select, organise and present content knowledge in their teaching, and to receive formative feedback that enables them to develop their teaching competence before they qualify.

This article offers an empirical analysis of how a group of capable student teachers organised and presented content knowledge in the lessons they taught during their pre-service teacher education, as indicated by the comments university tutors wrote as they observed and responded to the teaching. This analysis shows that learning to organise and present a coherent explanation to a class of learners is a complex process – one that student teachers do not master easily.

Content knowledge in Outcomes-Based Education

Most student teachers currently entering teacher education in South Africa have come through the Outcomes Based Education [OBE] school curriculum, which under-prioritised content knowledge. Department of Education [DoE] teacher guides from OBE training workshops described teachers as facilitators who were to avoid teacher-centred lessons. To democratise classroom relations between teachers and learners, the OBE philosophy tended to regard teachers' understanding of content knowledge as being of no greater importance than the learners' own experiential learning. Effectively, the professional authority of teachers, to direct the kinds of learning that induct learners into practices of the subject being studied, was unintentionally undermined (Slonimsky 2010). Teachers were urged to avoid focusing on the teaching of content knowledge to learners, and rather to strive to employ learner-centred activities – particularly the extensive use of group work (Mattson & Harley 2002). Recent curricula in South Africa have failed to recognise that content belongs to, and takes its place within, bodies of systematised and networked knowledge, with intrinsic value for developing understanding and thinking. Instead, OBE-driven curricula presented content as a randomly selected vehicle for helping learners achieve a specified set of outcomes (Allais 2010; Shalem 2010). This position promoted a crude, simplistic view of discovery teaching as 'good', and direct teacher-led instruction (e.g. explanations) as 'bad'. Such assumptions disregarded the observation of Criticos, Long and Moletsane et al. (2009:195) that effective explanations have been described as the 'cornerstone of teaching, whether one is committed to learner-centred teaching or not'. Dismissing the use of direct instruction as inherently undesirable shows an inadequate consideration of the purpose of teaching, and of the nature of the content knowledge to be learnt (Wiggins & McTighe 2005). With South African education entering a

post-OBE era, the importance of focusing prospective teachers' attention on the management of knowledge and ideas during the lessons they teach, needs to be duly recognised and re-emphasised.

Professional development of student teachers

Several guides have been produced to help South African student teachers develop their teaching practice. Some of them consider the construction of conceptually coherent explanations as an important part of learning to teach (e.g. Criticos et al. 2009; Killen 2010; Moll, Bradbury & Winkler 2010), while others actively discourage student teachers from formulating lessons around their explanations of content. For example, while De Beer and Gravett acknowledge that teachers need a 'strong base of subject knowledge' in a subsequent chapter, student teachers are specifically discouraged from assuming a 'role as a dispenser of knowledge', and are encouraged rather to 'act as a guide or facilitator along a journey of discovery' (De Beer & Gravett 2010:79). To help learners engage with new content they suggest that students use teaching methods such as classroom discussions (where open questions are used for engaging learners), group work, case studies, research projects, fieldwork and excursions, and practical work and experiments (2010:88–89). Explanation as an important teaching strategy is conspicuous by its absence. Similarly, in another guide for student teachers, Koen (2010) discusses the characteristics of an 'ideal teacher'. Student teachers are taken through a host of generic skills and dispositions that a teacher needs; the ability to understand learners, communication skills, organisational skills, time management and leadership skills. These are all, of course, important, but the pivotal role that teachers' understanding of their subject material plays in enabling learners' epistemological access to knowledge is facilely omitted from the discussion. In the same volume, Van der Westhuizen (2010) discusses the 'development of facilitation skills' and focuses students' attention on the different types of questions teachers can ask, and how teachers can organise and manage group-work activities and incorporate the generic teaching of critical thinking skills into their lessons. Again, these all are indisputably useful teaching techniques for particular purposes, but the author largely ignores the role of the teachers' ability to construct effective explanations based on a sound understanding of content knowledge.

