

## PEDAGOGICAL BUNGEE-JUMPING: LEARNING *IN PRACTICE*

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### **Abstract**

Teacher education institutions are often criticized as being distant from practice and ineffective in preparing student-teachers for the demands of the profession. This paper reports on a research project conducted to explore student's views of their pedagogical content development during an authentic and extended teaching intervention. In this research we investigate learning *in practice*, through a simulated teaching experience where pre-service teachers taught Life Sciences as an additional subject to learners from a teaching school in Johannesburg. Participants committed to attend classes on Saturdays at the university. This project blends elements of the Japanese Lesson Study approach, where students prepare and present lessons in groups of four. This differs from normal school experience, in that the pre-service student teachers take sole responsibility for learning activities. It increases their exposure to the practice of teaching and allows them to concentrate on expanding pedagogical content knowledge.

**Keywords:** teacher education; teaching schools; school experience; pedagogical content knowledge; pedagogy of care

### **INTRODUCTION**

In this paper the so-called "*theory-practice divide*" experienced by pre-service teachers engaged in a community project at a teaching school affiliated to the University of Johannesburg is explored. The Integrated Strategic Planning Framework for Teacher Education and Development in South Africa describes teaching schools as "*teaching laboratories*" where students can engage in *learning-from-practice*. The larger project under which this research resides focuses on developing an understanding of the preconditions for establishing teaching schools; the nature of the relationship between higher education institutions and teaching schools; the status of these schools in terms of the education legislation framework; and how

teaching schools could serve as “*teaching laboratories*” and research sites. Teaching schools already affiliated with the University include a primary school in Soweto, a rural school in Mpumalanga close to the Siyabuswa Campus, and a top-performing secondary school in Johannesburg. This project that we reflect upon in this paper is linked to the latter school.

This particular school does not offer Life Sciences in the Further Education and Training (FET) band as a subject. Although pre-service teachers in Physical Sciences and Mathematics conduct their school experience and service learning in this school, the Life Sciences pre-service teachers have not had similar opportunities. In an effort to introduce Life Sciences in this school and to expose pre-service teachers to an authentic teaching experience, the University has signed a memorandum of understanding with this school and is now offering Life Sciences Grade 10 as an extra subject on the main university campus on Saturday mornings. Learners are taught by final year pre-service teachers as part of this research project. As such we have the privilege of almost unrestricted resources (the Faculty of Science is very cooperative in this regard), and learners are taught under almost ideal conditions. At present we are able to demonstrate a number of enhanced teaching conditions due to the availability of more advanced equipment that would normally be found in a typical school laboratory. The learner-teacher ratio is also very low contributing to good discipline, a sense of community and increased opportunities for teaching and learning. Taking all this into consideration pre-service teachers can learn *in practice* through simulated teaching experiences that have a distinct theoretical grounding.

The “*theory-practice divide*” in the education of teachers is widely discussed in the teacher education literature (Holland, Evans & Hawksley, 2011; Laverty, 2006; Kessels & Korthagen, 1996). Teacher education institutions are often criticized as being distant from practice and therefore ineffective in preparing student-teachers for the demands of the teaching profession. Korthagen and Kessels (1994) argue for creating suitable learning experiences for student teachers in which these students can develop adequate Gestalts. Central in Gestalt psychology is that a person should see an object or a situation as a holistic entity, and to respond to them as such. For teacher education this would mean that the novice teacher should consider and appreciate the interplay between social, psychological and physical factors. Korthagen and Kessels (1994:13) further suggest that student reflection should be promoted in teacher education to assist students

in developing elaborated Gestalts and schemata, leading to phronesis. These authors describe phronesis as “*theory with a small t*”; the knowledge that is situation-specific and related to the context in which a teacher meets a problem; the “*knowledge that brings their already existing, subjective perception of personally relevant classroom situations one step further*” (*ibid*, p.7). One way in which teacher education institutions attempt to address the above Gestalt or phronesis, is through teaching practice in schools, which is considered to be learning *in practice*.

## **LEARNING IN PRACTICE**

Of the many professional development interventions to assist teachers in the teaching of the sciences, some international examples stand out. Each of these interventions, which we will briefly mention now, has a specific appeal based on their innovative design and delivery modes and we have adopted the essence of each intervention in our own pedagogical approach. Firstly, the Ohio Public Schools Project (Yeziarski & Herrington, 2011) highlights the teacher’s view of the nature of science as a crucial aspect in the development of their pedagogical content knowledge (PCK). The inquiry-based approach in the classroom is also emphasized in the Ohio Public Schools Project where teachers were required to engage in authentic activities in laboratories. Within the local context, the issue of under-resourced schools remains a problem, and De Beer, & Whitlock (2009) suggest “shoestring- approaches” in classrooms, improvising low-cost media and apparatus in order to overcome these deficiencies.

