CHAPTER 5

CANDIDATES IN CRISIS

I came back and a lot of my classes pretended we weren't just away on practicum. Like we came back and … [it was] "Let's continue on doing whatever we were doing before … so I don't really bring any of my practicum experience into this class at all." It's almost like they [teacher educators] are trying to treat it [the program] as four months of in-school and then four months of practicum, but just arranged it [alternating and separately]. (Max2, 20)

One of the most common findings in research on teacher education is that candidates place a high value on the practicum; some use the amount of time spent on practicum as a barometer of the quality of their learning in a teacher education program. Teacher candidates come to a program expecting to have a productive learning experience in school with a supportive associate teacher that will help them navigate the early days of their teaching careers. Many candidates are particularly conscious of the role that their practicum evaluations play in their ability to secure a job interview. For this reason, teacher candidates can feel an enormous pressure to impress the staff at their host schools, particularly if their practicum occurs in a school board where they would like to secure a teaching position.

The previous chapter indicated that participants in this study had both a strong desire to succeed during their placement and a fear of making mistakes that would have a negative impact on the quality of their students' learning. Such feelings are natural, but may also set the stage for teacher candidates to experience a significant amount of tension throughout their practicum as they constantly try to strike a balance between focusing on their development as new teachers, on pleasing their associate teacher, and on the quality of their students' learning. It is not surprising that, at the end of a month-long practicum block, teacher candidates typically feel tired and a bit burned out even if they are enjoying their practicum experience.

Anyone who has taught in a Faculty of Education has experienced the remarkable change in the building's atmosphere when candidates go on field experience, making hallways and classrooms seem underused. It might seem obvious to state that teacher educators do not go through the practicum placement experience with teacher candidates. It is less obvious, however, to draw attention to what can happen if teacher educators are not mindful of this fact. Even faculty liaisons, who are responsible for visiting teacher candidates during practicum placements, spend relatively little time with candidates in schools. What happens, then, if teacher educators pick up their courses where they left off when candidates return, as though the month in schools did not happen? During a practicum placement, teacher candidates have almost undoubtedly gone through a significant set of experiences that have affected them both cognitively and emotionally. Candidates have different learning needs as the

result of their first practicum placement. How can teacher educators respond to and value these needs? In particular, how can teacher educators respond to teacher candidates experiencing a significant crisis of confidence?

The opening section of this chapter describes the major events that occurred during the physics course in this block of classes. The data obtained from the focus group and individual interviews are then analyzed for insights into how teacher candidates were constructing professional knowledge from learning experiences in the physics course. Selected narratives of the candidates' practicum experiences are then presented in order to reveal many of the tensions associated with constructing professional knowledge during the practicum. The next section provides the perspective and voice of the teacher educator as I analyze the discussions Tom and I engaged in during the November block. The chapter concludes with a summary of the professional knowledge constructed and co-constructed by the teacher candidates and the teacher educators who participated in this study.

CONTEXTUAL FEATURES OF THE PHYSICS METHODS COURSE

The physics curriculum course reconvened on the first Monday in November and met for an additional five classes, concluding on the third Thursday in November. Tom began this block of classes by giving candidates time to talk in small groups about their practicum experiences. The database for the Project for Enhancing Effective Learning (PEEL) (Baird & Northfield, 1992) was presented to candidates as a source of active-learning pedagogies during the second class. The second week of the November block focused on preparing for and processing a visit from Professor Randy Knight of California Polytechnic State University. His book *Five Easy Lessons* was one of the required course texts, and Tom had arranged an interactive presentation by Knight during the second week of classes. After Knight's visit, Tom devoted a class to exploring characteristics of simple DC circuits and to introducing the concept of a Think-Aloud. The final class concluded with a presentation by a local associate teacher of physics who incorporates many active-learning pedagogies in his classroom.

LEARNING EXPERIENCES IN THE PHYSICS CLASS: TEACHER CANDIDATES

The data provided by the participants during the focus group interview and the individual follow-up interviews were analyzed with a view to understanding how teacher candidates construct knowledge from learning experiences during a physics methods course. Four themes are considered in this section: Learning from the Program, Learning from Peers, Learning from Tom, and Theorizing Teaching and Learning. The first theme focuses on how teacher candidates learned from the structure of the program, with a particular emphasis on the transitions from Queen's to host schools and back to Queen's again. The second two themes focus on learning that occurs as a result of the physics methods course. Finally, the last theme explores the theories about teaching and learning that participants constructed as a result of their experiences.

Learning from the Program

Teacher candidates who participated in this study indicated two major ways in which the overall program contributed to their learning. First, the rhythm of the initial months of the program provided different kinds of teaching and learning experiences, on-campus and in host schools, for the candidates to consider. Second, the expectations and assumptions that teacher candidates had for their learning in the program appeared to be significantly different during the month of November. This section interprets both aspects of how candidates learned from the program.

The rhythm of the program, namely, one month at the Faculty in September followed by 4 weeks of practicum followed by a return to campus for 3 weeks, forced candidates to attend to the effects that two very different types of learning experiences had on their professional development. When faced with the prospect of returning to campus in November, James (FG2, 98) stated that he "was a little annoyed because [he was] just getting into how to teach and [he] wanted to continue on with the material." Max felt the same way, saying that the transition to campus "interrupted [me] just as [I was] getting into the class" (Max2, 19) and that he had "started figuring out the flow of everything" (FG2, 100). Irene commented on the "weird" shift from practicum back to the Faculty:

> The transition was weird because I went from trying to be professional and being on time every day back to being a little more relaxed, which is probably bad because I'm always late, but, you know, in the weird sense, [being at the Faculty] is kind of relaxing. (Irene2, 24)

David felt that the transition from practicum to Faculty was a welcome change:

> By the end of that fourth week [of practicum], it was kind of like hanging on by my teeth, in terms of the workload was that close to getting me. I was a hair shy of getting behind, un-recoverably getting behind …. I was looking forward to some sleep. A couple of weeks where I could get to the gym. Revisit and talk to other people about how their placements have gone. I guess that was my initial thought; I thought that I wanted to see how things were going for other people. (David2, 13)

Despite initial misgivings about returning to the Faculty, both James and Max admitted in their individual interviews that the interruption to the practicum provided an opportunity to think about their learning on practicum. James said, "the three weeks here [at the Faculty] actually give you a chance to think" (James2, 22) while Max said that by the end of October he felt he "could definitely use a break" (Max2, 18).

The break provided by the on-campus weeks was a productive use of time for some of the candidates because "it forced us to stop and think about what we did" (Irene2, 24). James found that the on-campus weeks provided time to "get some good advice on … what we're going to need to do when the time comes to start looking for jobs" (James2, 22). During the focus group, Irene made a comment that seemed to resonate with the group: "On a basic level, this [first] week is the break week and next week is catching up and the third week is when everything is due"

(FG2, 97). By the end of the three weeks, Paul was ready to go back to his host school because he was frustrated with the assignments he had to do on-campus:

> I think I'm kind of ready to start doing things again that I care about. If I have something due for class [on practicum] the next day, it'll be something that I want to do well and that I'm eager to get done, you know? As opposed to this assignment [for Queen's] that's … I'm not really sure why I'm supposed to be writing a five-page essay about a poorly written article, about a very specific subject. In that sense, I think I'm looking forward to having work that's my own work and work that I care about. (Paul2, 10)

Paul's obvious frustration with the kinds of things he was being asked to do in the program underscored his changing expectations of the program. Increasingly, the participants in the study were recognizing some dissatisfaction with the teacher education program as a whole. As David noted in the second focus group, "I've seen people put their heads down here, just to tune out … Now we understand why high school students do it" (FG2, 73).

Paul and David expressed the greatest dissatisfaction with the program as a whole at this point in the year. Although their needs as learners had changed as a result of the practicum, some of the elements of the teacher education program had not changed significantly in response to those changing needs. David noted that "this time around is just worse and worse in terms of classes that seem to be too open, or too restrictive, or too much information to digest, or not interesting at all … Finally we're getting into a bit of that busy work that everyone talks about in a program like this" (David2, 21). Paul also commented on a general lack of intellectual engagement with the program, a feeling he did not experience in September:

> My frustrations with the classes right now have to do with a lot of talk of very little content sometimes … [classes are] different from September …. It's either kind of a lecture that doesn't really have much interest or else it's a kind of group discussion where I'm just forced to sit and listen to everyone else's opinions on things. (Paul2, 50)

Both Paul and David expressed a desire to return to the practicum, the portion of the program that candidates tend to perceive as more relevant and productive.

