AOSIS

Self-directed learning research

An imperative for transforming the educational landscape

Edited by
Elsa Mentz • Izak Oosthuizen

Self-directed learning research

Self-directed learning research

An imperative for transforming the educational landscape

EDITED BY
ELSA MENTZ
IZAK OOSTHUIZEN

AOSIS

Head Office
AOSIS (Pty) Ltd, Postnet Suite #110
Private Bag X19
Durbanville 7551
South Africa
Tel: +27 21 975 2602
Fax: +27 21 975 4635
Email: info@aosis.co.za
Website: http://www.aosis.co.za

First Edition published in 2016
Impression: 1

Listed in OAPEN (http://www.oapen.org), DOAB (http://www. doabooks.org/) and indexed by Google Scholar.

Published in South Africa by AOSIS (Pty) Ltd, 15 Oxford Street, Durbanville, Cape Town, 7550.
Book Title: Self-directed learning research: An imperative for transforming the educational landscape
ISBN: 978-1-928396-01-7 (pdf)
ISBN: 978-1-928396-02-4 (e-book)
DOI: http://www.dx.doi.org/10.4102/aosis.sdlr.2016.03

How to cite this work
Mentz, E. & Oosthuizen, I. (eds.), 2016, *Self-directed learning research*, AOSIS, Cape Town.

Printed and bound by
PRINT ON DEMAND, South Africa

Cover artwork provided by
M.C. (Marisa) Verster

We would like to take this opportunity to thank all reviewers who participated in shaping this book, they are:

Dr Batseba Mofolo Mbokane

Prof. Gail Derrick

Prof. Geoff Lautenbach

Prof. Gerrie Jacobs

Dr Jacqueline Batchelor

Dr Karen Swan

Dr Karl Wirth

Dr L.D. Beukes

Dr Lucy Guglielmino

Dr Lynette Nagel

Dr M. Ndlovu

Dr Marita Ooshuizen

Dr Mia Abrie

Dr Michael Boyle

Prof. Mona Lisa Dahms

Prof. Pieter du Toit

Dr Richard Durr

Dr Sharon Malan

Dr Stanley Ho

Mnr Rudi Pretorius

Social Sciences, Humanities, Education & Business Management Domain Editorial Board at AOSIS

Chief Editor: Scholarly Books

Board Members

Peer review declaration

The Publisher (AOSIS) and the Domain Editorial Board certify that the manuscript was subjected to a rigorous peer review process prior to publication, with the identities of the reviewers not revealed to the book's author. The reviewers were independent of the publisher and/or author in question. The reviewers commented positively on the scholarly merits of the manuscript, and recommended that the manuscript be published. Where the reviewers recommended publication subject to specified revisions for improving the manuscript, the author has responded adequately to the recommendations.

Research Justification

This book will benefit specialists in the field of the education sciences. It represents significant progress in knowledge production. Self-directed learning has become increasingly important, not only for education in South Africa but also for education sciences in the international arena. This is a result of the changing education landscape, caused by the demands of the 21st century as well as the rapid change in knowledge production. Learners should be equipped with skills to take responsibility for their own learning. New innovative strategies should be incorporated into teaching and learning in order to meet the changing demands in education. Traditional teacher-centred practices are still the norm in most South African schools and higher-education institutions and do not adequately prepare students for lifelong learning in the 21st century. The content focuses on the theory behind self-directed learning, explores strategies such as cooperative learning, problem-based learning, case-based teaching and large-group teaching that enhance self-directed learning and the use of blended learning in a self-directed learning environment. The book demonstrates how self-directed learning can be enhanced in mathematics, computer-science and life-science education and through the use of student tutors for geography. Digital technology could, for example, also be used in innovative ways for education in isiZulu folk poetry. The findings are based on original empirical research and a sound theoretical-conceptual framework. In an environment of rapidly changing knowledge production, this book responds to the challenge of how to equip learners with the necessary skills to take responsibility for their own learning. The book presents innovative teaching and learning strategies for meeting the changing demands in education. Group activities, the responsibilities of learners and the obstacles that hinder their learning are analysed, and the way in which educators can support them is discussed. Educational values such as mutual trust are discussed, and self-directed assessment is explored. This is a timely collective work authored by experts who subscribe to the approach of self-directed learning. Educators should discover new teaching and learning strategies and value the integration of self-directed learning in the classroom.

Elsa Mentz
Professor and Research Director: Research Focus Area Self-Directed Learning
Faculty of Educational Sciences
North-West University
Potchefstroom Campus, South Africa

Izak Oosthuizen
Professor and Research Fellow
Faculty of Educational Sciences
North-West University
Potchefstroom Campus, South Africa

Contents

List of abbreviations appearing in the Text and Notes

ACM	Association for Computing Machinery
AERA	American Educational Research Association
ALE	Academic Learning in English
ANA	Annual National Assessment
CAPS	Curriculum Assessment Policy Statement
CBG	Cooperative Base Groups
CBGP	Cooperative Base Group Perception
CDP	Curriculum Development Plan
CL	Cooperative Learning
CMS	Course Management System
DBDs	Digital Book Disks
ELI	EDUCAUSE Learning Initiative
HELTASA	Higher Education Learning and Teaching Association of South Africa
HLM	Hierarchical Linear Models
ICT	Information and Communications Technology
ITEI	Initial Teacher Education Institutions
KMO	Kaiser-Meyer-Olkin
LS	Life Sciences

MM	Mathematical Modeling
NRF	National Research Foundation
OCLI	Oddi Continuing Learning Inventory
PBL	Problem-based Learning
PLE	Personal Learning Environment
PS	Problem Solving
RSA	Republic of South Africa
SADC	South African Netherlands Research Program on Alternatives in Development
SAQA	South African Qualification Authorities
SANPAD	South African Netherlands Research Program on Alternatives in Development
SDL	Self-Directed Learning
SDLRS	Self-Directed Learning Readiness Scale
SRL	Self-Regulated Learning
SRSSDL	Self-Rating Scale of Self-Directed Learning
SOTL	Scholarship of Teaching and Learning
TIMSS	Trends in Mathematics and Science Study
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNISA	University of South Africa
UJ	University of Johannesburg

List of Tables

List of Figures and Appendixes

Foreword

Two major developments (some have termed them revolutions) associated with the early and late 20th century transformed conventional understandings of teaching and learning and spawned a range of new learning theories, and also theories associated with curriculum design, teaching methodology or instruction and teaching modality. The first development took shape in the early 20th century and concerned the unprecedented innovation associated with communication technology (in terms of landlines, radio, television and then satellite connectivity as well as modems, faxes, e-mail and mobile phones) and access to personal electronic devices (such as personal computers, laptops, tablets, iPads, lifebooks and so on). The second development, arising from innovation and progress in communication technology, was the development of the internet and internet-based search capacity (in which all types of knowledge became not only accessible but almost instantly searchable as can be demonstrated with reference to the internet and its search engines such as excite, altavista, Yahoo, WebCrawler, Google and Bing). Teachers and academics (Marshall McLuhon being the most celebrated example) realised by the mid-1950s what enormous implications the development of communication technology would have, not least for widening access to learning but also for revolutionizing the ways in which learning could occur and, thus by further implication, altering the role of the teacher as both communicator of knowledge and primary knowledge authority.

The literature concerning this development (classic works include The Gutenberg galaxy by McLuhon [1962], and more recent texts include The shallows by Carr [2010]) is massive, and the metaphor of (knowledge, net, information) explosion dominates the pages of numerous popular and academic works concerning the impact of technology on learning, teaching, and knowing. Another metaphor captures the paradox of this explosiveness in the form of 'the global village' in which the paradox of widened access, communication and knowledge explosion is contracted to the relative intimacy of a world reduced to a few common village streets and homes, all within almost immediate electronic reach.

How to cite: Balfour, R., 2016, 'Foreword', in E. Mentz & I. Oosthuizen (eds.), *Self-directed learning research*, pp. xxiii–xxv, AOSIS, Cape Town. http://dx.doi.org/10.4102/aosis.2016.sdlr14.00

Notwithstanding analyses of these two revolutions, perhaps the single most important implication of both, for teaching, concerns the possibility, for the first time in history, that learners can truly be enabled to become self-directed. This is not to suggest that learners have not, throughout all ages, engaged in self-directed learning but rather that the recognition of learner agency (as agency capable of much more than synthesis, assimilation and the memorization of knowledge) is new. Classic texts (such as Self-directed learning [Knowles 1975]) assume without much articulation that the world in which the learner and teacher finds themselves in the beginning of the 20th century is vastly different, in terms of its possibilities and capabilities, from that of an earlier century. In such a context, this book, which is comprised of a fascinating collection of chapters, addresses itself to the theme of learner agency as it relates to self-directed learning. In this brave new world, hitherto almost intangible possibilities for the learner came to be described for the first time since perhaps the classical philosophers of Greece in terms of learners' abilities to discern their own learning needs, to formulate objectives or outcomes associated with their learning, to describe the types of resource (and by implication knowledge) needed to realize the aspirations and the necessary approaches to learning that are appropriate to knowledge and, finally, to self-evaluate the learning. The influence of self-directed learning on the scholarship concerning learning is evident. For example, concepts such as the 'personal learning environment' have been added as new to the scholarship on blended learning. To be sure, the anticipated emancipation of the learner did not imply, and has never implied, the absence of a teacher but what is very clear is that the roles of the teacher has become altogether transformed and changed from those roles anticipated for the teaching processes associated with the 19th century and earlier. Changing theoretical definitions and philosophical speculation as regards the new roles associated with teaching and the teacher can be seen in the development of a range of approaches (for example, the learner-centred approach to teaching, the participatory action-research approach to research methodology and the capability approach), theories (for example, communicative language theory or communication theory, constructivist theory, cognitive theory, social-activity theory) and views on the curriculum (outcomes-based education, problem-based learning, case-based teaching, for example) during the 1960s, 1970s and 1980s.

