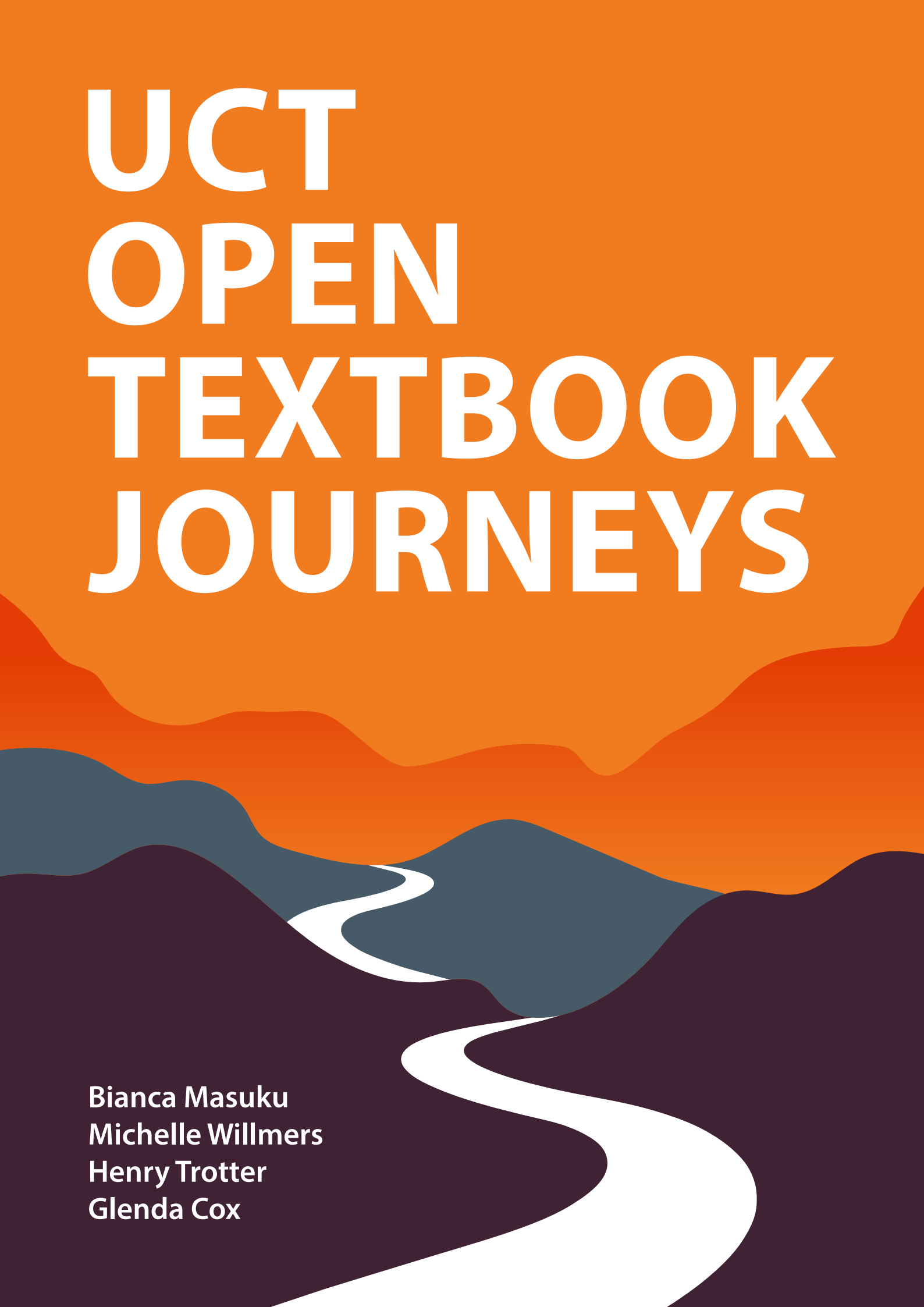
UCT OPEN TEXTBOOK JOURNEYS



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ABOUT THE AUTHORS

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Bianca Masuku is a PhD candidate in Anthropology and a Junior Research Fellow in the DOT4D project. Her research background and varied research experiences fuel her more recent interests in open education, open textbooks and open scholarship with a keen interest in the inclusion and recognition of student voices.

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Michelle Willmers has a background in academic and scholarly publishing and has worked as a project manager in scholarly communication initiatives since 2008. She is currently the Publishing and Implementation Manager of the DOT4D project.

Henry Trotter

Henry Trotter researches open education issues in the Global South. He is the lead-author of *Seeking Impact and Visibility: Scholarly Communication in Southern Africa* and the author of two ethno-historical studies, *Cape Town: A Place Betwee*n and *Sugar Girls & Seamen: A Journey into the World of Dockside Prostitution in South Africa.*

Dr Glenda Cox

Dr Glenda Cox is a Senior Lecturer and the Principal Investigator of the DOT4D project. With more than 10 years of experience in working on open education initiatives at UCT, she is an active member of the international open textbook and OER community.

All the authors are based in the Centre for Innovation in Learning and Teaching at UCT.

CONTENTS

INTRODUCTION

Multiple authors at the University of Cape Town (UCT) are undertaking open textbook journeys in which they navigate the intricacies of open textbook production and the successes and failures that are part of this endeavour.

Open textbook production at UCT currently takes place with limited formal institutional support or coordination, relying on academics' desire to develop and share their materials at no cost in order to provide a richer learning experience for their students. The lack of any formal recognition system for this work typically means that it needs to be undertaken after-hours, over and above formal teaching and research commitments. The fragmented nature of this activity also means that the expertise being developed around open textbook production is confined to small pockets within the institution. Thus, it is imperative that the stories of the academics who are undertaking this work are profiled and shared.

What are open textbooks?

Open textbooks are digital, freely available collections of scaffolded teaching and learning content published under an open licence on platforms and in formats that provide affordances for content delivery on a range of devices, the integration of multimedia and the incorporation of content from varying sources through collaborative authorship models. In some instances, they also provide affordances for print and low-bandwidth access strategies.

The collection of open textbook 'journeys' presented here aims to contribute to a better understanding of open textbook publishing and production activity at UCT by exploring the stories of open textbook authors. In the articulation of their journeys, this collection captures the granular details of academics' endeavours as relates to open textbook development, revealing their thoughts and reflections as they navigate different aspects of the process. It aims to shed light not only on how to go about open textbook production, but how to 'think' about this endeavour as different ways of conceptualising the process lead to different results.

Digital open textbooks for development

The journeys presented here emerge from the work of the Digital Open Textbooks for Development (DOT4D)[1] project at UCT. The project aims to contribute to improving inclusion in South African higher education by addressing equitable access to appropriate and relevant learning resources. It operates under the hypothesis that open textbooks have the potential to enhance social justice in teaching and learning through inclusive content development strategies. The specific aims of the project are to:

- Articulate and identify the options for open textbook approaches which contribute to a social justice agenda.
- Support open textbook publishing activity at UCT that prioritises strategies for integrating student perspectives, curriculum transformation and sustainability.
- Inform current textbook publishing policy-development initiatives at institutional and national levels.

The stories presented here provide detailed narratives of 10 open textbook initiatives which received funding in the DOT4D grants programme. It also includes the narrative of one open textbook practitioner who received DOT4D technical, but not financial, support. Together, they provide rich anecdotal evidence about current open textbook production models and practices at UCT that advance social justice.

The table below provides an overview of the authors and initiatives profiled, with links to author bios and outputs produced (where possible).

The work presented in this series informs the project's advocacy activity. In so doing, it also aims to provide an evidence base upon which to scale open textbook activity at other South African institutions.

[1] http://www.dot4d.uct.ac.za/

Grantee	Grant initiative	Output	Discipline
Dr Cesarina Edmonds-Smith & Dr Chris Barnett	Ingxoxo	Online discussion forum on first-year chemistry concepts (with focus on isiXhosa translation). 'Living textbook' still in 'closed' (classroom-only) prototyping and content development phase.	Chemistry
Dr James Lappeman & Dr Paul Egan	Marketing to South African Consumers	Open textbook comprised of 21 chapters co-published online in PDF, HTML and EPUB formats and in print by the Liberty Institute of Strategic Marketing and UCT Libraries.	Marketing
Dr Michael Held & Learning Innovation through Orthopaedic Networks (LION)	Orthopaedics for Primary Health Care	Open textbook comprised of 52 chapters co-published with UCT Libraries and made available on their open access Continental Platform.	Orthopaedics
Assoc. Prof. Maria Keet	An Introduction to Ontology Engineering	Open textbook comprising new edition of world's first textbook for computer scientists in this subfield (first published 2018), including new chapter co-written with former student and focus on multilingual approach.	Computer Science
Tim Low	Introduction to Probability (isiXhosa version)	Two chapters translated from existing Introstat (2013) open textbook as proof-of-concept collaboration between author, students and linguist academics. Translations in the process of being finalised for release in line with faculty transformation and multilingual efforts.	Statistics
Stella Papanicolaou and team	Modern Architectures: Cape Town	Open textbook profiling Modern Movement architecture of Cape Town in the context of the decolonial gaze. Part of a series of outputs and activities in the Modern Architectures in the Global South initiative.Student content also shared on uctma.gs Instagram page.	Architecture
Dr Jonathan Shock	Introduction to Complex Numbers	First prototype chapter for the Introduction to University Level Mathematics for a South African Audience open textbook, which is being designed to replace the prescribed work for first-year mathematics students in line with faculty transformation efforts.	Mathematics
Assoc. Prof. Abimbola Windapo	Fundamentals of Construction Management	Freely available textbook addressing construction management from Global South perspective.	Engineering
Dr Claire Blackman	Mathematics Textbooks for South Africa	Open textbook addressing high cost of current textbook, localisation and techniques for thinking about and writing mathematics. Process in incubation.	Mathematics
Kensleyrao Apajee	First-Year Mechanical Engineering Drawing	Undergraduate guide to engineering drawing tailored to the local context and structured to adequately support student learning. Process in incubation.	Mechanical Engineering
Dr Juan Klopper	The Open Surgery Textbook	Project engaging young doctors and domain experts to identify and collaboratively author content in video tutorial format for delivery via Instagram. Process in incubation.	Surgery

Methodology

The data presented in this study is derived from a mixed-methods research and implementation approach which gained insights from the range of research activities conducted within the project spanning over 18 months. These activities included:

- Two rounds of in-depth interviews (of approximately 1.5 hours each) with five UCT open textbook authors.
- A Background, Technology Fluency and Personal Reflection (BTFPR) survey administered to the 11 UCT grantees in the DOT4D grants programme and one open textbook practitioner.
- Analysis of grant proposals that were submitted by these 11 grantees in application for the DOT4D grant and the grant reports that were submitted by grantees at the close of their grant period.

These data collection activities were supplemented with the field notes of the DOT4D Publishing and Implementation Manager tracking 15 months of interactions with the UCT open textbook community.

Participants were invited to review drafts of their case studies in order to provide feedback and clarification. This consultation with authors served as a valuable data verification process as well as a reflexive opportunity for authors to examine their practice.

Open textbook journeys

The concept of 'journeys' emerged from exploring the various aspects and components involved in UCT authors' conceptualisation, production and publishing of open textbooks. In order to capture the details of these journeys, the stories presented here are structured around key components of activity they undertook in open textbook production. These are the elements of the journey we focus on in the stories presented:

Original plan

We began our exploration of these journeys by unpacking the ways in which academics envisioned their open textbook initiatives and their aspirations therein. We explored how they initially conceptualised their work and the different kinds of plans they set out for this endeavour. This component also explores the drivers that inspired these academics to undertake their open textbook development processes and their underlying social justice dimensions.

Authorship approach

Authorship approaches provide a means to understand the strategies that open textbook authors were employing in order to be able to produce their content. This element particularly highlights collaboration aspects of various authorship strategies.

Content development process and student involvement

Content development processes highlight the different approaches and methods of production that academics use in the creation of open textbooks and the kinds of approaches that are available to them. This was also done to help understand how their approaches towards content development could be best aligned with disciplinary requirements. In addition, this exploratory process helped the authors to understand the ways in which academics could include student participation in the development of content as a means to address social justice imperatives.

Publishing process

The processes around publishing allow us to understand the roles that academics assumed in publishing their work, the kinds of publishing strategies and models they adopted within their initiatives, and the partner entities they engaged. Within this, we explored how academics were thinking about ways in which to make their content more accessible and inclusive in terms of relevance, format and genre.

Content development and publishing tools

Content development and publishing tools provide insight into the mechanics of UCT academics' open textbook production and the technical resources they made use of in their processes, such as authoring tools and software.

Copyright and licensing

Academics had to navigate a variety of copyright and licensing issues during their content development and publishing processes.

Quality assurance and sustainability

Quality assurance and sustainability measures undertaken reveal the mechanisms and strategies for content review (whether it be by students, colleagues or external partners) that were established in the various content development processes. This included examining the steps these academics envisioned in order to address future updates and revisions to their work.

Challenges experienced and lessons learned

Lastly, we probed the challenges experienced and lessons learned in each author's journey as a means of capturing the struggles encountered in the various aspects of their production process and the ways in which they navigated this and adapted their processes in order to reach their goals.

Conclusion

The open textbook journeys presented here are a bouquet of stories and experiences as they happened for each author. As such, there is no question of right or wrong, or success versus failure, in the way in which we have chosen to present this collection or in the telling of these individual stories. Our hope is that each journey will provide insight into the varied ways in which the task of open textbook production can be undertaken, the different outcomes that can be produced and the lessons that can be learned.

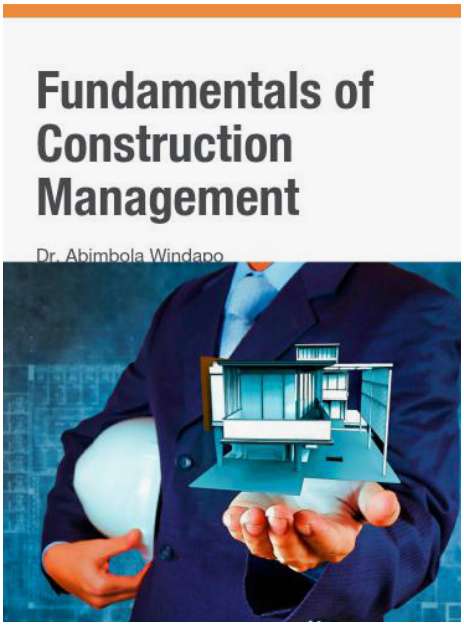
1

ABIMBOLA WINDAPO'S OPEN TEXTBOOK JOURNEY

Author: Abimbola Windapo
Position: Professor
Department: Department of Construction Economics and Management
Faculty: Engineering and the Built Environment
Course: Construction Management I and Construction Technology
Degree level: Undergraduate
Title of textbook: *Fundamentals of Construction Management*

Introduction

With more than 33 years of experience in the construction field – as a Registered Construction Project Manager in South Africa and a Registered Builder in Nigeria – Dr Abimbola Windapo brings a wealth of knowledge to her teaching across a range of construction management courses. A Professor in the Department of Construction Economics and Management at the University of Cape Town (UCT), Abimbola has developed an impressive set of teaching notes that she likes to share directly with her students, many of whom cannot afford the expensive textbooks that are sometimes prescribed in construction management courses. After years of refining her notes, she reached out to an online book publisher in 2015 to help her transform them into an open textbook that she wanted to: (a) look professionally designed, and (b) be freely available for students to access online. With the help of a commercial publisher (hereafter referred to as 'the publisher') she was able to achieve these goals with the publication of her book *Fundamentals of Construction Management*.[1]



[1] https://bit.ly/3i6F3Bp

The Digital Open Textbooks for Development (DOT4D) project in the Centre for Innovation in Learning and Teaching at the University of Cape Town (UCT) provided grant funding and implementation support to 10 open textbook projects in the period from March 2018 – March 2019, as well as implementation support to an 11th initiative. The Open Textbook Journeys series tells the stories of the people driving these initiatives, their teaching and publishing processes and what inspires them to do this work. These case studies were developed in collaboration with and reviewed by the open textbook authors profiled.

While Abimbola had long considered herself an open education advocate, it was with the publication of her textbook that she began to learn more about the various debates within the open education movement and their implications for her work. That is, she initially thought her book was an 'open textbook' because it was 'free'. However, as she came to learn, it was only free 'gratis' (no price barrier), but not free 'libre' (legally open for reuse and distribution without permission). Thus, even though her students could get PDF copies of her book for free (which was vitally important for her), she could not share the textbook on open platforms like the OpenUCT repository for others to find, download, use and re-share. Everyone had to get their copies via the publisher's portal after registering with the site. It was not a truly open textbook.
To overcome this, Abimbola reached out to DOT4D to help navigate the process of making her current textbook fully open. This case study discusses the open textbook journey that Abimbola embarked on with DOT4D and their engagement with the publisher to try and make her textbook fully open. Was Abimbola successful in her quest? We shall see.

This case study draws on:

- Interviews (x2) with the DOT4D Researcher.
- Field notes of the DOT4D Publishing and Implementation Manager.

What is the problem Abimbola is trying to address?

Given that there is a symbiotic relationship between construction management as an academic discipline and as a professional practice (where new innovations, standards and guidelines are fed back into the classroom), Abimbola wanted to bridge these worlds by sharing the latest academic research on construction management with students and educators, as well as industry professionals. As such, she wanted to do it in a way that was accessible to all parties.

Prior to engaging with DOT4D, Abimbola had already published *Fundamentals of Construction Management* with the publisher. Technically, it was already a 'free' textbook, thus it went a long way in achieving her core desire for the book. However, the problem was: it was not a fully open textbook. Thus she sought help in finding a way to make the book fully open (hosted on the OpenUCT repository under a Creative Commons licence).

> It was only free 'gratis' (no price barrier), but not free 'libre' (legally open for reuse and distribution without permission)

Textbook conventions in the discipline

Abimbola explained that the decisions around prescribed textbooks for courses in her department were made by course convenors, allowing them a sense of autonomy and control in the process. They based their decisions on what they were trying to achieve in the course. They often collected materials from multiple textbooks and resources and compiled them into a course reader for the students' use. She stated that 'it's based on the contents, so what is expected, what are you supposed to deliver, and then you now prescribe certain textbooks that have that content. Not all textbooks will have everything, so you pick and choose a textbook because you think it's good and it has so many citations, it's published by a good publisher and so on'.

Abimbola's open textbook journey

Original plan

Abimbola started her open textbook creation and conceptualisation journey with the development of an open educational resource (OER) – a set of lecture notes that she shared online. She initially shared this compilation of notes, which she had been developing since 1997, with her students through the learning management system as a supplementary reader titled 'Construction Technology I' in 2010. Students then used these notes as reference materials, with some asking whether they could be incorporated into the course reader which they would receive as part of their course fee. But this never materialised.

In response, however, Abimbola made her supplemental notes openly available in the OpenUCT institutional repository as two different but related resources – 'Construction Technology I Part A & B'[2] and 'Building Services Study Guide'[3].

[2] https://open.uct.ac.za/handle/11427/2507
[3] https://open.uct.ac.za/handle/11427/4143

Abimbola then decided to develop the notes into an open textbook as a way of protecting the content that she had produced from being misused or sold at a fee to students if she was ever removed from the course. She also envisioned this as a way of protecting her copyright and being acknowledged as the creator of this resource. She had learnt about this the hard way while guest lecturing at a different institution, revealing that, after she 'developed comprehensive notes for the assigned course … I was taken off the course. And the notes that I developed and used in teaching are now being used by someone else … I invested my time in developing those notes and then the following year you are told that 'no, we don't need you'. It's disheartening'. Thus, she wanted to assert greater legal control over her notes and ensure that she received proper credit for them.

> Abimbola wanted to use her textbook to create more locally relevant content that represented local practices and experiences

Abimbola began sharing her work openly with the vision that it would be found useful by a variety of groups, namely: construction management students across South Africa, construction management educators, and construction management professionals in the public (government) and private sectors (consultants/contractors). Making her teaching materials open was also part of her professional identity as an open education practitioner, in that she felt knowledge should be openly available for all.
In her teaching, Abimbola believed that one important contribution she could make to the transformation of her discipline would be to teach the basic principles and fundamentals of construction management. As part of this, she enjoyed highlighting local construction management practices and non-conventional building approaches, such as those found in rural areas (thereby shifting the usual focus of the discipline away from its urban bias). As she stated, she made a point to discuss the construction of 'traditional buildings with traditional technology. We don't ignore traditional construction technology, so we examine the techniques used as well'. As such, Abimbola wanted to use her textbook to create more locally relevant content that represented local practices and experiences.

Authorship approach

In the production of her first OER, 'Construction Technology I Part A & B', Abimbola adopted a 'solo author with student involvement' approach. That is, she authored the text herself and then asked students to help her in the production of images and graphics to support the content. Her OER, 'Building Services Study Guide', was co-authored with her son, Bayonle Windapo (a student in the Department of Architecture, Planning and Geomatics at UCT), who produced all of the images. She involved her students in this work as a way of helping build their research capacity. 'So I give them assignments and ask them to go and develop some of those courses as well…so you have to be able to delegate and give other people the opportunity.' As such, she saw the textbook development process as a mentorship opportunity.

In terms of the production of the final textbook product, *Fundamentals of Construction Management*, Abimbola worked as a solo author, reusing the visual material created by her students during her OER development process.

Abimbola stated that she preferred to work as a sole author 'because books are usually based on the approach or style a particular lecturer has to teaching. It is an extension to your being. This is similar to the debate between decolonised education. Some believe in it, while others don't. You need to be fortunate to find a scholar that shares your particular views on how a particular subject should be taught'. Thus, with the textbook being so closely aligned with her own teaching, the solo author approach made the most sense.

The content development process and student involvement

Abimbola included students (particularly her Masters and PhD candidates) in all her content creation processes. These students were predominantly involved in the creation of drawings for the resources, with PhD students participating in the research aspect of her content creation process. She ensured that all students who participated were acknowledged in the resources.

Abimbola saw this work with her students as a contract that she had to fulfil; within this context, she also ensured that students were reimbursed for their contributions.