Now that they had some distance from their early learning experiences in the program, candidates began to talk about the effects that experiences in September had on their learning and how practicum experiences shaped their revised expectations of the program. Although he had a positive outlook, James reported a disconnect between early experiences in the program and the practicum: "I thought September was good. All the theory they taught us was really good. When I got out on my practicum I realized that it's easier said than done" (James2, 24). Paul's perception of September ties in well to the overarching theme of disturbing prior assumptions, discussed in the previous chapter:

> September, I think, it just sort of was trying to shake you up a bit and get you thinking about what you would like to be doing and how you feel about teaching and having some people that could sort of nudge towards certain kinds of philosophies of teaching. (Paul2, 46)

> I think there was already a lot of stuff [in September] and I think just sort of having it there, even just sort of in the back of your mind while you were teaching, was still kind of helpful … just at least hearing it and getting to thinking about it and then sort of planting the seeds. (Paul2, 49)

Max also felt that September was a positive but idealistic learning experience: "Once you've figured out the basic ideas of teaching, you'll want to incorporate all of these things [learned at Queen's] in your teaching" (FG2, 43). Irene agreed with the idea that September put theory in the back of her mind during practicum: "The information was there and it maybe wasn't sinking in as much as it could but after going on practicum and then coming back and hearing some of it again, it really began to sink in much better" (Irene2, 25). David had a somewhat less enthusiastic opinion, stating that the "first week of school [in September] was surprisingly informative, helpful, and interesting" (David2, 18) and then positing that "maybe it was because the expectations [for teacher education] were so low that anything above that was a positive experience" (David2, 20).

The teacher candidates who participated in the research indicated that, although they felt that the program was a productive place for them to learn in September, the on-campus weeks in November generally fell short of their practicum-driven expectations. The candidates felt that the requirement to return to campus in November pulled them from their practicum placements just as they were becoming more familiar with their host schools, although most admitted that the slower pace offered by the Faculty was a welcome change. The major benefit offered by the three on-campus weeks in November was the time provided to think about the practicum experiences, outside the environment of the host school. The learning priorities for candidates were different than in September, when they were content to have their ideas about teaching and learning challenged. The practicum experiences changed their expectations for the program; aspects of the program that did not meet their expectation of helping them make sense of the practicum experience were criticized.

Learning from Peers

The participating teacher candidates continued to be influenced by their peers in the program. Again, the ways in which they learned from interactions with peers in the physics classroom differed from the ways in which they learned from peers in the program as a whole. This theme explores the ways in which participants learned from interactions with other teacher candidates in three different environments: their host schools, the physics course, and the program as a whole.

In the Queen's teacher education program, teacher candidates are assigned to host schools in cohorts ranging in size from about 4 to 20. They are asked to meet as a group once a week during their practica to discuss issues that arise during the week and topics that are suggested by their faculty liaison. The candidates who participated in the study had a mixed reaction to the learning opportunities afforded by these weekly meetings. On the one hand, the weekly meetings had the potential to serve as in-school support groups. As Irene said, "just to have a familiar face that first week and then be able to talk to someone, I found it helpful" (FG2, 115). David agreed: "It was

nice, on day one, walking in the school to spend time with a couple of people I knew" (FG2, 114). James had the most positive view of the weekly meetings: "I found the weekly discussions were good for little teaching tips, learning what teacher candidates did in the class, the activities they did, the methods they used" (FG2, 104). Although there was general agreement about the potential utility of weekly meetings, the consensus was that they were of little value after the first few weeks of practicum: "It added to my workload, every week I had to talk to these people for 3 hours" (FG2, 157). James also noted that the meetings "almost felt like a bit of a competition" (James2, 18), as candidates in his host school would often share stories about the successes they were having in class. David seemed to sum up the thoughts of the group when he stated that, in terms of working through the situations that arose on the practicum, "I just need to do it on my own" (David2, 101).

According to two of the participants in the study, the general tone of candidates in the preservice program was more negative in November than it was in September. James mentioned that he "heard a lot of negative comments" (James2, 27) during the month of November, particularly around the assignments that candidates had to complete. He was quick to add, however, that he "didn't feel that way" (James2, 27) about the program. James appreciated the opportunity that classes provided to "hear what other students had to say … it was nice to hear that some of them had the same concerns" (James2, 5). David was critical of the effects that other teacher candidates had on his learning. In particular, he was upset by the general negative tone among teacher candidates:

> You come back here and it's negativity, negativity, negativity, and it just sucks the desire to teach right out of you …. It's always something that we're all complaining about. I've done my share, you know, but I'd like to think that I look at both sides and if I do complain about something, then I've gone to the professor to express my concern. (David2, 17)

David attributed the increase in complaints from teacher candidates to the recent practicum experience, saying that "now we have 700 experts [the other teacher candidates] in the field of teaching, everyone knows absolutely how things should be done" (David2, 14). He believed that candidates got into a habit of critique due to their relationships with their associate teachers: "You can't talk to anyone about their practicum without some sort of comment about what their associate does wrong" (FG2, 102). According to David, then, teacher candidates became far more critical of the quality of teaching in the program because the month on practicum had given them a warrant to criticize other teachers, in terms of what teacher educators were doing wrong in their teaching.

Although Max stated that "the whole physics class is really friendly … so it makes for a more open discussion" (Max2, 11), Paul was the only candidate who spoke at length about how interactions with his peers in the physics course affected his learning:

> I think that I am kind of frustrated by the people in the class [because] I don't think they're very willing to help [Tom] towards that [student-centred learning] … it's also making it a little harder to see what he's trying to do … but

> I really don't think it's his fault. I think that there's just sort of an attitude that I'm not all that fond of in the class. (Paul2, 12)

Paul was of the opinion that Tom was working toward a "framework" (Paul2, 12) of teaching and learning in the physics class that focused on sharing intellectual control of the class with teacher candidates. He notes a problem with Tom's decision to try to share control of the physics course:

> I think that approach also requires a lot of interest and honesty from people in the class about what they don't know and about what they want to know. And for some reason I feel like it's just this sort of quiet independence idea that everyone has, [a characteristic] which I think probably has served them pretty well for most of undergrad, given [our] backgrounds [in physics]. (Paul2, 16)

Paul's frustration with the physics course was quite different from his frustration with the program as a whole. He found that Tom's classes provided worthwhile learning experiences, but that the quality of these learning experiences depended on the participation of the other candidates as a group. Thus Paul's frustration was not with how the class was being taught, but with what he perceived as a missed opportunity on the part of others in the class.

Learning from Tom

The teacher candidates who participated in the research unanimously felt that Tom's class was a productive place for them to learn, yet they described how they learned in different ways. Irene and James named specific teaching strategies that Tom used that had an effect on how they thought about teaching and learning. Irene stated that "the POEs are really changing my thinking" (Irene2, 4). James felt that Tom's message about the power of active-learning pedagogies remained consistent during November: "Having Randy Knight in and doing the POEs reassured me that doing these sorts of things … is a good way to get students more involved in class" (James2, 9). The "Dirty Tricks" note-taking PEEL procedure (Baird & Northfield, 1992, p. 254) had a particularly strong effect on James:

> The one thing that really had an influence on me was that exercise that Tom did when he wrote notes on the board. The paragraph that he wrote, as you know, made no sense, and I didn't really realize it made no sense until I was almost finished copying it down. A lot of the other people in the class felt the same way. So it really made me think about when I give notes as a teacher: Are students really thinking about what they're writing down and is it the best way to spend my time, the 75 minutes I have in a classroom? Say, the 15 minutes I would spend writing notes I could spend doing something else so it would be more productive for them, in terms of their learning. (James2, 4)

The way that James articulated his learning was an important step forward, because it represented the type of thinking that Tom was trying to encourage during the lesson study. During the month of September, however, most teacher candidates had particular difficulty linking teaching strategies to learning effects.