A 'serious and prevalent' problem in educational institutions in South Africa, according to Morrow (2007:82), has been this 'strong tendency to pay insufficient attention to what is to be taught, to construe teaching and learning as generic activities with scant reference to the content of what is being taught'. While some of these concerns were exacerbated by the implementation of OBE, Morrow's concerns are not uniquely South African. Internationally, the 'technicist era' of teacher training has been widely criticised for oversimplifying the complexities of teaching, with a focus on acquiring the techniques of teaching rather than understanding them in relation to content knowledge (Darling-Hammond 2006:81). There is growing evidence to suggest that pre-service teacher education programmes, despite their relatively short duration, can act as powerful interventions that consistently produce student teachers who are 'highly knowledgeable about learning and teaching, and who have strong practical skills, who know how to teach ambitious subject matter to students, and who learn in different ways' (Darling-Hammond 2006:5). Such powerful teacher education programmes recognise the crucial role that content knowledge plays in teaching and in learning to teach (Darling-Hammond 2006:81).

Student teachers' understanding of content knowledge can be developed and assessed in several ways. The tertiary study of teaching subjects is the accepted way through which student teachers are inducted into the practices of their teaching subjects and learn their main concepts, dispositions and ways of understanding. During their academic studies, core knowledge is often selected and organised for them through lectures, guided tutorials tasks and structured assignments. By contrast, when student teachers prepare lessons, *they* are engaged in knowledge selection and organisation. Constructing a conceptually

coherent explanation requires student teachers to draw on their understanding of content knowledge to select core ideas, emphasise key knowledge and minimise attention to peripheral details (Wiggins & McTighe 2005). An analysis of the explanations students present in their teaching, therefore, offers a productive way of investigating how student teachers work with their understanding of content knowledge, as they develop their teaching practice.

Direct instruction

Their use of direct instruction provides a clearly discernable concept of how student teachers demonstrate their understanding of the content knowledge they teach. Killen (2010:125) defines direct instruction as those approaches (such as explanations and demonstrations) in which the teacher 'delivers the academic content in a highly structured format, directing the activities of learners and maintaining a focus on academic achievement'. Wiggins and McTighe (2005:241) similarly describe direct instruction as 'explicit teaching and student reading, followed by checks for understanding'. For the purposes of this article, direct instruction will refer to instances of whole-class teaching, where the student teacher explicitly teaches content knowledge to learners.

Bransford, Brown and Cocking's (2000) notion of constructing 'usable knowledge' clarifies the criteria for analysing university tutors' interpretations of how students' understanding of content knowledge can be investigated productively. To construct 'useable knowledge', these authors argue, teachers should provide opportunities for learners both to extend their information base, and to organise this information within a conceptual framework that enables them to identify relations between information and concepts. Effective explanations are presented at a level appropriate to the learners, and are often enhanced by the inclusion of appropriate examples, demonstrations and questions that monitor learners' understanding (Wiggins & McTighe 2005).

Methodology and data analysis

This article draws on a qualitative doctoral study on the developmental teaching patterns of student teachers (Rusznyak 2008). The primary source of data was provided by 893 reports, written over a four-year period by 48 university tutors during their observations of lessons taught by a sample of 66 Bachelor of Education (BEd) teachers, who specialised in teaching intermediate/senior phase (grades 4–7) learners. The author regards this as a sample of capable student teachers, as they completed the requirements for graduation within the minimum four-year period. While acknowledging that the design of BEd programmes differs between institutions of higher education, the teaching of this group may be indicative of what can reasonably be expected from successful candidates in BEd programmes generally.

The BEd programme offered by the Wits School of Education at the time of this study required students to complete their academic studies to first-year level in four teaching subjects, including English. They continued with two of these subjects in the second year of study. They all studied the teaching methodologies of languages, social sciences and natural sciences. In the fourth year they completed two additional pedagogy courses linked to their choice of teaching subjects. The student teachers conducted practical teaching sessions in various school contexts for two three-week sessions in each of the four years. Although this exposed them to teaching and learning in different classroom contexts, at times they taught with different levels of subject and pedagogical knowledge. As prospective primary school teachers, they were encouraged to prepare and teach lessons over the range of subjects, therefore, in the course of their TE experience they would have taught lessons both within and beyond their subjects of specialisation.

During every practicum each student teacher was assigned a university tutor. The tutors visited the students in the schools and observed their teaching. During these observations they wrote lesson observation reports that included their open-ended responses to the student teaching they observed. The university tutors were all full-time staff members of the Wits School of Education, who lectured in the BEd programme. While tutors generally observed student teaching with scant knowledge of individual learners in the class, it is expected that they brought a theoretical perspective to bear on their observations from their roles as subject, pedagogical or education specialists. This analysis is limited by its assumption that the university tutors' comments reflect an accurate interpretation of what happened in the lessons they observed.