This book is devoted to research which explores self-direction in higher education as well as schooling contexts from theoretical, methodological as well as cognitive

perspectives and from the perspective of traditional contact or multi-modal learning (blended learning). Unsurprisingly, these expositions of perspective lead authors to re-think conventional conceptualisations of not only learning and teaching but of knowledge and knowing too. What is more, because learning is so intimately associated with motivation, and self-direction implies not only a highly developed sense of self but also an understanding of what motivates the learner to desire self-direction (that characteristic referred to as self-determination), motivation forms a theme addressed throughout the book in various forms. The reader will thus be gratified to find chapters concerned with achieving self-direction in the context of collaboration and cooperation as well as chapters illustrating how learners and teachers become aware of the importance of communication skills in negotiating the needs and goals associated with learning. Thus, the knowing (awareness and knowledge) that arises from strategies that may be described as collaborative or cooperative is well documented throughout the book, especially in those chapters which reflect on learner experience. How learners come to understand accountability and responsibility in relation to each other as well as the teacher is factored into discussions of self-direction in the context of group work whilst the application of self-directed learning in contexts of large-group teaching is also considered. This reconsideration of the role of the teacher (as facilitator, mentor, coach, tutor, guide) provides the reader with a richly textured account of the impact of self-directed learning on the teacher, and it results in scholarship and reflection. What emerges, especially in those chapters (Geography, Mathematics, Computer Science and isiZulu Education) in which knowledge of the subject forms part of the focus, is the strong relationship between the teacher's confidence in the knowledge domain and confidence in supporting and scaffolding self-direction in the curriculum. The book invites the reader to consider a wide and fascinating range of issues in relation to teacher readiness and learner readiness as regards to when, why and how self-directed learning comes to feature in a curriculum, or indeed outside of it.

Professor Robert Balfour (PhD)
Dean, Faculty of Education Sciences
North-West University
Potchefstroom Campus, South Africa

Notes on Contributors

Thabisile Buthelezi

Prof. Thabisile Buthelezi is an Associate Professor at the University of KwaZulu-Natal in the Language and Arts Cluster of the School of Education. She is a qualified teacher, nurse, and practitioner in Adult Basic Education and Training. Her research interests are in the areas of African Languages, Language Education, Curriculum and Pedagogy, Sexuality Education, HIV and AIDS in Curricula and Indigenous Knowledge Systems. She has vast experience in Teacher Education. She is an established researcher and is rated by the South African National Research Foundation. Her most recent book chapter titled 'IsiZulu Language and the Ilanga Newspaper as Catalysts for Participatory Democracy' appears in the book on *Indigenous Language Media, Language Politics and Democracy* edited by Abiodun Salawu and Monica Chibita published in 2016. Email: buthelezit10@ukzn.ac.za

Josef de Beer

Prof. Josef de Beer is a Research Professor in the School of Natural Sciences and Technology for Education, North-West University, Potchefstroom. His PhD (obtained in 1994) was in science education, and his recent MSc was carried out in ethnobotany, on the plant use of the Khoi-San people. He is currently doing a second PhD focusing on anthropomorphic and ethnobotanical perspectives in indigenous knowledge. He had been involved in teacher education for most of his life, and this remains his first love. In 2009 Josef was awarded the Higher Education Learning and Teaching Association of South Africa (HELTASA) national award for teaching excellence. In 2012 the American National Association of Biology Teachers honoured Josef with the Research in Life Sciences Education award. Josef is a fellow of the Royal Society of Biology. Email: josef.debeer@nwu.ac.za

Adri du Toit

Mrs Adri du Toit is currently a PhD student at the University of South Africa (UNISA) and a full-time lecturer at the Potchefstroom Campus of the North-West University. She specialises in research regarding the content, structure, curriculum and pedagogy of Consumer Studies education and the preparation of Consumer Studies educators.

Her research also includes investigations regarding the school subject Technology, a precursor to Consumer Studies in the Senior Phase of South African schooling. In successive UMALUSI national curriculum investigations (2011-2015), she served as supervisor for Consumer Studies and Technology respectively. She has published several academic articles and presented numerous papers at national and international conferences. Presently she is involved in benchmarking the Technology curricula of Botswana and South Africa and she is the project chair for an international Consumer Studies curriculum analysis. Email: dutoit.adri@nwu.ac.za

Aubrey Golightly

Prof. Aubrey Golightly holds a doctoral degree and is an Associate Professor in Geography Education in the School of Natural Sciences and Technology for Education at the Faculty of Education Sciences (North-West University, Potchefstroom campus) in South Africa. His research interests are active learning, learner-centered instruction, problem-based learning and self-directed learning in Geography education. His current research project concerns the implementation of problem-based learning in Geography education to foster students' self-directedness in learning. He is also the head of the Division for Professional Development in the Faculty of Education Sciences. Email: aubrey.golightly@nwu.ac.za

Sarah Gravett

Dr Sarah Gravett is dean of the Faculty of Education at the University of Johannesburg (UJ). Her initial postdoctoral research included transformative learning in higher education, dialogic teaching and the design of learning environments at university. In recent years her research focus has shifted to teacher education. She views her involvement in establishing a school at UJ's Soweto campus as the most meaningful achievement of her academic career. The school was established to serve the education needs of young children in close proximity to the UJ Soweto campus and to serve as a practicum site for the education of teachers of young children. Research emanating from this initiative includes groundbreaking work in developing a foundation phase teacher education model, incorporating a 'teaching school'. Email: sgravett@uj.ac.za

Marietjie Havenga

Prof. Marietjie Havenga is an Associate Professor in the School of Natural Sciences and Technology for Education in the Faculty of Education Sciences of the North-West

University. She is involved in teaching courses in Information Technology to pre-service teachers on undergraduate level as well as the supervision of post-graduate students. She has published in various journals and chapters in books. Her research interests include problem-based and project-organised learning to enhance self-directed learning with specific reference to Computer Science Education and Engineering Education. Email: marietjie.havenga@nwu.ac.za

Anitia Lubbe

Mrs Anitia Lubbe is currently a PhD student at the North-West University. The title of her doctoral thesis is 'Cooperative learning-oriented assessment: Implications for students' assessment literacy and self-directedness in learning'. Her areas of research include: implementation of cooperative base groups in Higher Education; enhancing first-year students' self-directedness towards learning; assessment as learning; as well as assessment literacy of students. Email: anitia.lubbe@nwu.ac.za

Judah P. Makonye

Dr Judah P. Makonye is a senior lecturer at the University of Witwatersrand, School of Education. He holds a PhD in mathematics education. He has authored more than twenty journal articles; most of them in Department of Higher Education accredited journals. He has authored three book chapters in a teacher education book entitled *Teaching Mathematics: Foundation and Intermediate Phase* published by Oxford in Cape Town. He has extensive experience of teaching mathematics at high school, teachers' colleges and universities in the Southern African Development Community (SADC). Email: judah.makonye@wits.ac.za

Elsa Mentz

Prof. Elsa Mentz is the director of the Research Focus Area Self-Directed Learning as well as a Professor in the subject group Computer Science Education in the Faculty of Education Science at the North-West University. She specialises in cooperative and self-directed learning. She is an NRF-rated researcher and have received several research awards from 1999 to 2015 including an NRF Thuthuka research grant for research on cooperative learning, a South African Netherlands research Program on Alternatives in Development (SANPAD) grant for research on the empowerment of IT teachers in economically deprived rural schools, an NRF Education Research in SA programme

grant for research in cooperative learning to enhance self-directed learning as well as various Vice-Chancellor awards for excellence. Professionally, she is a member of the American Educational Research Association (AERA) as well as the Association for Computing Machinery (ACM) and act on the editorial boards of three scientific journals. Email: elsa.mentz@nwu.ac.za

Neal Petersen

Dr Neal Petersen is a Senior Lecturer in the School for Natural Sciences and Technology for Education. His research is in Life Sciences teaching within the self-directed learning focus area. He specifically focuses on incorporating Indigenous Knowledge in a cooperative teaching-learning environment. Email: neal.petersen@nwu.ac.za

Paulinah Phahamane

Mrs Paulinah Phahamane is studying towards a PhD at the University of KwaZulu-Natal, and her doctoral thesis is titled: 'A case study: Exploring Students' and Lecturers' Experiences Pertaining to the Use of the Digital Technologies as a Mobile Pedagogical Device in Academic Writing at a South African University'. Her research interests are on Technologies particularly as used in everyday life and also to assist students in Blended Learning and academic development. She is an Educational Technology Consultant in Lesotho, and the School Principal at St. Joseph (Motloang) in Berea district of Lesotho. She had been a provisional tutor for the first year student doing Classroom Technology module for four years at the University of KwaZulu-Natal. Email: phahamane@gmail.com

Jessica Pool

Dr Jessica Pool is a lecturer in the Faculty of Education Science and is currently fulfilling the position of Researcher: Teaching and Learning in Higher Education at the North-West University, Potchefstroom Campus, South Africa. She completed her PhD in Blended Learning, and her research interests include the development, implementation and evaluation of blended learning in a self-directed learning environment. Since then she has published widely, nationally as well as internationally, on aspects of blended learning and self-directed learning (the design and development of e-guides for blended learning, students' expectations for blended learning, re-design of blended learning courses and guidelines for supporting academics with the establishment and sustainment

of communities of inquiry in blended learning courses). Methodologically she is well known for design based research to improve practice. Email: jessica.pool@nwu.ac.za