Max realized the importance of the relationships that Tom had worked hard to develop in the physics course. He named the effect that Tom's focus on relationships had on his learning:

> Right away, Tom got to know everyone. So I don't want to show up late for Tom's class because Tom knows me and he knows that I don't have any reason to not show up on time ….When you know the person, even if it's hard, you still put in that effort to make it there and stay awake and pay attention. In some other courses where you go and you don't even know the instructors' names, you don't really have that drive. (Max2, 10)

Tom's early effort to connect with teacher candidates played a key role in the amount of effort that Max put into the class. He also felt that the physics course was "structured differently than most things and [he] seemed to be getting more out of it than most other courses that are lectures" (Max2, 2). One other significant thing that Max learned to consider as a result of the physics course was "the idea of preconceptions that people tend to keep" (Max2, 5).

Of the participants, Paul spoke most often about his perceptions of how Tom was teaching the course and offered several ideas about why Tom might be trying to teach the class in particular ways. He also perceived tensions between the ways in which Tom was teaching and the ways in which other teacher candidates in the course were prepared to learn. He believed that some tensions were a result of the nature of the relationship that Tom's pedagogy demanded:

> Tom is considering the relationship he has with us and is probably carefully trying to have us understand that and what he hopes [to accomplish] from it: what he's doing, why he's doing it, and who he is …. I feel like most people in the class aren't really buying it. It's not that they don't trust him or like him or anything …. I could be really wrong, but that's what it seems like; they're not taking him up on it. (Paul2, 25)

Paul's perception of the relationship between Tom and the majority of the candidates in the physics course was a source of frustration for him, as indicated in the previous theme. He still trusted that Tom knew what he was doing: "I feel like Tom, even when he asks us how we feel about everything and he just gets complete silence, I think he still probably has some sense of where things are going" (Paul2, 27). Although Paul was quite sure of the pedagogical importance of the relationship between Tom and the rest of the physics class and of the direction that Tom was leading the class, he was less sure of what that productive direction was:

> Tom doesn't do this sort of like, "Here's the focus today, and we're going to do this and this, and then by the end you're going to have x figured out." He just sort of keeps tossing stuff out …. I feel like [class is] this really sort of complicated thing … I think Tom actually has a lot more figured out than even it probably seems. But I feel more like I'm sort of slowly kind of getting a sense of his idea of teaching and not even in a way that I'm really able to express yet, I don't think. But certainly his ideas of classroom dynamics, although I don't think he's being very successful with that because I'm getting a

> little frustrated with our class being too quiet, but I can see what he's trying to do and what he's hoping for, I think. And I think I can see some value in that …. I feel like we just keep getting more and more tastes of it and slightly different ways of looking at it in different kinds of activities that follow that sort of framework. But he never seems to want to conclude anything. He never seems to want to say, "So there you go. That's this." (Paul2, 11)

Paul's comments imply a belief that more co-operation from the other members of the class would help Tom to teach more effectively and thereby help the teacher candidates to take more from the class. Paul's beliefs seemed grounded in a deep trust in Tom's skills as a teacher; he believes that he can learn from what and how Tom teaches. Despite his frustrations, Paul is optimistic at this point in the year: "I think Tom's class is sort of a work-in-progress idea" (Paul2, 45).

Theorizing Teaching and Learning

For the first time, the teacher candidates who participated in the research used the interviews to theorize about the nature of teaching and learning beyond their prior assumptions. They talked about the nature of teaching and learning, both in their host schools and at the Faculty. Candidates' comments about the nature of learning fell into two broad categories: comments about how students in their host schools learn curricular content and comments about how teacher candidates learn to teach.

Max realized that students did not necessarily learn well from traditional ways of teaching: "Five guys at the front will be paying attention, writing notes, and thinking about what you're saying, and then the others would sort of copy down the notes and not really pay attention" (Max2, 4). For this reason, Max's goal for the next practicum was to "try not to teach in lecture mode" (Max2, 1). Paul also noted the effects that lecture-based teaching had on students' learning. Citing his frustrations with the tendency of some teacher educators to lecture, Paul stated: "It made me want to take it more seriously, in that math class when that one kid never wants to sit down and work on his homework. I'm starting to think that maybe I should let him walk around more" (Paul2, 6). Paul also noticed that traditional teaching strategies could produce "an active resistance to learning" (FG2, 29) because students had been so conditioned to trying to find the right answers to questions posed by the teacher. Irene had the same realization as Paul:

> It seems like students learn pretty quickly [what is expected of them]. They get set in their ways, I guess …. My physics classes [that I taught on practicum] were really kind of lectures, you know, with questions and all but not very interactive. Originally, that was expected [by students] …. When I tried to teach differently and it's more involved, they just kind of look at me blankly and ask, "Is this on the test?" … I guess it's just pretty impressive how ingrained that kind of mentality is. (Irene2, 8)

Irene, Paul, and Max all realized the shortcomings of the traditional, transmission-oriented approach to teaching that is so culturally familiar because of the apprentice-ship of observation. At the same time, however, Irene and Paul noted a resistance

from their students when they tried to enact pedagogies they saw as radical departures from traditional teaching.

Many of the teacher candidates theorized about the effect that a positive teacher-student relationship had on students' learning. Max made the following connection:

> I noticed the students who I could talk to or would come for extra help or would just come and say hi after the class were normally the ones who would pay attention during class or try and get something out of the lecture … Just the fact that they were interested made them also want to pay attention and get to know me …. Maybe if I went that extra bit to get the ones who weren't paying attention to get to know me, they would perhaps start paying attention in class if they knew me. (Max2, 8)

Here Max implicitly drew a parallel between the effect that Tom's focus on relationships in the physics class had on his own learning and the effects that his relationship with students on practicum had on their desire to learn. James commented on a tension he felt about developing a relationship with his class: "I think it's really important to have a good relationship with your students, but at the same time you don't want to be friendly with them because you're really not there to be a friend, you're there to teach them" (James2, 13). Irene also experienced some difficulty developing relationships with students that were conducive to learning:

> I found on my practicum I had trouble getting to know students. So I had seating plans and I knew them, but not well enough that I felt comfortable shouting out names and name dropping and when they knew the answer because I might not be able to ask the other guy in the front row because I didn't know his name exactly. I feel guilty about that but it's something I'm going to change in December because I think they feel more involved if they actually think their teacher knows them and then cares about how they're doing. Even in terms of marking they might think "Oh, she doesn't know me …" I'm trying to keep track of that kind of thing. (Irene2, 14)

Like Max and James, Irene set a goal to improve her relationships with her students during the December practicum, not because she was concerned about being liked, but because she theorized that a stronger teacher-student relationship would mean a more productive learning experience for her students.

David and James theorized about how teacher candidates learned to teach. David pointed out the effects of the apprenticeship of observation on teacher candidates' tendency to worry about grades: "We've got these candidates who've been programmed since the day they entered school. Don't forget that most of them have never been out of school yet, they have been trained to get the grades as opposed to getting something out of it" (David2, 26). He also recalled an incident, during Randy Knight's presentation, when he learned about the value of working through a problem in a group:

> Knight had [us work on] these Interactive Lecture Demonstrations, which were thermodynamics-based. I couldn't just look at that question and get the answer right …. He said, "OK, in groups, let's talk about this. See what you

> can come up with and make a prediction." It was funny, because an hour earlier [at the beginning of his presentation] I had looked at this and said to myself that there was no way I could recall any of this, I don't know what's going on …. The process working with the group, just vocalizing stuff and forcing you to communicate with other people. Just by talking it out, you ended up fumbling down the correct path to the right answer, which we ended up with. Left to myself, I probably wouldn't have done it and I would have waited for the answer. (David2, 6)

David's instinct to wait for the right answer, as opposed to working with other people, when faced with a challenging problem was disrupted by Knight's requirement to discuss a problem in groups. James also spoke of his experiences learning to work in groups: "I feel more comfortable in a group of two or three people … you can talk casually, rather than in front of the whole class, and it's good when you hear other students' ideas because they might trigger something that you were thinking about" (James2, 11). It is noteworthy that, although teacher candidates had been told about the value of learning in groups early on in the Faculty, they remained unconvinced of the power of learning in groups until they had a significant opportunity to work through a difficult physics problem with two or three of their peers.

