'Making a life': Academics and their roles in teaching, researching and community involvement

This is the second brief in the Centre for Teaching and Learning, or CTL's 'Making a life' series, where we explore the attitudes and experiences of academics at Stellenbosch University, with regard to their roles in teaching, research and what is generally called 'community involvement'. The series was approached as a set of interviews with individual academics, which took the form of reflective conversations between a CTL researcher and the individual academic. Academics approached for the interviews were not sampled, but drawn from different departments and different disciplines, and tended to be those who had had some involvement with CTL. At times we have incorporated other texts into the brief, to enrich the sense of the activities academics engage in, in 'making a life'.

In this brief **Professor David Holgate of the Department of Mathematical Sciences** is interviewed by Dr Catherine Kell, a researcher commissioned by the CTL.

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David Holgate is an Associate Professor in the Department of Mathematical Sciences.

The starting point of the conversation was that Stellenbosch sees itself as a research-led university, and yet it takes the three roles (in research, teaching and community engagement) very seriously. David was responding to the question of how academics see the three roles, how integrated they are, how they are balanced and the kinds of tensions that academics experience between them. He continued:

DH: I guess my point of departure especially when it comes to the teaching research connection would be that as a mathematician it would be quite hedonistic to be involved in pure research and not have a commitment to teaching, especially in an African context, and at the University of Stellenbosch. I really enjoy teaching, but that aside, I do feel what I suppose you can call a kind of moral obligation; that if I have been entrusted with a certain level of knowledge and skill I should share that. Obviously my particular skills and interests make it easier for me to take that stand. So it's not a tension for me at all, to teach as well as to research. So I'm happy to do both and I would never be able to focus on one without the other.

That being said, the reality of it in a mathematics department is that there are heavy teaching loads, and we do a lot of service teaching. You tend to teach constantly for a semester at a time, and to get a semester off is very difficult, unless you have a sabbatical. Some disciplines can block teaching off more easily, but in mathematics you can't compartmentalise your time so this is quite difficult as far as getting head-space for your research, so your research tends to get pushed and squeezed.

CK: So which of the three roles did you orientate towards at the beginning of your academic career?

DH: My orientation was definitely driven by a love of the subject – I don't think I had any deep understanding of what an academic career would be. I didn't have any close role models who had been academics, but my parents were both in education and I think I do have a heart for education and a degree of talent for teaching.

I took on jobs while I was still a PhD student before I took my first position in the Academic Development Programme at UCT. So that gave me an orientation towards teaching. I then applied for a lectureship simply because it was going. So I didn't set out on the career knowing or having an expectation about the balance between teaching and research, or the pros and cons of each. It was simply that I loved mathematics and it was fun.

So it's partly your love of the subject, partly that you perhaps are not entirely conventional, partly that you like a bit of freedom, that draws one into the university. I think it's those aspects that attracted me to becoming an academic rather than this compartmentalization of what you do into teaching, research and community engagement. The natural thing is simply that when you do love the subject you don't want to keep it to yourself, and then along with that, some degree of moral obligation that the state is funding your research you should plough some of it back. So I don't really agree with dichotomising the three different roles.

> CK: Certain disciplines lend themselves more easily to a focus on either one of the three roles. How are you able to connect your research with your teaching?

DH: With mathematics the research specialisation is such that students don't really encounter what you are actually doing in your research until maybe their 4^{th} or 5^{th} year of study. But the clarity with which you understand your subject filters through right down to your teaching at first year, and as you develop your knowledge that changes too. If you are busy doing research in your subject, you may develop a different take on just a simple concept or on what is mathematics broadly… so you are rethinking what you are teaching. And again, even if the content of your research is not directly related to what you are teaching, the clarity with which you are trying to understand that content changes and that's because of the research you are doing. So it trickles down, sometimes badly so! You forget that the students haven't been through what you have. So even if you are teaching the same content, you have a different philosophical level of understanding it and that can maybe negatively affect how you are able to communicate it to young students. You have questions they wouldn't think of.

> CK: Can you talk a little about the issue of community engagement?

DH: In a subject like mathematics it is not easy to find ways for interacting with the community, as much as one would wish. The level of speciality does make it difficult with mathematics. You can get involved with school maths Olympiads, I have done so, but it's not a big thing. I've also been to talk to school kids about maths. But it's not like you're a medic and you can get out there and use what you're researching to change people's lives. Education is so poor in the country we could try to make a difference to schooling. But we are not really experts in education so it's difficult to know exactly how to contribute there. What we do offer though, is the possibility of teaching better teachers, so that those who go through mathematics and go on to be teachers have a good understanding of their subject. But for pure mathematicians the classic community interaction is difficult. So I wouldn't say that that's a large chunk of what defines me as an academic.

> CK: So what does it mean to be a mathematician in Africa?

DH: I think South Africa is fairly unique in that academics still have a lot of freedom to do research mathematics, and research mathematics is cheap to do. My area of research has good international standing and researchers are able to get to many conferences. The department gets a high number of graduate students from other countries in Africa and is building up a strong link with Madagascar. However, ironically, given the connection with African countries, the research the graduate students do is at a very high level so is still quite removed from society in some ways. Finding research collaborators in Africa is not easy, so mostly research collaborations are set up with universities in the North.