Each lesson observation report was scrutinised, using methods of content analysis, for university tutors' comments relating to the student teachers' engagement with content knowledge. Drawing on Bransford, Brown and Cocking's notion of 'useable knowledge', the comments from the tutors were coded according to whether they indicated something about the information base of the explanation, about the organisation and networking of the knowledge structures, or both. Comments referring to information base were grouped into empirically generated categories. First, in terms of the comprehensiveness of the information, it was possible to distinguish three levels: some indicated that the student teachers had offered extensive information; others showed information that was limited to what learners needed to know according to the content of a textbook; and finally, the remainder offered little new information beyond what learners already knew and contributed. Second, the comments concerning the factual accuracy of information presented could be classified into those that indicated the student teaching was factually accurate, or, by contrast, that it contained factually inaccurate information. The author then considered another dimension of useable knowledge, namely how the information had been organised. The comments were scrutinised for indications about whether the student teacher had used some sort of organisational form to structure the content knowledge (e.g. a hierarchy, use of categories, examples to illustrate a generalisation, and so on) or had attempted to connect the lesson topic to a wider body of knowledge. The comments were then classified according to whether they indicated instances of students presenting conceptually organised information, atomistic information, or information that was incoherent.

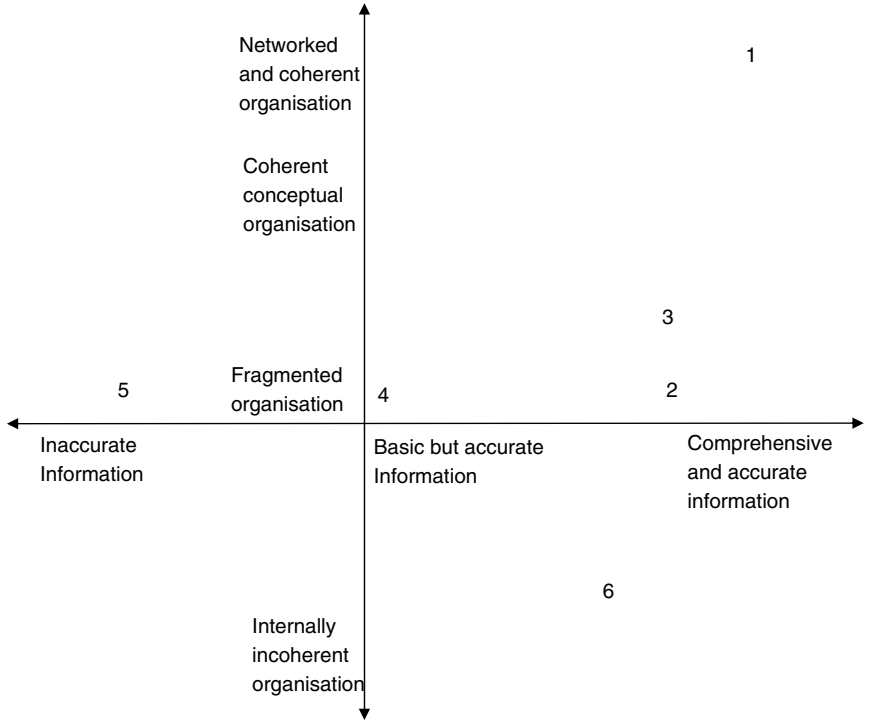
Next, the article focuses on a particular student teacher in this group, Zanele, showing how she organised and presented the content knowledge in several of her lessons.

Besides the lesson observation reports with their primary data for this study, semi-structured focus-group discussions were also conducted with three university tutors and 19 of the student teachers drawn from the sample group. The group discussions further explored the challenges facing student teachers as they prepared their lessons. The students who participated in these groups were diverse in terms of race, gender and schooling. The discussions probed initial findings from the documentary analysis, and were recorded and transcribed.

Findings

This article uses university tutors' comments as a lens through which to gain insight into students' understanding of content knowledge, from the lessons they taught. Yet it must be noted that only 47 per cent of the lesson observation reports analysed contained comments alluding to how the student teachers managed content knowledge within observed lessons. No reference to content knowledge was made in 32 per cent of the reports, and the remaining 21 per cent noted tersely that the 'content was sound' or the 'explanations were fine', without further elaboration. Of all the lesson observation reports, 34 per cent contained comments in which the university tutors expressed a measure of concern about the student teachers' understanding and/or presentation of content knowledge during the lesson. Their

comments in this regard have been classified into six categories, each of which represents the interplay of two dimensions: the accuracy and comprehensiveness of the information base; and the organisation of that information into a network of concepts. The six categories generated in this study can be positioned on a graph, with the horizontal axis representing the accuracy and comprehensiveness of the information base; and the vertical axis showing the degree of organisation of the information (see Figure 1).