Teacher candidates made more comments theorizing the nature of teaching than they did theorizing the nature of learning. Many of their comments about teaching described their visions of the kinds of teachers they wanted to be. Candidates often set goals for the kinds of teaching strategies they wanted to use during their December practica, in order to bring their visions of the kinds of teachers they wanted to be more closely in line with the kinds of teacher they thought they were. Max found it difficult to attend simultaneously to both the content of his lesson and the students he was teaching:

> I guess I pay so much attention to what I am teaching, I stop paying attention to the class. So I basically turn into a completely different person when I start teaching. Stop talking. Get the class organized, start the lesson, teach all boring. I'll stop, look back, and be like, "I haven't paid attention to anything else for 5 minutes." And then you look out, and think, "Oh no, what's going on now?" It takes so much of my attention still to get up there and write the lesson down and make sure I am doing everything I want correctly. But I really need to do both at the same time. (FG2, 84)

James had a similar experience to Max: "I was so focused on *my* learning, how *I* was teaching, I forgot to focus on how all the kids were learning" (FG2, 85). James also noted the importance of working co-operatively with other teachers and teacher candidates because "you can just give each other teaching ideas if you're part of a team" (James2, 12). James was particularly interested in exploring teaching strategies that encouraged students to take a more active role in their own learning as opposed to "doing worksheets and going through the motions" (James2, 8).

Irene lamented the challenges of incorporating active-learning pedagogies into her teaching: "I want to try more, but I don't really know what I can do …. It's felt like all of my lessons have been, 'Here's the concept, now let's do the math so that

you know it.'" She felt trapped by her tendency to fall back on familiar, default methods of teaching. Similarly, Paul stated that he wanted "to focus on the core of understanding math with these kids … to get them to think about understanding what they are doing." Both Irene and Paul were concerned about becoming mired in the rote elements of problem solving, stating they wanted to help students to understand the conceptual foundations of mathematics.

In addition to setting specific goals for themselves during the next practicum, teacher candidates theorized about the nature of teaching in general. Paul, David, and James all discussed the importance of relationships in teaching. On a pragmatic level, James felt that "telling a personal story while you are teaching a lesson" (FG2, 38) could help students relate to their teachers, and hence become more interested in the material. David agreed, citing his practice of greeting students at the door and chatting about video games (FG2, 39) before class began as a way to form relationships with his students. David mentioned that he learned the importance of establishing relationships with students from observing the ways in which teacher educators interacted with teacher candidates in his classes:

> I found that teachers who establish an environment of trust, they're given a break compared to individuals who haven't…. [If] you start down the wrong path you're never going to get off it. It's important to start things the right way, or start out the way that you want the class to go … establish the class environment that you want for the semester and model it. (David2, 8)

Paul went one step further:

> Working towards the relationship is pretty integral. It's not just sort of like a helpful thing, like "This will go better if you like me" or "You'll listen to my lectures more if you think I'm a fun person." But more that that relationship is actually a specific part of the teaching, and that if that relationship's not working, then there's some kind of failure there on someone's part. (Paul2, 29)

Significantly, both David and Paul articulated the importance of establishing a positive, productive relationship between teachers and students. Teacher candidates learned about the importance of relationship by considering their own relationships with their teacher educators and the impact of those relationships on their learning.

Teacher candidates used the term *the basics* to name traditional, teacher-centred approaches to teaching and learning. They admitted that they were more comfortable falling back on the basics in their own teaching; some went so far as to suggest that a mastery of the basics was a necessary prerequisite to using a more active, student-centred approach in their classrooms. Max characterized the practicum as follows: "You're learning the basics … [about] how you really want to be a teacher" (Max2, 16). Irene was concerned about her tendency to try to "get down the basics first" because she was concerned about "things becoming so ingrained"; she did not "want to get used to teaching the way everybody did" at her high school when she was a student (Irene2, 17). During the focus group, Irene commented that teacher candidates "have this conception … they have to teach in this general way that people always do" (FG2, 45) because they "assume that normal teaching is easy,

and we have to do that before we do anything else" (FG2, 47). Paul challenged this idea, saying that teaching that focuses on engaging students with active-learning approaches "isn't just basics done better, it's totally independent [and] different from day one" (FG2, 51).

Perhaps part of the reason why some teacher candidates felt a need to master a traditional approach to teaching before enacting unfamiliar pedagogy is that their apprenticeships of observation have conditioned them to expect teaching to look a certain way. Both Paul and David commented that traditional approaches to teaching resulted in certain default behaviours for both teachers and students on practicum. According to Paul, traditional teaching seemed to result in "kids who really aren't engaged and are mostly either just looking for marks, or not really looking for anything in particular and just sort of showing up" (Paul2, 22). By the time students reach high school, David felt, "students see it as the responsibility of the teacher to make them work" (David2, 25). Paul believed that part of the problem with encouraging students to take responsibility for their learning was not only that they were unused to that kind of teaching, but also that "people are often pretty lazy and they like getting away with not doing work a lot of the time if they can" (Paul2, 18).

The teacher candidates who participated in this study were able to theorize about the nature of both teaching and learning during this round of interviews, apparently because they had practicum experiences on which they could base many of their theories and in part because they could compare how they were taught by teacher educators in the program with how they were trying to teach their students on practicum. The next section examines in greater detail how teacher candidates learned from practicum experiences.

LEARNING FROM PRACTICUM EXPERIENCES

Each of the teacher candidates constructed narratives to share practicum experiences and to situate themselves on a professional knowledge landscape (Clandinin & Connelly, 1995). Three themes are discussed in this section. The first theme presents excerpts from the narratives the participants shared about powerful events that occurred during the practicum. The second theme interprets the nature of candidates' relationships with their associate teachers. Finally, the third theme illustrates some of the tensions experienced by candidates during the practicum.

Narratives from the Practicum

Many of the narratives about the practicum shared by teacher candidates focused on what they learned from considering the effects of particular teaching strategies on students' learning. For example, Irene learned the importance of organizing notes that she wrote on the board early in the practicum:

> I wrote things on the board and then we did the lab [based on my note]. One kid handed in his lab and he had written the note in the top half of it, but it fit in the top little margin! He just wrote it there [at the top of the page], kind of scribbled down little drawings because he wasn't sure if I wanted them to

> write it down or not …. It taught me to … make my [expectations of] board work a bit clearer. (FG2, 21)

Max had a similar experience to Irene's, when he noticed his students creating a "jumbling half of a diagram, then writing on their pages, then the other half of the diagram" (FG2, 23) in response to the note he created using a whiteboard and smartboard simultaneously. Both Irene and Max learned that their students tended to reproduce notes exactly as they saw them, with minimal consideration for how they would later use the notes as a learning tool.

One narrative that was nearly universal among the teacher candidates was the story of how difficult it is to move students beyond their focus on correct answers. James found this tendency particularly frustrating when he spent time providing students with written feedback on their assignment: "The kids wouldn't look at the comments; they would just look at the answers to see if they got it wrong" (FG2, 79). Paul's narrative about students' focus on correct answers resonated with the rest of the candidates in the focus group:

> I had this one kid who was asking me questions [in my math class]. The question was, "Can I multiply this here, in math?" I didn't want to say, "Yes," I wanted to say, "Well, why do you think you should do that?" I wanted to lead him a bit. I tried to lead him for a while. After a while, he was like, "Can I?" and finally I said, "Yeah, you can, because …" And as I started on the "because," he interrupted me and said "THANK YOU! The answer was 'yes' to my question." (FG2, 31)

James related a similar story about an event that happened in his grade 9 science class. During his unit on astronomy, a student asked if stars varied in size. The students were content with his one-word answer (yes); James said that when he tried to explain the reason, his students "just didn't care." David contributed the same kind of narrative based on his experiences in a grade 10 science class:

> I had this activity that I used with the grade 10 applied when we were talking about acceleration …. They weren't really getting the concepts, so I put them in groups [and gave each group] a cartoon picture …. A lot of them were easy, like a dog sitting on a sled zooming down an ice slope. The whole point of the exercise was to describe, using common language, what was going on [in the picture]…. [One picture], a bungee jumper, I just wanted them to look at one thing: after you initially jump off and the rope becomes initially taut just before you slow down. They all looked at different parts of the motion, either when it was speeding up, slowing down, or stopped. So when we took this [exercise] up as a class – and it went over really well, they were all engaged and talking about the pictures – when we got to this [bungee jumping] picture everyone had a different answer. It was OK, there are all of these different things, in one case this is happening and in another case this is happening. There were probably 200 solutions, and they all just wanted to know, "But what do we write down?" But what's the answer? [I said] "There is no right answer; they're all right answers." [They said] "But what do you mean they're

> all right answers?" I tried to calm them down by saying that if they had anything like this on the test it would be clear cut. It wasn't hard to get them engaged and talking about it, but at the end it came down to, "But what's the answer? What do I put on my sheet?" (FG2, 32)

David's narrative serves as a reminder of how conditioned most students are to seek the right answer from their teacher. He alluded to some frustration with the fact that, despite planning an engaging, open-ended lesson, in the end students were concerned only with having the right answers on their worksheets.