But the project in Madagascar is interesting. French countries have a better pure mathematics education system so they have students who have an understanding of pure mathematics rather than applied. So it's not always possible to immediately connect in terms of community interaction. We connect most actively to other African countries through the AIMS project[1]. A number of our students have come from Madagascar, through AIMS. Now some of these students will go back to Madagascar and be able to function in a less isolated way. For example, I have a PhD student who I am going to Madagascar to teach with next week. When my student finishes his PhD he would not be averse to going back to Madagascar, but there's the problem of research isolation. If we manage to set up a funded and well-established connection between our universities, that may give him stronger access and support to engage in an international context. So that's the idea.

Here in South Africa we always complain about the brain drain but South Africa is just as guilty of stealing from the rest of Africa in terms of brain drain. I'm fundamentally against doing that. But you can't say to a person 'go back to Madagascar' when they've finished their studies when you know that might mean the death of their research. So what we are trying to do may be a bigger dream that we can accomplish. But if we do manage to get a few folk back there, that's good. We realize it's a slow process and we can't solve the whole continent's problems.

> CK: What is your actual area of research? I know I'm unlikely to understand it, but it would be very useful to try to understand!

DH: My research work is in the overlap between two areas of mathematics: topology and category theory. Topology is a well-developed branch of mathematics that is about continuity of movement and time, and the structures that allow you to work with that. Another way to understand it is that it has to do with shape, so it comes from geometry and surfaces. Category theory is a language that you use to do your mathematics. Set theory is probably regarded as the general language of mathematics - the way we write what we do is using the language of set theory and the main idea in set theory is belonging. A set is understood by what's in or out of it so the key concept is belonging. Category theory says that the way you understand mathematical objects and structures is not by looking inside them but by asking how they relate to other things. So I like to do topology by taking the philosophical standpoint of how do I understand my mathematics by how things relate to each other, how do they interact? How does working in topology help me develop category theory and how does using the insights of category theory help me to understand topology?

> CK: Can you talk about what characterizes a good teacher and about your own teaching practices?

DH: I think I am able to explain clearly - people feel they are understanding the content. There's also a personality thing, at the end of the day teaching is about a personal relationship with your students. Maybe my personality is not that typically mathematical, so I'm able to tell jokes and communicate my personality, make it fun. I think I have a degree of empathy into students' struggles that not all academics would have. Along with that, because I feel that teaching is so important I am looking at how things can be improved. So it's not just something that I want to get out of the way.

CK: Yes, this was clearly evidenced in the response of your first year student, who was one of the top students in the Faculty in 2010. Her award was shared with you, as her lecturer who helped her to achieve that position. (See box for her comment on David's teaching). Can you talk about any particular teaching innovations, approaches or techniques that you've developed?

"Your unique and interactive teaching method ensured our constant attention...However, there is one aspect of your teaching that was clear to me from the very first lesson, and it was this that most impacted – your clear passion for your subject. The enthusiasm with which you introduced us to your "cute" pet proofs, or explained the "games" we were encouraged to try for homework, is infectious. Gone is the standard maths class atmosphere of necessity, replaced by a vibe of exploration and discovery. For this I thank you." Tarryn Rudnick

DH: Well, one idea I had was to use a tablet PC in first year mathematics teaching. I was introduced to this by colleagues in New Zealand who were capturing their lectures in video format and following their experience I decided to use a tablet PC in combination with a programme called BB Flashback to capture screen-casts of my lectures. All of my lectures are then made available in static PDF format and as Flash movie files on the WebStudies platform. This has been very popular amongst students.

I also set up a mobile technology project experimenting with SMS, and around using phones for clickers to get immediate feedback on questions in lectures. I'm now working on setting up a database of test questions, which is mobile-enabled and available in Moodle (the Learning Management System). I've been experimenting with a mobile-friendly version of this. I tested it last year and now feel confident enough to use it for my teaching. I am not mad about the technology for technology's sake, but I think we have to draw in the mobile devices because they are so much part of people's lives.

> CK: What is it in the university that facilitates your ability to experiment and explore with new teaching approaches?

DH: The amount of freedom that you have to explore your teaching in a university context is very helpful. The CTL has created opportunities for funding. There have also been other sources of funding that I have been able to access. I go to conferences that focus on teaching and learning where we can share ideas. I was awarded a teaching fellowship that provided funding for me to engage with new ideas in teaching. I used it to expand the tablet and the mobile technology project and we've organized seminars around the use of these technologies.

I used funding to go to a mathematics education conference and to send a few other people from the department too. I've now been asked to give a keynote address at an upcoming conference in New Zealand. So having a bit of money has really enabled me to step up my interests in this area. There's usually a track on teaching at mathematics research conferences, and it's increasingly seen as respectable to take part in such things.

> CK: Since your first university job was in the academic support programme at UCT, can you reflect a little on academic development?