Key	
1	Flexible and coherent understanding of content knowledge
2	Atomistic understanding of content knowledge
3	Formulaic understanding of content
4	Everyday understanding of content
5	Inaccurate factual basis
6	Conflation of disparate concepts

Figure 1: A graphical representation showing the ways in which students' understanding of content knowledge manifested in their explanations

The first category identified from the data showed those students with a sufficiently flexible and thorough understanding of the lesson topic, so as to be able to mediate content knowledge in coherent, conceptually sound ways. The second showed students with a disjointed understanding of aspects of the lesson content: they had difficulty in selecting and emphasising key material. In the third category, the

students were able to explain the procedures of how to arrive at a correct answer, but not the conceptual meaning or relevance of that answer. The fourth category concerned students who conducted group lessons, in which they relied on their everyday knowledge of the lesson topic. Lessons such as these seldom provided an opportunity for knowledge development. The fifth category consisted of students with inaccuracies in the factual base of their lessons. The students in the sixth category showed a poor grasp of the distinctions between separate concepts. The graphical representation of their positions shows that these six categories are not a continuum, but are different ways in which the two dimensions of useable knowledge interact to enable students to construct explanations that are knowledge productive, knowledge neutral or counter-productive. Each of these categories will be discussed in light of the empirical evidence, and in relation to literature in the field.

Comments indicating flexible and coherent understanding of content knowledge

In some lessons in this category student teachers provided opportunities for learners to participate in the practices of a subject, not merely in learning key concepts, but also in using appropriate ways to investigate this knowledge. A tutor commended a student teacher for having 'an excellent knowledge of the subject matter' and remarked that the student teacher had 'explained the material well'. The tutor added that the 'maps you used were clear and provided a useful basis for discussion on the population of various regions'. In examples such as these, learners were introduced to the processes of geographical inquiry as they analysed and interpreted authentic data on the topic.

Several examples were found where student teachers introduced learners to subject-specific terminology and created opportunities for learners to practise it. For example, a tutor noted that her student made 'good use of correct terminology', so that 'learners had access to the new vocabulary in context'. Another described how a student teacher carefully 'took learners through each stage of the fraction activity, step-by-step, hands on and using mathematical language'. Through such mediation, the learners were gradually introduced to the discourse of the subject.

The ability to locate a lesson topic within a broad network of content knowledge enabled student teachers to link the topic to current affairs, to their everyday experiences, and to what had been learnt previously. One tutor commended a student teacher for converting a possible disruption into a learning opportunity: 'The fact that the heater burst worked in your favour – they had a real-life experience of evaporation, which you cleverly incorporated into your lesson.' This student's flexible understanding of content knowledge enabled her to capitalise on an unexpected teaching moment, to further illustrate the central concept of her lesson beyond examples provided in the textbook, or the class teachers' notes. In another example, a tutor described how, 'by using cookery to contextualise your explanations [about capacity], you have tied the topic to real life'. In so doing, the student teacher made links between learners' everyday lives and the concept of capacity, explicitly facilitating a more networked understanding.

The most knowledge-productive lessons were those in which learners were afforded an opportunity to construct 'useable knowledge', both by extending their information base and by positioning the new content in terms of the knowledge structure of the subject learnt. This finding empirically confirms the assertion that 'before a teacher can develop powerful pedagogical tools, he or she must be familiar with the *process of inquiry* and the *terms of discourse* in the discipline, as well as understand the relationship between *information* and the *concepts that help organise that information* in the discipline' (Bransford et al. 2000:20). Student teachers with both a broad understanding of the subject and the ability to locate a topic for teaching within a network of knowledge, have better access to the conceptual selection tools that help them to foreground core concepts and identify appropriate ways of exploring those concepts further. When students were in command of their subject matter, they

displayed a thorough grasp of both the lesson topic and its relation to the broader discipline as a whole.

Comments indicating atomistic understanding of content knowledge

The focus here is on instances where tutors expressed concern about students presenting learners with a comprehensive collection of facts around a topic, in a disjointed manner.