In a related set of narratives, some of the teacher candidates commented on the challenges inherent in asking and answering questions in a productive way when the same students always want to contribute to discussions. James found it difficult to balance questions that were slightly off topic with his natural desire to "move [his] lesson along" (FG2, 40). Irene stated:

> Questioning is harder than I thought it would be. I knew it was hard, but … I had this one class where there was one really smart kid and he meant well … The teacher would ask a question, nobody is answering, and so he would raise his hand because he wanted the teacher to know somebody knew it. Meanwhile, I'm like, "Somebody else answer … I know you know it." (FG2, 41)

Max had a similar experience with a student who insisted on "telling the answer as he gets up out of his desk" (FG2, 42). He went on to say, "I think that one of the hardest things I've learned that I thought was simple was asking the class a question" (FG2, 42).

The narratives that teacher candidates shared about their practicum experiences provide a window into some of the challenges they faced during their early teaching experiences. Often, teacher candidates learned about teaching when their students did not act according their prior assumptions about how people learn. Candidates were often frustrated when forced to confront the effects of their teaching on students' learning.

Associate Teachers

The relationship between teacher candidates and their associate teachers can be characterized as a dynamic interplay between the freedom candidates felt to enact their own pedagogies, the restrictions they felt to conform to their associate teachers' styles, and the extent to which their associate teachers modelled effective teaching practices. Of the teacher candidates who participated in this research, only David felt as though he was given enough freedom by his associate teacher. He characterized his relationship with his associate teacher in the following way:

> I was given the freedom, not right off the bat, but certainly after a few days in, I could do whatever I wanted …. I guess that was because of the trust that was established between the two of us early on. My first day in front of the class, [my associate teacher] told me that he was very happy and surprised by how poised I was, that I didn't fumble, and that I had a good rapport with the

> students. He said I did extremely well …. [thus] it was very easy for a quick establishment of trust which allowed me to try my own things. I know lots of candidates who weren't even given that initial opportunity to stand in front of the class early on. They ended up being placed with associates who weren't as comfortable, and had to wait as many as 3 weeks in some cases. They were very restricted … .The first day in front of that classroom will probably have a big effect on how that associate perceives you. (David2, 12)

David also mentioned that he received feedback from his associate teacher after every class in the form of two pages of comments that gave him "a sense of timing and a sense of how often and when there was some sort of change between what we were doing and something else in the class" (FG2, 37). Of particular importance was the consistent message David received from his associate teacher: "Just do what you want. You'll make mistakes, we all make mistakes" (FG2, 37).

In contrast with David, Paul's relationship with his associate teachers was much more limiting:

> I couldn't use many of my ideas because I had two associates that were really rigid. Especially the grade 9 room where these kids were crazy and the teacher's solution – and she was great, I learned a lot from her for sure—but her solution was to just keep everything very rigid, every single lesson. So, take out homework, do examples, quiet homework time … every single day. There was no room for anything else at all. I had to do that in her class, because of the repetition, it worked the way she wanted it to. (FG1, 54).

In his individual follow-up interview, Paul went on to say that the same associate teacher "basically wanted [him] to be her" which, although she had "a lot to teach [him]," did not allow him to "get a good sense of [his] teaching" (Paul2, 32). He expressed his frustration, saying "I feel like there's so much that I'd really like to try and it's just restricted by the fact that it's someone else's class" (Paul2, 35). The situation was not much better with Paul's other associate teacher, although "there was a bit more room to move, [the associate teacher] wouldn't give much feedback" (Paul2, 37). An additional confounding factor to Paul's practicum was his perception that "a lot of the restrictions and teaching styles [of his associates] were really opposite to what [he] was learning here [at Queen's]" (Paul2, 42).

David and Paul seemed to be at opposite ends of a spectrum between being given a lot of freedom to enact their own pedagogies and being restricted by an associate teacher who had very particular expectations. The relationships that Irene, James, and Max described with their associate teachers seemed to fall somewhere in between these two extremes. Irene spoke about how her associate teacher modelled his expectations for teaching a class. She said, "My associate teacher, he was really good. He taught more of a lecture style because he had mostly grade 12s and he wanted them ready for university" (FG2, 35). Irene also thought her associate teacher "was really great when we got to talk one-on-one … that was wonderful to have his support" (Irene2, 11). Neither James nor Max spoke at length about the nature of their relationships with their associate teachers. During the focus group James mentioned several pieces of advice that he received from his associate teacher,

whereas Max talked about the collaborative relationship that his associate teacher had with other people in the department. Both James and Max implied that they had respect for their associate teachers' style, and that they were learning a lot from the advice they were given.

The nature of the teacher candidates' relationship with their associate teachers was, not surprisingly, a significant factor in their perception of how much they learned during the practicum. At one extreme, Paul felt restricted by the lack of freedom he had to try the pedagogies he embraced as a result of his experiences in Tom's physics course. On the other hand, David was grateful for the latitude provided by his associate teacher, and he frequently commented on the high quality of feedback he received on his teaching. Interestingly, both Paul and David commented during their individual interviews that, if possible, they would advise teacher candidates to ensure they had a productive relationship with their associate teachers. Paul quipped, "I wish I could give the advice to try and get a really great associate teacher to work with, but I don't think you can really do that" (Paul2, 42). David suggested that candidates should "get out into different classrooms and different associates" (David2, 12).

Tensions during the Practicum

The October practicum was, at various points, a source of tension for the teacher candidates. The source of the tension most clearly articulated by participants was the tension between how they thought they *should* teach and the reality of their *actual* teaching. Often, this tension was framed as a conflict between the messages they were receiving about teaching from Queen's and the messages they were receiving from their associate teachers. James related an example of this issue:

> In physics class we're really focusing on making sure that the students really understand the concepts. And I found on my practicum I would attempt to have students understand the concepts but my associate teacher said, "Well, just tell students what they need to know for the test." For instance … we were learning properties of stars, and I found myself wanting to explain to students how we understand, why we know certain stars are brighter than others, certain stars are bigger and more massive than others … But my associate seemed to say, "Well, you know they're not really going to be tested on that so just tell them that stars are brighter and some stars are bigger and …" So I guess that was a bit of a conflicting message because I didn't think that the students were really learning much by taking that approach. (James2, 16)

The candidates also commented on how the time constraints they were under in the practicum prevented them from enacting the pedagogies they felt would help students to learn effectively. The requirements associated with teaching everyday often superseded the lofty goals candidates had for their time on practicum. As Paul remarked, "Once you're actually in there, all this stuff you've heard [at Queen's] kind of fades. You're trying to focus on coming up with things in front of the class" (FG2, 3).

Max commented that he did not "feel ready to try a lot of things" (FG2, 118) on his practicum. James agreed, stating "We spend so much time getting ready for the next day. We don't have time to go through a manual; we have to teach the next day" (FG2, 44). Irene called the practicum "overwhelming," which resulted in thoughts such as "Oh man, there are 25 kids here. Just do the lesson … this works for most of the kids so I'll stick with that" (Irene2, 19). Candidates wanted to teach in a more progressive way, but felt that they had to use traditional teaching strategies as a way of coping in a stressful practicum environment.