Publishing process

Abimbola explored different publishing processes in the production of her work. She began her journey of publishing open content by sharing two open education resources, 'Construction Technology I: Part A & B'[4] (2012) and 'Building Services Study Guide'[5] (with co-author Bayonle Windapo, 2013), on the OpenUCT repository.

She then went on to publish her textbook, *Fundamentals of Construction Management*, with the publisher in 2015. The fact that the publisher provided professional editorial and layout services as part of the publishing process was an important consideration for Abimbola, as she felt that the professionalism of the final product was crucial if students were to engage with it and if it were to have an impact on industry.

Abimbola chose to publish with this external commercial publisher because of its 'open access' approach which allows students to use its textbooks for free. This is financed through advertising and subscriptions. The publisher currently has a list of almost 3,000 textbooks and ebooks which can be read online or downloaded as PDFs. The publisher's 'open access' approach 'allows users to:

- use the textbook for teaching and education without compensating the author;
- link to the eBook on the publisher's website; and
- distribute the textbook for non-commercial purposes via sending a link'.[6]

While these affordances are valuable – especially for students – in terms of facilitating access to the published work, the content published cannot be said to be authentically open access because the resource is not openly licensed. As discussed above, the publisher's titles are 'gratis' (i.e. with no price barrier) but not 'libre' (i.e. legally open for reuse and distribution without permission),[7] and thus do not qualify as open textbooks in terms of the definition used by the DOT4D project and the international open education community.

> The professionalism of the final product was crucial if students were to engage with it and if it were to have an impact on industry

The publisher's terms and conditions state that their titles may not be used in any commercial sense without written permission, and authors may not upload PDFs of published versions to a website or server.[8] Thus, some of the pedagogical and distributional virtues of the 'libre' element that normally reside in an open access resource are absent here.

The publisher currently offers access to Abimbola's textbook through two different channels on its website:

1. **Students – Free:** Readers who click 'sign up for free access' must register to receive a free account which allows them to access 1,000+ non-business textbooks via an online reader or by downloading them as PDFs. Both approaches contain ads, though the publisher says that these ads should not comprise more than 15% of a book's total space.

2. **Business – Free 30-day trial, then $5.99/month subscription:** By registering for this option, users can access the non-business textbooks (such as Abimbola's) and the 1,700+ business ebooks. No advertising is included in the books viewed or downloaded through this trial/subscription option.

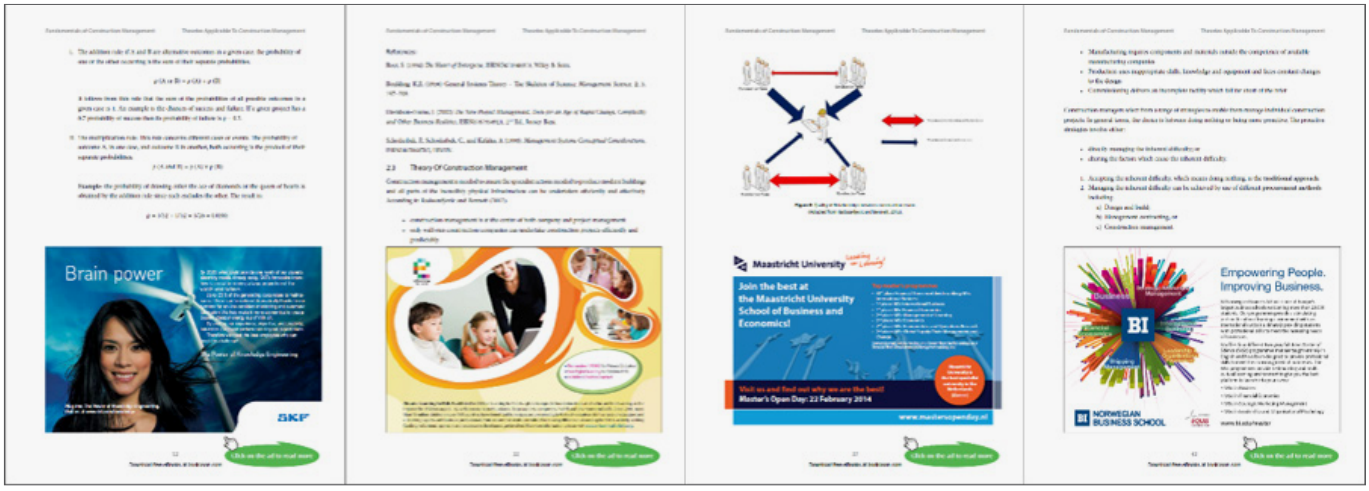
However, in the course of collaborating with the DOT4D project, Abimbola became aware of the limitations that the lack of an open licence exerted in terms of the openness that she desired for her work as an open education practitioner.

When re-examining her publication agreement with the publisher, she expressed: 'Maybe I didn't understand what I was getting into.'

In order to try and remedy this, Abimbola worked with the DOT4D Publication and Implementation Manager (PIM) to explore an alternative licensing and distribution approach for her (already published) textbook that would bring it closer in line with a fully open access text. This approach would, of course, have to include the consent of the publisher.

4 https://open.uct.ac.za/handle/11427/2507
5 https://open.uct.ac.za/handle/11427/4143
6 https://bit.ly/3kSRbZq
7 http://legacy.earlham.edu/~peters/fos/newsletter/08-02-08.htm#gratis-libre

8 https://bit.ly/3kSRbZq



The cost of 'free': advertisements in the published textbook

> Abimbola became aware of the limitations that the lack of an open licence exerted in terms of the openness that she desired for her work as an open education practitioner

The DOT4D PIM proposed the following to the publisher. Given that the publisher had recently contacted Abimbola in order to request updates for a second edition (for which Abimbola had already received galley proofs), would it be possible to share the first edition of this work on the OpenUCT repository with a Creative Commons licence and link to the updated edition on the the publisher's website?

This seemed like a win-win proposition. The value of an older edition typically goes down precipitously for a publisher once a new edition comes out, thus Abimbola and the PIM reasoned that the publisher would benefit with a new edition, while students, educators and practitioners would be able to choose between a fully open first edition on the institutional repository or a modestly restricted (though still free) updated edition. A representative of the publishing company responded by stating that they were happy for Abimbola to link to the book from a website, but that senior approval would be required in order to upload a PDF.

To this the PIM responded that, in terms of the UCT definition of an open textbook, the work requires an open licence, and that they would need to upload a PDF rather than merely link to the publisher website.

At the time of writing there had not been any response from the publisher. Abimbola and the PIM were instead exploring avenues through which the preprint version could be shared, but there were concerns around quality and the degree to which the preprint would vary from the published version of record.

The publisher negotiation process was disappointing for Abimbola, but she did not have the legal leverage to change the situation.

Content development and publishing tools

In all her publishing processes, Abimbola used MS Word to author the text and do the page layout. Her students used graphics software to generate the images.

Copyright and licensing

The author did not experience any challenges around copyright and licensing in the development of her original OER as she was guided in her approach by a UCT staff member as part of a prior UCT grant she received. Her challenges with copyright and licensing arose in the formal publishing process.

Quality assurance and sustainability

Abimbola's approach towards quality assurance for her two OER included review by a colleague for content and accuracy. She also engaged external editors and proofreaders.

To ensure the quality of her textbook, Abimbola edited for clarity and sought out high quality images and diagrams. These efforts were supported by external editors, professional proofreaders and her students. The quality assurance process was extended through the professional layout and design services provided by the publisher.

In addition, the prior use of the book's materials in class, before it was published as a textbook, contributed to quality assurance as years of student feedback in the courses helped improve the content. Most importantly, the publisher required that the textbook go through the publisher's review process and address reviewer comments before the work could be published.

In her interview, Abimbola stated that achieving a high level of quality for the textbook was paramount, affecting readers' interest in the book and colleagues' level of respect for her work. 'If it's not ready, then people will not use it … Putting out that kind of resource, you don't want to be subjected to ridicule in the academic community … You have to make sure that once the work is finished, you will receive accolades.'

Challenges experienced and lessons learned

Some decisions cannot be undone

Abimbola had already published her textbook when she got in touch with DOT4D, thus there were no challenges in the development process. Those had already taken place in the years prior when she created the book. The challenge came in trying to get the publisher to grant her permission to share her first edition of the book under an open licence, free for anybody to use and redistribute as they saw fit. Unfortunately, in that regard, she was unsuccessful. The publisher did not have any real incentive to change the conditions under which her book was being distributed on its platform and, furthermore, it did not have a second edition yet from her.

> The challenge came in trying to get the publisher to grant her permission to share her first edition of the book under an open licence, free for anybody to use and redistribute as they saw fit

Now she knows. Now we know too!

As an open educator, Abimbolba felt that she had learned an ironic, but important, lesson. When she published the book in 2015, she wanted it to be free for students and openly accessible. In a very important respect, she achieved this because her book is free of charge. It is just that it cannot be freely shared like a normal openly licensed textbook can. For students, this may not matter so much, because price is often the key consideration for their interest. It is free of charge: job done! But for other academics and construction management practitioners, the lack of an open licence inhibits their ability to re-use, adapt, translate or share the book as they wish. This is unfortunate, but a valuable lesson for all open education authors and advocates as they decide how to release their work.

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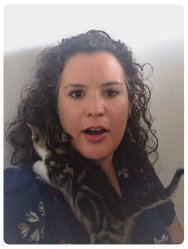


CESARINA EDMONDS-SMITH AND CHRIS BARNETT'S OPEN TEXTBOOK JOURNEY

Grantees: Cesarina Edmonds-Smith and Chris Barnett
Position: Lecturers
Department: Chemistry
Faculties: Science and Centre for Higher Education Development
Course: Chemistry
Degree level: Undergraduate
Title of initiative: Ingxoxo
Title of envisioned open textbook: *Ingxoxo: Physical Chemistry Fundamentals*

Introduction

Much of students' best learning occurs outside the classroom when they are with their peers. As they chat with each other about issues that arise in a lecture, textbook or assignment, they're often able to clarify to each other – through their preferred languages and generationally relevant analogies – key insights about a given topic. In this sense, students often teach each other.

For some, peer learning is a crucial feature of their university experience, for others less so. It is however compelling to consider ways in which all students in a course can benefit from the virtues of peer learning and tap into a well of collective student wisdom. Might there be a way to formally connect lecturer-led teaching with peer-to-peer learning in order to enhance the student experience?

It is compelling to consider ways in which all students in a course can benefit from the virtues of peer learning and tap into a well of collective student wisdom

Dr Cesarina Edmonds-Smith is a lecturer in Chemistry in the Science Academic Development Programme in the Centre for Higher Education Development at the University of Cape Town (UCT). As a former high school science teacher, she knows that 'students know more than you think, they just think differently to you'. She believes that if you ask students to explain what they understand, you can learn how they think and apply this knowledge in your teaching.

The Digital Open Textbooks for Development (DOT4D) project in the Centre for Innovation in Learning and Teaching at the University of Cape Town (UCT) provided grant funding and implementation support to 10 open textbook projects in the period from March 2018 – March 2019, as well as implementation support to an 11th initiative. The Open Textbook Journeys series tells the stories of the people driving these initiatives, their teaching and publishing processes and what inspires them to do this work. These case studies were developed in collaboration with and reviewed by the open textbook authors profiled.

Dr Chris Barnett is a physical and computational chemist who teaches chemistry in the Science Faculty at UCT. He subscribes to the principle of 'learning by every means' and encourages students to try their best, find confidence to ask questions, and realise that getting something 'wrong' is a key part of learning.

In February 2019, Cesarina and Chris were awarded a grant from the Digital Open Textbooks for Development (DOT4D) project to develop the Ingxoxo digital platform, a forum-based approach to peer-to-peer learning and open textbook development. (Ingxoxo means 'conversation' in isiXhosa.) This case study tells the story of their open textbook journey.

This case study draws on:

- The Ingxoxo grant proposal to the DOT4D project.
- The Ingxoxo grant report to the DOT4D project.
- Fieldnotes from the DOT4D Publishing and Implementation Manager.

What is the problem Cesarina and Chris are trying to address?

Because the majority of available textbooks are written in English and from a Global North perspective, South African students typically have to engage with textbooks that communicate in a second or third language for them and emanate from a perspective that only partially aligns with their own. These linguistic and epistemological divergences can lead students to struggle with key concepts that are necessary for understanding the lectures and succeeding in the course. To mitigate these challenges, students sometimes buy alternative textbooks that are more suited to their learning preferences, but most seek out textual and video resources on the internet to better understand chemistry concepts.

In their proposal, Cesarina and Chris stated that many students find it difficult to understand their lecturers who teach in a language (English) which is often different from their mother tongue. Their textbooks are all in English and typically written from a Global North perspective, which means that students might not fully understand certain key ideas (usually built upon unstated assumptions).

They believed that if students do not learn the foundational concepts of a discipline, they can't be expected to understand the application of these concepts to the subject at hand.

In addition, they said that the way that lecturers explain concepts and illustrate examples are not always relatable to students due to generational differences. If students are unable to relate the concept to their own life experiences, the work gets complicated, students fall behind, withdraw in class, stop attending lectures and ultimately perform badly in assessments.

Textbook conventions in the discipline

Cesarina and Chris stated that the standard practice within their discipline is to support teaching with the use of proprietary textbooks. The first-year Chemistry course textbook is identified annually by course conveners who meet with the Chemistry Department Teaching Committee to discuss their options.

> South African students typically have to engage with textbooks that communicate in a second or third language for them and emanate from a perspective that only partially aligns with their own

Cesarina and Chris' open textbook journey

Original plan

In line with Cesarina's belief in the value of peer-to-peer learning and Chris's philosophy of engaging with students in ways that are meaningful to them, the Ingxoxo initiative aimed to leverage the fact that students are well-placed to explain concepts to each other. In fact, they often do so in their mother tongue rather than the language of formal instruction, using examples that are relevant and understandable to their generation.

Cesarina and Chris therefore wanted to: (a) create a digital platform for first-year students to share their ideas and understandings of chemical concepts, and (b) use the students' explanations – in combination with short video and audio explanations – to create an interactive digital textbook called *Ingxoxo: Physical Chemistry Fundamentals*.

The team believed that students were technologically savvy enough to engage with a digital resource if it was geared towards their needs. The innovative aspect of the textbook would be that it consisted of core chemistry concepts explained with references to the primary text through focused concept videos and audio. Students would be asked to come up with further analogies to explain these concepts in a way that was relevant to them. The team believed this would give the book a uniquely African feel, which was not seen in their current chemistry textbooks.

> They used a 'social' approach, in which students interacted with a user-friendly digital platform that mimicked social media principles

Authorship approach

Cesarina and Chris adopted a 'content development facilitator with student and colleague co-authors' approach, in that they saw themselves as expert intermediaries facilitating student- and peer-driven content development. They used a 'social' approach, in which students interacted with a user-friendly digital platform that mimicked social media principles, incorporating 'like' reactions, linking, bookmarking, sharing and avatar options.

Students were encouraged to get involved through modest incentives such as earning chocolates, stickers and classroom accolades for frequent posting, responding to fellow students' queries or translating content into another language.

The team's goal was to accumulate content for the open textbook over many years of engagement, while starting the forum conversations afresh each year in the hope that this would enable students to feel at home in a virtual environment dedicated to their needs. The aim was for the eventual textbook to be openly licensed for use at UCT as well as at other South African universities, though Cesarina and Chris thought some concepts would need to be added, modified or deleted based on curriculum requirements.

> The Ingxoxo content development process was founded on the principle of student involvement

The content development process and student involvement

The Ingxoxo content development process was founded on the principle of student involvement. Cesarina and Chris envisioned that either they or a postgraduate student would draw up a survey which would be distributed to first- and second-year students. They planned to establish student focus groups and run tutorial sessions in the hopes of explaining chemical concepts with them. During these sessions, tutors (postgraduate students) would ask students to explain different concepts to their peers and record (with permission) the explanations and any questions that followed. Finally, they would ask for feedback through a forum-like website where students could provide additional concepts, questions or explanations that weren't discussed during the sessions, or that they were still struggling with.

Cesarina and Chris' content development process started similarly to what they planned. The team surveyed senior students and identified key themes. However, the process of establishing the forum platform took a great deal of effort, requiring Cesarina and Chris to grapple with IT-related concerns, such as establishing the domain name, customising Ingxoxo according to the Discourse app's[1] platform options and linking UCT sign-on credentials with Ingxoxo for login purposes. In addition, through their interaction with DOT4D, Cesarina and Chris looked into how they could brand their project to raise its recognition value.

[1] https://www.discourse.org/

> The platform contained links to video and audio explanations, as well as other resources posted by first-year students and the Ingxoxo community

To help with this, the team placed adverts and began interviewing postgraduate students to assist with the project. However, finding the right assistants took more than a month to achieve, affecting the initial timelines set within the project.

Once the team and platform were in place, Cesarina and Chris started campaigning to the first-year students and generating content on the Ingxoxo platform. The team held several student engagements and took note of how students explained concepts to peers on the platform, in class and in revision sessions. To ensure that they themselves did not end up producing too much of the content, Cesarina and Chris held a research engagement week for students in November 2019 which generated a lot of content and interest in the project. The overall process was highly collaborative and agile.

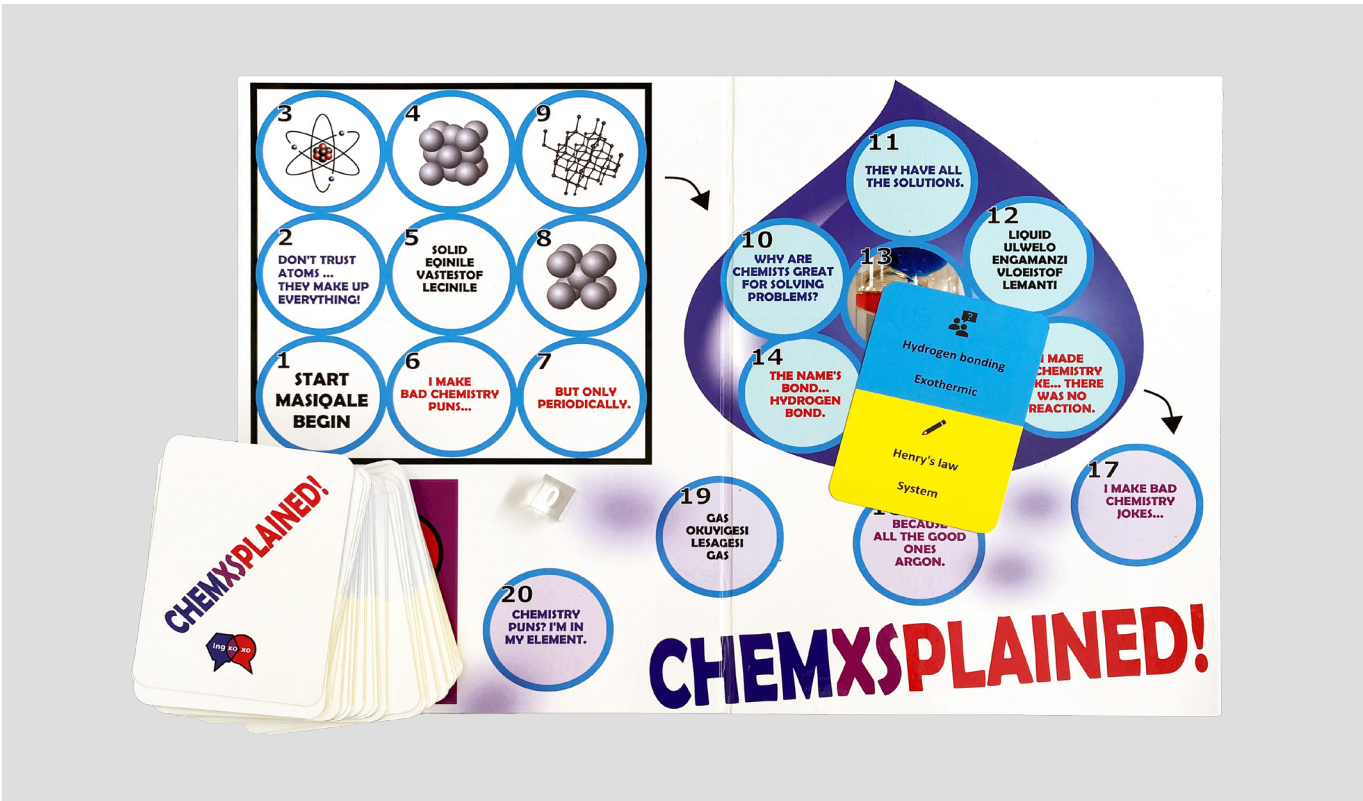
As such, the Ingxoxo platform – which was made available to first-year chemistry students, interested second-year students and academic staff at UCT – served as a forum for student discussions around first-year physical chemistry in any South African language, providing a safe, comfortable space for students to pose questions and contribute to discussions without 'public performance' fears. Questions were answered by fellow students and course lecturers who were participating in this virtual environment.

The platform contained links to video and audio explanations, as well as other resources posted by first-year students and the Ingxoxo community, which were relatable to South African and African experiences with chemistry. The aim was that these new ideas and explanations would eventually be compiled into an online, openly licensed, mixed-media e-book, co-authored by students to allow for a fully inclusive look into first-year chemistry.

The platform provided Cesarina and Chris with an opportunity to learn from their students: seeing where the missing links were between the lecturer, the work and the student; learning how students explain concepts to their peers; and allowing students to take a greater role in the teaching process by encouraging them to use Ingxoxo to explain concepts and provide feedback on lecture content.

Publishing process

Cesarina and Chris adopted an 'initiative as self-publisher' approach in their publishing process and produced several outputs within their one-year grant period.



ChemXsplained cards and board images

> The game had a lot of potential for group learning and in some sense could be considered as ‘practising the textbook’

First, though this was not part of the original plan, they developed the ChemXsplained[2] board game in collaboration with students during the student research engagement week. It is a game that aims to make basic chemistry concepts understandable in a fun and competitive way. The idea for it arose from a brainstorming session with students who put together a prototype and tested it with a postgraduate cohort. The gameboard, cards and rules were then further refined. The team believed that the game had a lot of potential for group learning and in some sense could be considered as ‘practising the textbook’, stating that ‘the idea is not just to learn knowledge off by heart, but thinking on the spot and sharing knowledge with peers’.