Some student teachers related how, early on, they coped with the difficulty of having to teach unfamiliar concepts. They learned a number of facts by rote, which they then reeled off to the learners. A student teacher recalled how he 'was able to stand in front of the kids and teach from memory'. Students who lack an adequate grasp of the content knowledge become highly dependent on the information provided in textbooks, worksheets or class teachers' notes. A university tutor remarked that she immediately noticed when student teachers were 'willing to stand in front of a class of learners and read from teachers' worksheets', but did not 'demonstrate any personal engagement or processing of the material'. The students' reluctance to deviate in any way from the materials-to-hand made their insecurity in their conceptual understanding of the lesson topic all too obvious. Morrow (2007:66) cautions against a 'false synonymy between knowledge and information'. Merely memorising facts does not necessarily enable students to indentify clear hierarchical relationships between concepts, sub-concepts, categories and illustrative examples. Thus, the student teachers may have provided learners with opportunities to increase their information base, but without clearly exploring connections, the potential for their development of 'useable knowledge' remained limited.

Some student teachers were able to venture beyond their teachers' resources, and spent considerable time actively processing what they had read around a lesson topic. For example, a student recalled how she had been 'asked to teach a topic I knew nothing about and about which I had to become an "expert" overnight'. Others shared how they made it their 'personal duty' to 'find more information' and 'spent hours researching a particular topic'. A fourth-year student teacher explained how the subjects she 'knew best suffered because the unfamiliar ones took most of my time to prepare'. Without a deeper understanding of the knowledge structures of subject areas, student teachers find it difficult to distinguish between core ideas, important things to know, and interesting but peripheral facts (Wiggins & McTighe 2005). A student teacher illustrated this when she considered her greatest challenge as 'having too much information on a subject [and not knowing] what I should teach. What should I leave out? What is vital?' A tutor advised her: 'Don't try to teach too much [content] – teach less, and do so more effectively.' However, without access to the ordering principles that govern the criteria for identifying what constitutes key ideas, selection decisions are difficult and time-consuming.

Reports written by university tutors show that although student teachers found ample information on a topic, they were not always able to adopt an appropriate disciplinary gaze over the topic they taught. A tutor, for example, observing an English lesson on bullying, commented that it 'was more a Life Orientation lesson than a language lesson'. Where student teachers lack understanding of what constitutes 'appropriate learning' within a particular subject, the generic presentation of a topic may amount to a mere collection of topical information. Such teaching does not facilitate the induction of learners into the practices of the discipline. Offering information-rich lessons does not, therefore, necessarily lead to the development of 'useable' knowledge.

The inclusion of much unnecessary and distracting detail makes the planning process tedious for student teachers, and also serves to undermine intended learning. Unstructured explanations tend to 'leave learners with a mass of information without any structures through which they can organise it. It becomes more difficult to remember, so they resort to rote learning' (Criticos et al. 2009:202). Learners

are able to acquire complex skills more easily when teachers 'help them understand the underlying concepts and patterns that tie together the ideas they are studying' (Bransford, Darling-Hammond & LePage 2005:24). Likewise, Morrow (2007:63) argues that basic education serves to enable epistemological access to knowledge by helping learners to 'systematically develop conceptual frameworks that render the modern world less opaque'. With atomised facts dominating our 'information-promiscuous world', teachers have a major role to play in promoting learners' development of the foundational blocks for conceptual understanding and thinking, through the ordering and networking of a system of knowledge. Morrow (2007:63) suggests that teachers should 'foster that kind of learning which systematically advances understanding of learners so they can achieve *organising insights* into the world'. For student teaching it is, thus, not enough that learners are presented with discrete pieces of information, but lessons should help them make sense of the relationships and structures of that knowledge.

In a handbook for student teachers, Hayes (2003:190) asserts that a student teacher's weak content knowledge can be rectified by 'some serious study'. The analysis here, however, suggests that while 'serious study' may increase the extent to which the lesson is information-rich, its contribution to the learning potential of the lesson is not assured – it also depends on the student teacher's ability to understand and internalise the concepts, and link them to knowledge structures within the subject. An examination of the empirical evidence shows that, for some student teachers, simply reading textbooks and other resource material enabled them to present comprehensive information on a topic, but not necessarily to organise the ideas around key concepts.