At the Annenberg Institute for School Reform “*the importance of viewing teaching not just as an individual act, but as a collective and connected activity within and beyond school walls*” evolved (Kronley & Ucelli-Kashyap, 2010). They propose supportive school conditions and professional learning communities (PLCs). In Finland, the FINNABLE 2020 project also used a community-oriented approach (Niemi, 2012). Finland is often considered a country that succeeds in training teachers well for the profession- of providing novice teachers with elaborated Gestalts or phronesis. Kansanen, Tirri, Meri, Krokfors, Husu & Jyrhama (2000) indicate that part of the Finnish success story is that students study their subjects in subject departments at university, and undertake their practice teaching in teacher training schools. Another interesting hallmark in Finland, is the focus on research. All teacher education students study research methods and

undertake research projects integrated throughout their normal studies, culminating in a Master's thesis at the end of their studies (Tuovinen, 2008). The purpose of this research-based preparation programme is to develop the teacher education students' capabilities to operate as autonomous professionals in the field who are able to *“think and act on the basis of theory and research, and to justify educational decisions using formal, systematic arguments”* (Tuovinen, 2008:3).

The FINNABLE 2020 and the Annenberg projects also involved corporate companies as part of their community, not only for funding purposes, but also to tap into the available human and physical resources (Brand & Moore, 2011). These projects promoted collaboration amongst teachers of different schools. We are of the opinion that teachers learn best through interactions with other teachers. We also believe that exposure to good teachers and good teaching could compensate for the inadequacies of pre-service teachers and help them to capitalise on the strengths of others. To this end we implemented aspects of the Japanese Lesson Study, also implemented in the US, which promotes deep understanding of specific concepts.

### **AN ALTERNATIVE TEACHING AND LEARNING EXPERINCE**

The class of 26 university Life Sciences pre-service student teachers collectively take responsibility to teach and mentor 12 Grade 10 Life Sciences learners. The Japanese lesson study model forms the basis of this intervention and students are assigned to work in groups of four. We place great emphasis on practical work, and the Life Sciences classes on Saturdays, which are scheduled from 09:00 – 12:00, always involve practical lab-based investigations. Students start preparing labs at 07:00 on a Saturday morning. Every week there are two groups of students present during the classes: the incoming group (who will teach the next week) and the teaching group.

The main aim of the lesson study approach was to develop inquiry-based teaching strategies and a sense of community among the pre-service teachers (Compare Demir, Sutton-Brown, & Czerniak, 2012). The cycle of pre-service teacher participation begins in week 1 where they observe another group teaching their prepared lesson. They then provide general feedback to

these students on their teaching. In other words, the pre-service teachers integrate subject matter and pedagogy and present lessons to each other first, before adapting and refining the lessons for implementation (Crockett, 2007). This is also an opportunity to familiarize themselves with the learners as well as the teaching conditions. During the rest of the week they work in their groups to prepare their own lessons according to their assigned portion of the curriculum. This is done in collaboration with the lecturer who advises them on revisions and possibilities for practical work. During week 2 they then teach their assigned theme. On the day of their lesson they are responsible to prepare the lab for practical work before the time and usually meet two hours prior to the class. After the lesson they are also responsible to clear up and consult with Grade 10 learners with specific educational needs. They also write reflections on their experiences which we have analysed and used as supporting documents in this paper. Additional tasks include setting and marking of assessment tasks and examination papers as well as accompanying learners on educational excursions.

## **RESEARCH METHODS**

The Life Sciences group from the participating school consist of eleven girls and a single boy. It is a racially and religiously diverse group and it is important to note that they are all volunteers who signed up for an additional school subject that had not been presented previously at their school. As such these learners are academically strong and have a definite interesting the subject. There are 26 Life Science methodology pre-service student teachers who teach the entire Grade 10 Curriculum in groups of four according to a roster. A PhD student working on this project is also a Subject Advisor for Life Sciences for the GDE and she ensures compliance with the curriculum assessment policy statement. Three lecturers (the principle researchers and coordinators of the initiative) attend to the activities mentioned in the previous section.

Data were collected through individualized interviews with all pre-service teachers and learners. The pre-service teachers wrote reflective essay and completed a questionnaire with open-ended questions. Classroom observations were made according to a schedule by the lecturers and the PhD student/subject advisor. Documents considered included teaching artefacts (presentations, worksheets, models, posters, videos and assessment items). These rich sources of data were

subsequently analysed using qualitative data analysis techniques which led to the emergent themes.