Second, the team (along with their two project assistants) created the Ingxoxo platform on the Discourse app and maintained it during the second half of 2019. They had planned to distil the information and insights from this platform to create a textbook, but they realised that the platform itself represented a ‘living textbook’ that could be continuously updated by the first-year students. In this sense, they believed that it should continue to function as an independent entity, aside from the envisioned textbook.

Third, the team started writing up sections of textbook content in 2019. A postgraduate assistant wrote up a topic and volunteer students wrote up a section. The team’s aim of writing throughout the year was, however, impossible due to time constraints. The team also realised that some of the topics they identified as important were not a priority to their students. Some topics were also overdeveloped, or needed to be taught from the ground up.

Fourth, the Ingxoxo team produced data, code and media as a result of activities such as interviews, revision sessions, surveys, notes from research week engagements and analysis of the discussion platform. They also planned to translate some of the content on Ingxoxo into isiXhosa and Afrikaans.

Finally, the team created engaging videos with custom artwork based on student review. They presented on various topics and tested props and interactive functionality. As such, they were able to use the videos to create an unscripted and dynamic debate with the students around problem-solving aspects in their work which the team felt could be engaging for student viewers. The undergraduates who assisted in the work made an informative video explaining one of the physical chemistry concepts which the team planned to use as a resource in their textbook. They stated: ‘It was well thought out and done in a way that we as lecturers would not have thought of. This was the point of the project, to get the students’ ideas on how content could be taught and how they understand concepts.’

> Some of the topics they identified as important were not a priority to their students

Content development and publishing tools

The chapters of the textbook were written on a number of different platforms – MS Word, Google Docs and Authorea – in order to determine which one would be best to use for authoring and collaboration. In the end, the team preferred Authorea, as it supports sharing, WYSIWYG, Markdown and LaTeX.

The Ingxoxo virtual forum runs on the Discourse app, a forum-based web platform for community discussions. Posts can be formatted using Markdown, LaTeX, MathJax and mhchem.

To create videos, the team used the One Button Studio (OBS), an automated video recording facility in the Centre for Innovation in Learning and Teaching at UCT. The team also used the OBS to film a few concept videos in the traditional lecturing style using PowerPoint.

The analytics platform code, game media and project overview webpage are hosted on GitHub.[3] The data generated for the various activities within the student research experience, such as videos, discussions, student feedback, student surveys and recordings are currently stored on Google Drive through UCT’s GSuite subscription.

[2] https://github.com/ingxoxo/chemxsplained-game

[3] https://ingxoxo.github.io/ingxoxo

Copyright and licensing

In the course of the Ingxoxo content development process, students used memes from the internet. Cesarina and Chris were unclear about how to deal with copyright in these instances. They were also concerned about using diagrams from the existing textbook in discussions with students.

In addition, privacy was also a central concern; Cesarina and Chris did as much as possible in order to ensure student anonymity.

All Ingxoxo content released via GitHub was published under a Creative Commons Attribution 4.0 International licence.

> The team made use of both student and colleague review

Quality assurance and sustainability

In their quality assurance process, the team made use of both student and colleague review. Students gave feedback on content and concepts using the Ingxoxo app, while Cesarina, Chris and a Masters student moderator checked the content. In the case of the content created by student focus groups, material was reviewed by those students and the content moderator.

In terms of sustainability, Cesarina and Chris envisioned that their initial grant would fund the first round of interviews, surveys and the website for one year. This data would then be created and stored on an institutional repository. The content from the Ingxoxo site would also be used to create a PDF version of the most informative content, which would comprise the first edition of an open textbook. This too would be openly licensed and accessible via an institutional repository. The team envisioned that further updates to the text would require ongoing maintenance of the Discourse app, and perhaps further interactions with students. The continued maintenance of the virtual forum would however require resources.

Status at grant closure

As part of their continuing development and future plans, the team was able to offer the Ingxoxo discussion platform to first-year Chemistry students in 2020. They planned for the board game to be tested during first-year tutorial sessions in order to get feedback from students and tutors. They also felt that there was potential for them to generate a journal article based on their experience.

The team had a few incentives that worked well in 2019, which they felt they could offer the 2020 students to ensure that the platform continued to grow. In their final grant report, they stated that 'it was exciting to see the number of first-year students in 2020 who have already signed up to the platform without any knowledge of what the platform is about; it shows that students are hungry for any additional tools to help them in their first year'.

Challenges experienced and lessons learned

Cesarina and Chris believed that the project had numerous successes, especially related to the ability of the online platform to foster peer learning among the students. Ingxoxo created a virtual forum similar to the ones that students themselves create in small groups outside the classroom, allowing for more intimate learning opportunities. They could interact in their preferred languages, share links, video and textual content, and then point other students to the forum's saved discussions after the fact. In addition, student interaction led to the development of the board game which went far beyond initial planning and expectations. There were, however, challenges along the way and some key lessons learned around timing, planning and branding.

> Students could interact in their preferred languages, share links, video and textual content

Get the students onboard immediately

Cesarina and Chris believed that they should have been more engaged and open about the project with their students from the outset. Students are very motivated in their first semester of their first year, so it helps if you can grab their attention during that time. They stated: 'In the first semester, students are still keen and have lots of energy to engage in new ideas. We were hesitant to do so as we had just created the brand and were still waiting on stickers and for the website to be available. We had to put in a lot of work to engage with students in the second semester and get them interested in the project. We should have surveyed the first-year students in the first semester and asked if this kind of platform would be useful to them. If not, we should have asked for input and ideas for creating an open textbook.'

Innovation takes time and patience

Cesarina and Chris had high expectations of the quantity and quality of output that they would produce and the amount of engagement they would have with students. In reality, the team had numerous competing commitments (teaching, supervision, research, committee meetings, etc.) and therefore limited time to promote student community engagement. A number of lessons flowed from this.

The first was they should have planned everything six months in advance and accounted for delays (finances, ordering, adverts, marketing). Secondly, they needed to be more aware of their budget. The team benefitted from academic discounts offered on some software tools and their hosting site, but realised the value in being cautious spenders as this allowed them to devote more money to the board game and student incentives. Finally, they learned to be open and adaptable to the changes in their vision, stating, 'it was through the students that the project developed. It had to grow in the way that they could relate to, not necessarily in our original ideas of the outcomes of the project'.

> In order to get students excited about the project, they had to grab their attention through an intuitive and intriguing brand identity

Branding is essential for generating interest

The team had originally planned that the project would be student-driven, but they realised early on that, in order to get students excited about the project, they had to grab their attention through an intuitive and intriguing brand identity. They had ideas about student incentives and giving out small prizes, but only after they designed the Ingxoxo logo were they able to properly market the project to students. As such, the Chemistry 2020 first-year students were already excited about joining Ingxoxo. Cesarina and Chris ascribed this to the previous marketing campaigns and word of mouth from the 2019 class.

Budget

Overview of the original budget submitted to DOT4D as part of 2018 grant application, with actual expenditure.

Budget projected at proposal phase
Platform hosting: R15,000
Software developer: R8,280
Student assistant (Computer Science): R8,000
Student assistant (Chemistry): R8,000
Video recording: R8,000
Graphic design: R2,400
Translation: R7,000
Incentives: R8,000
Consumables: R8,000

DOT4D grant amount: R73,180

Project actual expenditure
Discourse app hosting: R14,407
Postgraduate students: R17,717
Undergraduate students: R7,500
Revision sessions: R3,019
Branding: R12,759
Content creation: R17,933

Total expenditure: R73,335

3

CLAIRE BLACKMAN'S OPEN TEXTBOOK JOURNEY

Grantee: Claire Blackman
Position: Lecturer
Department: Mathematics and Applied Mathematics
Faculty: Science
Course: Mathematics and Applied Mathematics
Degree level: Undergraduate
Title of initiative: Mathematics Textbooks for South Africa
Title of envisioned open textbook: *Introduction to Abstract Algebra*

Introduction

Dr Claire Blackman was a lecturer in the Department of Mathematics and Applied Mathematics in the Faculty of Science at the University of Cape Town (UCT) until she took a position at another institution in 2020. She was, and remains, an open education practitioner and advocate, having started her open education journey in 2015 when she began releasing videos of her mathematics lectures via her YouTube channel[1] as open educational resources (which, at the time of writing, includes more than 80 videos).

At UCT, Claire taught students in the second-year Mathematics and Applied Mathematics course. In 2019, she received a grant from the Digital Open Textbooks for Development (DOT4D) project to create a mathematics textbook for the 'Introduction to Abstract Algebra' module of this course which was aimed not only at creating content best suited for the practice and teaching of mathematics within a local context, but also training students to develop a 'mathematical mind'. As an open education practitioner, it was also important to her that the textbook be freely available for access and reuse.

Due to the emergence of a number of competing personal and professional obligations, Claire was unable to complete the textbook development process within the allotted grant period. For DOT4D, this means that Claire's open textbook story has a particular arc to it, one that is heavily shaped by the parameters of the project lifecycle.

[1] https://www.youtube.com/c/ClaireBlackman/videos

The Digital Open Textbooks for Development (DOT4D) project in the Centre for Innovation in Learning and Teaching at the University of Cape Town (UCT) provided grant funding and implementation support to 10 open textbook projects in the period from March 2018 – March 2019, as well as implementation support to an 11th initiative. The Open Textbook Journeys series tells the stories of the people driving these initiatives, their teaching and publishing processes and what inspires them to do this work. These case studies were developed in collaboration with and reviewed by the open textbook authors profiled.

For Claire, it is the preamble for a longer open textbook development story, one that started long before her involvement with DOT4D and one that will hopefully go far beyond it.

This case study draws on:

- Claire's grant proposal to the DOT4D project.
- Interviews (x2) with the DOT4D Researcher.
- Field notes of the DOT4D Publishing and Implementation Manager.

What is the problem Claire is trying to address?

Claire planned to address certain financial and pedagogical challenges through the development of her open textbook. First, the recommended textbook for her course costs around R700 ($50). The high price meant that many students were unable to afford the book and therefore did not purchase it. This resulted in a situation where many students struggled to effectively participate in the classroom and succeed in the course. Second, the textbook reflected mathematics from a European and American perspective, and was therefore of questionable relevance for students in the South African context.

Claire is interested in addressing issues related to her students' lack of background knowledge, their struggle to write mathematics (proofs, formulas, etc.) and the language barriers they face. Within this context, she aims to make maths less abstract and address the challenges her students face in writing mathematical proofs, which she sees as indicative of the fact that they are struggling to think in a particular way. She gears her work towards teaching her students thought processes and empowering them to be able to think mathematically.

Textbook conventions in the discipline

In her interview, Claire explained that there were varied conventions around prescribed textbooks in her department. Most courses included a recommended textbook, but the department was making a concerted effort to move away from having these textbooks as a requirement. She stated: 'I think some of the first-year courses do have a required textbook, but most of those we provide through the faculty online. And if students want a hard copy they need to buy it. So, we've tried to take the financial burden off the students.'

> Currently available textbooks focus entirely on the content, giving students no guidance on how to learn to think mathematically

Claire's open textbook journey

Original plan

Claire submitted a proposal to the DOT4D grant programme in collaboration with departmental colleague Dr Jonathan Shock. Their collective project, Mathematics Textbooks for South Africa, had two main branches – both of which were aimed at addressing the accessibility of mathematics education for undergraduate students at UCT.

Claire was responsible for the second branch of the project, the aim of which was to develop a textbook for the 'Introduction to Abstract Algebra' module. A variety of textbooks had been used in this course over the years, all of which suffered from the same issues as the first-year maths textbook (which Jonathan Shock was working on). Claire stated that currently available textbooks focus entirely on the content, giving students no guidance on how to learn to think mathematically; the textbooks seldom explain the process of writing proofs and never give alternative proofs of the same theorem.

Claire's textbook project was to contribute to a growing body of research on training different 'thought processes'. While teaching the course in 2018, she worked with her students on exercises to improve mental clarity and focus. She also developed a curriculum on how to write mathematical proofs, which improved the standards of the answers provided in tests and exams. She stated that, 'students have commented that they were able to successfully apply the techniques learned in both interventions in their other courses. Including these techniques and exercises in a textbook will give me the opportunity to expand on them, and provide students with further resources, including multiple proofs of the same theorem'.

Caire believed that providing students with multiple proofs would show students that there is no single correct answer and that there are many different styles of proof. She would also be able to address the issues raised in Jonathan Shock's textbook development process, especially as relates to making the language of mathematics more accessible.

At the proposal phase of her work, Claire spoke with colleagues at various South African universities about the Abstract Algebra textbook concept and the response was uniformly positive.

She stated that the teaching of tertiary mathematics was changing worldwide, with greater emphasis being placed on helping students develop the necessary skills to be successful mathematicians. As such, the book would be useful beyond South Africa.

> The proposed textbook would make explicit many of the thought processes, techniques and uses of language that are missing in current textbooks

The proposed textbook would make explicit many of the thought processes, techniques and uses of language that are missing in current textbooks. It would be far more accessible to students and provide support for a wider range of student abilities and backgrounds. It would also contain some neuroscience to help students understand how their brains work and how this impacts their learning, which would have application beyond mathematics.

Lastly, the textbook would include content and exercises for developing mathematical thought processes and proof writing which are not included in existing textbooks.

Authorship approach

Claire envisioned that she would adopt a 'solo author with student involvement' approach to developing her textbook content, in that her textbook would be created through extensive student engagement and feedback. The textbook would be used for the 'Introduction to Abstract Algebra' module in the second semester of 2019, with student feedback elicited throughout the term. Strong undergraduate students who had completed the course in previous years would be invited to collaborate on content development.

The content development process and student involvement

Claire planned to include students in the creation of content by involving third-year students in the development of questions, exercises and solutions. In addition, she would draw on feedback from students in her second-year class as they made use of parts of the textbook which were under development. Colleagues in the maths department would provide input on content development processes and play a role in quality assurance.

Content development and publishing tools

The aim was that Claire would produce all content, including graphics and assessment components, using the PreTeXt open source XML authoring tool and publishing suite, which enables content publishing in a variety of formats, including HTML, PDF and EPUB. One of the key features of PreTeXt is its easy inclusion of runable code within HTML, which enables students reading the book online to check answers, run examples and interact with the textbook.

Quality assurance and sustainability

The quality assurance process for the textbook was to include scrutiny by at least three lecturers in the maths department. It was also envisioned that students would provide ongoing feedback which could highlight gaps in explanations or errors in the writing. Claire also envisioned that the work would be proofread by a professional proofreader when it reached an appropriate stage of maturity.

Status at grant closure

Due to competing professional pressures and despite her best efforts, Claire was unable to complete her textbook development process within the DOT4D grant period of March 2019 to February 2020 and her open textbook production process remained in incubation at the time of writing.

Challenges experienced and lessons learned

Grant timeframes do not necessarily align with work and life timelines

Claire had every ambition to complete her textbook within the timeframe of the grant period but, as noted above, other competing work and life priorities intervened; an experience all academics have at some point. In addition, the challenge of creating a new open textbook which includes student collaboration is difficult enough in the best of times. Claire's open textbook journey provides an indication of how challenging it is for academics to undertake work of this kind over and above their standard teaching and research obligations. It also demonstrates that the timeframes required for open textbook development do not necessarily align neatly with semester cycles or grant periods.

> Claire's open textbook journey provides an indication of how challenging it is for academics to undertake work of this kind over and above their standard teaching and research obligations

Budget

Overview of the original budget submitted to DOT4D as part of 2018 grant application, with actual expenditure.

Budget projected at proposal phase
Student assistant salary: R10,000
Proofreading 200 pages: R10,000

DOT4D grant amount: R20 000

Project expenditure
None. Grant funding returned.

4

JAMES LAPPEMAN'S OPEN TEXTBOOK JOURNEY

Grantee: James Lappeman (with colleague and co-editor Paul Egan)
Position: Senior Lecturer
Department: UCT Liberty Institute of Strategic Marketing, School of Management Studies
Faculty: Commerce
Course: Marketing
Degree level: Undergraduate
Title of initiative: Marketing to the South African Consumer
Title of open textbook: *Marketing to South African Consumers*

Introduction

Dr James Lappeman, a Senior Lecturer in the University of Cape Town (UCT) Liberty Institute of Strategic Marketing, specialises in consumer behaviour and has experience teaching both undergraduate and postgraduate students in a range of marketing disciplines.

He has lectured and convened courses at UCT's School of Management Studies and Graduate School of Business, as well as various other prominent marketing and advertising agencies and schools.

After years of dreaming about developing their own first-year marketing textbook for UCT and all students of Africa to enjoy, James and his colleague Paul Egan received a grant from the Digital Open Textbooks for Development (DOT4D) project for the period March 2019 – February 2020 in order to undertake production and publication of the M*arketing to South African Consumers* [1] open textbook.

[1] https://openbooks.uct.ac.za/uct/catalog/book/29

The Digital Open Textbooks for Development (DOT4D) project in the Centre for Innovation in Learning and Teaching at the University of Cape Town (UCT) provided grant funding and implementation support to 10 open textbook projects in the period from March 2018 – March 2019, as well as implementation support to an 11th initiative. The Open Textbook Journeys series tells the stories of the people driving these initiatives, their teaching and publishing processes and what inspires them to do this work. These case studies were developed in collaboration with and reviewed by the open textbook authors profiled.

This is the story of James and his many collaborators who put in extensive work to produce their open textbook, and the partners that helped them reach their goal. James was the primary Editor-in-Chief of the process and is the focus of this case study.

This case study draws on:

- James and Paul's grant proposal to the DOT4D project.
- James and Paul's grant report to the DOT4D project.
- Field notes of the DOT4D Publishing and Implementation Manager.

What is the problem James is trying to address?

The *Marketing to South African Consumers* textbook addresses two main problem areas: (1) traditional marketing textbooks are very expensive, more than most South African students are willing or able to pay and (2) those textbooks are typically delivered from a Global North perspective. As such, they are financially prohibitive and rarely represent local experiences and realities.

Compounding this, students often only use a small portion of a marketing textbook, making them a poor investment. These books can also become quickly outdated, as the rate of practical change often outstrips the rate of curriculum evolution.

Textbook conventions in the discipline

The undergraduate Marketing degree at UCT has traditionally relied on a prescribed textbook. Over the last 20 years, the main textbook for Marketing 1 was *Principles of Marketing: Global and Southern African Perspectives* by US-based authors Kotler and Armstrong. The first edition of this book was published in 1980 (recent edition, 2016) and is a global staple in many classrooms. There is a South African edition. In January 2021, the cost of this book at South Africa's largest online retailer was R719 ($52) and the average class size for the Marketing 1 course was 675 students over a full year. The net textbook expense was therefore R485,325 if all students purchased this edition at the quoted price.

> Many sections in the 700-page book are not used and thus constitute a waste for students ... In reality, many students do not purchase it, which compromises their learning experience

The Kotler and Armstrong textbook is very comprehensive, with content that far outreaches the scope of the Marketing 1 course. Many sections in the 700-page book are not used in Marketing 1 and thus constitute a waste for students, given the expense of the book. In reality, many students do not purchase it, which compromises their learning experience. In 2018, a cheaper book was prescribed, but this did not meet the curriculum requirements of the course.

The extent to which the Kotler and Armstrong textbook is 'fit for purpose' is another challenge for prescribing this work in South Africa. While the localised edition is more appropriate when compared to the global edition, there is a lack of local theory and mainly a transfer of case studies from international to local context. In a country as diverse as South Africa, the imposition of Western models is appropriate for only a minority of the market, and the lack of emphasis on the informal sector and lack of understanding for the South African consumer landscape is often evident. The marketing courses at UCT are both theory-heavy and in need of practical application. Neither arm can be compromised in a robust marketing education.

James' open textbook journey

Original plan

As part of a continued drive to educate students and marketing practitioners, James and Paul envisioned working with a network of academics, marketing practitioners and students to create an open textbook. The original thinking behind producing the textbook was underpinned by the following principles:

1. **Inclusivity:** The authorship approach had to represent various sectors of society and give consideration to gender and culture dynamics. The textbook would be guided by the reality that consumer behaviour in South Africa is a diverse and complicated subject, and that low-income consumers and the informal sector needed to be well represented.

2. **Balance:** There had to be a balance between theory and application (and therefore a mix of academic and practitioner perspectives). Merely asking academics to contribute content, as is the norm in the current textbook offering, would compromise the practical element; whereas working solely with practitioners may weaken the theoretical aspect. The key theme behind each chapter was relevance and a solid theoretical base.

3. **Relevance:** The textbook needed to serve as a foundation for Sub-Saharan African expansion, as there is currently a deficit in marketing resources catering to the local context. The plan was to eventually extend this publication process into other Sub-Saharan countries through the editors' university networks, and beyond. Once the complete South African manuscript was finalised, the editors aimed to guide academic partners to adapt the South African content in order to produce local textbooks that have a practical and theoretical foundation already provided.

Authorship approach

James adopted a 'lead author as editor-in-chief with student and colleague co-authors' approach in the *Marketing to South African Consumers* production process. Working with Paul Egan, as well as colleagues Gillian Rightford and Thabang Ramogase as co-editors, he invited authors who were experienced in various elements of the book's contents. Each author was given a brief and worked with the editors over 18 months to craft the 21 chapters of the textbook.

The selection of chapters was informed by a ground-up approach where existing marketing theory was incorporated without being bound to traditional marketing textbook structures. A major emphasis was placed on localised context. Marketing practitioners, academics and students were involved in the writing, editing and peer reviewing process.

After assessing 15 local and international marketing textbooks, the editors developed a vision for a book that included more contextual chapters than usual, which sometimes meant sacrificing theory for application. They made sure to be true to sound marketing fundamentals that form the backbone of the discipline and which are practiced by the world's leading organisations. In line with this, the *Marketing to South African Consumers* textbook is aimed at providing a base for a number of undergraduate marketing courses. The marketing curriculum at UCT is currently under a multi-year review process and this textbook is an aspect of the discussion.

Marketing practitioners, academics and students were involved in the writing, editing and peer reviewing process

The content development process and student involvement

Authors produced first drafts of chapters in various stages of readiness. Once these drafts were received, the DOT4D Publishing and Implementation Manager (PIM) copy-edited the text and worked with James to establish cohesion across chapters. This was a time-consuming task, as the 22 authors involved had varying authorship styles and approaches to content delivery. The process also required a nuanced approach in order to retain the various authors' voices and perspectives, while still having the level of cohesiveness and rigour required for a professionally published scholarly work.