Another source of tension for teacher candidates was the expectations they placed on themselves during the practicum experience. Irene lamented that she felt badly because "two of the other teacher candidates [in her host school] were on sports teams but … [she] found there was enough on [her] plate" (FG2, 108); the pressure to help with extracurricular activities was overwhelming, "it added to the pressure [on the practicum] … if I was a volleyball star in high school, I would have helped with volleyball" (FG2, 110). Frequently, the teacher candidates commented on the late nights they spent planning for the next day: "I struggled to go to bed before midnight" (FG2, 74); "There was a lot of work, I didn't sleep a lot" (David2, 16); "You're just so busy trying to get ready for the next day" (James2, 21). Paul felt that there was tacit pressure put on teacher candidates to take on more than they were ready for:

> I think I saw some people that took it, took too much on, and maybe even took the practicum a bit too seriously. Not that you shouldn't take it seriously, but a couple of people at my school were teaching three courses within a week and were incredibly stressed about it and felt like, and sort of felt maybe pressured into it. (Paul2, 43)

Max thought that the tendency to stay up late every night to plan was "not a healthy balance" for teacher candidates on practicum (Max2, 17). He argued that candidates should be careful about how much they take on during the practicum, saying "It is more important to really figure out what you want to do and how you want to do it, as opposed to just getting as much experience a possible because there is plenty of time for getting experience" (Max2, 15). Irene agreed, stating that "balance and reflecting" (Irene2, 23) were the most significant challenges she faced on her practicum. She regarded her practicum as "an opportunity to learn and think" (Irene2, 23), and tried to ensure she had time to take a step back from the hectic pace of the practicum to do both of those things.

LEARNING EXPERIENCES IN THE PHYSICS CLASS: TEACHER EDUCATORS

The perspective of the teacher educator can again be represented by one overarching theme: exploring active-learning pedagogies. During the six classes of the November on-campus weeks, Tom revisited themes that he had introduced during the first month of the program. Tom continued to develop the idea of teaching in non-traditional ways by explicitly modelling the use of active-learning pedagogies such as Predict-Observe-Explain and Rubbish Notes, both from PEEL (Baird & Northfield, 1992).

In addition to reminding students of how it feels to learn in an active-learning environment, Tom added a more explicit metacognitive component to his course by providing opportunities for teacher candidates to work with him at processing their own learning both in the physics course and in the program in general.

Revisiting PEEL

Tom began the first class by inviting the candidates to have some unstructured "time to talk" (Journal, November) in their table groups, in order for candidates to reconnect with one another and continue developing the relationships that had been suspended for the month of October. During the conversations, he made an effort to spend a few minutes conversing with candidates at each table group. After 30 minutes, he asked candidates to write a short response to the question "How did the teaching you did during September [i.e., Lesson Study] have an impact on your learning during your October practicum?" (Journal, November). Most candidates immediately began writing their responses, while some continued their conversations at their table groups for a few extra minutes. After 20 minutes of nearly silent writing, candidates got up to take the coffee break they had come to expect. Tom reconvened the class formally after a 15-minute break to make some announcements regarding the guest speakers he had invited to the class in upcoming weeks.

After the announcements, Tom directed candidates' attention to a Wimshurst machine, an electrostatic device designed to generate high voltages by manually cranking two parallel insulated disks in opposite directions. Tom explained that the output terminal arms were connected to metallic leads, which were in turn placed in vegetable oil in a clear glass dish on an overhead projector. After sprinkling grass seed on the oil, Tom asked the candidates, "What might someone predict would happen and why?" (Journal, November). After obtaining five possibilities from the class, he cranked the Wimshurst machine to generate a potential difference, and the candidates watched as the grass seed arranged itself in an electric field pattern in the vegetable oil. Two candidates offered their explanations at the conclusion of the POE.

After telling the story of the first time he used a Wimshurst machine during his own student teaching experience, Tom invited the candidates to change their focus from attending to the POE to attending to how he was teaching the class. He said:

> You've noticed that at the end of some of our classes, I've been trying to get you to ask me questions about how I am teaching. You've been at this for two months; you can now pretty well predict your classes here and what the practicum is like. How do the two modes add together to you becoming a teacher? Isn't a big part of the difference between the practicum and what you do here that you learn best when you're doing something, even in classes here? Have any of you tried to play with that notion in the school with the students? (Journal, November)

The teacher candidates seemed not to know what to make of the questions Tom asked. After what seemed like a long silence, a few of them offered comments about the lab activities they had done with students during their practicum experiences.

At the conclusion of the first class, Tom revealed to me that he "felt better about the class than he could possibly have dreamed of" (Journal, November), even though the time that he provided for students to talk at the beginning of class was much longer than he originally planned for, a situation that would probably cause a fair amount of discomfort for many teachers. It is particularly significant that Tom did not begin the first class back, at least in a formal or traditional sense, until nearly 75 minutes after the class began. He recognized the importance of giving the candidates time to reconnect after a long absence, and trusted that their unstructured time to share some experiences would be used productively. By making an effort to sit at each of the table groups, Tom provided himself with an opportunity to reconnect with his class in small groups. The most important feature of the first class in November was the continued emphasis on the classroom community. The Wimshurst machine POE was an important reminder of the active-learning pedagogy that Tom introduced in September. The discussion at the end of class foreshadowed the Think-Aloud pedagogy that Tom was to introduce later in the November block of classes.

The second class in November began with the following prompt from Tom to the teacher candidates: "How many people asked students to copy things off of the board? How many of you had students ask, 'Are we supposed to copy this down?'" (Journal, November). After the candidates agreed that the situation was indeed familiar, Tom said, "This is going to be a silent exercise. I want you to focus on what it feels like to copy notes from the board" (Journal, November). Tom then proceeded to write the following paragraph on the board:

> The degree of rainfall for each half-year and the annual seasonal deficit are the systems which determine which areas will receive rain and which won't. However, in planning where to plan crops it is not enough to know the system; one must also take account of the different levels within each seasonal system. We much also know how much of the soil will be lost by evaporation. (Hynes, 1987, p. 30)

The paragraph is nonsense. Tom used it as an example of PEEL procedure F5, Dirty Tricks, which are designed to "demonstrate how students accept uncritically what they hear or read" (Baird & Northfield, 1992, p. 254). A few of the teacher candidates noticed that the paragraph was meaningless and shared their opinions with the class after Tom had written the note on the board.

Tom admitted to doing the exercise as a way of introducing several ideas at once. On one level, he wanted candidates to consider the implications of the traditional teaching and learning behaviours associated with copying notes from the board. He pointed out that students exhibit a wide range of reactions to copying notes, and many accept uncritically everything they write. The same range of responses was present in the physics curriculum course. Tom asked candidates, "Do you think that teachers assume that kids think when they write it down, or is it more 'Write now, learn later'?" (Journal, November). The Rubbish Notes had a particularly strong effect on James, who said during the focus group: "That little note-taking exercise was an eye-opener for me … it definitely changed the way I think about writing

notes on the board. When we were writing the note, I didn't even think about what I was writing" (FG2, 1).

Tom chose the Dirty Tricks procedure as a way of introducing candidates to the procedures contained in the PEEL database. After describing how PEEL began, he emphasized that the purpose of PEEL procedures was to "recruit students into the learning process" (Journal, November). Teacher candidates were then given the opportunity to explore the PEEL website (http://peelweb.org), with the caution that the procedures "are not an instant fix for tomorrow's lesson" (Journal, November).

During the first week back on campus, Tom used the PEEL procedures POE and Dirty Tricks as a way for candidates to revisit the theme of active-learning pedagogy that he introduced in September. In a post-class conversation, Tom stated, "Despite their early enthusiasm for doing POEs in this course, candidates rarely try a POE during practicum" (Journal, November). The data obtained from teacher candidates who participated in this study corroborated Tom's assertion. Candidates indicated that they felt too constrained to try non-traditional teaching strategies on practicum, because of the expectations of their associate teachers, their focus on getting through the next day's lesson, or a combination of both. It is likely that Tom's focus on the active-learning pedagogies of the PEEL project was intended not only to remind candidates of how it feels to learn in a more student-centred environment, but also to challenge them to try one or more PEEL procedures during practicum.

Learning about Teaching Physics from a Physicist

As a primer for Randy Knight's visit, which occurred outside of regular class time, Tom asked candidates to consider how Knight teaches about his ideas of teaching physics. During his presentation, Knight was quick to state that he is a consumer of Physics Education Research, as opposed to actually being involved in research on how students learn physics. He characterized himself as an "applied scientist" (Journal, November) who wanted to use the results of Physics Education Research to help the weaker students improve their experiences with first-year physics courses. Knight characterized the teacher candidates as "somewhere in between" (Journal, November) being experts and novices in physics, and challenged them to think about the mental models they have for a variety of physics situations. Knight's central thesis was that "misconceptions about physics are both deeply ingrained and difficult to see" and "traditional lecture-mode instruction, regardless of the instructor, has minimal impact on students' conceptual understanding." (Journal, November).