Comments indicating a formulaic understanding of concepts

Students in this category emphasised the rote learning of a set of routines. While learners were able to use these routines to obtain a correct answer, the university tutors expressed concern that the student teachers had failed to facilitate learners' conceptual understanding of these procedures. In several lessons, instead of building towards learners' understanding of concepts, student teachers gave rules for attaining the correct answer. One tutor commented: 'The focus of your lesson was on "getting the right answer" rather than exploring the possibilities of understanding, and engaging with the concepts.' Another instance was described by a tutor who commented that 'the teaching of "figures of speech" is a wonderful opportunity to get learners to engage with language and meaning in a creative way, but I think you missed this opportunity. To give the poems [only] as a mechanical exercise in finding figures of speech is such a pity.'

In such instances student teachers directed their explanation towards showing learners how to arrive at the correct answers through a sequence of procedures, rather than towards understanding the conceptual principles that would give the content meaning and relevance within a real-life context. An example of this is a student teacher who taught addition of time by simply counting hours and minutes mechanically, without exploring the meaning of cumulative time. The opportunity for discussing the real-life circumstances in which learners may need to work with time increments, such as the legs of an extended journey, was lost. Similarly, a student teacher explained the concept of 'average' as 'when you add up all the numbers and divide by how many numbers you added', but was unable to explain the significance or meaning of the resultant value.

These students were able to convey a set of mechanical procedures, but left the underlying principles and relevance of the procedures obscured. The learners memorised routines to obtain correct answers without developing the conceptual grasp needed to connect these 'tricks' to a system of knowledge. Because such teaching does not help learners access the internal logic that governs why such procedures work, their potential for the development of 'useable' knowledge is significantly reduced.

In certain instances, student teachers introduced their lessons by presenting a formal definition to learners, without an explanation of concepts or illustrative examples to help the learners make sense of the definition. A university tutor noticed her student teacher teaching language skills by giving definitions, without illustrating the concept with examples from a text. The student teacher was advised: 'The use of "and" as a conjunction needed to be shown in a sentence – don't talk in a vacuum!' Without illustrative examples, the university tutor rightly considered the concept to have remained inaccessible to the learners. In another example, a tutor was 'astonished' that the student teacher 'found it necessary to provide a "correct" definition of relationships'. He asked: 'Surely your learners are capable, with your facilitation, to arrive at an adequate, and more owned, definition?' In these examples a definition was provided without relating it to an information-rich factual basis, or to (multiple) illustrative examples.

Failure to locate a topic within the context of a wider body of knowledge results in learners failing to see the relevance of the particular topic they are studying. For example, a tutor observing a poetry lesson in which the learners were writing Haiku poems urged the student teacher to 'please do additional background research'. She went on to explain that 'Haiku is a form of poetry that has its origins in Zen Buddhism – this is the reason for its simplicity and economy with words'. Without locating the lesson topic within its wider context, the opportunities for knowledge development, presented in the lesson, were significantly limited.

Comments indicating an everyday understanding of the content knowledge

University tutors noticed that in some lessons learners were given too little opportunity to extend their information base or to establish links between the facts they had been taught. In addition, the observation was that learners' existing knowledge was not consolidated, reinforced or reorganised in any meaningful way to explore new relationships within that knowledge.

Several student teachers described how they 'strive to organise fun-filled environments' for their learners. Of course, 'fun' in lessons is not necessarily inimical to learning, but it equally cannot be claimed to promote it. University tutors responded to that kind of teaching with comments such as: 'He should demonstrate the ability to do more than act as a good babysitter for the teacher.' However well a student teacher manages classrooms or organises group work, if the learning does not take learners beyond their everyday knowledge, then opportunities for knowledge development are inhibited. A tutor responded to a lesson in which learners 'brainstormed' what they knew about bullying, saying:

> *More discussion would have been instructive – the learners asked interesting questions and they needed to be responded to in more depth. I think it is important for learners to brainstorm, but they need to be taken further down the road in relation to their understanding – this is where your research plays a role.*

Another tutor asked a student teacher: 'Do you think you gave enough input on relating your lessons to plants? What is there to say other than they get leaves and flowers, and then lose leaves? Have [the learners] learnt anything new? On the other hand, if you together examined some plants that illustrate those things, perhaps there would be some new knowledge.' While the data show student teachers having gone to great lengths to make sure their lessons were sufficiently 'learner-centred', this analysis shows that learners were frequently asked to share what they knew about a particular topic, based on their everyday experience.