Working collaboratively throughout, James and the DOT4D PIM undertook the following content development process:

1. Editors commissioned chapters from authors.
2. Authors submitted first drafts of chapters to editors for review.
3. Editors commented on chapters.
4. The PIM edited chapters and submitted tracked changes files with comments/queries to James.
5. James reviewed edits, resolving some comments/queries, accepting/rejecting some edits.
6. James sent chapters back to authors with tracked changes and outstanding queries.
7. Authors addressed queries and returned content to James.
8. James administered the peer review process.
9. Following peer review, content went back to authors who addressed reviewer comments.
10. James and the PIM prepared the full first draft manuscript for professional proofread.

A handful of chapters diverted from this workflow due to the fact that they required a deeper level of editorial intervention and developmental editing. This resulted in an interactive process where multiple versions were exchanged between James, the PIM and authors. A dynamic, flexible approach was therefore required in dealing with multiple versions of content being in circulation at any given time.

As part of his process, James included students in the authoring and research team. As the end users of the textbook, their voices were considered an important addition. As an inclusive project, the editors also wanted to give students a platform to participate in a publication that may boost their confidence and enhance their CVs during the early stages of their careers. Most chapters with student involvement were monitored, with much assistance given in order to ensure quality. The editors were very proud of the student contributions.

> As an inclusive project, the editors also wanted to give students a platform to participate in a publication that may boost their confidence and enhance their CVs during the early stages of their careers

Publishing process

Institutional partnerships for publishing

The *Marketing to South African Consumers* publishing process formed part of a pilot exploration between the Centre for Innovation in Learning and Teaching (CILT) and UCT Libraries as part of an ongoing collaboration between these two entities to support open education at UCT and in the Global South more broadly. Within the context of this collaboration, the DOT4D project operated under the auspices of CILT.

As part of its commitment to address Sustainable Development Goals (SDGs), UCT Libraries has positioned itself as an open access publisher and online content host in order to promote access to scholarship produced in Africa. To further this ambition, it established a Continental Platform[2] in 2019 for open access publishing, built on Public Knowledge Project's Open Journals System and Open Monograph Press software.

The Libraries' publishing approach was originally focused on journal publication, but later expanded to include teaching and learning content.

The CILT/UCT Libraries open textbook collaboration is premised on CILT functioning as a partner to academics in pedagogical and content development, while UCT Libraries functions as the publisher. The combined, central focus promotes the imperative to support transformation in teaching and learning at UCT and promote visibility of African scholarship.

The third partner in the publishing process was the UCT Liberty Institute of Strategic Marketing, the department in which James and Paul were based. The Institute was regarded as the co-publishing entity with UCT Libraries, in that it was the primary driver and owner of the content development process. In this three-pronged approach, the academic department and UCT Libraries were positioned as co-publishers, while CILT/DOT4D was the facilitating intermediary.

Production and publishing

Part of the Marketing to South African Consumers approach to accessibility and inclusion was the ambition to have a professional, clear and accessible content design approach. The DOT4D grant proposal budget (and eventual grant) was therefore focused solely on design and typesetting services.

In other institutional publishing collaborations, UCT Libraries has undertaken the typesetting of content using standard templates in the Open Monograph Press platform. This was, however, deemed inappropriate for this content, as the publishing team desired a more dynamic approach.

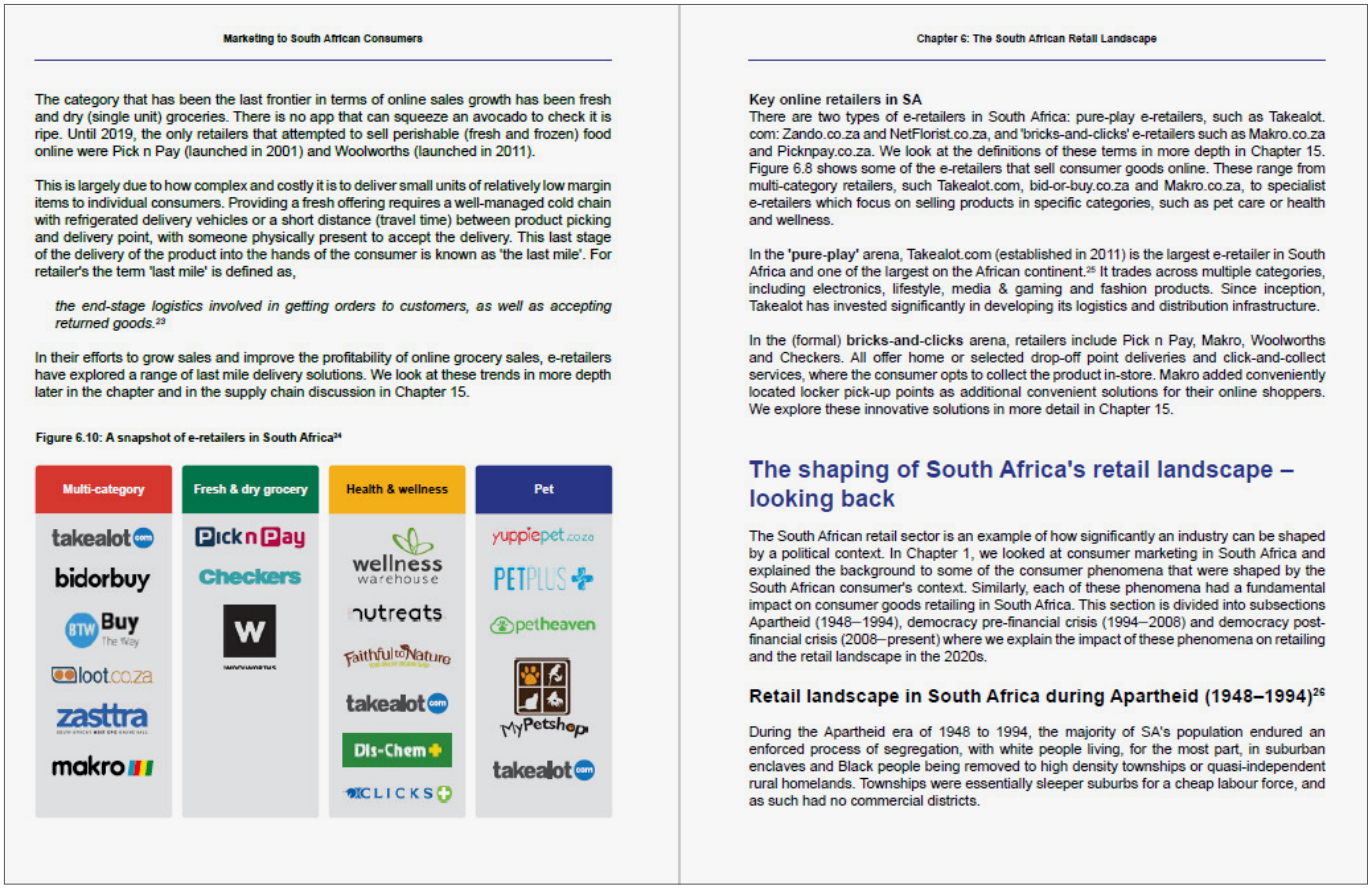
To this end, the PIM commissioned an external graphic designer who did cover and page design as well as the typesetting of the book (including processing multiple rounds of author corrections). The graphic designer was on board with the objectives and ethos of the publication and became an important partner in the publishing process.

The text/page design process was guided by the objective for content to be clear and visually appealing. It also had to abide by UCT Libraries' accessibility guidelines, which include provisions for optimal disability access.

Given the fact that graphic design and the typesetting process was outsourced, the process had two components:

- **Production (design and typesetting)** – undertaken with an external service provider and managed collaboratively by James and the PIM.
- **Publishing** – undertaken by the UCT Libraries Scholarly Communications and Publishing team.

[2] http://www.openaccess.lib.uct.ac.za/oa/continental-platform



Marketing to South African Consumers

The category that has been the last frontier in terms of online sales growth has been fresh and dry (single unit) groceries. There is no app that can squeeze an avocado to check it is ripe. Until 2019, the only retailers that attempted to sell perishable (fresh and frozen) food online were Pick n Pay (launched in 2001) and Woolworths (launched in 2011).

This is largely due to how complex and costly it is to deliver small units of relatively low margin items to individual consumers. Providing a fresh offering requires a well-managed cold chain with refrigerated delivery vehicles or a short distance (travel time) between product picking and delivery point, with someone physically present to accept the delivery. This last stage of the delivery of the product into the hands of the consumer is known as 'the last mile'. For retailer's the term 'last mile' is defined as,

the end-stage logistics involved in getting orders to customers, as well as accepting returned goods.[23]

In their efforts to grow sales and improve the profitability of online grocery sales, e-retailers have explored a range of last mile delivery solutions. We look at these trends in more depth later in the chapter and in the supply chain discussion in Chapter 15.

Figure 6.10: A snapshot of e-retailers in South Africa[24]

Multi-category: takealot.com, bidorbuy, Buy The Way, loot.co.za, zasttra, makro

Fresh & dry grocery: Pick n Pay, Checkers, W

Health & wellness: wellness warehouse, nutreats, Faithful to Nature, takealot.com, Dis-Chem, CLICKS

Pet: yuppiepet.co.za, PETPLUS, petheaven, MyPetshop, takealot.com

Chapter 6: The South African Retail Landscape

Key online retailers in SA

There are two types of e-retailers in South Africa: pure-play e-retailers, such as Takealot.com: Zando.co.za and NetFlorist.co.za, and 'bricks-and-clicks' e-retailers such as Makro.co.za and Picknpay.co.za. We look at the definitions of these terms in more depth in Chapter 15. Figure 6.8 shows some of the e-retailers that sell consumer goods online. These range from multi-category retailers, such Takealot.com, bid-or-buy.co.za and Makro.co.za, to specialist e-retailers which focus on selling products in specific categories, such as pet care or health and wellness.

In the **'pure-play'** arena, Takealot.com (established in 2011) is the largest e-retailer in South Africa and one of the largest on the African continent.[25] It trades across multiple categories, including electronics, lifestyle, media & gaming and fashion products. Since inception, Takealot has invested significantly in developing its logistics and distribution infrastructure.

In the (formal) **bricks-and-clicks** arena, retailers include Pick n Pay, Makro, Woolworths and Checkers. All offer home or selected drop-off point deliveries and click-and-collect services, where the consumer opts to collect the product in-store. Makro added conveniently located locker pick-up points as additional convenient solutions for their online shoppers. We explore these innovative solutions in more detail in Chapter 15.

The shaping of South Africa's retail landscape – looking back

The South African retail sector is an example of how significantly an industry can be shaped by a political context. In Chapter 1, we looked at consumer marketing in South Africa and explained the background to some of the consumer phenomena that were shaped by the South African consumer's context. Similarly, each of these phenomena had a fundamental impact on consumer goods retailing in South Africa. This section is divided into subsections Apartheid (1948–1994), democracy pre-financial crisis (1994–2008) and democracy post-financial crisis (2008–present) where we explain the impact of these phenomena on retailing and the retail landscape in the 2020s.

Retail landscape in South Africa during Apartheid (1948–1994)[26]

During the Apartheid era of 1948 to 1994, the majority of SA's population endured an enforced process of segregation, with white people living, for the most part, in suburban enclaves and Black people being removed to high density townships or quasi-independent rural homelands. Townships were essentially sleeper suburbs for a cheap labour force, and as such had no commercial districts.

Sample pages from the *Marketing to South African Consumers* textbook

Production process: Design and typesetting

1. An external professional academic editorial service provider proofread the first draft manuscript.
2. James resolved proofreading queries, where possible, and went back to authors for clarification and resolution where required.
3. The second draft manuscript was prepared for typesetting.

Publishing process: UCT Libraries online publishing

1. UCT Libraries' Scholarly Communications and Publishing team published PDFs on Continental Platform (first phase).
2. UCT Libraries' Scholarly Communications and Publishing team published EPUB and HTML versions on Continental Platform (second phase).

In addition to having the textbook openly available online in multiple formats to boost accessibility, James also felt it was important to have a print version of the textbook in order to more effectively market it. This would also help with promoting the development of further textbooks building on this edition amongst the marketing academic and practitioner community. James also felt it was important to explore the prospect of print-on-demand options in order to get a sense of what the process would be (and what it would cost) if students wished to have a print version of the book.

To this end, the PIM engaged the services of a South African open access publisher and academic publishing services provider. Two hundred copies of the book were printed at a cost of R23,834 ($1,699), which equaled a unit cost of R120 ($8) each. Some decisions (and compromises) were required around paper stock, given the size of the work and the ambition to keep it affordable.

Working with the publishing services provider, the publishing team was able to arrive at a printed product that was light in weight, adhered to best practice guidelines on accessibility principles, and was relatively affordable.

Content development and publishing tools

All content was developed and edited in MS Word. James and the PIM relied on Google Drive for sharing project management documents.

Graphic design and typesetting was done using Adobe InDesign. Adobe Acrobat was also utilised in the process to convert InDesign files to RTF format for online publication and to produce print files.

The publishing process was done using Open Monograph Press.

Copyright and licensing

In cases where third-party figures and graphs were used, content was redrawn and original author(s) attributed. For the stock images used in section-divider pages of the final layout, the relevant photo stock libraries were accredited in line with their licensing requirements.

The final published *Marketing to South African Consumers* textbook is licensed under a Creative Commons Attribution 4.0 International licence. All authors retained their copyright.

> The peer review process took additional time but was valuable in ensuring a quality product

Quality assurance and sustainability

James incorporated a peer review process in order to ensure that content met industry and academic standards. Academic experts and industry leaders were approached by both the authors and editors in order to proofread chapters and provide input in terms of possible missing content and appropriateness of terminology. The peer review process took additional time but was valuable in ensuring a quality product.

The partnership with the DOT4D project, particularly as relates to the role of the PIM, was also an important quality assurance aspect, as the PIM provided extensive editorial guidance, proofread all chapters and managed the publishing process in collaboration with James. Coupled with this, the activities of the professional designer and typesetter formed important aspects of the textbook's quality assurance process.

The co-publishing partnership with UCT Libraries was another important aspect of the textbook's quality assurance process, in that it provided access to a team of content publishing professionals who could format content for delivery across a range of devices according to international best practice.

In terms of sustainability, the *Marketing to South African Consumers* textbook provides an indication of what is required in terms of the resourcing to produce an open textbook. In this publishing scenario, the original DOT4D grant of R35,000 ($2,495) was bolstered by R73,834 ($5,263) in additional funds made up of a supplementary DOT4D grant, funding from the Liberty Institute and money from James's personal research fund.

Status at grant closure

At the end of the formal DOT4D grant period (February 2020), James and the PIM were still in the process of editing chapters and working with authors to ready content for peer review. James and the PIM collaborated on the production and publishing processes described here until December 2020, when the online version of the textbook was published and print copies were delivered.

Challenges experienced and lessons learned

Difficult to manage busy contributors

James expressed that while he had published journal articles and edited a textbook before, there was a steep learning curve in working with interested stakeholders outside of a traditional external, proprietary publishing model. The editors struggled with accountability to the project as authors had various competing priorities. It was also a challenge to manage the large group of contributing authors, as they all had their own personal agendas and professional commitments, which made setting and keeping to deadlines difficult.

> It was also a challenge to manage the large group of contributing authors, as they all had their own personal agendas and professional commitments

Support is everything

At the point of grant closure, James expressed that he saw the need to be more organised and to create stronger systems of accountability. He did, however, also acknowledge that a process of this kind is organic and expressed that having so many moving parts is difficult to manage. He viewed partnerships as being key to the process, and expressed that the support from DOT4D, CILT and UCT Libraries was the game changer for a project that the editors had been passionate about for years, but had become 'a little stuck' until 2018 when the DOT4D grant opportunity arose.

Budget

Overview of the original budget submitted to DOT4D as part of 2018 grant application, with actual expenditure.

Budget projected at proposal phase
Design expenses:
- Graphic design and page layout: R20,000
- Proofreading: R10,000
- Publishing and legal costs: R5,000

DOT4D grant amount: R35,000

Budget at grant closure
Design expenses:
- Cover design
- Page layout
- Figure and table design

DOT4D grant amount: R35,000

Additional resourcing
- Proofreading: R20,000
  (DOT4D supplementary grant)
- Typesetting: R30,000
  (UCT Liberty Institute contribution)
- Print: R23,834
  (UCT Liberty Institute contribution)

Total expenditure: R108,834

5

JONATHAN SHOCK'S OPEN TEXTBOOK JOURNEY

Grantee: Jonathan Shock
Position: Senior Lecturer
Department: Mathematics and Applied Mathematics
Faculty: Science
Course: Mathematics and Applied Mathematics
Degree level: Undergraduate
Title of initiative: Mathematics Textbooks for South Africa
Title of envisioned open textbook: *University Level Mathematics for a South African Audience*

Introduction

Dr Jonathan Shock is a senior lecturer in the Department of Mathematics and Applied Mathematics at the University of Cape Town (UCT). His research interests include string theory, machine learning, neuroscience and medical data analysis. Over the past five years he has been convening the first-year maths for scientists course.

In 2016, Jonathan was honoured with a UCT Distinguished Teacher Award in recognition of his contribution to teaching. Over the years, Jonathan has applied for grants to meet his teaching ambitions. In 2016, he received a UCT Teaching Grant (with Claire Blackman and Anita Campbell) for a first-year mathematics resources project. With it, they collated resources from different first-year maths courses across the university as a first step in creating a system whereby staff can access and share materials where courses overlap. In 2018, Jonathan received a UCT Teaching Innovation Grant for developing a chapter on complex numbers which received excellent feedback from students.

In 2019, Jonathan was awarded a grant from the Digital Open Textbooks for Development (DOT4D) project to develop a series of chapters for a first-year mathematics textbook, *Introduction to University Level Mathematics for a South African Audience*. The first of these chapters, 'Introduction to Complex Numbers'[1] (co-authored with Mashudu Mokhithi), was published in the OpenUCT repository in 2020.

[1] https://open.uct.ac.za/handle/11427/31769

The Digital Open Textbooks for Development (DOT4D) project in the Centre for Innovation in Learning and Teaching at the University of Cape Town (UCT) provided grant funding and implementation support to 10 open textbook projects in the period from March 2018 – March 2019, as well as implementation support to an 11th initiative. The Open Textbook Journeys series tells the stories of the people driving these initiatives, their teaching and publishing processes and what inspires them to do this work. These case studies were developed in collaboration with and reviewed by the open textbook authors profiled.

Jonathan seeks to open people's minds and expand their worldviews, and is inspired by the idea of using an abstract subject like mathematics to do so. This case study tells his story.

This case study draws on:

- Jonathan's grant proposal to the DOT4D project.
- Jonathan's grant report to the DOT4D project.
- Field notes of the DOT4D Publishing and Implementation Manager.

What is the problem Jonathan is trying to address?

Feedback from Jonathan's first-year maths course has revealed to him a number of prevailing problems that he is seeking to address with his open textbook. First, the R800 ($55) price tag for the currently prescribed textbook is too expensive and creates a high cost burden for students. Second, the current textbook is orientated towards an understanding of mathematics deriving from the Global North. Third, the textbook is not calibrated to the specific needs of local matriculants-turned-varsity-students who would benefit from more exercises and assessments in the text.

Jonathan aims to meet these challenges by providing a low cost (free), locally relevant open textbook that can function as a 'roadmap' to help students transition from high school to university-level courses and beyond. This forms part of his exploration of alternative teaching practices which present an interdisciplinary and localised approach to mathematics that includes history, culture and linguistics.

> The current textbook is orientated towards an understanding of mathematics deriving from the Global North

Textbook conventions in the discipline

Jonathan indicated that, in his department, the choice of textbook was made by the course convenor, but that this was often shaped by historical precedent. It was easier to simply re-use the previously used textbook because changing textbooks required a change to the entire course approach, as it dictates curriculum. Jonathan's textbook development process structures the content to match existing course requirements.

Jonathan's open textbook journey

Original plan

Jonathan submitted a proposal to the DOT4D grant programme in collaboration with his departmental colleague Dr Claire Blackman. Their collective project, 'Mathematics Textbooks for South Africa', had two main branches, both of which were aimed at addressing the accessibility of mathematics education for undergraduate students at UCT.

Jonathan was responsible for the first branch of the project, which was focused on the major first-year Mathematics and Applied Mathematics course, in which the same textbook had been used for over a decade.

As such, the aim of this project was to develop a book at UCT which would be open access, multi-format (online and print), inclusive (culturally and linguistically) and tailored for the South African school leaver. By writing a book in-house, Jonathan envisioned that all of the above problems could be addressed, and by working collaboratively with students, he hoped to create a sense of ownership regarding their mathematical knowledge and materials.

Authorship approach

Jonathan adopted a 'lead author as editor-in-chief with student and colleague co-authors' authorship approach, in which different components of the textbook would be developed concurrently through varying levels of collaboration with colleagues and students.

In his proposal, he described how student feedback and engagement would form a vital part of the project. In the past, efforts had been made to work closely with former Mathematics and Applied Mathematics students (in particular those in second and third year) to improve homework questions, and Jonathan believed that it was important to have the perspective of students to create something which was appropriate for their level. In addition, he believed that it was particularly important to work closely with students when developing the first chapter of the book so that the bridge between school and university was engineered correctly. This approach involved discussions with students to engage them on what they found to be the hardest aspects of their transition.