The majority of Knight's presentation to teacher candidates followed from a slide entitled "Making an Active-Learning Classroom Work for You" (Journal, November). He introduced candidates to his Interactive Lecture Demonstrations (ILDs), a teaching strategy that is similar to POEs. Candidates had the opportunity to participate in ILDs that focused on principles from optics, electricity and magnetism, and thermodynamics during the seminar. Knight concluded with a question-and-answer session, during which he challenged teacher candidates to teach less physics content in a way that would promote active learning, as opposed to teaching more physics content in a lecture style that does not result in most students developing a deep understanding.

Comments from the five teacher candidates who participated in the study indicated that Knight and his ideas about teaching physics were well-received. James said:

> It was great to get Randy Knight in. I've read parts of his book but it was actually really nice to actually do some of the things that he was talking about in his book. Because when you read about it and actually do what he advocates, it really helps you understand how it works and why it will work better in a physics classroom. (James2, 7)

Irene admitted that she "didn't read Randy Knight's book until this past weekend … but that when [she] read it, it started to really click that [she] was really used to lecture style" (Irene2, 1). Irene was concerned, however, that "it's still very hard to incorporate [Knight's ideas]" (Irene2, 9). Paul also felt that, because Knight "was usually working with university students," the ways in which he implemented his teaching philosophy would be "pretty different" (Paul2, 21) from a secondary school teacher. In contrast, David felt that implementing Knight's ideas was a matter of deciding to "just do it" (David2, 4) in one's own classroom.

One of the interesting things about Knight's visit was that, unlike the guest speakers who are usually invited into the physics course, Tom did not have a pre-existing personal relationship with Knight. In addition, although he obviously gives a lot of thought to the way he teaches undergraduate students, Knight was a physicist at a teaching university, not a high school physics teacher. Tom admitted to me that he "didn't have a sense what Knight was going to do with the candidates" (Journal, November) before he came, so it was fortuitous that Knight emphasized many of the same points that Tom had introduced early in the course. Before Knight's visit, Tom asked the class, "Would most of you admit to having a deep-seated fear of sending students off to university unprepared for what they'll find? You know what they'll find [lectures], so the answer must be 'Give it to them now!'" (Journal, November). It was meaningful for candidates to hear that lecturing is generally an unproductive way to teach physics from a *physicist* who teaches first-year physics courses, even though Tom had been working hard to convey that message since the course began.

Processing Learning in the Physics Course

The third and final week in the November block began with simple physics equipment: one flashlight bulb, one AA battery, and one piece of wire per teacher candidate. Tom introduced the activity in the following way:

> I'd really like you to work at this next activity on your own. Some of you will take a few seconds; some of you will take longer. That's OK. The point is whether you learn something about how to work with kids. Everyone gets one bulb, one wire, and one battery. Find how many ways you can make it light, without breaking the wire. (Journal, November)

When the candidates reconvened 10 minutes later, Tom asked them to share their perceptions about what one needs to know in order to make the bulb light. Many candidates in the class made comments about how safe they felt doing the activity.

The majority of this class was devoted to three POEs that used simple physics equipment. The first POE explored the concept of voltage in a DC series circuit by asking candidates to predict the relative brightness of bulbs connected in series. This POE was planned as a direct follow-up to one of the concepts that Knight explored during his presentation. The second POE required candidates to think about the concept of circular motion as they predicted the path that a ball would follow after leaving the curved surface of the rim of a paper plate. The third POE also followed up on a concept mentioned by Knight. Candidates were asked, in groups, to predict the shape of the magnetic field produced by a flexible fridge magnet.

At the end of the class, after candidates had spent the majority of their time exploring physics concepts using variations of the POE procedure, Tom asked the candidates to sit in a large circle around a group of tables. He switched on a digital recorder and said:

> If the recorder puts you off, you can either leave or stay silent. It's very strange to say, but we're halfway through our time together. We aren't going to see each other until January. What I am interested in hearing from you is whether you've worked out how I am trying to work with you, and if you have any questions about how I am working with you. Questions, descriptions, suggestions? (Journal, November)

A few of the candidates offered comments about Tom's focus on active-learning pedagogy in the physics course and their perception that he wanted candidates to try to use those teaching strategies during their practica. Tom went on to say:

> The standard frame of mind is: I told you, I taught you, you know it, now go out and do it. The big gap is between I taught you and you know it. The real issue isn't to slam the lecture method, but to understand it. The first year of teaching is not about applying what you learn here. This year is about learning how to track your own development, so that in those rare moments in the first year when you have the opportunity, you will take a minute and track what happens to you. The first year is hell, and there isn't a teacher education program on the planet that can change that. The buck stops with you and the textbook is novel. The nightmare is keeping up with the kids. Once you've been through a textbook once, the second time is so much easier. After 5 years, you'll know your subject inside and out. We all grow up inheriting the notion that virtually every science teacher teaches in such a way that they can tell the students, then send them to the back of the lab and verify it. Instead, give them some kind of experience, talk about it, then more experience. The first four weeks you learned the ropes. You're going back and you know where things are. You know the students' names. Did that wind anyone up? (Journal, November)

After a few minutes, Tom switched off the recorder and said, "Let's leave it at that" (Journal, November). He went on to make a few announcements about the final class of the November block.

Tom attempted to engage the candidates in a Think-Aloud, which Kosminsky, Russell, Berry, and Kane (2008, p. 197) describe as "a metacognitive strategy in

which we [teacher educators] think publicly about our thinking processes … and examine those processes with our student teachers." In this particular instance, teacher candidates did not take the bait; they did not choose to engage with Tom in a discussion about how he was teaching and how they were thinking about learning to teach. As Tom would later note, the "silence was awkward for some [of the teacher candidates], but several did manage to offer some personal perspectives" (Kosminsky et al., 2008, p. 199). We met immediately after the class and I offered a comment: "Perhaps the candidates are overwhelmed with the idea of going back to their host schools. They only have four more days here and their attention may already be switching to pragmatic issues" (Journal, November). We both agreed that it was important to return to the idea of Think-Alouds in January.

Consolidating November and Looking Ahead to January

The final physics class in November began with a mechanics activity for candidates to complete in small groups. Each group was assigned a set of distance-time, velocity-time, and acceleration-time graphs and given a toy car. After a few minutes of discussion, representatives from each group had to use the toy car they had been given to demonstrate to the class the motion described by the graph.

During the presentations, Tom frequently interjected with clarifying questions to ensure that candidates could verbally describe the graph they were responsible for presenting.

The majority of the final class was devoted to a presentation by a local associate teacher who was a student of Tom's many years ago. His presentation focused on showing the candidates examples of how teaching strategies such as POE and ILD might be implemented in the high school classroom, with suggestions on how to assess students' learning in non-traditional ways. His presentation resonated with James, "I like what [he] said, 'You're not going to be a perfect teacher after your first year, it takes time'" (James2, 3). The class concluded with Tom thanking the teacher for his presentation and wishing the candidates well on their practicum.

Tom and I met after the final class to discuss the November block as a whole and look ahead to the lengthy amount of time he had with the candidates in January. Tom said that he was comfortable with the way the previous three weeks had unfolded, although he admitted to feeling that "everything was spun around what Knight was doing" (Journal, November). From prior conversations that we have had over the years, I knew that Tom considered January to be the most important part of the physics course. I asked what his thoughts were as he looked ahead to January in the physics class:

> January is it. I try to keep the show going in September and November, but January is pivotal because the program is half over. Candidates have had more time to process the transition between their undergraduate degrees and their teacher education program. They've had time in schools; many have had more than one associate teacher. The challenge for me is to come across as signal rather than background noise. We [in teacher education] pay a high price if we don't work to understand where candidates are at, how they are different,

> after they've had significant practicum experiences. Only in conversations with teacher candidates can we help them to see some of the big picture perspectives of what is actually happening over the course of the teacher education program. (Journal, November)

We then discussed possible activities to engage the teacher candidates upon their return in January. Tom's notion of "signal" versus "noise" struck me as an important distinction between the types of learning experiences teacher candidates were having at the Faculty. How does Tom manage to consistently be perceived as signal rather than background noise by the teacher candidates who participated in this study?