Initial analysis of the rich data has led to some findings which are explored in this paper through descriptive metaphors that students have used to describe their development as Life Sciences teachers in this project. Metaphors including “*bungee jumping*” and “*the sinking Titanic*” will be explored in some detail. We also elaborate in the paper how students did not necessarily have the support of traditional teacher-mentors but argue that university lecturers following the model proposed in this paper could take over this role.

## **FINDINGS AND DISCUSSION: STUDENT METAPHORS AND FEEDBACK**

Findings in this sections will include pre-service teachers initial feelings and reactions to this new intervention, how they experienced their first class, how they compare the intervention with their first three week school experience, what they have learnt from the experience, their biggest shock or discomfort, how they currently feel about the project, and how this intervention contributes to their own professional development as a teacher.

In response to the question: “**What was your initial reaction or feelings, when you heard that you will be teaching Grade 10 Life Sciences learners on Saturday mornings?**” nine of the students anticipated teaching Grade 10 learners on Saturdays in a positive way using words such as *excitement, opportunity, happy, not too stressed, fascinating* and welcomed the opportunity to action their learning by “*putting what was learnt into practice*”. The remaining 12 students experienced some anxiety expressed in words such as *scared, shocked, intimidated, fearful, traumatized and painful*. One student regarded it as increasing prospects for future employment in that it is “*good for my CV*”. In summary initial reactions seems to show mixed feelings with an overarching sense of nervous excitement due to the uncertainty and novelty of the initiative.

The question on how students experienced their first class showed that students were not prepared for the level of learner engagement during the lessons. Learners were excited and asked numerous questions and at times challenged the students in their thinking and left them feeling

poorly prepared. Students also report that they found it difficult to answer some of their questions and undertook to be better prepared for future classes. One student in particular was also hesitant in teaching a multi-racial class not knowing what to expect from learners. Another student reflects on feeling comforted by being “*surrounded by three amazing fellow teachers*”. In her mind she no longer regarded herself and the rest of her group as student teachers but has made the transition to being a professional teacher. The following vignettes are also of interest and contribute to the overall sentiment of discovery and adventure:

*“Overall and above this was an experience equivalent to **“bungee jumping”** as everything gets heightened, this includes ones fear, anxiety, stress, emotions and the best thing one can do is to act calm and act a teacher one who is in control and enjoy everything as it comes and learn from each learning experience”.*

*“Day 1 felt to me like the **sinking Titanic**. I was SO nervous... and every time a learner asked a question, I could feel my heart racing in my chest... what if I cannot answer?”*

Regarding their feelings on how this intervention differs from service learning and their normal school experience (which was for three weeks at the start of the year) they report huge differences in many regards. The main differences include greater support from lecturers and peers, fewer discipline issues, a greater focus on the teaching and learning, fewer disruptions, a more focussed and eager learner group, small class size, greater responsibility and more structure. One student remarked: “Challenging, because with the TS project we have all the resources needed for lessons” perhaps implying that they now have no excuse for not being fully prepared and innovative in their teaching. Only one student found the two experiences “similar” and this can only be due to the fact that she was perhaps placed at a well-resourced school with access to good mentor teachers?

The next question on what students gained from these lessons emphasized the realisation amongst students that a teacher should be well prepared. In fact being well prepared was mentioned by all who responded to the question. Three of the most powerful statements include: “*To be 110% prepared*”; “*Prepare, prepare, prepare*”; and “*A good teacher is a prepared teacher*”. Another student shared his sentiments:

*“Victory loves preparation” this is what I think me and my group represent, we planned in time and worked as a unit and delivered the lesson as smoothly and as enjoyable as possible. The planning process was quiet drastic as a lot had to go into it, including time management which I think we executed perfectly as we started the lesson in time and finished in time, and also preparing for the practical in time before we went to class enabled us to execute the practical effectively enough for the leaner’s to learn and have fun at the same time”.*

In addition they mention not to underestimate the learners and to expect difficult questions from them. They recognised the need to be familiar with the content and to structure their lessons accordingly to ensure that are not left feeling inadequate.

Students report that the biggest shock or discomfort they experienced was that they did not expect learners to be so well prepared for class and in one instance even *“felt discomfort for not being able to answer their questions”*. They also struggled to make their lessons exciting and interesting due to the fact that *“learners know a lot more than I thought”*. They were also not prepared for the amount of work required for lesson preparation and describe it as *“intense and hard work”*. It was interesting to note that some of the students did not know how to use a microscope.