DH: One thing that I would like to see changed is that the AD practitioners should be seen as genuine academics, that they should be respected as academics. And I don't think the university has quite got it right in terms of acknowledging 'being an academic' in a rounded way. There are these rector's rewards for teaching and for research. There have been attempts to flatten them and make them more equal, to reduce the sharpness of the dichotomy but they are still categorized into one or the other through the reward and incentive mechanisms. With some imagination we could rethink this.

It's here that I feel a bit of an issue. There is more lip service paid towards academics developing their teaching. But we are still rewarded for excellence in research and excellence in teaching. I'm not sure if they have put enough thought into what is an excellent academic.

> CK: Exactly, that's one of the things we want to explore, how inseparable those roles are and that when you start pulling them apart it loses something - the parts are less than the sum of the whole.

DH: Yes, I like to use an analogy of a cricket team. They reward the fast bowlers and the opening batsmen, but the people that are batting in the middle order and those that are doing a bit of batting and a bit of bowling and accumulating the runs, the team could not do without them. I don't think the university has quite got it right. I think people's contributions can be assessed in a more rounded way. I don't think there's a single definition of a good academic but that the whole endeavor needs to be good.

What's nice about a university is that you do have the scope for so much diversity. I don't think that a good academic should be someone who should necessarily be excellent at both teaching and research. You do get good academics who are excellent in their research and yet are shocking teachers, and some that shut themselves in their office all day and are of no use to society… that is the price you pay for academic freedom! I don't think we should try to prescribe how that freedom should be used, and how exactly people need to balance the different roles: by definition that would ruin the freedom.

For me the answer is that I strive to be a better than average researcher and better than average teacher. I don't have to be the best researcher OR the best teacher. But if you feel that you are never going to be acknowledged for it; that can be difficult. I am fortunate in that do get some acknowledgement, so I don't feel unvalued. But I know that some academics do feel that that can happen. They are faced with career choices and feel channeled in one or the other direction, so it becomes a dichotomy.

At the moment I'm doing a stint as the Head of Mathematics. With the younger staff, I'd love to make the space for them to be stronger in teaching, to put more into it and certainly to keep their research ticking over because that's their passion. But to advise them to do that at the moment would be very risky. I think there's a lot of lip service given that that's not the case, but it's still the reality. I would like to see that changing.

> CK: You are presenting a critical but very nuanced picture of the University's stress on the three roles, and on the university as a very heterogenous place, one that tolerates difference and that should and has to do so. This may be challenging of this notion of the third role being 'community involvement'. In a way, I prefer the term 'public intellectual' rather than community involvement. So the concept of academic freedom in total reproduces this sense of heterogeneity: the university should be a place that is respectful of this incredible diversity and guards it jealously.

DH: My other big thing, on a personal level is with regard to academic freedom I don't think that we feel very free. People feel bogged down by the heaviness of poor students and that the teaching industry is dragging you down more and more and that academic freedom per se is becoming restricted. People have been writing about this as 'performativity', and they do feel constrained by performativity; by administrative and teaching related constraints and they feel they are losing freedom, and the time to pursue their own work.

> CK: It's about no longer feeling free to pursue knowledge for knowledge's sake?

DH: Yes, but yet when you step back we do still have an enormous amount of freedom. I think lecturers should embrace that more and actually the administration should also embrace that, and use that as an argument, as a lever to open things up.

> CK: Yes, that would be a very useful line of argument to take, to challenge the pressures towards performativity. With regard to the 'pedagogy of hope' I'm wondering how you see that and what it means for mathematicians and people in your department. Someone raised a critical point about this saying that the university should be about the 'pedagogy of doubt'. I really liked that because I really believe that hope can come from doubt and I feel very encouraged by the self-reflexivity I've been seeing at SU.

DH: Well, with regard to the 'pedagogy of hope' some people feel that, as mathematicians, there's nothing that you can hang what you are doing onto. So people like mathematicians tend to think, well, this has nothing to do with me, and they notice the amount of money that is being spent, when they are struggling to raise funds themselves. Personally, I have no issue with the idea of the pedagogy of hope, per se. Teaching is important, and I do feel that mathematics, and the doors that it opens, is something that fundamentally can bring hope.

> CK: That's a great place to end! You've presented such a nuanced but exciting picture of how these three roles play out for someone working in the basic sciences. Clearly 'community involvement' is not something straightforward or easy for mathematicians. But your commitment to experimentation in your teaching and work with students from Africa, in particular, shows how a narrow, localised idea of community involvement can

exclude a much wider vision of the university's role. I think you've portrayed a picture of the university and of your role in it that is rich and spans over the simple distinctions that can so easily be made between these three roles. Thank you very much!

[1] The African Institute for Mathematical Sciences (AIMS) is a centre for education and research in Cape Town, South Africa. AIMS was established in 2003 as a partnership project of the following 6 universities: Cambridge, Cape Town, Oxford, Paris Sud XI, Stellenbosch, and Western Cape. The goals of AIMS are:

To promote mathematics and science in Africa

To recruit and train talented students and teachers

To build capacity for African initiatives in education, research and technology