CONSTRUCTING PROFESSIONAL KNOWLEDGE FROM TEACHING AND LEARNING EXPERIENCES

In this final section of the chapter I summarize the professional knowledge constructed and co-constructed by the teacher candidates and teacher educators who participated in this study. The themes in the data are synthesized with a view to making claims about how participants were theorizing teaching and learning during the second phase of data collection. The overarching theme of this block was the cognitive conflict between candidates' expectations of teaching and learning and the kind of teaching they themselves were enacting in the practicum and experiencing in teacher education classes.

The five participants in this study left for their October practicum placements full of ideas about how they wanted to teach and what they wanted to learn. As shown in the previous chapter, some of the effects of their long apprenticeships of observation had been named and called into question by ideas that were presented in the physics course. After four weeks of practicum experiences in host schools, working with associate teachers of varying levels of utility to their learning, the teacher candidates somewhat reluctantly returned to Queen's for the November block of classes. Their teaching experiences during the practicum had changed them. For the most part, however, they returned to a teacher education program that had not changed to suit their needs as learners.

When teachers try to improve their practice, it is possible and even likely that they will have to acknowledge experiencing themselves as a "living contradiction" (Whitehead, 1993, p. 70). The practicum experience is no exception, for the question of "How do I improve my practice?" (Whitehead, 1993, p. 69) is precisely the question that engages each teacher candidate on a daily basis. Like their more experienced counterparts in education, teacher candidates "have the experience of holding educational values and the experience of their negation" (Whitehead, 1993, p. 70) on a regular basis. Candidates' educational values have been shaped largely by their apprenticeships of observation, but they were also informed by their learning experiences in the physics course in September, the ideas they took from the Faculty of Education, and the expectations of their associate teachers. For teacher candidates, the potential for experiencing contradictions between the teacher they are and the teacher they want to be is perhaps greater than it is for either experienced teachers or teacher educators. At various points, for the candidates who participated in

this study, the experience of being a living contradiction seemed to be nothing short of an existential crisis.

The experience of living contradiction began the moment teacher candidates entered their host schools in October. One of the most consistent conclusions of teacher education research is that, for teacher candidates, the practicum is the most powerful learning experience of their preservice programs (e.g., Smith & Lev-Ari, 2005). Yet powerful learning experiences are not always positive; learning can also be powerful during moments of cognitive conflict. The educational values held by teacher candidates going into their placements would eventually come into conflict with their lived experiences. The teacher candidates told narratives to situate themselves on the professional landscape of teaching and learning and to share stories of such conflicts. They shared what they learned when they experienced themselves as living contradictions arising from interactions with their students and with their associate teachers. They theorized about the kinds of pedagogies they wished they could enact, and they told cover stories to excuse why they had yet to enact them. They told stories about the constraints imposed by associate teachers, by the requirements of curriculum, and by their fear of teaching in ways that feel radically different from what they were taught by their apprenticeships of observation. The constraint of the apprenticeship of observation is salient, revealed by language such as the need to master "the basics" (Irene2, 17; Max2, 16) of teaching. The *basics* of teaching is a synonym for the traditional approach found in so many schools: teacher-centred, with an emphasis on telling students information. This is not to belittle the cover stories told by teacher candidates. The grammar of schooling (Tyack & Tobin, 1994) is a complicated set of cultural tools that are difficult for experienced teachers to navigate. It is unrealistic to expect teacher candidates to do anything other than construct cover stories as they struggle to conform to the multiple pressures of the grammar of schooling. Nevertheless, the candidates who participated in this study put considerable pressure on themselves. Their narratives of the practicum include tensions that reveal how teacher candidates experienced themselves as living contradictions.

The existential crisis begins when they are pulled back to the Faculty, perhaps having just found a rhythm to their practicum experiences. The default reaction upon returning to the university is to revert immediately to the familiar student role. However, their recent experiences teaching in schools seemed to make them much more critical of the ways in which they are taught by teacher educators. After a practicum experience full of critiques from associate teachers, it is not surprising that candidates return to the Faculty with a somewhat impatient attitude toward teaching strategies that are not having productive effects on their learning. Teacher candidates seemed to come to the Faculty of Education with expectations that were so low that teacher educators could have done almost anything and the candidates would not have questioned what they did. Practicum experiences taught candidates the questions they needed to ask: They returned to Queen's with much higher expectations of their teachers and of themselves. Although the on-campus portion of the program has the potential to relieve many of the symptoms of the existential crises associated with experiencing oneself as a living contradiction, the program seemed to fall short of its potential.

The teacher candidates continued to be strongly influenced by their peer groups, both within the physics class and in the program as a whole. Again, if teacher candidates who participated in this study experienced themselves as contradictions in varying degrees over the practicum, then it follows that the anxiety associated with the quest to answer the question "How do I improve my practice?" is amplified many times when nearly 700 candidates return to the Faculty in November. The "negativity, negativity, and more negativity" (David2, 17) could be seen as a natural consequence of so many candidates simultaneously trying to resolve inner conflicts about the nature of teaching and learning. Although the candidates who participated in this study did not, by and large, have the same perceptions of their peers in physics as they did of their peers in the overall program, it could be that the frequent silences and perceived lack of co-operation that was so frustrating to Paul were symptoms of the same kinds of anxiety being experienced throughout the program.

Tom's pedagogy resonated with the teacher candidates because *how* he teaches generally matches *what* he teaches. The candidates' frequent descriptions of Tom's emphasis on teaching the importance of relationships in teaching by focusing on relationships in the physics course provides clear evidence that the candidates are sensitive to the consonance of his pedagogy of teacher education. The low-risk, trusting environment offered in the physics course seemed to provide a sense of relief for the teacher candidates, even though they were largely unable to articulate Tom's overarching goals for teaching the course. They trusted him as a teacher and, for now, that seems to be sufficient for them to have productive learning experiences in the physics course.

The perspective of the teacher educator reveals Tom's focus on using active-learning pedagogies, a focus that he began in the first class in September. Tom implicitly recognizes that the needs of the teacher candidates change when they return to campus in November; his response is to strengthen the message he began in September. The candidates' experience of themselves as living contradictions is exacerbated in the physics course. Tom maintained a safe environment where candidates were forced to confront the fact that it is possible to consistently teach and learn in non-traditional ways, despite the traditional views of teaching that encourage candidates to master the *basics* before trying anything risky on their practicum. Tom provided experiences that encouraged candidates to live at one end of their lived contradiction, the end where their educational values were challenged and encouraged through PEEL procedures, guest speakers, and Tom's commitment to his relationship with the members of the physics class. Knowing that candidates would return to another practicum experience where educational values and optimism are likely to be implicitly or explicitly negated by the rigours of daily teaching, Tom focused on the opportunity he had to create an environment where candidates were engaged in their own learning, even when they responded to a Think-Aloud with silence. There is no way for a teacher educator to control or mitigate the fact that teacher candidates will experience themselves as living contradictions on practicum. It is possible and, as the data suggest, far more preferable, to engage candidates in conversations about the teaching and learning that occurs in a methods course. The narratives that candidates construct on and about practicum are important

and necessary for the development of their professional knowledge about teaching and learning. The metaphors that teacher candidates use to theorize about teaching and learning offer a far richer potential for teacher educators to help candidates to navigate the treacherous waters of their existential crises.

For the first time in the data, the teacher candidates began to articulate their theories of teaching and learning. Candidates theorized that traditional, transmission-based approaches to teaching fall far short of the goals they hold for the quality of students' learning. They also realized that they did not learn about teaching by being lectured. Candidates theorized that relationships were a specific component of how they approached teaching students. They also realized that they responded to teacher educators who attended closely to their needs as learners. Perhaps most importantly, the teacher candidates who participated in this study realized that there were parallels between how students learn curricular content and how they were learning to teach. The corollary is that teacher candidates could begin to see parallels between the way Tom taught them and the way he hoped they would consider teaching in their host schools and in their future careers as teachers. Tom encouraged them to see as real the possibility of remaining true to their educational values and to embrace rather than ignore experiencing oneself as a living contradiction.