Pre-service teachers were asked: How do you currently feel about this project? Would you have rather done the ordinary service learning component, with your new insight? They are currently extremely positive about this project, despite the fact that it meant a lot of work. All of them indicated that the project assisted them in their professional development as teachers and find it to be a meaningful experience that is *“highly beneficial”*, *“well organised”* and due to its practical nature agree that they *“learnt a lot”*. There is only one that would *“rather like to teach as individual, not in group”*. There is a general feeling of fun, optimism, enthusiasm and even gratitude for the *“insightful experience”*. One viewed it as *“beneficial for my growth”*. They seemed to have gained confidence, a feeling of professionalism and in general have discovered themselves as teachers. They mention becoming aware of different teaching strategies, development of their teaching methods, and engagement with the curriculum, being punctual,



and being creative in lesson planning. One particular students declares that *“I now have a voice; with every lesson it becomes easier”* while another adds *“it helps overall to identify my strengths and weaknesses”*. One of the most profound statements was: *“it has made the theory of teaching a practical experience. It has taught me to think on my feet”*.

### Emerging themes

The most prominent themes that emerged from the feedback from pre-service teachers after the first six months of participation in this initiative are summarised in Table 1. These themes are derived from codes that were generated during the simple content analysis phase and then distilled into categories.

**Table 1: Pre-service teacher experiences of participating in a teaching school initiative – Emerging themes**

CODE	CATEGORY	THEME	
Engaging learners	Ideal culture of learning	Accompanying young scientists on their journey of discovery, by embracing their curiosity and enthusiasm	
Critical questions			
Well disciplined			
Enthusiasm of learners	Relevance of science to daily lives		
Enjoyment of excursions			
Need for various teaching methods	Providing effective learning opportunities	PCK development should be central in such a project, especially highlighting the professional development needs in terms of facilitation of inquiry-based approaches	
Working on higher Bloom levels			
Subject knowledge limitations	Working on PCK development		
Coming to know the CAPS			
Inquiry-based labs	Need for developing skills to facilitate practical work		
Lack of understanding of practical procedures			
Limited microscopy skills			
Need for preparation	Professionalism		The need for developing a professional ethos and pedagogy of care
Being punctual			
Taking responsibility for learners	Pedagogy of care		

We gained the following insights during this project:

***Accompanying young scientists on their journey of discovery, by embracing their curiosity and enthusiasm***

Pre-service teachers need to engage learners in the learning process, in order to answer critical questions related to their own teaching while creating a culture of learning that enables learners to do find relevance of science in their daily lives. At the same time these students will need to be well disciplined in their approach and preparation to stimulate the enthusiasm of learners. One example we have noted is the need to translate learner enjoyment derived from excursions and to channel their curiosity and positive energy which will sustain them on their learning journey.

***The importance of PCK development***

For our students (in the sciences), it is crucial to get hands-on experience of inquiry labs, and how to structure it. At least two of our students did not know how to use a microscope. One of the fourth year BEd students, who has been to schools on several occasions (school experience) has never witnessed a lab/ practical work session. The selection of a teaching school is crucial. In any school, students will probably benefit, and learn important lessons towards their professional development. However, what became clear with this project, is that the learners (bright; engaged; enthusiastic) challenged student teachers to reflect on their own PCK. Many of the students mentioned that school experience forced them to work on classroom management and discipline, but that they “*could get away*” with being unprepared for lessons, or having insufficient knowledge. For PCK development of student teachers, we need schools with an inviting culture of learning.

In terms of providing effective learning opportunities, students need to be cognisant of various teaching methods whilst implementing higher order thinking skills. Familiarity with CAPS, linked with an inquiry-based approach and good subject knowledge, seem to be essential elements in the development of sound PCK. Part of their professional development is linked to

their understanding of practical procedures which became evident during the intervention when their limited practical skills were exposed. It is noted that these are students in their final year of study and it is rather disconcerting that even simple microscopy skills are lacking.

### ***The need for developing a professional ethos and pedagogy of care***

The programme should be structured in such a way that students should take responsibility for the learners. This is a strong theme emerging from the data so far. The students feel like professional teachers who have a responsibility towards the Grade 10 learners. They are already worried about the commitment of the next cohort of students, who will have to teach the Grade 11 material to the current group. This is reflected in the comment: *“I’m praying that the students who are following us would treat our learners and present themselves the way we started it”*. Another student said: *“By teaching these learners I feel such a sense of accomplishment. I felt that I was making a contribution that was worthwhile. I cannot wait to see them graduate”*.