> The aim of this project was to develop a book at UCT which would be open access, multi-format (online and print), inclusive (culturally and linguistically) and tailored for the South African school-leaver

The content development process and student involvement

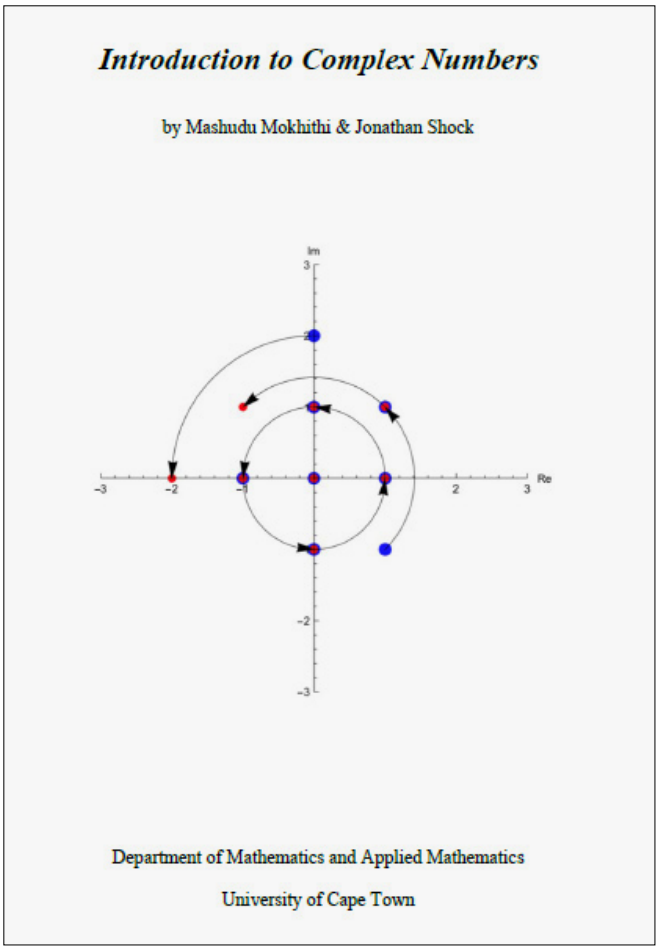
In Jonathan's original grant proposal, he outlined a one-year time frame for the production of his open textbook (March 2019 – February 2020).

Jonathan engaged two student assistants who played different roles in the project's content development process. One was responsible for familiarising themselves with PreTeXt[2], the XML-based authoring tool which was used in the chapter authoring process.

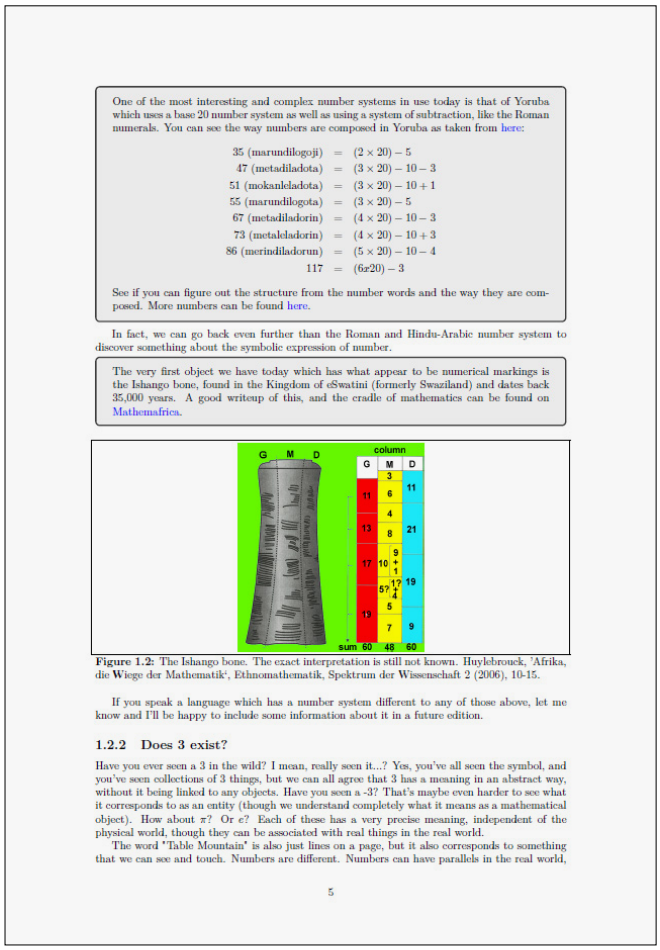
The other's role was to collate a bank of useful questions which could help students transition from high school level to what was expected of them in the first few weeks of university, focusing on topics they typically struggled with. The students' participation was motivated by their desire to improve the student experience for others and the shared ambition to try and create a growth mindset.

In developing the 'Introduction to Complex Numbers' chapter, Jonathan wrote up a LaTeX[3] document relating some of the basic ideas of what university mathematics encompassed, and then co-authored (with colleague Mashudu Mokhithi) notes on complex numbers which included discussion of issues relating to languages and number systems around the world. Following this, one of the students put the notes into PreTeXt so that they could be converted into PDF and HTML.

At the conclusion of the DOT4D grant period in February 2020, the team had a working document of roughly 100 pages covering much of the underpinnings of thinking about university mathematics, as well as a comprehensive set of notes on complex numbers which could be used by the 2020 intake of students in the Mathematics and Applied Mathematics course.



Cover page of the 'Introduction to Complex Numbers' chapter


One of the most interesting and complex number systems in use today is that of Yoruba which uses a base 20 number system as well as using a system of subtraction, like the Roman numerals. You can see the way numbers are composed in Yoruba as taken from here:

35 (marundilogoji) = $(2 \times 20) - 5$
47 (metadiladota) = $(3 \times 20) - 10 - 3$
51 (mokanleladota) = $(3 \times 20) - 10 + 1$
55 (marundilogota) = $(3 \times 20) - 5$
67 (metadiladorin) = $(4 \times 20) - 10 - 3$
73 (metaleladorin) = $(4 \times 20) - 10 + 3$
86 (merindiladorun) = $(5 \times 20) - 10 - 4$
117 = $(6x20) - 3$

See if you can figure out the structure from the number words and the way they are composed. More numbers can be found here.

In fact, we can go back even further than the Roman and Hindu-Arabic number system to discover something about the symbolic expression of number.

The very first object we have today which has what appear to be numerical markings is the Ishango bone, found in the Kingdom of eSwatini (formerly Swaziland) and dates back 35,000 years. A good writeup of this, and the cradle of mathematics can be found on Mathemafrica.

Figure 1.2: The Ishango bone. The exact interpretation is still not known. Huylebrouck, 'Afrika, die Wiege der Mathematik', Ethnomathematik, Spektrum der Wissenschaft 2 (2006), 10-15.

If you speak a language which has a number system different to any of those above, let me know and I'll be happy to include some information about it in a future edition.

1.2.2 Does 3 exist?

Have you ever seen a 3 in the wild? I mean, really seen it...? Yes, you've all seen the symbol, and you've seen collections of 3 things, but we can all agree that 3 has a meaning in an abstract way, without it being linked to any objects. Have you seen a -3? That's maybe even harder to see what it corresponds to as an entity (though we understand completely what it means as a mathematical object). How about π? Or e? Each of these has a very precise meaning, independent of the physical world, though they can be associated with real things in the real world.

The word "Table Mountain" is also just lines on a page, but it also corresponds to something that we can see and touch. Numbers are different. Numbers can have parallels in the real world,

5

Discussion of African numbering systems in the 'Introduction to Complex Numbers' chapter

[2] https://pretextbook.org/

[3] https://www.latex-project.org/

The next step would be to gradually develop these notes into the collection of chapters which would comprise the Introduction to the *University Level Mathematics for a South African Audience* open textbook.

Jonathan believed that the interaction with the student assistants in the content development process had been a valuable part of the process, particularly because their collaboration with the project helped enrich their first-year experience. They also emerged with new skill sets. One became proficient in using XML markup language, which would be useful in other maths projects. The other had been given an opportunity to think more deeply about mathematics pedagogy, which was valuable in terms of opening up his future career opportunities and ambitions.

> Interaction with the student assistants in the content development process had been a valuable part of the process, particularly because their collaboration with the project helped enrich their first-year experience

Production and publishing

Jonathan has adopted an 'author as self-publisher' approach towards the publication of his open textbook.

In collaboration with one of his colleagues, he typeset and produced the first chapter (of the envisioned open textbook), 'Introduction to Complex Numbers', which was published in the OpenUCT repository in April 2020.

Content development and publishing tools

The complex numbers notes and chapter were all produced using Overleaf (LaTeX). The other chapters are being produced using the PreTeXt XML publishing tool. This open source publishing tool enables content to be exported in a variety of formats, including HTML, PDF and EPUB.

One of the key features of PreTeXt is it allows for the easy inclusion of runable code within HTML so that students reading the book online can check answers, run examples and interact with the textbook.

Copyright and licensing

Jonathan and the student assistants developed all the material for the introductory chapter, thus there were no third-party copyright concerns that had to be navigated.

The 'Introduction to Complex Numbers' chapter is published under a Creative Commons Attribution 4.0 International licence.

Quality assurance and sustainability

Jonathan employed both student review and colleague review in his project's quality assurance process.

Alongside Jonathan, two other lecturers helped oversee this project. First-year students were also asked to provide feedback, highlighting gaps in explanations or errors in the writing. This was seen as an ongoing aspect within the project. In the past, the project's team had found that, because there were so many students involved in the process, any errors were picked up very quickly and a new version could be produced almost immediately. In addition, Jonathan employed professional proofreaders to improve the quality of the work being produced.

In terms of sustainability, Jonathan believed that, because the project was producing the textbook in a modular fashion, each chapter would build on the previous ones and that motivation to complete the textbook would grow as more chapters appeared. He envisioned this would be in progress for at least two years, but that design of early pilot chapters, such as the 'Introduction to Complex Numbers', would aid the project in recognising what the main hurdles of production would be.

> First-year students were also asked to provide feedback, highlighting gaps in explanations or errors in the writing

Status at grant closure

At the end of the grant period in February 2020, Jonathan was in the process of finalising the 'Introduction to Complex Numbers' chapter for publication. Despite some delays in the publication of the final version, the notes that formed the foundation for this chapter could still be used in the first semester of the 2020 academic year.

Challenges experienced and lessons learned

A generally pleasant experience

Apart from one student dropping out of the project's development team, Jonathan experienced few hurdles in his open textbook journey and expressed that there was very little he would have changed about the process. He felt it turned out to be productive and successful, with many benefits experienced by the various collaborators involved in the project as well as the broader student community.

Project structure enhanced motivation

In addition, Jonathan expressed that, 'this has been very useful in terms of being able to dedicate time to writing. While I was not paid directly, having the project was itself a very good motivator to get something finished in a finite amount of time'.

Budget

Overview of the original budget submitted to DOT4D as part of 2018 grant application, with actual expenditure.

Budget projected at proposal phase
Student assistant salary: R17,500
Proofreading: R2,500

DOT4D grant amount: R20,000

Budget at grant closure
Student assistant salary: R17,500
Proofreading: R2,500

DOT4D grant amount: R20,000

6

JUAN KLOPPER'S OPEN TEXTBOOK JOURNEY

Grantee: Juan Klopper
Position: Senior Lecturer and Head of Acute Care Surgery Unit
Department: Surgery
Faculty: Health Sciences
Course: General Surgery
Degree level: Undergraduate
Title of initiative: The Open Surgery Textbook
Title of envisioned open textbook: *The Open Surgery Textbook*

Introduction

Some people make open education look easy. They're open practitioners who have somehow figured out how to make virtually everything they do freely accessible to the public. They open up their classrooms to the world by making sure everyone has access to what they teach. Of course, this is not easy, but with planning, practice and consistency, they're able to systematise their open practices so that it is their default teaching mode.

Few educators exemplify this approach better than Dr Juan Klopper, the former Head of the Acute Care Surgery Unit at Groote Schuur Hospital in Cape Town, where he specialised in emergency surgery. He was a Senior Lecturer, Head of Postgraduate Surgical Research, and Head of Surgical Education at the University of Cape Town (UCT).

Now based at another university, Juan's passion lies in creating and sharing knowledge that is free and open to all. By developing content using various formats and methods, he has explored the use of online platforms and social media for broadening access to knowledge, particularly as relates to health care in South Africa.

Juan previously received two grants from UCT which resulted in the creation of three open educational resources: (1) Acute Care Surgery Lectures (22 online tutorials)[1], (2) Topics in General Surgery and Critical Care (35 online tutorials)[2], (3) Surgery Intermediate Examination Masterclass (56 online tutorials and in-person preparation programme)[3].

[1] https://www.youtube.com/playlist?list=PLsu0TcgLDUiKNr6FBKtm3-hD3QUBx0FRe
[2] https://www.youtube.com/watch?v=NRinYCsY1yM&list=PL2E695C7E0C926BFE
[3] https://www.youtube.com/watch?v=YRwlvydqYII&list=PLsu0TcgLDUiJXoY9tP4PjRxlx3gI4U_b3

The Digital Open Textbooks for Development (DOT4D) project in the Centre for Innovation in Learning and Teaching at the University of Cape Town (UCT) provided grant funding and implementation support to 10 open textbook projects in the period from March 2018 – March 2019, as well as implementation support to an 11th initiative. The Open Textbook Journeys series tells the stories of the people driving these initiatives, their teaching and publishing processes and what inspires them to do this work. These case studies were developed in collaboration with and reviewed by the open textbook authors profiled.

> Juan has posted hundreds of lectures on his YouTube channel over the past 11 years, resulting in more than 1.3 million views

As an award-winning open educator[4] who shares his lectures openly as a default practice, Juan has also posted hundreds of lectures on his YouTube channel[5] over the past 11 years, resulting in more than 1.3 million views of his lectures on a diverse range of topics, including: clinical research, data visualisation, human anatomy, life science mathematics, physics, statistics, and various computer languages.

In February 2019, Juan received a grant from the Digital Open Textbooks for Development (DOT4D) project to support the development of *The Open Surgery Textbook*, a textbook that would be openly licensed and freely accessible online for anyone to use.

This case study draws on:

- Juan's grant proposal to the DOT4D project.
- Interviews (x2) with the DOT4D Researcher.
- Field notes of the DOT4D Publishing and Implementation Manager.

What is the problem Juan is trying to address?

Juan's work is concerned with addressing the financial and structural barriers that exist around the production and dissemination of knowledge regarding health care. In addition, he noted that the surgical textbooks currently in use are not applicable to the realities faced by South African community service interns and junior doctors in their daily work. That is, they are not fit for purpose. The open textbook he planned to develop aimed to create content which was not only openly licensed and free for use, but also relevant for use in the South African context.

Textbook conventions in the discipline

Juan indicated that, in his field, teaching resources were rarely designed according to an inclusive pedagogical philosophy that involves the end user of the product in the content creation process.

Thus, students are not included in the design of their own curriculum. Juan believed that such resources have been based on patriarchal philosophies of 'the teacher knows best' – or, in this case, 'expert surgeon knows best'. Juan believed that these philosophies were inauthentic and out of touch with modern educational principles, particularly as relates to decolonisation and inclusivity.

Juan's open textbook journey

Original plan

Juan's open textbook journey was driven by his belief that the lack of appropriate medical educational resources that are sensitive to both local environmental resources and cultures is one of the reasons why many people do not have access to adequate surgical care both locally and globally. He believed that the development of educational material local to UCT, the Western Cape, South and Southern Africa, Africa, and the broader Global South had not been pursued with appropriate vigour. As such, there were often only disorganised combinations of random lecture notes and other materials for students and practitioners to use.

> The solution to the problem of inclusivity and curriculum change is presented in a very elegant way by engaging the end-user in the guidance of this expression

Authorship approach

Juan planned to adopt a 'lead author as editor-in-chief with colleague co-authors' approach in his authorship process which would be centred around a 'bottom-up' strategy, in which medical students and practitioners in the field decide on the content. He believed that this approach would enable an interrogation of the power dynamics in knowledge creation and an opportunity to engage with the realities experienced by health care workers in different parts of the country.

Juan stated that, 'an important constraint to the development of inclusive open educational resources is the fact that knowledge of the content lies solely with the domain expert. Their input can therefore not be ignored. The expression of this knowledge, though, must be guided. The solution to the problem of inclusivity and curriculum change is presented in a very elegant way by engaging the end-user in the guidance of this expression.'

[4] https://awards.oeglobal.org/awards/2014/educator/juan-klopper/
[5] https://www.youtube.com/user/Jhklopper/featured

Juan identified medical specialists in hospitals who work in consultation with students, interns and junior doctors in their facilities. These students, interns and doctors would be tasked with identifying the content areas for which they were in most need of support. The medical specialists who played the role of domain experts would then be tasked with the actual writing of the content and develop short content modules to address these skills gaps. In his role as editor-in-chief of the process, Juan would ensure that the content developed was applicable and of acceptable quality. At the end of the process, the group of medical students would then evaluate the content and inform the changes required to make the content fit for purpose.

> The creation of his open textbook would be modelled on the philosophy of 'hacking' a textbook

Screenshot of a selection of Juan's open textbook content shared on his @docjuank Instagram page

The content development process and student involvement

In describing his envisioned content development process, Juan stated that the creation of his open textbook would be modelled on the philosophy of 'hacking' a textbook. To do this, he wanted to set aside a weekend for engaging interns and junior doctors face-to-face and discussing the content that should be included. He would use the Delphi method to obtain a more democratic view on the content which needed to be created. The domain experts would then be given an eight-week period to create the actual content. Following this, the student body would be given a four-week period to provide feedback. The domain experts would then be given another two weeks to make the required changes.

In total, Juan envisioned that this process would take six months to transform the content into online video tutorials and Instagram posts, his preferred modes of content release. However, Juan left the university before completing his content development process.

Production and publishing

Within his publishing process, Juan intended to employ the 'author as self-publisher' approach, as he had done with his previous open education resources.

Content development and publishing tools

Juan believes in the power of technology and innovation and envisioned that his textbook development and publishing process would utilise a range of platforms to host and disseminate content. He highlighted how one of the innovative aspects of his work was the fact that he would be transforming the resource into other modalities. He stated that, 'we can no longer assess any service or gain any information without the help of technology ... Unfortunately, the majority of our pedagogical efforts exist in an outdated analogue world. This is not the world in which our students exist. Instead, they live in a digital age with information at their fingertips. It is our duty as domain experts to exist in this reality where our goal is to guide and shape the information that exists here.'

As such, Juan envisioned the transformation of all the open textbook content into video tutorial format that would be fit for consumption on the Instagram social media platform, which would be appropriated to facilitate uninterrupted accessibility of content and convenience for students in training.

At the time of writing his DOT4D grant proposal, Juan had already started engagement on this platform and the majority of the 2018 fifth- and sixth-year medical students at UCT had signed up to follow his professional Instagram account. He stated that, 'in its current form, it has become an online textbook of emergency surgery and it is used as a preparation resource from the written examination for both groups of students. It is arguably a more important resource than a textbook, available to everyone with a free account, at all times, and everywhere where they have internet access. This means that information is at hand where service delivery is required, not as a large PDF or similar document, printed out or saved on a hard drive. It is also easy to update and available long after graduation.'

> A selection of more than 50 open textbook video resources produced in 2020 is available on his @docjuank Instagram page

Quality assurance and sustainability

Juan believed that the tiered and equal-partner design of this proposed open textbook had the benefit of built-in quality assurance.

In terms of sustainability, he envisioned including the UCT Student Surgical Society as a major long-term partner in the maintenance of this project. He described this student society as being the largest, most active and innovative student group in the Faculty of Health Sciences at UCT and that it had achieved many milestones. Juan had also personally taken part in many of their programmes and had acted as an advisor for many of their projects. They were also the student body from which he had planned to draw his student participants.

Status at grant closure

Juan was unable to complete his open textbook within the DOT4D grant period (March 2019 – February 2020) and later left the university in 2020. A selection of more than 50 open textbook video resources produced in 2020 is available on his @docjuank Instagram page.

Budget

Overview of the original budget submitted to DOT4D as part of 2018 grant application, with actual expenditure.

Budget projected at proposal phase
Domain experts, intern doctors and medical students: R40,000
Audio and video equipment for video tutorials: R20,000

DOT4D grant amount: R60,000

Project actual expenditure
None. Grant funding was returned to the DOT4D project

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KENSLEYRAO APAJEE'S OPEN TEXTBOOK JOURNEY

Grantee: Kensleyrao Apajee
Position: Head Tutor / MPhil student
Department: Mechanical Engineering
Faculty: Engineering and the Built Environment
Course: Engineering Drawing
Degree level: Undergraduate
Title of initiative: First-Year Mechanical Engineering Drawing
Title of envisioned open textbook: *Sketching, Drawing and Visualisation for Engineers*

Introduction

Can you imagine being a South African university student and having to pay R2,000 for a one-semester engineering drawing textbook where all the measurements in the book are referenced in inches, feet, yards and miles … and you only use a portion of the textbook? It doesn't make sense.

That was the reality Kensleyrao 'Kensley' Apajee faced as the Head Tutor in the first-year Engineering Drawing (ED) course in the Faculty of Engineering and the Built Environment at the University of Cape Town (UCT) from 2017–2019. The issue arose from the textbook selected for the course which forced students to choose between buying an expensive and (perhaps) ill-suited textbook or ignoring it at their peril. He thought there must be a better alternative, so he set his mind to creating one in the form of an open textbook.

Hailing from Mauritius, Kensley had developed a passion for teaching and planned to create some free, locally relevant resources to replace, or complement, the prescribed textbook for the ED course. This effort would be part of his MPhil in Engineering Education at UCT. When he heard that the Digital Open Textbooks for Development (DOT4D) project was offering grants for open textbook development, he applied and won a grant in 2019 to develop a first-year mechanical engineering drawing open textbook under the guidance of his MPhil supervisor, Dr Bruce Kloot.

What follows is a story that is both inspiring and frustrating. It combines all the ups and downs you would expect of any difficult, yet worthwhile, journey. Anyone interested in open textbook production will want to read on.

The Digital Open Textbooks for Development (DOT4D) project in the Centre for Innovation in Learning and Teaching at the University of Cape Town (UCT) provided grant funding and implementation support to 10 open textbook projects in the period from March 2018 – March 2019, as well as implementation support to an 11th initiative. The Open Textbook Journeys series tells the stories of the people driving these initiatives, their teaching and publishing processes and what inspires them to do this work. These case studies were developed in collaboration with and reviewed by the open textbook authors profiled.

This case study draws on:

- Kensley's grant proposal to the DOT4D project.
- Kensley's grant report to the DOT4D project.
- Field notes of the DOT4D Publishing and Implementation Manager.

What is the problem Kensley is trying to address?