H.J. (Hennie) Steyn

Prof. H.J. (Hennie) Steyn former dean of the Faculty of Education Sciences at the North-West University Potchefstroom Campus, taught Comparative Education at under- and post-graduate level. He served on several bodies regarding the formulation of education policy. His field of research specialisation is the structure and functioning of the education system with the recent focus on 'the planning of the education system', 'education provision to minorities', 'productivity in the education system' and 'education provision in developing countries. Email: hennie.steyn@nwu.ac.za

Johannes (Hannes) L. van der Walt

Prof. Johannes (Hannes) L. van der Walt, DEd, PhD and DEd (Honoris Causa), is Professor Emeritus and currently Specialist Researcher in the Edu-HRight Research Unit of the Faculty of Education Sciences, Potchefstroom Campus of the North-West University, South Africa. After his retirement in 2000 as Dean of the Faculty of Education, North-West University, he became involved in academic building projects, particularly the training of young academics in the philosophical foundations of their subjects, in theory construction and scholarly article writing. A Philosopher of Education by original profession, he has recently been involved in research projects ranging from pedagogical issues to investigations into religious intolerance and the relationship between religion and education. Amongst his most recent publications count articles in the International Journal for Religious Freedom, Problems and Perspectives in Management and the Journal of Third World Studies. Email: hannesv290@gmail.com

Charl Wolhuter

Prof. Charl Wolhuter has studied at the University of Johannesburg, the University of Pretoria, the University of South Africa, and the University of Stellenbosch. His doctorate was awarded in Comparative Education at the University of Stellenbosch. He is a former Junior Lecturer in the Department History of Education and Comparative Education at the University of Pretoria, and a former Senior Lecturer in the Department of History of Education and Comparative Education at the University of Zululand.

Currently he is a Comparative and International Education Professor at North-West University, Potchefstroom Campus, South Africa. He is the author or several articles in the fields of History of Education and Comparative and International Education. He has been a visiting professor at Driestar Pedagogical University, Gouda, Netherlands; Bowling Green State University, Ohio, United States of America; Brock University, Ontario, Canada; Mount Union University, Ohio, United States of America; University of Crete, Greece; Canterbury Christ University, United Kingdom; University of Joenssu, Finland; University of Queensland, Australia: Banska Bystrica University; Beijing Normal University, China; and the University of Modena and Reggio Emilia, Italy. Email: charl.wolhuter@nwu.ac.za

Chapter 1

The feasibility of grafting self-directed learning theory onto the capability theory

Hannes van der Walt
North-West University
South Africa

Introduction, background and statement of purpose

The origins of self-directed learning lie somewhere in a moment in the distant past when a human being experienced a sense of self-awareness or self-consciousness in the process of trying to master a particular chunk of knowledge or a necessary skill – and then systematically began steering or managing the learning process. As time passed, however, guiding groups of

How to cite: Van der Walt, H., 2016, 'The feasibility of grafting self-directed learning theory onto capability theory', in E. Mentz & I. Oosthuizen (eds.), *Self-directed learning research*, pp. 1-34, AOSIS, Cape Town. http://dx.doi.org/10.4102/aosis.2016.sdlr14.01

children towards the mastery of knowledge and skills became entrusted to (in modern times) professional teachers. In the end, this movement resulted in teacher-centred teaching, in what Freire (2005:71–72) refers to as the 'banking' approach to teaching and learning where the teacher 'deposits' knowledge in learners and where the latter become mere 'receptacles' to be 'filled' by the teacher. This problem has been exacerbated in recent times as a result of an increase in the participation rate of learners to the extent that classes of up to 60 learners are entrusted to the guidance of a single teacher (cf. Guglielmino 2008:2). In such conditions, teaching tends to become a highly regulated and prescriptive teacher-centred undertaking in which the learners' self-directedness and self-regulation in the learning process seem to deteriorate or disappear altogether in a state of 'other-directedness' – the 'manufacturing model of education' as it is referred to by Guglielmino (2008:2–3; also cf. Ryan & Deci 2000:68).

In teacher-centred teaching and learning situations, learners tend to become passive absorbers of the knowledge and skills dispensed by their teachers, and rote learning (without much insight) becomes the favoured way of mastering knowledge and skills. The extent to which the knowledge and skills have been mastered in these circumstances tends to be assessed by means of standardised tests and examinations. According to Bass (2015:718), a system-wide approach to reform has become necessary because of the systemic nature of the problems associated with such standardised assessment in modern education systems. Her conclusion resonates with an observation by MacDonald (2012:8, 10–11) that there has lately been a movement away from a standard-based test approach. It has been argued, according to her, that standard-based assessment tends to be in conflict with true democracy and multiculturalism, that is, with the recognition of the uniqueness of each individual learner in the system. For

this reason, many parents and their children have decided to opt out of the system. In sum, the standardised teacher-centred approach that characterises modern education systems has begun to fall out of favour, and there are those who insist that it should be replaced by an approach that recognises the uniqueness of each participating learner.

In view of the above, concerned scholars have begun intentionally to employ the notion of self-directed learning in an effort to help learners take charge of their own learning and not to be unduly dependent on their mentors or teachers. One such scholar was Malcolm Knowles who published a book entitled *Self-directed learning: A guide for learners and teachers* in 1975. Since then scholarship regarding self-directed learning has steadily developed. The following is a brief overview of that scholarship (which will lead up to the statement of the problem addressed in this chapter).

According to Knowles (1975:18), self-directed learning in its broadest meaning describes a process in which individuals take the initiative, with or without the help of others, (1) in diagnosing their own learning needs, (2) formulating learning goals, (3) identifying human and material resources for learning, (4) choosing and implementing appropriate learning strategies and (5) evaluating learning outcomes.

The emphasis in self-directed learning is on three aspects, namely 'self' as in self-planning, self-education, self-instruction, self-teaching, self-study, autonomous learning and – as Long (2000:11) indicates – auto-didaxy and self-regulated learning. 'Self' refers to the distinct individuality or identity of people (in this case, the learners) as well as their consciousness of their own identity and being (Sinclair 1999:1346). The 'self' is regarded as the 'driver' or the manager of the learning process. Self-directed learners display curiosity, initiative, persistence, independence, discipline and self-

motivation in learning. Such learners attend to problems in learning, which are seen as challenges (Banerjee 2011; Guglielmino 1978). As Long (2000:13) emphasises, self-directed learning is characterised by the fact that the learner as an individual is conscious of at least some of the important parts of the learning process and is able to apply self(-consciousness) to those elements for purposes of controlling the learning process. The self-directed learner, according to Long (2000:15), displays three primary psychological dimensions, namely metacognition, motivation and self-regulation as well as four secondary psychological dimensions: choice, competence, control and confidence.

Secondly, the emphasis in self-directed learning is on being directed or purposeful, on the ability to conduct or control one's own affairs (Sinclair 1999:406). It entails managing one's own learning by actions such as setting one's own learning goals, making decisions about what and how to learn, applying the appropriate learning skills and strategies and reflecting about one's own learning and the degree to which self-determined aims have been reached (Bagheri *et al.* 2013:15; also cf. Lee & Teo 2010). Self-directed learning places the emphasis on a learner's deliberate actions to make informed decisions in mastering the learning material (Knowles 1975:18). According to Thornton (2010:161–164), the self-directed learner moves through the typical phases of management: planning, implementing, monitoring and evaluating one's own learning processes, all based on reflection.

Emphasis is, thirdly, on 'learning', not in the first instance as knowledge acquisition but rather as the *process* of mastering the learning material (Shin 2011:604–612). As Lee *et al.* (2014) indicate, self-directed learning is a form of learning that is more challenging and requires more action on the part of the learner than just being a passive absorber of knowledge, a

passive participant in the transmission of knowledge dispensed by the teacher. The learner in self-directed learning is an active role player in the learning process, a person who can communicate effectively, cope with challenges and possesses problem-solving skills (Larson & Miller 2011). Put succinctly, learners are active participants in their learning process (Nepal & Stewart 2010). In sum, then, it could be said that self-directedness is a personal attribute that can be considered along the dimensions of a cognitive and motivational process.

The problem with most of the labels attached to self-directed learning is that they seem to imply learning in isolation whereas self-directed learning usually takes place in association with various kinds of helpers such as instructors, teachers, tutors, mentors, resource people and peers. According to Knowles (1975:18), there is 'a lot of mutuality amongst a group of self-directed learners'. Self-directed learning is also characterised, according to Long (2000:14 et seq.), by a sociological aspect which emphasises the learner as individual though assisted by mentors, teachers and other experts. The influence of the mentors, teachers and experts is limited to their competence in content or skill, and they become expendable when they have served their purpose. The second aspect, after the sociological aspect, is technique, namely the fact that the learners are humans learning in groups. This aspect is also founded upon the ability of a leader, teacher, tutor, mentor or facilitator to design a format according to which learners effectively direct their learning.

Apart from reflecting on what self-directed learning implies, as has been discussed above, scholars in the field have focused their attention on at least two other issues, namely the extent to which it could be applied in various disciplines or subjects (cf. Schach 2005; Zou & Mickleborough 2015 in engineering; Shin 2011 and Liddell 2008 with respect to executive

women in charitable organisations; Schwalbe 2010 and Lee & Teo 2010 in information and communication technology; Zimmerman & Bandura 1994 in academic writing; Victori & Lockhart 1995; Mohammadi & Mahdi Araghi 2013 in language learning) and the extent to which its advantages could be harnessed in teaching method (cf. Yusof *et al.* 2015; Bell 2010 in problem-based learning; Server 2015 in higher education; Turker & Zingel 2008 on scaffolding in self-directed learning; Staker & Horn 2012 in blended learning; Du Toit & Pool 2015 in e-learning; Bleed 2001 in hybrid learning).