While some learners brought interesting contributions to the discussion, which actually made for learning, they were often incidental to the students' intentional attempts to create opportunities for learner knowledge development. The findings add empirical weight to the claim of Criticos et al. (2009:192) that activity-based teaching often leads to lessons where 'learners are asked to discuss things

in groups without the content knowledge they need to make discussion meaningful'. Excessive emphasis on the equal importance of learners' experiential learning and teachers' professional knowledge of the practice they teach has resulted in a proliferation of lessons where 'learners are kept busy, but learn very little' (Criticos et al. 2009:191).

Opportunities for knowledge development are equally limited when student teachers lack the wherewithal to engage with learners' answers in a productive manner. For example, a university tutor advised: 'When you ask your learners questions, respond. Don't just move to the next learner without saying anything, because a learner wouldn't know if they gave you the correct answer or not.' In a similar expression of concern, a university tutor pointed out that 'the learners had to rely on each other for the correct answers. Perhaps your lesson could have run through a selection of answers to ensure learners are on the right track?' In such cases, explanations or class discussions do not generate deeper understanding or deal productively with misunderstandings that become evident from learner responses or contributions, effectively leading to a knowledge-neutral lesson.

Comments indicating an inaccurate factual basis

The analysis of student teaching brought forth various kinds of misinformed and misguided teaching practices. Student teachers made errors, then recognised them in time and were able to correct them. For example, a tutor noted that, although a student teacher had made careless slips in her explanation, these errors were 'minimal, and immediately corrected'. In these cases the student teachers' content knowledge was sufficient to recognise and rectify errors without external prompting.

By contrast, several student teachers presented misinformation to the learners and remained unaware of this fact. In a lesson on democracy, for example, a university tutor asked her student: 'Please double check on the meaning of '*kratos*' – according to my interpretation, it means "power" not "rule"'. Similarly, during a lesson on the Great Trek, the tutor identified numerous instances of misinformation, saying: 'You are using the word "*trekboers*" but you actually mean "*voortrekkers*"... you said they trekked to Limpopo – a name only invented recently ... there was no such thing as Apartheid then ... In other words, you simply get so many facts wrong that the lesson was actually counterproductive.' In this case, and others like it, the student teachers appeared unaware that the information they were presenting was factually inaccurate.

Learners inevitably, from time to time, contributed misinformation in their answers, examples or contributions to class discussions, which more knowledgeable teachers could use as opportunities for further learning. A tutor cautioned a student teacher against accepting answers too readily, saying: 'Careful! The answer you accepted [as an example of] "simple life forms" included humans – which is inaccurate.' Another tutor wrote: 'I felt that some of the comments of the learners were rather implausible, but were accepted uncritically and tended to distort the collective interpretation somewhat.' Again, these student teachers were unable to recognise or rectify errors that arose during the course of their lessons.

Comments indicating students' conflation of disparate concepts

Several student teachers conflated ideas that the observing university tutors considered to be distinct matters or concepts. A tutor, for example, observed a student teacher moving the discussion topic from 'The Constitution' to 'What the government does for us' and comments: 'It's quite a difference. The class needed to understand the difference between national, provincial and local government. The linkages between the ideas and the activities in this lesson weren't smooth.' In another lesson about the daily and

annual motion of the Earth, a tutor commented: 'You explained the 24-hour cycle reasonably well using the globe and torch. Unfortunately, you seemed confused on the [Earth's] annual cycle. Where does the 365-day cycle come from? How does it differ from the 24-hour cycle?' Without an understanding of the conceptual structure and ordering principles of knowledge around a subject, conceptually muddled explanations may be presented in a lesson; either because of inaccurate sources (which are accepted uncritically), or because of student teachers revealing their own misunderstandings in the explanations they provide to the learners in their class. In such cases, incoherent explanations undermine learning.

A case: Comments on Zanele's lessons

The study of the lesson observation reports involved many different students over the four-year period. It was, clearly, not possible to categorise the teaching of any particular student teacher neatly into a single category. In her third year, Zanele was observed teaching lessons that fell within her teaching subject specialisations. Her lessons demonstrated a clear and coherent understanding of the content knowledge, prompting her university tutor to comment: 'Your knowledge of the topic is excellent. Your explanations are clear', and 'You approached this topic with confidence because you had prepared properly and you were on top of the content'. However, in the next year, observed by a different tutor in unscheduled lessons outside of her specialisation subjects, her handling of the content knowledge fell into categories two and six. This prompted her tutor to conclude, in her final analysis: 'While Zanele researched her topics, she did not always internalise the knowledge and was not always able to make it accessible to her learners. I found that her explanations were, thus, not always clear, and there were sometimes problems with the lack of explanation of technical terms.' The qualifiers 'always' and 'sometimes' confirm that her teaching was inconsistent as a result of her differing levels of content knowledge across various subjects. Her competence to teach effectively in her specialist subjects, however, was clearly demonstrated.