All mechanical engineering students at UCT take the ED course in their first year. Only a small portion of them are exposed to engineering drawing or engineering graphic design in secondary school; thus most have no prior experience with this kind of technical drawing, which is critical for the development of spatial visualisation ability (SVA). SVA is a skill which has been shown to be a predictor of success in science, technology, engineering and mathematics (STEM) fields (Khine, 2017).

The path to greater proficiency in technical drawing is complicated at UCT, however, by the fact that students are taught this new discipline in English, which is a second or third language for many. They do so in a class with about 150 other students, making it difficult for some to receive the attention they might need from teaching staff. And only a minority of students can afford private tutoring to get around these issues.

These challenges are compounded by the high price of the prescribed textbook for the course, *Fundamentals of Graphic Communication* (Bertoline, Wiebe, Hartman & Ross, 2011). In July 2020, the book cost $125 (R2,000) on Amazon[1]. Most students would think twice before spending that much money on a book that is prescribed for just one semester, and of which (according to Kensley) they will only use 10% during the course.

While UCT Libraries stocks other ED textbooks (as well as copies of older editions of the prescribed textbook), they are not sufficient to meet students' needs. Furthermore, the prescribed American textbook lacks relevance for certain aspects of the South African context. It uses imperial measurements (feet, inches) rather than metric. It presents different types of projection, line styles, dimensional standards and lettering standards than are locally used. And it is geared more for draughtspersons studying at technical schools rather than university-level mechanical engineering students.

[1] https://www.amazon.com/Fundamentals-Graphics-Communication-Robert-Bertoline/dp/0073522635

The prescribed American textbook lacks relevance for certain aspects of the South African context

Because of these issues, Kensley estimated that less than a dozen of the 150 students actually bought the textbook. Thus, they were faced with significant pedagogical and financial challenges in trying to succeed in this critical discipline.

Textbook conventions in the discipline

Kensley indicated that in mechanical engineering courses at UCT, lecturers largely decide which educational resources they use. For in-class instruction, he stated, 'most of the lecturers have their own slides…some get it from other places….Most of them have some good resources'. The selection and combination of these materials is often the result of years of experimentation and adjustment while teaching.

For at-home readings and assignments, lecturers may ask students to draw on materials from a tailored reading pack, a reference textbook, or materials that they themselves must search for on the internet or at the library.

Kensley's open textbook journey

Original plan

Through his experience as a tutor at UCT, Kensley came to believe that an open textbook focused on the practical elements of engineering drawing in the South African context could not only address the learning needs of local students – especially as they relate to the development of their SVA – but do so in a manner that was financially viable for them.

Before even hearing about the DOT4D grants programme, Kensley started compiling ideas in 2018 of what he thought should be included in a resource for supporting student learning. He wanted something that would reassure ED students and lighten their load a little. Using Scribus open-source desktop publishing software, he produced a few pages of his own personal writing for the first two modules of the course, which

included the main theory and explanation and a couple of worked examples. He also developed some material on SVA (which is not a formal course component, but nonetheless crucial for drawing proficiency) and made all of these materials available to the students from the start of the first semester of 2019. This work formed part of his MPhil project.

In formulating his teaching approach, Kensley drew on the work of scholars who identified numerous challenges students encounter in engineering drawing, including teaching approach, acquisition of fundamental knowledge of the subject in secondary education, the learning atmosphere and time allocated. Kensley felt that, step by step, each of these factors could be addressed so as to make the learning experience a much better and more fruitful one.

When Kensley was awarded the DOT4D grant in 2019 for developing a *Sketching, Drawing and Visualisation for Engineers* open textbook, it was conceived as a means to support the formal tutorial process by taking students on a journey of acquiring the necessary practical drawing skills.

> Kensley aimed to design a resource that was freely accessible to UCT students, containing learning materials adhering to South African drawing standards

To do this, Kensley aimed to design a resource that was freely accessible to UCT students, containing learning materials adhering to South African drawing standards. It would be locally relevant, using appropriate measurement units, projection types, line styles, dimensional standards and lettering standards. And it would be aimed at South African university students, complementing their journey through the mechanical engineering degree.

The intention was for the textbook to be made freely available online under a Creative Commons licence. While aimed at UCT students, it would be available for anyone in South Africa who wished to learn ED and hone their SVA skills. It would also fill a gap in the South African market, in that there were no similar resources that sought to develop ED skills while enhancing the SVA of students.

Kensley hoped that the book would make a highly technical subject like ED more accessible and enjoyable to first-year students, particularly those who had not been exposed to it prior to university.

Authorship approach

Kensley adopted a 'solo student author with UCT intermediary support' authorship approach, in which he envisioned that he would be the sole author of the book, conceptualising, designing and producing the text and graphics by himself. For the most part, this was the case.

He embedded his authorship approach in the ED course teaching and tutoring framework. As part of his MPhil work, and as a precursor to the full open textbook development process, he developed three prototype chapters to support topics which were being taught at the time. He consulted with the course lecturer to ensure that his content was adequate and appropriate to support the knowledge conveyed in class. When he had a draft chapter ready, his MPhil supervisor reviewed the content, after which additional edits were made and a preliminary chapter layout was completed.

These preliminary chapters formed the foundation for a more thoroughly conceptualised open textbook, the development of which was undertaken with the DOT4D grant. From that point onwards, Kensley worked with the DOT4D Publishing and Implementation Manager (PIM) who provided assistance in the form of editorial and production support.

The content development process and student involvement

Kensley was able to trial three prototype chapters with the students over the course of one semester. They, in turn, gave him useful feedback (via a survey he sent to them) at the end of the term, which shaped later iterations of the book.

The main suggestion they offered was that he should include more practice exercises. Kensley acknowledged that this made sense, as 'drawing is best learnt through drawing itself'. Thus, instead of going into great detail regarding the theory underlying the different topics, he provided concise summaries for each of them, freeing up more space for an emphasis on worked examples and practice exercises. Through the expanded practice opportunities in the updated version of the textbook, he hoped that students would develop not only greater insights into ED, but also become highly proficient in drawing.

Publishing process

Prototyping (pre-DOT4D grant period, 2018/2019)
Three chapters were developed and trialled with students in tutorials. Kensley's supervisor, Dr Kloot, provided input on the chapters during this phase.

Pre-production / editorial development (DOT4D grant period, March 2019 – February 2020)
Seven draft chapters were developed. The PIM proofread all chapters and provided guidance on editorial approach, cohesion in chapter structure and integration of visual elements.

Production (envisioned)
The next step was to finalise all 11 chapters (as per the proposed table of contents) and move to the layout phase, at which point the PIM would support with layout advice and page-checks. Kensley produced a sample layout for one chapter, on which the PIM provided feedback.

Publication (envisioned)
As the production process has yet to be completed, the publishing process remains in incubation.

Content development and publishing tools

Kensley wrote the textbook content in MS Word, managed image production in Adobe Photoshop and created the page layout in Adobe InDesign.

Copyright and licensing

As an aspiring graphic artist and illustrator, Kensley produced all of his own images for the textbook, therefore he did not anticipate any copyright or licensing issues.

The aim was to release the final published textbook under a Creative Commons Attribution 4.0 International licence, with Kensley being the sole author and copyright holder.

Quality assurance and sustainability

In terms of quality assurance, Kensley anticipated that he would call on academics and professionals in the engineering drawing field as well as educational and pedagogical experts to review chapters and advise on how to optimise the book and the publishing process. In the prototype phase, quality assurance was provided by Kensley's MPhil supervisor, a lecturer in mechanical engineering at UCT.

In the DOT4D grant phase, as the textbook development progressed, Kensley worked closely with the DOT4D PIM, who played the role of editor for the book. It was envisioned that Kensley's supervisor would continue his quality assurance role in the later stages of the production process when typeset pages were produced.

> The survey, which was given to students after the first semester prototype implementation provided feedback on the efficacy of the materials and informed the content included in the chapters

In addition, the survey, which was given to students after the first semester prototype implementation provided feedback on the efficacy of the materials and informed the content included in the chapters still under development.

The original ambition was that once the full open textbook was produced, Kensley would continue to update the book in line with new advances and developments in the field so as for it to remain fit for purpose.

Status at grant closure

At the end of the grant period (February 2020), 90% of the book's textual and graphic content was ready to be laid out according to the finalised designs and themes. Kensley had aimed to complete his textbook production and publishing process by the end of 2019 for implementation in the first semester of 2020, but that period turned out differently than he had hoped. At that time, Kensley was juggling multiple commitments as a member of his department's teaching staff, as an emerging open textbook creator, and as a foreign student studying abroad. His visa to study in South Africa was not renewed, creating new stresses on top of what he was already coping with as he tried to finish his MPhil. In those circumstances, he put his open textbook production to the side, hoping to come back to it after the completion of his degree.

Challenges experienced and lessons learned

Finding the right tone

As Kensley engaged in his textbook development process, new issues and opportunities emerged.

> ‘The open textbook is an opportunity to leave a legacy of good drawing practices for the young engineers of tomorrow’

He initially wanted to write the text in a ‘spoken’ style – a more conversational approach that would reassure students who might feel intimidated by formal academic language. But he soon realised that listening to someone speaking versus reading someone’s spoken words are not the same.

With the help of the DOT4D PIM, he tried to strike a balance between a colloquial spoken style and a formal academic tone that remained easy for students to understand.

Technological assistance was critical

Because ED is, in essence, a graphic subject, when Kensley acquired a new laptop and digital drawing tablet through the DOT4D grant, he was able to enhance the quality of the pictorial elements included in the book. He could hand-draw concepts in a digital format without having to scan them from paper.

It is impossible to anticipate all of life’s challenges

Kensley made good progress with his open textbook initiative within the parameters of the DOT4D grant period, but a number of administrative and temporal challenges arose which have – hopefully temporarily – stalled its progress. This does not mean that this open textbook journey is over for Kensley, just that it will have to move forward under different circumstances when he is able to do so.

Kensley learned as much – if not more – than his students during this process

Kensley stated that his open textbook development process gave him great insight into the learning experience of students, and into himself as a teacher and individual. He said, ‘We, as teachers, are major stakeholders in the field of education. We should not only be aware but also be appreciative of the opportunity we have to inspire the younger generations to be better and happier members of our society. The open textbook, in my view, is therefore an opportunity to leave a legacy of good drawing practices for the young engineers of tomorrow and also keep up a bit of much-needed cheer in the classroom environment.’

References

Bertoline, G., Wiebe, E., Hartman, N. & Ross, W. (2011). *Fundamentals of Graphic Communication*, 6th Edition. New York: McGraw-Hill Education.

Khine, M.S. (Ed.) (2017). *Visual-spatial Ability in STEM Education: Transforming Research into Practice*. Cham, Switzerland: Springer International.

Budget

Overview of the original budget submitted to DOT4D as part of 2018 grant application, with actual expenditure.

Budget projected at proposal phase
Book content writing by main content creator: R19,500
Adobe software licence: R2,400

DOT4D grant amount: R21,900

Project actual expenditure
Adobe Creative Cloud package: R2,695
MSI PS42 Creative laptop: R18,900

Total expenditure: R21,595

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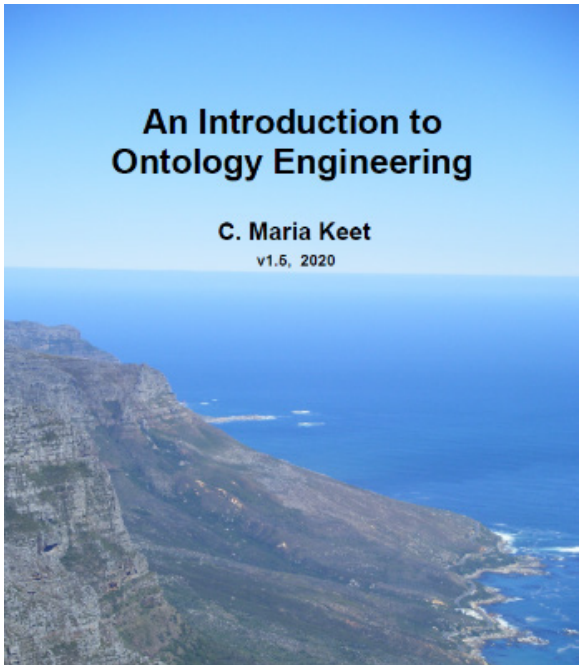
MARIA KEET'S OPEN TEXTBOOK JOURNEY

Grantee: Maria Keet
Position: Associate Professor
Department: Computer Science
Faculty: Science
Course: Ontology Engineering
Degree level: Postgraduate
Title of initiative: Ontology Engineering
Title of open textbook: *An Introduction to Ontology Engineering*

Introduction

Imagine if you could write the first textbook in your academic discipline. Would you produce an expensive, copyrighted, printed volume (the default choice) or would you avail yourself of new technological and legal innovations and produce a freely accessible, openly licensed, digital textbook (thereby establishing a powerful precedent)? This was the choice that faced Associate Professor Maria Keet in the Department of Computer Science at the University of Cape Town (UCT) who, in 2018, wrote the world's first textbook in the new subfield of ontological engineering, titled *An Introduction to Ontology Engineering*. The work emerged from her research interests in knowledge engineering with ontologies, concept modelling and related natural language generation, and from the fact that she was teaching an Ontology Engineering course in Computer Science which she felt would benefit from a dedicated textbook.



The Digital Open Textbooks for Development (DOT4D) project in the Centre for Innovation in Learning and Teaching at the University of Cape Town (UCT) provided grant funding and implementation support to 10 open textbook projects in the period from March 2018 – March 2019, as well as implementation support to an 11th initiative. The Open Textbook Journeys series tells the stories of the people driving these initiatives, their teaching and publishing processes and what inspires them to do this work. These case studies were developed in collaboration with and reviewed by the open textbook authors profiled.

Maria has an interest in open approaches towards knowledge production and dissemination and thinks that knowledge should be available free of charge so that it can increase possibilities for new research, scholarship and application. She feels that open educational resources play an important role in saving students (and interested lay people) money on expensive textbooks and that they can help redirect resources into parallel activities, such as content translation into different languages.

In February 2019, Maria was awarded a grant from the Digital Open Textbooks for Development (DOT4D) project to update and enhance her original *An Introduction to Ontology Engineering* work into a dynamic, interactive online textbook[1] with more content, more educationally relevant software, exercises and tutorials than found in the static PDF. She also increased the amount of locally relevant examples and content.

Maria's open textbook journey is fascinating because she has written the first textbook in her subfield, creating a compelling precedent for other educators to follow.

This case study tells her story, drawing on:

- Maria's grant proposal to the DOT4D project.
- Maria's grant report to the DOT4D project.
- Field notes of the DOT4D Publishing and Implementation Manager.

What is the problem Maria is trying to address?

Maria aims to fill the gap in educational material for ontology engineering that exists internationally – not only for the development of ontologies, but also to enable computer scientists to devise new methods, techniques and tools to facilitate the development of better-quality ontologies. Aimed at Honours and early postgraduate students, her work identifies and demarcates ontology engineering; introduces the reader to its essential components; and provides explainers, summarised and digested versions of scientific papers, as well as exercises to interactively engage with the material. At the time of writing, it is still the only textbook in ontology engineering for computer scientists.

Maria also aims to address the issue of cost savings for students, estimating that an imported commercially published textbook of this nature, if it existed, would cost in the region of R1,500–R2,000 ($100–$140).

Maria also aims to address the issue of cost savings for students, estimating that an imported commercially published textbook of this nature, if it existed, would cost in the region of R1,500–R2,000 ($100–$140)

Disciplinary conventions regarding textbooks

Maria indicated that, in her department, the decision about which textbook(s) to use for a course, including whether to use a textbook or not, is made by whoever teaches the course. For her, the main considerations when choosing a textbook include the:

- Level and primary envisioned audience.
- Topics covered and the order of topics, including its pedagogy.
- Degree to which it contains ancillary materials, such as adaptable slides, answers to exercises, code snippets and assistive software.
- Popularity and reputation of its authors.
- Cost and licensing (preferably open).

Maria indicated that her department tends to choose free resources wherever possible, or otherwise utilise a low-cost option to keep the costs down for students.

Maria's open textbook journey

Original plan

At the beginning of her open textbook journey, Maria set out to develop her resource through exploring how she could address the fact that there had not been any kind of ontology engineering textbook available for computer science students up until the first version she published in 2018. The writing of this first version began in 2009 with informal blogs which Maria improved and extended over many years. This initial version was made available as an open textbook on various platforms, such as Maria's website, the OpenUCT repository, and the Open Textbook Library in July 2018. Maria did however feel that the resource required content updates and enhancements in order for it to become a dynamic online textbook that includes software, additional exercises beyond those included already, tutorials and more locally relevant examples.

[1] https://people.cs.uct.ac.za/~mkeet/OEbook/

> The writing of this initial version began in 2009 with informal blogs which Maria improved and extended over many years

Authorship approach

Maria worked as a 'solo author' in terms of the production of the online textbook but has forged collaborations with colleagues and students to address certain aspects of the materials development process. She worked with Zubeida Khan (a UCT PhD graduate and now Senior Researcher at the Council for Scientific and Industrial Research) on a new chapter for the updated 2020 release version. She also engaged with current and former students in the process of updating material, as well as colleagues who could assist with foreign language aspects of the work.

The students involved in the project gained significant experience in writing and refining the tools presented in the textbook and the tool developers in particular expressed pride in being acknowledged in the software page accompanying the textbook.

> Maria held a 'typo contest' in order to get students to spot errors in the textbook

The content development process and student involvement

There were various deliverables that were achieved within Maria's grant period. Firstly, Maria produced a new chapter on modularisation in collaboration with Dr Khan. Following this, she carried out significant revisions to the multilingual aspects of the textbook. This included extending Chapter 9, compiling the multilingual Controlled Natural Language (CNL) literature list, adapting the ontology-based software development environment (ODE) localiser in a reusable way for Afrikaans and Spanish, and including instructions for localisation in other languages.

In an effort to promote student involvement in the content development process, Maria held a 'typo contest' in order to get students to spot errors in the textbook.

In addition, more exercises and answers were created, with an increase of about 10% to the 114 exercises that were part of the originally published textbook. This process also included two new tutorials on OntoClean and Ontology-based Data Access (OBDA) with data on South African national parks and elephant populations. The OntoClean tutorial was incorporated as an appendix in the new version of the textbook with adjustment of authorship.

More software has been developed and improved in Maria's textbook production process, enabling better support for the exercises and transitions between chapters in the textbook. This is now also presented systematically for all relevant tools. The two main tools that were enhanced as part of the project are the Description Logic (DL) plugin and the ODE localiser. In addition, instructions for access to the DL symbols for the visually impaired, and writing with DL symbols, were written by colleague and UCT PhD graduate Joan Byamugisha and made available online.

Lastly, the slides within the initial textbook were updated, cleaned up, converted from LaTeX into PowerPoint, and both versions were made available on the textbook page.

These last four aspects of the content development process greatly contributed to turning the textbook from 'just a PDF' into the interactive textbook that was expected by students and lecturers. The new and localised content that was produced resulted in a 10% increase of the main text and a 30% increase in the number of appendices due to the addition of tutorials and answers to the exercises.

Several people were involved in the series of updates entailed in producing the online textbook, including current and former students of the course. Maria described how the students involved in the project gained experience in writing and refining the tools. In addition, the tool developers expressed pride in being included in the software page of the textbook and being recognised as contributors in one of Maria's blog posts. She stated that, 'this, perhaps, reflects a culture in computer science, where software design and development has a higher status than writing text (which is generally despised as an activity). While there is clearly a benefit to the students in learning to write in a teaching style, I doubt that was appreciated to that extent.'

Production and publishing

Maria adopted an 'author as self-publisher' approach to publication of her originally published 2018 textbook and her 2020 online textbook, in that she managed all the production and publishing aspects herself.

Maria indicated that she conducted extensive research on getting the 2018 edition published, but comparable books at all the publishers she checked ranged from R1,400–R2,500 ($96–$170), which was too expensive in her view. She also felt that an external publishing process would take too long and that the textbook was already overdue. After she had taken the self-publisher approach, a non-profit academic publisher, College Publications, took an interest in the work and published a hard copy version of it.[2]

Maria's decision to openly license her work under a Creative Commons licence helps to facilitate global reach, in that it enables adaptation and translation into a range of languages. Usage data from the OpenUCT repository,[3] where the original 2018 version of the textbook is hosted, indicate that the 2018 edition has been accessed from Germany, France, Norway, Vietnam, Canada, Estonia, the USA, among others.

In addition to the main delivery channels of the OpenUCT repository and the interactive website, the textbook was also disseminated via a number of portals and repositories, such as unglue.it[4], OpenLibra[5], E-Books Directory[6] and Open Textbook Library[7].

Content development and publishing tools

Maria authored the textbook in LaTeX, using the TexShop editor and TexLive. She generated figures using OmniGraffle and references with JabRef. She also used Protégé OWL for making and double-checking exercise files. The website was produced using an HTML editor (first with Taco HTML Edit and then Komodo Edit).

Copyright and licensing

In addition to the text which Maria and her collaborators produced, Maria also adapted third-party CC-licensed content for inclusion in chapter 3 and modified some of her own previously released CC-licensed work for inclusion.

> Maria's decision to openly license her work under a Creative Commons licence helps to facilitate global reach

Maria's *An Introduction to Ontology Engineering* open textbook is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International licence.

Quality assurance and sustainability

In the range of feedback provided by the broader community of scientists that reviewed the content of the textbook, comments included the spotting of typos and taking the effort to inform Maria about it, such as was done by a colleague in Bulgaria. This enabled Maria to correct the new version (and update the list of contributors on the errata page accordingly).

In terms of the sustainability of the textbook, Maria undertook various activities to promote it, including an announcement via a blog post and profiling on social media sites such as LinkedIn.

Status at grant closure

At the close of the grant period, Maria believed that her textbook was a 'proper package deal', stating, 'I hope that some benefits will come from that, whatever they may be.'

Maria stated that she had no plans for another version in the near future. It had taken a lot of work to produce the textbook, which was possible as an activity conducted within a sabbatical period, but which had also substantially affected her research output during that time. She therefore deemed that this level of activity and production would be unfeasible to maintain during a regular academic teaching year.

She also considers that the basics of ontology engineering were relatively stable now and would therefore not require further major updates in the short term.