Having said all of this about self-directed learning, the question now arises: on what view of reality (ontology and cosmology), the human being (philosophical anthropology), society (societal relationship theory), knowledge (epistemology) and values (axiology) has this method of self-directed learning been founded (also cf. Strauss 2009:29–30; Van der Walt & Potgieter 2012:597–607)? Put differently: what are the pre-theoretical and theoretical foundations of this method or approach to learning? Through which pre-theoretical frame – pre-judgements, world view – do the proponents of self-directed learning view the (educational) world and make sense of it (Olthuis 2012:5, 7)? A teaching-learning method is never neutral in its conception of life; it is always rooted in some or other deeper pre-theoretical foundation. The answer to the questions posed above seems to be that self-directed learning as depicted displays only a basic outline regarding its pre-theoretical and theoretical preconditions. Self-directed learning as a teaching-learning approach is rooted in three basic assumptions, namely that learners are human beings able to learn, able to master learning contents and able to attempt to manage this process independently and even autonomously (literally, as a law unto themselves) or with the (temporary) assistance of a tutor or mentor (also cf. Guglielmino 2008:10). The rudimentary theoretical

status of self-directed learning finds expression in the terms used in literature to describe it. Fisher, King and Tague (2001:516) refer to self-directed learning as a method of instruction. Abraham, Upadhya and Ramnarayan (2005:135) see it as a process in which students take initiative. Merriam (2001:8) refers to it as a form of study or a type of learning. Blumberg (2000:199) regards it as a model of learning, and Agran, Blanchard and Wehmeyer (2000:361) describe it as a goal to be attained through self-determination.[1]

The fact that self-directed learning as such – as a rudimentary theory – is rooted in this rather frail pre-theoretical foundation raises the suspicion that it was conceived mainly for a pragmatic purpose. This purpose was to inspire learners to take responsibility for their own learning with the aim of getting them to achieve better than when under the strong direction and guidance of a teacher or a mentor. A pragmatic approach unfortunately implies that the learners are kept in the dark about the deeper rationale behind the act of taking responsibility for and managing their own learning. Pragmatism is an approach to education aimed at ensuring practical and effective results regardless of any deeper life-conceptual (world view) considerations and motives that might lurk behind the exhortation to take charge of the learning process. The value of the method depends entirely on its practical workability and effects.

1. Scholars of self-directed learning counteract this theoretical frailness by drawing from theory regarding the three elements of self-directed learning, namely from (educational) psychological theories about 'self', amongst others by resorting to self-determination theory, from (educational) management theories about 'directedness' and from learning theories and epistemology about the 'learning' element, and the scholarship of teaching and learning (SOTL). As will become clear as the argument in this chapter unfolds, there is however also the possibility of bolstering self-directed learning theory by grafting it onto another theory that already possesses a substantial and relevant theoretical as well as pre-theoretical foundation.

Pragmatist Richard Rorty (1982:160ff) is quite clear about the anti-metaphysical (that is, the anti-pre-theoretical and theoretical, anti-world view or anti-life view) orientation of pragmatism. Pragmatism eschews all 'theories of truth', 'theories of knowledge' or 'theories of morality'. In fact, he claims, true pragmatists believe that there *are* no such theories of such matters, neither *should* there be. Pragmatism is therefore an anti-foundational approach to issues. It is simply anti-essentialism (anti-foundationalism) applied to notions like truth, knowledge, language, morality and similar objects of philosophical (metaphysical) theorising. There is no epistemological difference between truth about what ought to be and truth about what something actually is (Rorty 1982):

> nor any metaphysical difference between facts and values, nor any methodological difference between morality and science' (*ibid.* 163). Pragmatism is the doctrine that there are no constraints on an inquiry [*or on a standpoint such as insisting on self-directed learning*] save conversational ones, no wholesale [*that is, theoretical or pre-theoretical*] constraints derived from the nature of the objects [*in this case, self-directed learning*], or of the mind, or of language, but only those retail constraints provided by the remarks of our fellow-inquirers (*ibid.* 165).[2] (p. 160ff)

It is doubtful whether the proponents of self-directed learning indeed had such an uncompromising pragmatist orientation in mind when they conceptualised it as a teaching-learning approach. Whatever the case, a pragmatic outcome was unavoidable, and this leads to a measure of discomfort amongst educationists admitting that they practise their scholarship on the basis of a life map or life and world view (Peck 2006:179; Van der Walt 1999:47–60), a map and view that embody the pre-theoretical and theoretical orientation and convictions of the educator (teacher) in question. Scholars who do not align

2. It is interesting to note that an anti-foundational or anti-metaphysical stance is nevertheless in itself a philosophical frame of mind, a world view stance, a lens through which reality is viewed.

themselves with the anti-foundationalism of pragmatism, including this author, find themselves in a predicament. Whilst they wish to make use of the advantages of self-directed learning, they do not concur with the life-conceptual neutrality that seems to characterise it.

Is there a solution to this problem, which could be formulated as follows: how does one adapt the notion of self-directed learning so that it would be able also to possess and display the pre-theoretical and theoretical sub-structure that is so typical of a well-developed theory and so that it would be allowed also to project the loftier purposes of self-directed learning (that is, loftier than merely expecting learners to master knowledge and skills) and how learners should learn (that is, loftier than merely stating that their learning should be self- or learner-centred and self-managed)? How could one improve the notion of self-directed learning so that the learning that results from it becomes more worthwhile and sensible to the learner than merely self-directing the process or act of learning content and mastering skills?

A few other theories considered

The problem concerning furnishing self-directed learning with a deeper theoretical and pre-theoretical foundation could be solved by complementing the core ideas of self-directed learning with the precepts of another theory that already embodies a more sophisticated pre-theory and theory in its scientific infrastructure. Three such theories come to mind: Lev S. Vygotsky's (1978:79–91) theory on the zone of proximal development, Ludwig von Bertalanffy's (1969:33–50) general systems theory and Urie Bronfenbrenner's (1979) ecological systems theory. Despite possessing a more sophisticated pre-

theoretical and theoretical underpinning, these theories have unfortunately become rather unappealing to the 21st century (postmodern) mind because of their deterministic, even mechanistic, and linear way of viewing teaching and learning (cf. Bower 2005:181; Strauss 2009:173; Wright 2010:120, 122). We therefore have to cast the net wider to be able to consider theories that are somewhat less deterministically linear, such as complexity theory. Complexity theory is more appealing to the postmodern mind as, according to Dekker, Cilliers and Hofmeyr (2011:1–2), it regards all aspects of human existence as complexities in which no single factor can deterministically and linearly explain phenomena. For instance, whether learning has occurred at a desired level cannot be explained by one factor only. One cannot truly assume that, given a particular set of circumstances, a particular learning result will be attained. Only time will tell whether a desired effect has been reached.

Single-factor (monistic and even dualistic) explanations (theories) are inadequate in view of the complexity of reality (Strauss 2009:173). We therefore have to revert to theories that allow for diffuseness and relative freedom for all concerned. According to Dekker *et al.* (2011), we have to search for a theory that regards an outcome as emerging from a complex network of causal interactions and not from a single factor. Such a theory, according to Anderson (1999:217–218), should resist simple reductionist analyses because interconnections and feedback loops preclude holding some sub-systems constant in order to study them in isolation. Our interest should therefore be centred on 'emergent properties', that is, results that appear at different levels in a complex situation. Such properties emerge because complex situations tend to exhibit self-organising behaviour. They often start in a random state and tend to evolve to order rather than to disorder.

The problem to address in terms of self-directed learning, then, is as follows: Which theory, on the one hand, reflects the same or a similar

teaching-learning value system as that embodied in self-directed learning but can, on the other hand, provide it with a stronger pre-theoretical and theoretical underpinning, that is, a stronger transcendental[3] system that explains the existence of the theory and its application? Which theory would be able to support and reinforce the core ideas of self-directed learning by furnishing self-directed learning with an appropriate pre-theoretical and theoretical underpinning and meet the criterion of reflecting the complexity of the teaching-learning situation?

In response to questions such as the above, scholars in the field of self-directed learning have in the past turned to self-determination theory as Guglielmino (2008:10)[4] has done. This theory complies with the requirement of complexity. It is non-linear and not mechanistic-

3. The philosophical-technical terms 'transcendental' and 'transcendent' will occasionally be used in the discussion below (cf. Strauss 2009:69, 361). The former refers to the assumptions and convictions (meta-theory) underlying or undergirding a particular theory that constitute its pre-theoretical underpinning. It refers to the basic motives that control the immanent course of thought as embodied in the theory. The latter refers to a life-conceptual, religious and/or spiritual stance or commitment that goes beyond and above the theory and hence gives purpose and direction to the theory and its applications. As Merriam (2009:8) has observed, there is almost no consistency amongst writers in how this aspect of research is discussed or presented. Some refer to traditions and theoretical underpinnings, others to theoretical traditions and orientations, theoretical paradigms, world views, epistemology and theoretical perspectives. She rightly concludes that each researcher should make sense of these *underlying influences* in his or her own way. The point is, as Strauss (2009:639) has convincingly argued, that every discipline, and hence the theories therein, 'proceeds from some or other philosophical view [*as expressed in transcendental and transcendent viewpoints*]. … the question is whether this unavoidable underlying philosophical perspective succeeds in giving a satisfactory theoretical account of reality by articulating a non-reductionist ontology …' This is, as will be explicated below, also the question that will be asked with regards to self-directed learning theory in combination with the self-determination theory and the capability theory.