Discussion

Universities are required to verify that qualifying teachers have a sound understanding of the content knowledge they teach and that they are generally competent to teach. This study has shown that determining teaching competence is highly complex. Zanele's case illustrates how qualifying students may demonstrate sound content knowledge in some of the subjects they teach, but not in others. This is particularly so for those specialising in primary school teaching, where teachers are expected to be able to teach across a wide range of subjects. The period of pre-service teacher education programmes is short, and learning to teach is complex; so it is to be expected that certain students – hypothesised here in Zanele – qualify, having demonstrated sound content knowledge and evidence of PCK in some, but not all, of the subjects offered at primary school level. It is important, therefore, for tutors in summatively assessing student teachers to undertake several of their lesson observations within the students' specialisation subjects.

Of the lesson observation reports analysed, only 34 per cent contained comments on the student teachers' understanding and presentation of their content knowledge of the lesson. This finding is significant, despite the sample being limited to student teachers who had qualified within the four-year period, for it suggests that university tutors do not always exploit the opportunities during teaching practicum sessions to draw students' attention to how they organised and presented the structure of content knowledge in the lessons they teach. There are several possible reasons for this: tutors must observe lessons outside their field of expertise, where it would be understandable that they might focus on the technical aspects of the teaching. Some might decide not to comment on the content knowledge when other aspects of the students' teaching need more urgent, targeted intervention. A tutor, for

example, explained that if a lesson had gone poorly, she would attempt to 'pick out five or so critical points to discuss'. For some, it may have been a case of the tutor considering the student's understanding and presentation of content knowledge to be adequate. As a tutor commented: 'We tend not to notice when something goes right.' However, this trend was almost certainly exacerbated by the design of the Student Teaching Assessment Rubric used at the time, whose criteria prioritised 'mastery of the technical skills of teaching over the systematic development of students' PCK' (Rusznyak 2011). Further research into the professional judgement and mentoring practices of tutors is clearly warranted.

The findings of this study have informed several changes to the BEd programme and the teaching practicum at the Wits School of Education. The study reaffirms the central role that content knowledge plays in effective teaching. The academic study of teaching subjects and their associated pedagogies has been extended and strengthened in a recent restructuring of the BEd degree. During the study, student teachers began preparing and delivering lessons three months into their first year of study. The findings show that lessons dominated by factual inaccuracies and atomistic teaching were delivered mainly by first-year students during their first practical session. First-year students are no longer expected to teach during their first teaching practicum session, but are rather given a carefully structured observation assignment which, in part, requires them to identify and articulate the core content knowledge of the lessons they observe. In this way their attention is explicitly directed to the conceptual structure of the lessons they observe. When they begin teaching, student teachers are encouraged to plan lessons within their fields of specialisation, for the purpose of a 'quicker transition from survival concerns to considerations of instructional practice' (Gess-Newsome 1999:86). The student teaching assessment instrument used by the Wits School of Education has been redesigned to reflect the construction of PCK, and to draw primary attention to the importance of content knowledge in effective teaching (Rusznyak 2011).

Conclusion

Research has shown that student teachers frequently underestimate the importance of content knowledge in their lessons and in developing teaching practice. Concomitantly, there is often an understandable tendency for student teachers – particularly those specialising in primary school teaching – to focus their efforts on planning fun-filled activities for the lessons they teach. The findings of this study show that lessons marred by inaccurate, disjointed or incoherent content knowledge can undermine the construction of potential learning opportunities, however well managed and replete with interesting learner-centred activities they may be.

In recent years, teachers and student teachers alike have been encouraged to maximise the use of 'learner-centred' teaching strategies. Student teachers learn those techniques fairly easily, but their ability to formulate coherent explanations should not be assumed, nor should student teachers be discouraged from using explanations. Instead, the construction of coherent explanations should be encouraged and fostered as an essential initial step towards helping them develop the sound conceptual foundations on which learning-centred activities find meaning.

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