She highlighted the fact that an interesting next level of work would be the production of a comprehensive textbook (estimated about twice the length) but acknowledged that such a process would require a multi-author approach. This has been discussed in her academic community for the past 10 years, but nothing has come of it to date.

2 http://www.collegepublications.co.uk/computing/?00020
3 https://open.uct.ac.za/handle/11427/28312/statistics
4 https://unglue.it/work/316551/
5 https://openlibra.com/es/book/an-introduction-to-ontology-engineering
6 http://www.e-booksdirectory.com/details.php?ebook=12071
7 https://open.umn.edu/opentextbooks/textbooks/590

Challenges experienced and lessons learned

Maria reflected on both the benefits and the challenges she experienced as part of her open textbook development process.

She realised she was not alone

Maria noted that her participation in the workshops hosted by DOT4D in 2019 provided a comforting realisation that, 'I [was] not the only one spending a disproportionate amount of time on something ideologically good, but what seems to be (perceived to be) a 'time waster''. Indeed, Maria highlighted how there was a good amount of social media feedback on her posts in which she announced the tools. Emails arrived soon after she made the slides available in LaTeX and PowerPoint formats from colleagues around the world. In addition, multiple comments were broadcast 'from a generally critical crowd' on the textbook being freely available.

> The open textbook production process took up a large proportion of her time

Open textbook development takes more time than you think

Maria stated that the open textbook production process took up a large proportion of her time. Maria cautioned others against taking on this endeavour during a regular academic year, as this would clash with the everyday demands and pressures of teaching, research and administration.

Maria stated that, 'what I would do differently next time is to demand buy-out or time off from teaching or administration in order to give the content production more attention. This is unlikely to happen, since it is part of a culture to under-charge teaching workload allocations'.

Don't pin all your hopes on student engagement

It was difficult finding students willing to do the work; and once students were found, they often did not respect deadlines. Due to the reluctance of students to participate in certain tasks, such as aiding parts of the quality assurance process with the typo-finding contest, Maria had to take on these tasks herself in order to meet the specified deadlines.

A series of missed deadlines created a ripple effect within the textbook development process and affected Maria's opportunities to be able to test different aspects of the textbook, such as the OBDA tutorial, due to the fact that there were no students left within the course at the point of its completion to test this tool.

In addition, in 2019, the Ontology Engineering course ran as an MSc course rather than an Honours course (which previously had 30 students), and none of the comparatively few MSc students were interested in taking up any vacation work. Maria suggested that open textbook authors should limit the number of collaborators within the development process, as this led to increased administrative work.

Computer science students aren't very keen to write educational text

While Maria initially assumed the benefits of having students participate in the writing of particular sections of the textbook, the main problem she noted was that computer science students generally disliked the task of writing and that they were inexperienced in the practice of 'writing for learning' due to their lack of teaching experience. Maria highlighted the fact that the precarious engagement with students significantly affected the way in which she had imagined the structure, content and quality of the tutorial for her textbook.

Institutions should fund open textbook development

In her final grant report, Maria expressed her frustrations with the current systems in place, stating that, 'besides aforementioned buy-out to make time for writing the textbook to help making knowledge freely available, I still think money deserves to go also to the open access costs of a journal article reporting on some of the materials'. She stated that if the institution wants academics to publish open textbooks, it should accept that this comes at a price for the content producers and make funding and time available for this task.

> If the institution wants academics to publish open textbooks, it should accept that this comes at a price for the content producers and make funding and time available

Budget

Overview of the original budget submitted to DOT4D as part of 2018 grant application, with actual expenditure.

Budget projected at proposal phase
Software developer: R10,560
OBDA tutorial/exercise: R5,280
OBDA tutorial testing: R230
Multilingual tasks: R9,900
Slides: R3,720
Typo voucher (airtime/data): R300
External expertise: R5,995
Other admin: R930
Bound hardcopies for students: R1,800

DOT4D grant amount: R38,715

Project actual expenditure
Collaborator visit: R5,040
Printing: R1,961
Software development DL plugin + bit multilingual: R6,000
Software development Afrikaans + Spanish ODE: R5,000
Software & content development CLaRO tool + categorising multilingual verbalisation: R4,600
Content development OntoClean tutorial + literature list multilingual ontology verbalisation: R6,600
Content development OBDA with local data: R5,280
Content development slides: R3,720
UCT payroll costs: R199
Typo contest: R300

Total expenditure: R38,700

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MICHAEL HELD'S OPEN TEXTBOOK JOURNEY

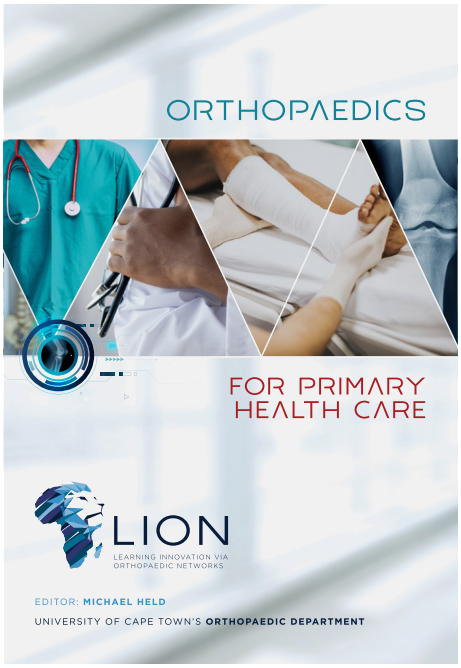
Grantee: Michael Held
Position: Director
Department: Orthopaedic Research Unit
Faculty: Health Sciences
Course: Orthopaedics
Degree level: Undergraduate
Title of initiative: Learning Innovation through Orthopaedic Networks
Title of open textbook: *Orthopaedics for Primary Health Care*

Introduction

Dr Michael Held is the Director of the Orthopaedic Research Unit in the Faculty of Health Sciences at the University of Cape Town (UCT) and a founding member of the Learning Innovation through Orthopaedic Networks (LION) initiative. Michael currently teaches orthopaedics to undergraduate students and postgraduate trainees. He also runs a fellowship for knee surgery.

Through the work of the LION initiative, he aims to provide an interactive educational platform for medical students and primary care providers in Southern Africa.

Michael is passionate about student-centred collaborative learning and believes in the power of a networked approach towards building a curriculum that is appropriate for the South African context. In February 2019, Michael received a grant from the Digital Open Textbooks for Development (DOT4D) project to support the development of the *Orthopaedics for Primary Health Care* open textbook.



The Digital Open Textbooks for Development (DOT4D) project in the Centre for Innovation in Learning and Teaching at the University of Cape Town (UCT) provided grant funding and implementation support to 10 open textbook projects in the period from March 2018 – March 2019, as well as implementation support to an 11th initiative. The Open Textbook Journeys series tells the stories of the people driving these initiatives, their teaching and publishing processes and what inspires them to do this work. These case studies were developed in collaboration with and reviewed by the open textbook authors profiled.

This case study draws on:

- Michael's grant proposal to the DOT4D project.
- Michael's grant report to the DOT4D project.
- Fieldnotes from the DOT4D Publishing and Implementation Manager.

What is the problem Michael is trying to address?

One of the main educational challenges for medical students is the limited contact time they have to acquire skills and knowledge in orthopaedic surgery. As such, the brief exposure students get to orthopaedic surgery in their undergraduate studies is inadequate in terms of the preparation they require for clinical work. This problem is amplified by the fact that internships and community service work in South Africa have a large orthopaedic component, with a high percentage of trauma patients suffering from orthopaedic injuries.

Current orthopaedic learning resources are mainly based on guidelines and textbooks from the Global North. There is therefore a severe lack of African learning materials which are tailored to local pathology and circumstances, and written by local experts.

The *Orthopaedics for Primary Health Care* textbook aims to provide accessible learning material that is practical and relevant to undergraduate medical students in Southern Africa and can be used as a continuous learning or reference resource by primary care physicians.

Michael's open textbook journey

Original plan

It was originally envisioned that the resource could be used as a basis for ongoing collaborative content development and student-centered teaching and learning. The plan was set to a particular timeline with the goal of producing 10 chapters in four to five months as a pilot.

The overall transformative and innovative ambition of the resource was that it could function as an openly licensed, content-based 'backbone', which general practitioners (GPs) and medical interns would be able to use as reference in their practice, with a particular focus on local pathology and local treatment options.

> The brief exposure students get to orthopaedic surgery in their undergraduate studies is inadequate in terms of the preparation they require for clinical work

The content development process and student involvement

Michael adopted a 'lead author as editor-in-chief with student and colleague co-authors' approach to content development, involving students, academics and practitioners.

The process of scoping and developing content for the *Orthopaedics for Primary Health Care* textbook was linked to the curriculum transformation process for the undergraduate orthopaedics course. In line with this approach, a Delphi consensus study was run with a target group of medical students and primary care physicians by the LION initiative in order to establish which cases, knowledge and skills were deemed most important to include in the curriculum. Once these topics and areas of interest were identified, local authors were approached to establish collaborative authorship relationships with students to avoid expert blind spots.

The next step in the process was to create an open textbook of short chapters (originally envisioned as one or two pages each) written by orthopaedic consultants in collaboration with medical students. These local experts were approached by Michael under the auspices of the LION initiative.

In order to kickstart the content development process, 10 topics were chosen through the prioritisation suggested by the Delphi consensus study as a pilot. Chapters for these topics were then written by the local experts and given to a group of students who were invited to provide feedback and edit them as part of their course work. The content development process involved students in the production process in the hope that this would make the textbook more student-centred and understandable, and eliminate expert blind spots.

In addition to the development of text-based chapters, students were brought on board to develop video-based content demonstrating the procedures in skills-based chapters.

This content was released as part of the established UCTeach Ortho[1] YouTube channel, which has an extensive collection of content and over 6,000 subscribers.

This pilot process, which took place in 2019–2020, was emulated on additional topics which had been identified in the Delphi study and resulted in the publication of 32 chapters of the *Orthopaedics for Primary Health Care* textbook, 13 of which were accompanied by video demonstrations of procedures. PDFs of the chapters were published on the UCT Orthopaedic Department website[2] and on UCT's learning management system (LMS)[3] in 2020. The published chapters range between one and five pages in length, and retain the original ambition of being short, practical chapters that can be accessed and understood independently of the larger collection of textbook content.

> 'Get it out first and then work on improving the editing is the advice I was given ... This was instrumental'

In reflecting on his experience, Michael stated that the production of the book had taken a lot of time. He explained that the start of the textbook development process was extremely challenging and that buy-in was minimal. In this process, Michael learned to be persistent. He stated that it was unnecessary to get hung up on detail and that it was more important to produce the final product, saying: 'Get it out first and then work on improving the editing is the advice I was given ... This was instrumental.'

Publishing process

In terms of the publishing process, Michael adopted the 'initiative as self-publisher' approach, in that the LION initiative was the primary publishing entity (with Michael as editor-in-chief). Within this process, Michael took on the responsibility for content commissioning, authorship, quality control and publishing.

Michael utilised the UCT Orthopaedic Department website and the UCT LMS in his initial dissemination strategy, as he had control over this publishing process (in that he could upload chapters himself) and did not need to adopt any new platforms or technologies to share the textbook content.

UCT's LMS had the additional benefit of being zero-rated[4] for students and did therefore not incur data costs. It was also the primary interface between Michael and his students for the undergraduate orthopaedics course, allowing for easy integration of the textbook content with the curriculum.

At the time of writing, Michael was continuing his publishing process with support from the DOT4D project, and was working on adding additional chapters to the collection. This publishing process entailed proofreading of the first 32 chapters published on the website, as well as layout and proofreading of an additional 20 chapters. This total set of 52 chapters would comprise the full first edition of the textbook.

Content development and publishing tools

Michael and his collaborators used MS Word to author their content. The typesetting of the original 32 chapters was done in Adobe InDesign.

When Michael undertook the additional layer of publishing work with the DOT4D Publishing and Implementation Manager (PIM) in 2020 following the release of the first batch of chapters, a decision was taken to adopt a MS Word template approach. The text design of the original 32 chapters was imitated in a Word template and the additional 20 chapters were typeset in line with this style. This measure was taken so that Michael (or a collaborator) could more easily produce and lay out new chapters without requiring knowledge of InDesign.

Copyright and licensing

Chapter authors utilised their own images as far as possible, or obtained permission for image reuse with attribution in certain instances.

All content in the *Orthopaedics for Primary Health Care* collection is licensed under a Creative Commons Attribution 4.0 International licence. All authors have retained their copyright.

Quality assurance and sustainability

The quality assurance within the textbook's content development process involved a number of academic orthopaedic surgeon consultants who checked the quality of the material presented in the chapters. The Orthopaedic Department website,[5] which hosts the content, also has a feedback mechanism for anyone who wishes to comment on or correct content.

1 https://www.youtube.com/channel/UCR_mzghDSTLZ32sBJ18Xow/featured
2 https://www.ortho.capetown/primary-care-orthopaedics
3 The content in the LMS was password-protected and restricted to Michael's students and immediate colleagues.
4 http://www.icts.uct.ac.za/Zero-rated-access-some-UCT-websites
5 https://www.ortho.capetown/primary-care-orthopaedics

Michael also played a quality assurance role in his capacity as editor-in-chief, in that he remained attentive to the quality of work produced by students.

Status at grant closure

At the close of the one-year grant period in February 2020, Michael reported that students had benefited from the open textbook, in that they had a new textbook which had been made available to them free of charge. In addition to this, it was peer reviewed, modernised, included new pictures, and up to date with recent literature.

The *Orthopaedics for Primary Health Care* textbook received the inaugural UCT Open Textbook Award in 2020,[6] shared with Professor Johan Fagan's *Open Access Atlas of Otolaryngology, Head and Neck Operative Surgery* textbook.

> The main challenge experienced within the textbook development process was that it took a lot of time to conceptualise and develop the contents

Challenges experienced and lessons learned

Textbook development takes time

The main challenge experienced within the textbook development process was that it took a lot of time to conceptualise and develop the contents. Michael believed that he should have assembled a team before starting the process of chapter writing in order to avoid the time challenge this incurred.

Contributors had varying levels of interest and capacity

Michael stated that it was not always possible to get the correct author configuration for the different chapters. Consultants sometimes produced expert blind spots and students did not always have the deeper knowledge and insight to counteract this. Thankfully, however, the postgraduate students were eager to produce content.

Budget

Overview of the original budget submitted to DOT4D as part of 2018 grant application, with actual expenditure.

Budget projected at proposal phase

Editing: R17,000
Chapter design and formatting: R10,000
Formatting for print and digital layout: R3,000

Total: R30,000

DOT4D grant amount: R30,000

Project actual expenditure

Editing, design of book chapters and images: R18,000
Cover and logo design: R3,150
Software purchase (InDesign): R1,525
Equipment: R7,325

Additional resourcing

Proofreading: R10,000 (supplementary DOT4D grant)
Typesetting: R10,000 (supplementary DOT4D grant)

Total expenditure: R50,000

[6] http://www.dot4d.uct.ac.za/news/uct-open-textbook-award-winners

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STELLA PAPANICOLAOU'S OPEN TEXTBOOK JOURNEY

Grantee: Stella Papanicolaou
Position: Senior Lecturer
Department: School of Architecture Planning and Geomatics
Faculty: Engineering and the Built Environment
Course: History and Theory of Architecture III
Degree level: Undergraduate
Title of initiative: Modern Architectures in the Global South
Title of open textbook: *Modern Architectures: Cape Town*

Introduction

Is it better to start a big project with an elaborate plan? Or should you just jump in, try some different approaches, and see what ultimately works? In our professional lives, we're typically encouraged to take the planning route, to establish goals, deadlines and deliverables while charting our progress. Any deviation from that plan is often treated with suspicion or anxiety. But in reality, our 'best laid plans' often overestimate what can be achieved, underestimate the timelines involved, and misjudge how to best approach a problem. This is because it is often hard to know what the optimal approach is until you've experimented and landed on the one that ultimately proves most suitable for your ambitions.

When Stella Papanicolaou, a Senior Lecturer in the School of Architecture Planning and Geomatics in the Faculty of Engineering and the Built Environment at the University of Cape Town (UCT), decided that she wanted to create an open textbook, she had a good sense of the kind of textbook that would be useful for her students. Being a

The Digital Open Textbooks for Development (DOT4D) project in the Centre for Innovation in Learning and Teaching at the University of Cape Town (UCT) provided grant funding and implementation support to 10 open textbook projects in the period from March 2018 – March 2019, as well as implementation support to an 11th initiative. The Open Textbook Journeys series tells the stories of the people driving these initiatives, their teaching and publishing processes and what inspires them to do this work. These case studies were developed in collaboration with and reviewed by the open textbook authors profiled.

teacher of design in the postgraduate programmes of Architecture and Histories and Theories of Modern Movement Architecture in the Bachelor of Architecture Studies (BAS) programme, she developed a concrete plan to achieve this.

Stella, along with teaching assistants and candidate architects Valerie Lehabe and Maashitoh Rawoot, constituted themselves as the core trio of the Modern Architectures open textbook production team in the Digital Open Textbooks for Development (DOT4D) grant period of March 2019 to February 2020. But despite Stella's extensive planning for a long-desired open textbook, her journey did not go as expected. This case study tells her story.

This case study draws on:

- Stella's grant proposal to the DOT4D project.
- Stella's grant report to the DOT4D project.
- Interviews (x2) with the DOT4D Researcher.
- Field notes of the DOT4D Publishing and Implementation Manager.

What is the problem Stella is trying to address?

Modern buildings from the Global North dominate the publications referenced by architecture students and professionals in the precedent studies used to inform their design work. Stella and her collaborators in the Modern Architectures open textbook production process believe that the historical narratives and technological developments of modern buildings in the Global South should be made more visible and accessible to students in South Africa, as well as to scholars worldwide. The study of these buildings offers an opportunity to investigate the role of the Modern Movement in the Global South and the nature of its relationship to colonial and apartheid agendas.

> The historical narratives and technological developments of modern buildings in the Global South should be made more visible and accessible to students in South Africa

The Modern Architectures team also believe that buildings studied in students' countries of origin contribute to an understanding of their own identities. The dominance of European and North American examples in the literature means that South African students are often led to believe that buildings located elsewhere, and theorised by scholars from the Global North, have more relevance than buildings closer to home or in similar Global South contexts.

> South African students are often led to believe that buildings located elsewhere, and theorised by scholars from the Global North, have more relevance than buildings closer to home or in similar Global South contexts

These objectives were all in line with Stella's teaching ambitions relating to her Modern Architectures in the Global South initiative that emerged out of eight years of teaching in the History and Theory of Architecture III (HATA3) course to second-year architecture students. The course initially focussed on the Global North narrative of the Modern Movement of architecture with reference to its impact on the South African built environment, but steadily shifted towards the multiple narratives of architectures across the world, with a central focus on the Global South.

Stella's open textbook development process therefore aimed to:

1. Include more examples from the Global South.
2. Treat students as collaborators in the production of the textbook, which would be an empowering experience for them.
3. Involve students from three different courses in the BAS programme – History and Theory, Technology, and Representation – so as to highlight the relevance of studying the same subject matter through a variety of lenses, thus emphasising the multimodal nature of architecture and design knowledge.

Textbook conventions in the discipline

Stella indicated that the use of prescribed textbooks within the department and the discipline is not common practice. Instead, students are encouraged to seek out texts that are relevant to the specific projects in which they are engaged. She stated: 'As a principle, most of us don't believe in [traditional] textbooks. I was never taught with a textbook. It's a bit of an anathema. It sort of sets us apart from the engineers. The engineers work with a manual. They follow the formulas of the manual. And what we try to do is get the students to be creative, to be responsive to the information that comes in.'

Stella's open textbook journey

Original plan

When Stella first developed her proposal for a DOT4D grant, she envisioned that her open textbook project would develop multiple outputs in several formats. The primary output would be a 'proof-of-concept' open textbook(let) working with a sample of buildings from Cape Town drawn from the work produced by the HATA3 students in 2019.

Stella conceived of this work as an 'open textbook(let)' in that it was to be a guide or booklet which would be developed into a longer-term open textbook representing modern architectures in the Global South and an online platform for 20th century architecture in the Global South.

It was envisioned that the most innovative aspects of the content development process would be:

1. The offering of a list of good buildings located in the Global South for students to study, including a summary explaining their scholarship value and references for further investigation.
2. The formation of a digital archive where a collection of documentation, and links to texts, on such buildings could grow and be sourced by scholars worldwide.
3. Introducing undergraduate students to concepts of authorship, copyright, open access and the publishing process of architectural research.
4. Building a network of scholars and practitioners interested in architecture in the Global South. This network would be beneficial for future research and collaboration in the construction of architectural knowledge.

Time and logistical constraints meant that Stella and the Modern Architectures team were only able to focus on the development of the proof-of-concept open textbook(let) in the DOT4D grant period. Once Stella realised the amount of time involved in brokering collaborations and undertaking the various aspects of the content development process, she realised she would have to treat the other activities as ongoing works in progress.

> The course invited students into the authorship process and provided them with the agency to propose relevant material to be used in the textbook

Authorship approach

Stella adopted the 'lead author as editor-in-chief with student co-authors' approach and worked collaboratively with second-year HATA3 students who co-created the content for the open textbook(let). As part of this process, students explored notable buildings in Cape Town and produced the content for the textbook(let) as part of their coursework. Thus, the course invited students into the authorship process and provided them with the agency to propose relevant material to be used in the textbook.

In order to process, format and curate content for the open textbook development process, Stella worked with two assistants who played a critical role in the content creation process – candidate architects Valerie Lehabe and Maashitoh Rawoot.

The content development process and student involvement

In 2019, second-year HATA3 students were divided into groups and allocated three buildings per group to research, analyse and present to their peers as part of their coursework in the first semester – one from Cape Town, one from anywhere in the Global South, and one highly published example from the Global North. Stella initially intended for the second-semester, first-year students to produce construction models of each of the Cape Town buildings covered. In another course, students were to photograph and produce digital models of the buildings. These were to be featured in the open textbook. However, this aspect was not completed by the relevant teaching staff, as it was difficult to coordinate the project to satisfy teaching objectives in all three courses with three different course convenors.