4. Guglielmino uses the examples of George Washington Carver and Madame Marie Curie to illustrate how someone can succeed in changing his or her past, present and future through sheer self-determination. However, not all people possess this ability as she emphasises: 'Some individuals will overcome all obstacles to continue their self-directed learning; others need assistance in accepting the responsibility and developing the skills and attitudes for lifelong self-directed learning'.

deterministic (Deci & Ryan 1985:6; Ryan & Deci 2000:69), and it employs an organismic meta-theory that highlights the importance of humans' evolved inner resources for personality development and behavioural self-regulation (Ryan & Deci 2000:68). It also encapsulates many aspects pertinent to self-directed learning[5] as Deci and Ryan (1985:6) indicate: its proponents began realising that, apart from external stimuli, choices and intentions also play a role in behaviour, and the study of volition and self-direction gradually became integral to research on motivation. They began to understand that, although drives or impulses account for tendencies to act, the drives and impulses do not provide an adequate theory of action. There needs to be a concept of *self-direction*, entailing conscious processes such as imaging future outcomes, to account for the wide range of volitional activity observable amongst people. The key issue of *self-direction* is flexibility in psychological structures, flexibility that allows one's attitudes to direct action towards the effective achievement of one's aims. Increasingly, choice and decision-making replaced stimulus-response associations to explain the directedness of behaviour. Agran *et al.*'s (2000:351–353, 361) study reveals how self-determination theory could tie in with self-directed learning: the application of the *self-determined model of instruction* helped the participants in their study to become self-regulated problem solvers, able to *self-direct* their instruction towards self-selected goals.

Self-determination theory also resonates with capability theory, which will be examined in more detail below. Self-determination, according to Ryan and Deci (2000:68–69), is indispensable for social development and

5. The frequent cross-referencing in the literature regarding self-directed learning and self-determination theory seems to suggest that a reciprocal and even symbiotic relationship exists between them.

personal well-being, the latter also being one of the key precepts of capability theory. Much of the research guided by self-determination theory has examined environmental factors that hinder or undermine self-motivation, social functioning and personal well-being, ideas that also often appear in discussions in capability theory. As Guglielmino (2008:9–10) has argued, self-directed learning offers a pathway to increased life satisfaction and life enrichment. It also offers values consonant with well-being and quality of life in capability theory. The basic thrust of self-directed learning, as Knowles (1975:16–17) pointed out four decades ago, namely that the ability of the learner to learn on his or her own with or without the assistance of a tutor or mentor should be developed, likewise points in the direction of capability development as expounded in capability theory.

In sum then, the three theories involved in this discussion could feed into and off one another in the following manner. Capability theory holds that learners have capabilities to be and do what they have reason to value, and these capabilities have to be developed. Self-determination theory, in turn, holds that learners should show determination, amongst other things, through self-directed learning (Agran *et al.* 2000:361) and self-regulating behaviour in order to be strongly motivated for their education and for creativity, self-esteem, cognitive flexibility, autonomy and support, interpersonal relationships, internalisation, integration of personality and introjection (Deci *et al.* 1991:326). It could be advantageous to educational practice and policy, the learners' competence, their psychological needs, well-being, classroom practice, educational reform policies (Niemiec & Ryan 2009:134) and for student engagement if all this could be achieved (Reeve 2012:*passim*). The feedback loop between the theories could

also run in the opposite direction. Self-determination theory highlights the fact that self-determined learners are able to make the necessary self-directed choices that affect their learning and hence their lives (Deci *et al.* 1991:327, 342) – another key precept of capability theory.

Because self-determination theory embodies many precepts that could impact on education in general (Niemiec & Ryan 2009:134) and is rooted in its own meta-theory,[6] it could well serve as the preferential pre-theoretical and theoretical substratum for self-directed learning. This conclusion raises the question why the rest of the discussion in this chapter is then devoted to the potential of *capability theory* to provide such a meta-theoretical substratum for self-directed learning. The answer is simply that capability theory is fundamental to self-directed learning, self-regulated learning as well as self-determination theory in that it is rooted in the core thesis that all people possess capabilities to do and become what they have reason to value. Self-directedness, self-regulation[7] and self-determination in the learning process all rest on this core thesis of capability theory. Capability theory can therefore be regarded as fundamental to the other theories or approaches: learners potentially possess the *capability* to self-direct, self-regulate and self-determine. These three capabilities have to be developed and brought to fulfilment on condition, as will be seen, that the learner has reason to value the development of these capabilities.

6. In fact, as Reeve (2012:149) has indicated, it embodies at least five mini-theories, each with its own meta-theoretical infrastructure: basic-needs theory, organismic-integration theory, goal-contents theory, cognitive-evaluation theory and causality orientations theory.

7. Self-regulation and self-direction are not synonymous concepts. Whereas the former embodies the concept of regulating the learning process (for instance, by subjecting it to certain rules or procedures), the latter embraces the notion of managing and controlling the learning process.

The purpose of the rest of this chapter is to examine capability theory as a theory that might meet with the requirement of supplying self-directed learning and by implication also self-determination theory with a still deeper meta-theoretical and theoretical underpinning. Firstly, however, it is necessary to explain from which basic research orientation this task was undertaken.

Research orientation

The argument and conclusions with respect to this study are rooted in a constructivist-interpretivist approach to the problem (Merriam 2009:8–9). This orientation, as Cohen, Mannion and Morrison (2011:17–18) explain, helps one to understand the subjective world of human experience. It helps to understand an action that takes place as well as its meaning and purposes. This constructivist-interpretivist orientation is, in turn, embedded in a post-post-foundationalist epistemology, that is, an approach that avoids being bold, direct and up-front with one's own views, convictions and norms but rather allows the relevant views, convictions and norms of the author to surface as the argument unfolds (Van der Walt 2014:*passim*; Van der Walt & Steyn 2014:822). In allowing this, this orientation dovetails with the notion of complexity mentioned in the previous section.

A brief summary of capability theory

An issue to be cleared up in advance is the fact that, in the discussion below, reference is made to capability *theory* and not to the capability *approach*. As Wells (2015) argues, the latter is the name attached

to the capability orientation by Amartya Sen, an economist who developed the approach for purposes of measuring and alleviating poverty amongst nations. His approach was subsequently developed into a theory by Martha Nussbaum, a legalist and philosopher, into 'a partial theory of [*social*] justice' (Robeyns 2005:94). Theorists then used the basic precepts of the theory for examining other problems and issues. Ingrid Robeyns, for instance, used it for generating lists for empirical research in the social sciences, Sabine Alkire for developing a participatory approach to evaluating capability expansion, Elizabeth Anderson for developing a view regarding justice as equal capability of democratic citizenship and John Alexander for developing a theory regarding capability as freedom from domination (see Wells 2015). As will be shown below, capability theory has been extensively applied in an educational context as well (cf. Cockerill 2014:17).

The following outline of capability theory does not follow the internal logic of the theory as developed by Sen, Nussbaum and its other proponents. The form of the presentation is predicated by the abovementioned search for the pre-theoretical assumptions, the transcendental (underpinning) layer as well as the transcendent perspective on which the capability theory depends for its existence and which could complement the perspectives of self-directed learning and self-determination theory. This is done, as indicated, to provide self-directed learning and self-determination theory with a more robust transcendental and transcendent infrastructure.

The following is a brief description of capability theory. All human beings possess particular capabilities that they have to develop, and they should be afforded the freedom and the opportunities to develop their capabilities. Their dignity as human beings should be respected,

and they should be given every opportunity in life and society to develop their capabilities optimally, to be and to do what they have reason to value. In the process, they should be allowed to participate in the good life and experience their share of well-being and quality of life. The capability theory is a normative framework for the evaluation and assessment of individual well-being and social arrangements (Dang 2014:460; Robeyns 2005:94). It is also useful for the design of policies and proposals about social change in society. The core characteristic of capability theory is its focus on what people are effectively able to do and to be, that is, on their capabilities.

The three basic tenets of self-directed learning seem to dovetail into the precepts of capability theory in the following manner: all learners without learning disabilities possess the ability to master learning contents and skills. Not only should this capability be developed and honed, but learners should be guided and encouraged to self-manage their learning – a capability that they should be allowed to develop to optimal levels. This would enable them to partake in the good life, experience personal well-being and have an excellent quality of life.

Dovetailing the precepts of self-directed learning into the essentials of capability theory, I have effected a virtual grafting of the former (as the 'scion') onto the 'trunk' of the latter (as the 'stock'), which implies that self-directed learning and, by implication, self-determination theory could also be nourished by the perspectives (the 'sap') flowing from the transcendental 'root system' of capability theory. The following section describes this 'root system' of capability theory which could 'nourish' self-directed learning as well as self-determination theory.

The set of transcendental preconditions on which capability theory rests and depends and which could lend transcendental support to self-directed learning and self-determination theory

The proponents of capability theory have rooted it in the following set of pre-theoretical, subject-philosophical assumptions, convictions, presuppositions and beliefs, that is, the transcendental preconditions on which the theory depends for its existence.