It is encouraging to note that through this intervention students are developing an awareness of what the professional ethos of being a teacher entails. We have alluded to the fact that these students associate being well prepared and punctual with being professional. They are mindful of the fact that they need to be one step ahead at all times especially when dealing with academically strong learners. This responsibility only emerged due to the unique classroom settings where they had to deal with a small number of well-behaved learners in contrast to a normal school setting where these scenarios would have been masked or hidden due to ill-discipline and other detracting factors. Students gradually started to take ownership of the intervention and started to know the learners and their individual needs. Ultimately their professional ethos has expanded to include pedagogy of care.

### **A FINAL WORD**

Feedback from the Grade 10 learners indicate that limited inquiry learning takes place in the classrooms in their normal school. Some demonstrations are done and there is a very strong focus on teaching for the examination. The pre-service teachers in Life Sciences project highlighted their own empowerment in learning to design inquiry-based labs as one of the

biggest advantages of the project. There is potential for the University to assist teachers in this school in their own professional development through the establishment of a community of practice over time.

This project showed us that emerging students in authentic teaching situations, and “*throwing them in at the deep end*”, despite the anxiety (and feeling of “*bungee-jumping*”) provide them with a wonderful opportunity to develop professionally. Whereas our Physical Sciences and Mathematics students were simply observing (and did a little bit of teaching) at the teaching school, the Life Sciences students had to take responsibility for the Grade 10 learners. They also came to realise the importance of inquiry-learning approaches and laboratory work in Life Sciences. This approach in teacher education clearly provides the opportunity for student teachers to develop adequate Gestalts, or phronesis development.

Some quarters suggest that universities should be involved in the development of a teachers’ PCK by providing them the opportunity to spend time in research labs, to develop a more nuanced understanding of the nature of science. In this intervention we have reinstated the true nature of science into the classroom by introducing authentic learning experiences for both pre-service teachers and the grade 10 learners. We have addressed barriers to inquiry-based learning such as the lack of resources, curriculum constraints and inadequate in-service education by developing teaching strategies through improving the PCK of the pre-service teachers within a functional community of practice.

## REFERENCES

- Brand, B. R., & Moore, S. J. (2011). Enhancing teachers’ application of Inquiry-Based strategies using a constructivist sociocultural professional development model. *International Journal of Science Education*, 33(7), 889-913.
- Crockett, M. D. (2007). The relationship between teaching and learning: Examining Japanese and US professional development. *Journal of Curriculum Studies*, 39(5), 609-621.
- De Beer, J., & Whitlock, E. (2009). Indigenous knowledge in the life sciences classroom: Put on your De Bono hats! *The American Biology Teacher*, 71(4), 209-216.

- Demir, K., Sutton-Brown, C., & Czerniak, C. (2012). Constraints to changing pedagogical practices in higher education: An example from Japanese lesson study. *International Journal of Science Education*, 34(11), 1709-1739.
- Holland, M., Evans, A., & Hawksley, F. (2011). International Perspectives on the Theory -Practice divide in Secondary Initial Teacher Education. *Annual Meeting of the Association of Teacher Educators in Europe*. Latvia.
- Kansanen, P; Tirri, K.; Meri, M.; Krokfors, L.; Husu, J. & Jyrhama, R. (2000). Teachers' pedagogical thinking: Theoretical landscapes, practical challenges. New York: Peter Lang.
- Kessels, P., & Korthagen, F. (1996). The Relationship between Theory and Practice: Back to the Classics. *Educational Researcher*, 25(3), 17-22.
- Korthagen, F.A. & Kessels, J.P. (1999). Linking theory to practice: Changing the pedagogy of teacher education. *Educational Researcher*, May 1999: 4 – 17.
- Kronley, R. A., & Ucelli-Kashyap, M. (2010). Collective practice: Strategies for sustainable improvement. *Collective Practice Quality Teaching*, 58.
- Laverty, M. (2006). Philosophy of Education: Overcoming the Theory-Practice Divide. *Paideusis*, 15(1), 31-44.
- Niemi, H (2009) Why from Teaching to Learning? *European Educational Research Journal*, 8(1), 1-17.
- Tuovinen, J.E. (2008). Teacher professionalism- Viewpoints on best practice; the case of Finland. Paper delivered at the AARE Conference, Brisbane, Australia, December 2008.
- Yeziarski, E. J., & Herrington, D. G. (2011). Improving practice with target inquiry: High school chemistry teacher professional development that works. *Chemistry Education Research and Practice*, 12(3), 344-354.