> This inclusive approach was intended to offer all students in the class a sense of accomplishment in terms of being part of the process

The students from HATA3 were all aware that the group tutorial fed into an open textbook publication process and that the work they were gathering and collating could be included in the textbook. The students' names were all mentioned in the publication, whether the buildings they worked on were included or not. This inclusive approach was intended to offer all students in the class a sense of accomplishment in terms of being part of the process.

In 2020, HATA3 students were given access to examples produced by the 2019 student cohort via Instagram[1] in order to give them an idea of what they were working towards and provide a platform for discourse around the examples selected. The short descriptions of buildings in the open textbook(let) served as models for the descriptions they were asked to produce as part of their research. In this sense, it was envisioned that the content would be developed over years of student work, which would form the basis for ongoing open textbook development informed by student topic selection and collaborative input.

Publishing process

Stella adopted the 'initiative as self-publisher' approach, in which she drove the publishing process in her capacity as editor-in-chief on behalf of the Modern Architectures initiative.

The publishing process involved working with the DOT4D Publishing and Implementation Manager (PIM), who was instrumental in assisting with the editing process, providing publishing advice and playing the role of proofreader for each section of content as it was produced.

Stella also worked with an external graphic designer who designed the cover and produced a template for the book layout. Project assistants did the layout in Adobe InDesign in order to produce a professionally typeset product. The designer supervised this layout process and became an important partner in the publishing process. She embraced the key principles of the initiative and provided enthusiasm and support, with a keen eye on the audience and underlying intentions of the publication.

When the full publishing process was complete, a PDF of the textbook(let) was deposited in the OpenUCT repository[2] under a Creative Commons licence, while Stella's students primarily accessed the content via UCT's learning management system.

Content development and publishing tools

Stella and her team used Google Docs to develop and edit a final manuscript, and Adobe InDesign to produce the typeset pages.

Copyright and licensing

It was anticipated that the issue of copyright and licensing would constitute an interesting challenge to the project, and that it may be difficult to obtain permissions for photographs of buildings sourced through social media channels. Principles of copyright and licensing were explored and investigated throughout the content creation and publishing process. However, many authors of photographs were happy to allow free use of their images as long as they were appropriately credited.

The final published *Modern Architectures: Cape Town* open textbook(let) is licensed under a Creative Commons Attribution 4.0 International licence. Copyright is held by Stella as the primary author.

Quality assurance and sustainability

In order to address quality and cohesion in the final product, one of Stella's tutors provided formatting guidelines, a matrix and a checklist for students to follow in the documentation of the buildings to be utilised in the textbook. If the work produced by the students was of a good standard, it would be used in the draft of the final comprehensive open textbook in the future.

While many images found by the students were appropriate for publication, the quality of their written descriptions was relatively poor and had to be rewritten by Stella. Few second-year students managed to adhere to imposed formats and to deliver work of adequate quality for publication purposes, meaning that the assistants had to reformat all the material using the template provided. Collaboration between teaching staff was intended to ensure the work produced was of an appropriate quality through a process of reviewing each other's course outcomes. This did, however, not materialise, as the two staff members of the first-year courses withdrew from the publication process.

[1] https://www.instagram.com/p/B_zDbJlHRQj/

[2] https://open.uct.ac.za/handle/11427/33338

In terms of sustainability, Stella had planned the publication of the first Modern Architectures open textbook(let) would take place at the end of 2019, and an associated exhibition would be used to showcase the project and entice future funding from various potential sources including large architectural firms, institutes and suppliers of materials in the construction industry. This exhibition never materialised because the textbook production process took longer than anticipated and a final PDF was only released in 2020, but the idea has not been abandoned.

Status at grant closure

At the closure of the DOT4D grant period in February 2020, the *Modern Architectures: Cape Town* textbook(let) was in the final stages of production. Once produced, Stella wanted the textbook(let) to be made available electronically to the 2021 cohort of students.

Stella also hoped to source funding in order to print hard copies which could be made available to collaborators and scholarly networks in order to explain the project, future ambitions and how others could contribute. In this sense, the printed version would be used as a marketing sample to solicit future collaboration and, potentially, the funding required to continue production of further volumes.

In addition, the new cohort of 2020 HATA3 students delivered further material for a second volume of a small selection of the open textbook(let). In response to the limitations of remote teaching under the COVID-19 lockdown and based on the recommendation of tutors, the work of the 2020 student cohort was exhibited on Instagram (uctma.gs)[3] rather than in traditional poster format. Students in the course followed the Instagram site where cases from the 2019 volume as well as cases produced by the 2020 cohort were shared as a live, ongoing exhibition. The ambition was to use this platform as a means of engaging students and bringing other contributors on board.

At the time of writing, Stella was still engaged in discourse and planning around the Modern Architectures in the Global South initiative and had engaged a number of colleagues in academic debate and practical planning around how to integrate a decolonised pedagogical approach with a new approach towards textbook creation.

> The project made it possible for her to work collaboratively with her students and the project team, and to experiment with ideas towards decoloniality in concrete terms rather than purely in theory

Challenges experienced and lessons learned

Experimentation allows clarity to emerge organically

Reflecting on her process, Stella explained that she would have liked to start sooner with less material and, perhaps ironically, with less clarity, because it is in the process itself that real clarity emerges. The process requires several iterations before the idea settles. She believed that the lesson was to dive in and give it time and be flexible to make changes along the way that will improve the end product, but always to hold the original intention in focus.

Some collaborators took on major roles

In terms of working with various types of collaborators, the graphic designer unexpectedly became more of a conceptual partner and team member, taking on ownership in the process, rather than merely being a service provider. This was also true of working with the DOT4D PIM, who served as an important publishing partner. The camaraderie amongst the partners who participated in the production process helped to fulfil Stella's vision as editor-in-chief and advance the team dynamic.

The (partial) fulfillment of a long-time dream

At the end of the grant period, Stella described multiple benefits that she experienced. She explained that the idea for a series of booklets has been with her since she began teaching the HATA3 course in 2012. The production of a first edition had been very satisfying, but more importantly, it was essential as it was only in its actualisation that the true potential of the product could be understood and the gaps or shortfalls noticed.

[3] https://www.instagram.com/p/B_zDbJlHRQj/

The project had made it possible for her to work collaboratively with her students and the project team, and to experiment with ideas towards decoloniality in concrete terms rather than purely in theory. The realisation of a concrete deliverable in the publication of her first textbook(let) was exciting to Stella, as she could now approach potential collaborators and funders with conviction and with a product of which she was proud.

> With an ambitious, multi-phase project such as this, collaborators were essential for the project's initiation

Collaboration can be tricky

With an ambitious, multi-phase project such as this, collaborators were essential for the project's initiation. Stella needed others' input, wisdom, time and sweat. However, the expansive level of inclusivity increased the complexity of managing all the moving parts of the project and the varied personalities. As discussed above, some key collaborators pulled out, radically slowing the progress of the project. Students tried their best, but could not write building descriptions that were up to publication standard, thus Stella had to step in and do them herself. This was time consuming and not part of the original plan. Students struggled in other ways to stay within the template parameters, thereby creating extra work for the main coordinators. Thus, ironically, the delegation of activities sometimes ended up creating extra, unanticipated work for Stella. Despite these challenges, Stella expressed that she remained committed to ongoing work in this area.

Budget

Overview of the original budget submitted to DOT4D as part of 2018 grant application, with actual expenditure.

Budget projected at proposal phase
Research assistant: R33,600
Form design for Vula submission: R5,000
Data wrangler: R8,000
Graphic designer: R13,400
Storage: R1,000
Exhibition printing costs: R10,000

Total estimated budget: R71,000

DOT4D grant amount: R56,000

Project actual expenditure
Research assistants: R33,600
Graphic designer: R22,400

Additional resourcing
Research assistant: R10,000 (DOT4D supplementary grant)

Total expenditure: R66,000

11

TIM LOW'S OPEN TEXTBOOK JOURNEY

Grantee: Tim Low
Position: Senior Lecturer
Department: Education Development Unit (Commerce), Department of Statistical Sciences
Faculty: Centre for Higher Education Development
Course: Statistics
Degree level: Undergraduate
Title of initiative: Introduction to Probability in isiXhosa
Title of envisioned open textbook: *Introduction to Probability in isiXhosa*

Introduction

In South Africa there is a gap between high school and university-level statistics. There is also a gap (for most students) between the languages they speak at home and the language in which they are taught. Bridging these gaps takes time, care and consideration.

These are some of the concerns that have faced Tim Low, a senior lecturer who teaches mathematics and statistics in the Education Development Unit of the Commerce Faculty at the University of Cape Town (UCT). A former high school maths teacher with research interests in mathematical and statistical education, Tim seeks to support and advocate for transformation through creating greater inclusivity, localisation and multilingualism in the teaching of statistics at UCT.

In recognition of these efforts, Tim was honoured with a UCT Distinguished Teacher Award in 2011 for his contribution to undergraduate teaching, particularly as relates to the use of technology.

In February 2019, Tim was awarded a grant from the Digital Open Textbooks for Development (DOT4D) project to start translating the first-year *IntroStat* textbook from English into isiXhosa. His hope was that, with this experience in hand, he would be able to create an app that can translate statistics terms from English into South Africa's other 10 official languages for first-year university students.

This case study draws on:

- Tim's grant proposal to the DOT4D project.
- Tim's grant report to the DOT4D project.
- Field notes of the DOT4D Publishing and Implementation Manager.

The Digital Open Textbooks for Development (DOT4D) project in the Centre for Innovation in Learning and Teaching at the University of Cape Town (UCT) provided grant funding and implementation support to 10 open textbook projects in the period from March 2018 – March 2019, as well as implementation support to an 11th initiative. The Open Textbook Journeys series tells the stories of the people driving these initiatives, their teaching and publishing processes and what inspires them to do this work. These case studies were developed in collaboration with and reviewed by the open textbook authors profiled.

What is the problem Tim is trying to address?

Tim's work supports the UCT Language Policy,[1] which aims to develop multilingual awareness and proficiency at the university. Within this context, his open textbook project addresses the barriers and challenges faced by first-year university students who have English as a second or third language when they learn statistics for the first time at university.

Recognising the disparities between high school mathematics and the new material that students are exposed to when they enter university, the objective of Tim's initiative is to create a localised, openly licensed isiXhosa resource which is a translation of components of the widely used UCT first-year statistics textbook, *IntroStat*,[2] which is also a locally developed open textbook.

> His open textbook project addresses the barriers and challenges faced by first-year university students who have English as a second or third language

Tim's open textbook journey

Original plan

Tim's investment in this process and collaboration with students is driven by the belief that not being able to understand the conversations students have is equivalent to the students not being able to understand him and the language of statistics. It is this disconnect that he is attempting to address.

The aim of Tim's project was to create the start of a possible series of books aimed at isiXhosa-speaking students. By offering examples in the home language of the students, he hoped that they would be able to better understand various statistical concepts by supporting their practice of 'code switching', going back and forth between isiXhosa and English when thinking about and explaining material from the course. He planned to start the process by translating the *IntroStat* textbook, the core resource for the first-year Statistics course at UCT, into isiXhosa.

Authorship approach

Tim adopted a 'content development facilitator with student and colleague co-authors' authorship approach in which he worked collaboratively with UCT's Department of African Languages and Literatures, the Multilingualism Education Project in the Centre for Higher Education Development as well as isiXhosa-speaking Statistics students and tutors.

In this way, he envisioned that the students would enjoy the recognition of their home languages and add value to the content creation process.

As the content development process commenced, the envisioned authorship approach shifted as there were fewer students willing to participate in the process than had originally been expected. Tim stated that, 'we were hoping to have about three students and we were going to have three academics so that the three of them in each grouping could be having these conversations to actually help each other and support each other and ensure the richness of the translation. It didn't quite work out as planned.' Thus, the project team ended up consisting of three academics and one student, who largely operated in isolation from one another.

Tim explained that this particular collaborative approach was adopted in order to foster a team effort around the translation work that was to be undertaken, stating that 'the conversation that the individuals have, because they all come from a slightly different perspective because of their own interpretation of the language, actually creates the richness of the translation and helped with the understanding that we produced'.

The content development process and student involvement

In his proposal, Tim envisioned translating two chapters of the *IntroStat* textbook which cover the building blocks of the subject. To do this, the project planned to work with staff from the Department of African Languages and Literatures who were willing to assist with the translations and with students studying statistics who were interested in helping out.

When the project commenced, staff members and students were excited. This enthusiasm was sustained in the course of 2019, but it was clear that trying to complete this activity during the normal academic term was going to be impossible due to a number of challenges.

[1] http://www.students.uct.ac.za/sites/default/files/image_tool/images/328/about/policies/Language_Policy_19-June-2013_Final.pdf
[2] https://open.uct.ac.za/handle/11427/4150

To begin with, the project needed three students, but could only find one dedicated individual. The academic staff were busy with their own research, admin and lecturing commitments. Hence, the team decided to meet at least once a term to discuss the project and keep it focused; beyond this, project work was limited to vacation time. This limitation on time and capacity resulted in the translations for the textbook taking longer than had been assumed by the team.

> Both translations had a similar theme, but as was expected and encouraged, the academic team and the student took very different approaches to their translations

To keep the project moving forward, the team decided to have the translations carried out separately by the academics and the student. After each group had translated a section, the team would meet to discuss whether the work was aligned with their initial visions and to check if the translations made sense. As this was the first time any of them had tried translating mathematics and statistics, the process moved slowly, with particular caution being exercised by the student, who was new to the practice of formally translating work for academic use.

The textbook development process resumed in February 2020 when the project team were able to meet again to discuss the translations of both chapters. Both translations had a similar theme, but as was expected and encouraged, the academic team and the student took very different approaches to their translations.

The linguists took a rather purist approach with literal translations (given that they didn't have mathematical backgrounds), while the student used more colloquial language because of their statistical knowledge and understanding of students' language use.

This divergent outcome from the translation process was encouraged, as they wanted to see what would emerge. Tim explained that, 'the likelihood is, as a student, you're going to come up with translations and explanations which will be different to a theoretical translation that an academic might do. And I encourage that because ... as much as we want the translation to be academically sound, it's going to be used by students. And so the language the student might read and understand is likely to be different to the traditional academic approach or my approach'.

Within this context, Tim expressed that he tried to avoid placing any boundaries on the manner in which the translations were being developed, as he wanted the textbook to be a useful document rather than an academic process in which an existing textbook was merely translated into a different language.

In their February 2020 discussions, the academics wanted to keep the text truer to a formal understanding of isiXhosa, while the student worried that the inclusion of certain (formally correct, but functionally questionable) phrases and terminology would make the text less useful. The team worked through each others' translations, and, through a process of mediation, created one document which was a marriage of the translations. With this, the concluding discussions were that the project's team would try to keep the translations reasonably academic in nature, with the inclusion of a colloquial translation in areas where it might aid the clarity and understanding of the content. In addition, a glossary of terms with both colloquial and traditional terms would accompany the chapters.

Tim expressed that he wanted to continue this content development process for other chapters in the *IntroStat* textbook in the future because he believed that there was a need to create more resources for students in languages other than English. He stated that, with the body of work he was creating, 'the idea is that eventually it will help tie in with my glossary of terms and so eventually it will become a bank of resources one way or the other. And the idea is that it's going to be open source, so it's going to be changed and adapted and improved. And as a group of academics, lecturers and statisticians, we can be improving it'.

Production and publishing

Tim has adopted an 'initiative as self-publisher' approach, in which the project team undertakes the production and publication of the content developed.

Content development and publishing tools

At the end of the content authoring process, both sets of translations were converted into LaTeX. By doing this, Tim endeavoured to type up the varied sets of translations that had been produced by the team and include in them the mathematical formulation of the work. Tim stated that he was 'trying to fit the isiXhosa around the current mathematics that's there' as a means to aid the reading of the content and see the similarities and differences in both sets of translations.The LaTeX typesetting approach was also adopted because this was the format in which the textbook content was going to be printed and displayed and which would facilitate the textbook being readable as a PDF.

Copyright and licensing

The original *IntroStat* textbook from which the chapters for translation were drawn is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International licence. The isiXhosa translation chapters are licensed similarly, in line with the ShareAlike principle. Given the fact that the original English resource carries an open licence, no copyright issues were encountered.

Quality assurance and sustainability

The quality assurance process adopted within the project was based on both student and colleague review. Due to the collaborative nature in which the chapters were developed, the review process took place as a brokered conversation between the two groups in order to create content that would reflect both academic rigour and the student perspective. Within this, Tim stated that, 'I'm obviously being bound to a point by the academics. This is meant to be an academic text, so in that sense it needs to be of a reasonable academic rigour. That was my first thought, but it's got to be useful enough for students.'

> The process of brokering academic rigour and student voice within the quality assurance practices of the team raised concerns for Tim about how his textbook would be received beyond the UCT community

The process of brokering academic rigour and student voice within the quality assurance practices of the team raised concerns for Tim about how his textbook would be received beyond the UCT community. He expressed that, 'there is always a worry that the critique that you're going to receive by putting out something that somebody else says, 'oh, this is not very academic', if it's going to be used in an academic sense is obviously a concern. I think the point is, we see it all the time, that if someone writes something and someone says, 'well, that's not very academically good', but it might be fine for somebody else who is not an academic to understand, it will not receive recognition in the same way as someone who writes something completely academic that nobody follows at all'.

In terms of sustainability, Tim stated that once the current chapters in development were completed, the team would assess how useful they were for students' needs and use that feedback to devise a way forward. He expressed that he was interested in discussing this work with colleagues at Statistics departments elsewhere in the country so that they could also play a role in the production of this material. He was also exploring ways of sourcing voluntary participation in the process to foster a sense of doing the work for the greater good.

> He was interested in discussing this work with colleagues at Statistics departments elsewhere in the country so that they could also play a role in the production of this material

Status at grant closure

The outbreak of the COVID-19 pandemic at the beginning of 2020 constrained the progress of the project as everyone involved had to make the adjustment to working remotely. At the point of formal grant closure in March 2020, Tim did however indicate that he and his team had started work on translating the next chapter of the *IntroStat* textbook.

Challenges experienced and lessons learned

The project team faced several challenges during the development of the textbook, but the most important centred on the collaboration process itself.

Collaboration invites coordinating challenges

The academics in the project found that their personal commitments and activities limited the time they could devote to the project. In addition, the student had full-time coursework to attend to (a constraint compounded by the fact that they lost their phone at one point and had limited communication with the team for an extended period of time). As such, the production of the translations took longer than the team members expected.

This resulted in only one chapter's translation being completed in the project's grant period, with the other following shortly after.

With this in mind, Tim highlighted the challenge of coordinating collaborative efforts such as this and stated that, 'someone has to be a driver'.

Balancing academics' and students' perspectives difficult but worthwhile

At the heart of the content creation process was a dialogue between the academics and the student about the best way to present the material in isiXhosa. The academics preferred to take a more formal approach to translation, using the standardised version of the language, while the student argued for a more colloquial, contemporary and spoken version which better approximated students' actual language use. The groups found merits to both approaches and debated the pedagogical implications between them. Rather than seeing this debate as a problem to be solved, Tim sought precisely such a productive tension in this deliberative process, as he believed that it was through such dynamic interaction that a higher quality output was ensured.

Budget

Overview of the original budget submitted to DOT4D as part of 2018 grant application, with actual expenditure.

Budget projected at proposal phase
Specialist translation support: R44,000

DOT4D grant amount: R44,000

Project actual expenditure
Specialist translation support: R44,000

Total expenditure: R42,000

CONCLUSION

Open textbook authors face many challenges and the need to make compromises in terms of balancing their open textbook development ambitions with the everyday demands of their academic careers. In some cases, their plans have to be scaled down; in other cases they have to be abandoned.

The journeys presented here highlight the complexities of conceptualising and creating open textbooks and the challenges authors face. Despite the highs and lows of the process, the heroic efforts of the academics undertaking this work with limited funding or other forms of institutional support is testament to their desire to improve the learning experience for their students.

DOT4D research (Cox, Masuku & Willmers, 2020) demonstrates that open textbooks have the potential to address social (in)justice in South African higher education, especially with regards to the high costs of textbooks for students, the need for curriculum transformation and the inclusion of student voices in their own learning.

DOT4D implementation activity suggests that demand is growing for open textbook development support as academics change the way they teach online; and that localisation is key to addressing curriculum transformation. This potential can however only be realised if there is broader institutional and inter-institutional support for open textbook production and use.

DOT4D advocacy efforts include engaging higher education stakeholders in a national-level 'Open Textbooks in South African Higher Education' forum. It aims to provide a platform for facilitating inter-institutional collaboration and the development of a national open textbook community of practice. The project's recently published Call to Action 2021 (DOT4D, 2021) highlights the need for broader coordination of open textbook creation and use in order to address curriculum transformation, the undergraduate performance gap and COVID-19 learning losses.

References

Cox, G., Masuku, B. & Willmers, M. (2020). Open Textbooks and Social Justice: Open Educational Practices to Address Economic, Cultural and Political Injustice at the University of Cape Town. *Journal of Interactive Media in Education*, 2020(1), 2. DOI: http://doi.org/10.5334/jime.556

DOT4D (Digital Open Textbooks for Development). (2021). *Call to Action 2021: Open Textbooks in South African Higher Education*. Cape Town: Digital Open Textbooks for Development.

Recommendations

For institutional leaders

- Maximise efficiencies and address sustainability across the South African higher education sector. Synergies and efficiencies can be gained by addressing open textbook production by collaborating across higher education institutions.
- Initiate pilot programmes for the support of open textbook development at your institution. This would entail setting aside modest amounts of money to support academics who require assistance in textbook writing and publishing. Establish an Open Textbook Award to provide institutional recognition for open textbook development and ideals.
- Seek inter-institutional collaborators so that you can share the burden of this work. Different institutions are at different levels of readiness with regards to open textbook support, so it is worthwhile to partner with those who can assist in this activity.

For academics

Draw on these narratives to get a sense of the processes involved and lessons learned … as well as the gains experienced. It is our hope that the insights shared here can shed light on your own processes, and help you not to fall prey to similar setbacks.

For students

Start considering yourself as a co-creator of your knowledge and seize opportunities to get involved with the production of open textbooks and other open educational resources.