Ontological and cosmological preconditions

Capability theory is not very robust in terms of ontological and cosmological assumptions. Its proponents do not spend much time on explaining the origins of the human being or how people come to possess particular capabilities or why they should exert their agency. They seem summarily to accept that human beings exist and that they possess a number of capabilities. Bessant (2014) recently postulated as follows:

> The capability that we are concerned with is our ability to achieve various combinations of functionings that we can compare, judge against each other in terms of what we have reason to value. (p. 143)

The core concepts of capability theory, namely functionings (that is, what a person manages to do or be, including achievements), capabilities (that is, the different functionings that a person might achieve), conversion factors (that is, the translation of commodities or resources into functionings and capabilities), freedom (that is, to choose) and agency (that is, the ability to achieve the goals that a person values regardless of whether these goals are connected to human well-being (Dang 2014:461–462, 464)) seem to possess conceptual status only. They have not been rooted ontologically in the sense that

explanations are offered about their respective origins or structural compositions. They are just assumed to be there as characteristics of the human being.

Even the controversy about whether capability theory is too individualistic and hence pays insufficient attention to social structure and groups (Robeyns 2005:94) has failed to impel the discourse about capabilities into the realm of ontology and cosmology. After studying capability theory, Robeyns (2005:107–108) concludes that the theory operates with ethical individualism, that is, an approach that postulates that only individuals are the units of moral concern. The theory does not rely on ontological individualism, in other words, the conviction that human beings were created or have evolved to be individuals in the first place. It accounts for social relationships on a theoretical level, not an ontological or cosmological level (Robeyns 2005:108).

Philosophical anthropological underpinning

Capability theory is rooted in a particular philosophical anthropology (that is, the view of the human being and of humanity) which also forms part of its pre-theoretical underpinning.

According to the theory, people possess capabilities (Nussbaum 2000:5), a term that refers, as mentioned above, to the different functionings that a person might achieve through his or her agency.

A key analytical distinction in capability theory is that between the means and the ends of well-being and development. Only the ends have intrinsic importance whereas means are instruments to reach the goal of increased well-being, justice, development and quality of life. These goals have to be conceptualised in terms of a person's capabilities to function, that is, the effective opportunities to undertake the actions and activities

in which they want to engage and to be who they wish to be. These beings and doings, to which Sen refers as 'functionings', together makes life valuable (Robeyns 2005:95).

All people should have 'a bare minimum of respect' for human dignity, according to Nussbaum (2000:5, 2012:65). She claims that humans possess dignity. Furthermore, people live together in situations where they can develop 'overlapping consensus', and, importantly, they are individuals who should not be used as tools of others but are ends in themselves (Nussbaum 2000:6). Everybody is entitled to a share of the good life, quality of life and well-being (Nussbaum 2000:6, 8). People are all equal but nevertheless have different threshold levels of capability (cannot all achieve the same) (Nussbaum 2000:12). They live in societies where they experience different levels of social justice and dignity (Sen 2010:231). This means that a person's value and dignity should not be assessed in terms of utilitarian values such as income, wealth or access to resources (Sen, 2010:231). Thus, the emphasis in capability theory is less on the means of living than on the actual opportunities of living (Sen 2010:233).

Another philosophical anthropological underpinning of the capability theory is freedom. Capability theory promotes respect for people's ability to do the things that they have reason to value. People are disadvantaged if they have less opportunity to achieve the things that they have reason to value. The idea of freedom also entails that people are free to determine what they want, what they value and ultimately what they decide to choose (Sen 2010:232). A person's quality of life can be judged by the extent to which they have the space to exercise freedom, to choose between different ways of living and pursue what they have reason to value. What matters is the person's entire life and not just parts of it that are isolated for closer scrutiny such as income or social status (Bessant 2014:144).

People are also very diverse in what they achieve, in their conditions and in their ambitions (Sen 2010:233).

Another part of the philosophical anthropology with which capability theory operates is the call to analysts to look at the extent to which people can actually achieve that which they have reason to value. The focus of the capability approach is not just on what people actually end up doing or being but also on what they are in fact able to do, whether they make use of the opportunities available to them (Sen 2010:234–235). The capability approach therefore does not focus on achieved functioning, on the culmination of choice (Sen 2010:236), but rather on the process of achieving what people have reason to value.

Assumptions about societal relationships

The capability theory has been suspected of being too individualistic and atomistic in that it pays insufficient attention to social structures and groups (Robeyns 2005:94). Capabilities are seen primarily as attributes of people, not of collectives such as communities. However, the concern of the capability theory with people's ability to live the kind of lives they have reason to value does indeed introduce social influences, both in terms of what they value (for example, 'taking part in the life of the community') and in terms of the influences that operate on their values (for example, the relevance of 'public reasoning in the life of the community'). It is hard, in view of this, to envision how people in society can think, choose or act without being influenced in one way or another by the nature and working of the world around them (Sen 2010:244–245). Individual human beings with their various plural identities, multiple applications and diverse associations are quintessentially social creatures with different types of social interactions (Sen 2010:247).

The capability theory embraces ethical individualism, but it does not negate the fact that individuals tend to congregate in groups and in social structures. It nevertheless only accounts for the social aspect of human existence on a conceptual-theoretical (not an ontological) level. In this process, it accounts for the constraints and opportunities that social structures and institutions impose on individuals in two ways. Firstly, it recognises the social and environmental factors that influence the conversion of commodities to functionings, and secondly, it draws a theoretical distinction between capabilities and functionings. Capability theory therefore does not view individuals in isolated terms. To a large extent, people's options depend on their relationships with others and on what the state and other institutions do (Robeyns 2005:108, 110). What individuals have to do, according to Bessant (2014:143), is to choose 'the actual opportunities for living well rather than the "means of living"'. The capability theory can be used to help less experienced people to become engaged actors in society, capable of making good judgements individually and with others (Cockerill 2014:13).

Assumptions about axiology (value) and morality

Exponents of capability theory approach their respective tasks, for example as educators or educationists, by asking questions about what they value. The first question they ask is what a person is able to do or to be. Human capabilities have to be developed to ensure the good life and for the promotion of a just and more equitable society. Individuals are seen as an end in themselves and not as a means to an end.

Another typical question asked by proponents of capability theory is: what is needed to be sufficiently free to choose what one values? Once such choices have been made, a second order of questions can be asked, namely:

what does it take to achieve the 'doings and beings' that people value? Capability theory is characterised by normative claims that freedom is morally valuable and important. Freedom is required to achieve well-being, which is needed if a person is to have opportunities (capabilities) to do and be what they value. As such, then, denying a person freedom is morally wrong (Bessant 2014:139). Other values expounded by the capability theory are justice, respect for human dignity, the good life and diversity. In view of this, it is understandable that Bessant (2014:143) concludes that the capability theory has developed into 'a far-reaching ethical and analytical framework that considers how we might promote the good life'.

Capability theory assumes multiple and incommensurable ways of determining what constitutes a good life. There are pluralities of values, and little is gained by measuring just one single aspect of a person's circumstances, like income. Non-commensurability points to the need for several ways of valuing, which would need to be not reducible to one another. The non-commensurability of values reflects the diversity of valued ends that characterises our lives as good lives (Bessant 2014:143).

The diversity in humanity makes us understand that capabilities are irreducibly diverse and non-commensurable. This non-commensurability is present when several dimensions of value are irreducible to one another. In the context of evaluating a choice, non-commensurability requires that, in assessing its results, we do not judge the value of all the relevant results in terms of one dimension only, measuring the significance of all the distinct outcomes on a common scale. This means that, in deciding what would be best, we need to go beyond 'counting' the overall value in terms of a homogenous metric. We are compelled to evaluate alternatives with a non-homogenous scale (Sen 2010:240–241). Reflective evaluation

demands reasoning regarding relative importance and not just rigid counting or calculation (Sen 2010:241).

A key value assumption of capability theory is that opportunities and capabilities are valued for their intrinsic good rather than for their instrumental importance. This means that, when confronted with a situation, one should ask whether the situation affords opportunities needed to achieve what one values (Bessant 2014:145).

Capability theory includes an explicit ethical dimension when considering human development, defined by a shared humanity with important capabilities to realise. The theory is underpinned by the notion of a basic, shared human capacity for care, affiliation and deliberation which is of intrinsic value and which forms an essential part of the moral imperative which society must work to realise (Cockerill 2014:14).

Epistemological underpinnings

Not much could be found in the exposition of capability theory regarding the four aspects of knowledge acquisition usually distinguished by epistemologists: perspectives regarding the knower, the knowable, the knowing process and the results of knowing. Proponents of capability theory seem to be ad idem about the fact that knowers should be allowed the freedom to choose what and how to know or to learn, and that knowing or learning should be enabling in that it helps the knowers to make informed choices and assist them to achieve what they have chosen (Bessant 2014:146). Children need guidance in order to make such well-informed choices and decisions about matters that concern them, and this

guidance should be sensitive to their experience (Bessant 2014:148). According to Cockerill (2014:20), the result of knowing in educational context (that is, learning, mastering knowledge and skills) is to help create the ethos we seek in teaching and learning by nurturing the capabilities of practical reason (wisdom) and affiliation.

The supposition that scholarly work can be metaphysically 'neutral'

According to Robeyns (2005:104), Nussbaum's list of capabilities is composed of the following 10 categories: life; bodily health; bodily integrity; senses, imagination and thought; emotions; practical reason; affiliation; other species; play, and control over one's environment. Nussbaum (2000:5) claims to have presented this list of central human capabilities 'in a manner free from specific metaphysical grounding' in the assumption that the items in the list are the product of 'overlapping consensus amongst people who otherwise have very different comprehensive conceptions of the good'. Comment with regards to this claim is kept in abeyance until the 'Discussion' section below.

How self-directed learning and by implication self-determination theory could draw from the transcendental infrastructure of the capability theory

The above outline of the transcendental preconditions of the capability theory is not exhaustive. It is nevertheless sufficiently detailed to substantiate the claim that, as a theory, it rests on particular transcendental preconditions in the form of assumptions, convictions, beliefs and points of departure. Now that we have 'grafted' self-directed learning and by

implication also self-determination theory onto capability theory, the question is: how could self-directed learning and self-determination theory draw from the transcendental root system, the transcendental underpinning, of capability theory? I suggest that they could be enriched in their transcendental underpinning by drawing from the transcendental underpinning of capability theory in the following ways.

Regarding the 'self' in self-directed learning and in self-determination theory

The 'self' is a human being that possesses a number of capabilities and the agency to convert circumstances into functionings (achievements). The 'self' possesses freedom, dignity, individuality within a social context and the ability to choose what is deemed to be valuable and worthwhile. It also is an end in him or herself and never a means for another person, a threshold of achievement, a total person, an engaged actor in society, is unique, different and part of the diversity of mankind.

Regarding the 'directedness' in self-directed learning and the 'determination' in self-determination theory

The learner possesses the agency to decide on and transform the conversion factors in the learning situation into functionings or capabilities, is able to distinguish between means and ends, possesses the freedom to choose what is worthwhile and to work towards achieving that which was freely chosen and deemed to be valuable. Furthermore, the learner is able to make moral choices and to do what is morally justifiable, is able to work towards attaining the good life, personal well-being and an improved quality of life and also, is able to see and grasp opportunities.

Regarding the 'learning' in self-directed and self-determined learning

The learner possesses the freedom to choose what to learn (contra the 'banking' approach to learning). Learning should be enabling in that it places the learner in a position to make informed choices about what would be worthwhile for personal well-being, the good life and the ability to reach the goals that have been selected. The learner requires guidance and assistance to make these choices and to learn to apply practical reason and enter into particular affiliations.

Discussion

Capability theory has been accused of being under-theorised (Dang 2014:460–461; Wells 2015). The same can be said of self-directed learning, as explicated above. Mature theories operate at three distinguishable levels: the practical, the transcendental and the transcendent. Self-directed learning theory, self-determination theory and capability theory comply with the first requirement, namely that they be applicable in practice. As has been shown, to a greater or lesser extent, all of them comply with the second requirement as well, namely that they should reveal the pre-theoretical and theoretical assumptions upon which they rest (that is, their respective sets of transcendental – undergirding, supporting, underlying – presuppositions, assumptions or convictions) (cf. Coletto 2008:461). The same applies to the 'grafted version' of self-directed learning and self-determination theory, that is, after they have been theoretically complemented by capability theory. The graft enables these two theories to enrich themselves with presuppositions flowing from the transcendental root system of capability theory. It has to be kept in mind, though, that the

exponents of capability theory have not yet succeeded in working out all the transcendental preconditions of the theory. It falls short, for instance, as far as ontology and cosmology are concerned.

According to Coletto (2008:461), a sound distinction between the abovementioned two levels of presupposition (transcendental and transcendent) and the actual practical application of a theory allows for a more nuanced (that is, many-sided) view of scholarship, a view that radiates the acknowledgement of a connection between the pre-suppositional framework and the concrete application of a theory, a connection which is 'sometimes not immediately visible yet nevertheless real'. At present, capability theory and self-determination theory seem to do this more adroitly than self-directed learning, which was the reason for theoretically 'grafting' self-directed learning onto capability theory.

Self-directed learning, self-determination theory and capability theory all fail to reveal a deepest – the transcendent ('beyonding') – level, that is, the level of pre-theoretical presuppositions, assumptions and convictions that stem from a deep life-conceptual, religious and/or spiritual level. Even in combination, that is, after the theoretical 'grafting' of self-directed learning and, by implication, self-determination theory onto capability theory, they fail to meet this requirement, which is of crucial theoretical importance as will now be argued.

According to Strauss (2009:47), the cardinal question about a theory is not what the theory engages with but rather from what *perspective* the theory attempts to explain the object with which it engages. The basic question of every theory is therefore philosophical in nature (Strauss 2009:58). It is consequently incumbent upon every scholar to give account

of the philosophical presuppositions with which they work (Strauss 2009:59). Scholars operating with self-directed learning and the self-determination theory in combination with capability theory have to acknowledge the presence of these 'supra-rational orientations' (Strauss 2009:631; Kubow 2011:163–164).

The totality of a scholar's pre-theoretical convictions forms his or her world view or life concept. The world view, according to Strauss (2010:63), has motivational power; it is a spiritual driving force. When a theory has developed to the extent that it fully reveals both its philosophical layers, that is, the transcendental (underlying, undergirding) and the transcendent (the 'beyonding' layer of the theory that is associated with the scholar's life concept, religion or spirituality), it enables the theorist to make normative position choices. Such choices imply a certain integration of pre-existent knowledge (pre-theoretical and theoretical suppositions, etc.) and value judgments in any new situation with which the scholar has to deal (Lategan 2010:152–153). Unfortunately, as Coletto (2009:294–298) observes, often these deepest layers of theories are not properly defined and distinguished. This is a failing of capability theory as well and explains why Nussbaum (2000:5) could see her way clear to present a list of central human capabilities supposedly 'in a manner free from specific metaphysical grounding' in the assumption that the items in the list are the product of 'overlapping consensus amongst people who otherwise have very different comprehensive conceptions of the good'.

Revealing the transcendent ('beyonding') pre-conditions of a theory implies that the theorist in question be prepared to reveal his or her deepest life-conceptual, religious and/or spiritual orientation. Not all scholars are prepared to do this in the current secularised world, that is, a world in

which it is not fashionable to admit in public to being committed to some or other religious or spiritual principle.[8]

There are nonetheless some scholars who refuse to succumb to the secularism implied by a failure to develop or display a transcendental ('beyonding') perspective. These scholars are prepared to reveal their deepest religious convictions. Two examples will illustrate this point. After having dealt with the negatives of secularism as they see it, Tripp and Tripp (2008) reveal their worldview orientation by stating:

> Our objective when we teach [*and by implication, therefore, when they apply self-directed learning as teaching method and self-determination theory as grafted onto the capability theory*] is not simply to ensure, by some venerable or socially acceptable child rearing method that our children are not criminals, or that they 'do well'. Rather, our desire is that they should love the Lord their God with all their heart, soul and mind. Therefore, formative instruction should be rooted in Scripture [*and not in what influential people*] tell us to do. (p. 19)

Another author, Cloud (1992:137), wrote in the same vein: 'Another aspect of our identity is our talents and abilities. God has given each of us certain talents and abilities, and holds us responsible for developing them'. These views represent a particularistic approach to method and theory[9] and hence would not necessarily be acceptable to scholars with a secular or non-Christian orientation. These two examples

8. Secularism does not only refer to the relinquishment of membership of a religious institution such as a church, synagogue or mosque, but it also entails departure from any belief in the God of the Bible or any other theistic deity (Mohler 2008:29–30).

9. The direction, scope and content of the educator's transcendent orientation are highly personal in that they are life-conceptually, religiously and/or spiritually determined and directed. These transcendent aspects often only emerge in the actual process of teaching and guiding a learner when the educator draws the learner's attention to the loftier (life view or religious) purposes that learning is intended to serve.

illustrate how the deepest layer of a theory, the transcendent or 'beyonding' layer, could give meaning and direction to a theory such as self-directed learning or self-determination theory as grafted onto capability theory.

Conclusion

Mature theories function on at least three levels: a practical level where the theory's precepts are directly applied for purposes of improving practice at the rock face; a transcendental level, where its proponents declare their basic pre-theoretical (philosophical) and theoretical (scientific) assumptions, convictions, beliefs and points of departure; and a transcendent level, where they declare and explain the deeper life-conceptual, religious or spiritual purpose for which they have developed the theory and for which they apply it in practice. At this point in time, self-directed learning and self-determination theory seem to function well at the first level and display some of the pre-theoretical and theoretical assumptions on which they are based at the second level. They do not yet function on the third level, however.

Capability and self-determination theories could compensate for these shortcomings of self-directed learning on the second level, that is, the level of transcendental preconditions. They could do this by offering a number of perspectives regarding the learner as a human being with capabilities that have to be developed optimally, a being with dignity that should be respected and a being who should be afforded the freedom to choose actions and functionings that he or she has reason to value. The learner is also a person who should ideally share in the well-being associated with a good quality of life in his or her societal relationship context. In view

of this, self-directed learning and, by implication, self-determination theory were theoretically grafted onto capability theory in this chapter so that they could be enriched by the transcendental root system of capability theory. It transpired, however, that capability theory itself falls short in that it seems to centre on anthropological, societal relationship and pre-theoretical value judgments and that its proponents occasionally assume that their theoretical work could be 'non-metaphysical' (life-conceptually neutral) in some respects.

Even after this theoretical grafting of self-directed learning on capability theory, self-directed learning 'theory' fails to acquire any pre-theoretical convictions at the deepest (that is, the transcendent, beyonding) level, the level of life concept, world view, religion and/or spirituality. Hence, it fails to reveal the life-conceptual direction in which self-directed learning could be applied. The same applies for self-determination theory; it also does not display any such transcendent dimension. Scholars who expect self-directed and self-determined learning to be able to possess and reveal a transcendent dimension should therefore look further afield for yet another, even more sophisticated theory to link to in order to strengthen their pre-theoretical and theoretical position.

As intimated earlier in this chapter, practitioners of self-directed learning have two options. They could either draw from the assumptions of existing theories regarding the self, directedness and learning, or they could consider grafting self-directed learning theory onto another theory with a more developed theoretical and pre-theoretical basis such as self-determination theory and/or capability theory. Whatever route they follow, they have to be conscious of the role played by theoretical and pre-theoretical assumptions in their theorisation. The discussion

in this chapter once again confirms a conclusion drawn by Strauss (2009):

> A self-directed learning scholar and/or practitioner either takes cognisance of and gives an account of the philosophical presuppositions involved in their work, in which case they consciously and intentionally work with a philosophical view of reality, or implicitly and uncritically proceed from some or other world view (often hidden in theories about self, directedness, determination and learning), in which case they become victims of unaccounted for philosophical views. (p. 59)

The thrust of this chapter was that the first route be followed by scholars and practitioners of self-directed learning.

Chapter 1: Summary

After giving an overview of self-directed learning theory, its precepts and the scholarship in the field, it is concluded that this theory offers not much more than a pragmatic approach to teaching and learning as it is not grounded in a relatively mature pre-theoretical and theoretical infrastructure, which is one of the characteristics of a full-fledged theory. It is therefore suggested that self-directed learning be grafted onto another, related and more developed theory, on condition that this other theory not be similarly pragmatic and that it be able to reflect the complexity of education as a reality. After considering a few candidate theories, including self-determination theory to which scholars of self-directed learning have occasionally reverted, it is proposed that self-directed learning as well as self-determination theory be grafted onto capability theory as the latter seems to be fundamental to both theories in that it deals with the concept of capability (amongst others, to self-direct, self-regulate, self-determine). In this sense, self-directedness could be seen both as a personal attribute and a phenomenon that could be considered along the dimensions of a

motivational process. An analysis of capability theory and its pre-theory (its assumptions and pre-suppositions) reveals that its precepts tie in fairly neatly with those of self-directed learning and self-determination theory and that its transcendental pre-conditional infrastructure (its pre-theoretical assumption system) might also be relevant to both these theories. However, as capability theory lacks a transcendent ('beyonding') perspective, the grafting of self-directed learning (and also self-determination theory) on capability theory does not seem to offer a final solution to self-directed learning's lack of a transcendental and transcendent underpinning.

Chapter 2

The affordances of case-based teaching for self-directed learning: A case study with first-year student teachers

Josef de Beer
North-West University
South Africa

Sarah Gravett
University of Johannesburg
South Africa

Introduction

Case-based teaching in pre-service teacher education holds affordances[10] for the professional development of student teachers, and the literature

10. With 'affordance', a term that was coined by Gibson (1979), we refer to the possibilities of an action or object. In the context of this chapter, we explore the possibilities of case-based teaching.

How to cite: De Beer, J. & Gravett, S., 2016, 'The affordances of case-based teaching for self-directed learning: A case study with first year student-teachers', in E. Mentz & I. Oosthuizen (eds.), *Self-directed learning research*, pp. 35-71, AOSIS, Cape Town. http://dx.doi.org/10.4102/aosis.2016.sdlr14.02

highlights several advantages of case-based teaching. Some of these advantages or possibilities include that case-based teaching elicits engaged learning, that it enables student teachers to experience the reality of school teaching vicariously, that it develops problem-solving skills and that it addresses the so-called theory-practice divide by enabling student teachers to relate course literature and theoretical knowledge to dilemmas of practice. Despite evidence that case-based teaching seemingly stimulates independence in thinking, pursues learning beyond the explicitly stated expectations and allows students to identify their own learning needs – all aspects associated with self-direction in learning – little is published on the affordances of case-based teaching for self-directed learning. Gade and Chari (2013) are two of a few authors who establish a direct link between case-based teaching and self-directed learning. This served as impetus for us to do research amongst first-year student teachers who were subjected to case-based teaching in one of their modules. The research question that guided this research was: what are the affordances of case-based teaching for fostering self-direction in learning? In this chapter, we provide a critical look at the possible affordances of case-based teaching for self-direction and deep learning.

Self-direction in learning

Knowles (1975) provides the following definition of self-directed learning:

> In its broadest meaning self-directed learning describes a process by which individuals take the initiative, with or without the assistance of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes. (p. 19)

In his comprehensive book *Self-direction for lifelong learning,* Philip Candy (1991) makes the case that self-direction:

> … has become the unwitting accomplice of many educational schemes, some of whose intentions are the very antithesis of what might be understood as true 'self-direction'. Self-direction has been, and is, recruited by behaviourists and humanists, idealists and pragmatists, radicals and conservatives, positivists and constructivists. (p. 411)

The result of this is that the term self-direction as applied to learning is used in conceptually confusing ways.

In this chapter, we focus on the fostering of self-direction in learning as it relates to a formal programme in the context of higher education. As indicated, self-direction is an encompassing concept which is used in many different ways. We address the fostering of self-direction in terms of increasing independence or autonomy in learning or in assisting student teachers to engage with the learning content deeply.

We take as point of departure Candy's (1991) view that self-direction in learning is not a fixed quality that exists in an individual or the situation independently. He argues that self-direction is a result of the interaction between a person and a situation. It is a 'person-situation variable; that is; it is not a quality that inheres in the person independent of the situation or in the situation independent of the person' (Candy 1991:312). We develop Candy's argument by invoking research on student approaches to learning. In agreement with Candy, we argue that a learner 'could not be considered to be truly autonomous if his or her learning were restricted to surface-level approaches, but only if she or he had engaged in deep-level learning' (Candy 1991: 346). We then move to discussing strategies that have the potential to encourage both a deep approach to learning and self-direction in learning. We show how these strategies were used as filters in looking at the research data.

Deep and surface approaches to learning

Over the past years, an extensive, international research programme has developed which investigates learning as it occurs in the context of higher education, using qualitative and quantitative research methods. Some of this research on student learning has its roots in phenomenography and a constitutionalist perspective on learning (Prosser & Trigwell 1997, 1999:13) whilst other studies draw mainly on social-constructivist perspectives. The strength of the body of 'student-learning' lies in its sustained and international character. Another reason why this strand of research has been so influential is because it has involved many different knowledge domains, for example, physics, chemistry, mathematics, history, economics and engineering.

At a risk of oversimplifying, the focus of 'student-learning research' entails the relationship between the context of learning (which includes teaching) and the type of learning in which students engage (Barnett & Hallam 1999). A main theme that has been explored extensively in this research is student approaches to academic (institutionalised) learning. This research shows that students tend to approach learning in one of two ways and that the different approaches lead to differences in the quality of the learning outcomes. A distinction is metaphorically drawn between a deep approach and a surface approach. Biggs (1999) shows that some students tend towards taking a deep approach to learning whereas other adopts a surface approach.

In adopting a deep approach to learning, students seek to understand. They try to focus on underlying meaning: main ideas, themes and principles for successful application. When adopting a surface approach to learning, learners focus on the surface characteristics of the situation. They focus on the signs instead of what is signified (Bowden & Marton 1998). They are

bound to facts and do not search for relationships between ideas. A surface approach is further characterised by an intention to complete the requirements of externally imposed tasks (e.g. examinations) and a reliance on rote learning as a means to meet the perceived requirements.

The quality of the outcomes of learning is functionally related to the approaches adopted by the learners. A deep approach is a prerequisite for the realisation of significant learning that will last, the type of learning that we associate with higher education.

It is important to note that a student's learning approach is not a fixed characteristic of the student. Approaches to learning describe the relationship between the student and the object of learning within a particular context. Students do have a preference for a particular approach, but that preference may or may not be realised, depending on the learning context. Therefore, a student may be depicted as having adopted a surface approach to a specific learning task or project but should not necessarily be described as a surface learner. In another learning environment or situation, that same student may adopt a deep approach. The approaches that students adopt to different objects of learning relate, on the one hand, to the kind of meaning that studying at university holds for them (their general orientation towards studying) and to the conception of learning that they hold (Marton & Saljo 1976; Marton & Svensson 1979). On the other hand, it relates to their understanding of what the institution requires of them and what view of learning its way of acting reveals.

Research on student learning has demonstrated that the teaching environment has a significant effect on students' approaches to learning. Students generally try to adapt their approach to what they perceive as the requirements of teachers and, particularly, of formal assessment. Academic teachers may stress to students how important understanding

and application in learning is, but students will judge teachers on their teaching and assessment practices and not on their words (Bowden & Marton 1998). It is unlikely that students will maintain a deep approach under poor teaching conditions and assessment practices that implicitly require rote learning. However, even when experiencing the best teaching, some students will maintain a surface approach. Unfortunately, it is much easier to maintain a surface approach than it is to foster a deep approach (Trigwell & Prosser, as cited in Biggs 1999). The significance of 'student-learning research' is that it demonstrates that the way in which students are taught and assessed does indeed impact on the quality of student learning. Barnett and Hallam (1999:144–145) assert that '[*t*]his research has demonstrated that lecturers now cannot evade their responsibilities to act as educators'.

Strategies with the potential to foster self-direction and a deep approach to learning

From the literature, it is clear that there are a number of teaching-and-learning strategies with the potential to foster self-direction and a deep approach to learning. The brief discussion that follows draws on Candy (1991) but is not restricted to the strategies suggested by him.

Invoking students' existing knowledge

The classic work of Ausubel (1963) reminds us that what learners already know is an important determiner of effective learning. Because learners' existing knowledge provides the framework through which, and into which, all new learning is appropriated (Candy 1991:278), learners construe and organise new information and experiences in relation to their existing knowledge base. We subscribe to the view of

Duckworth (1987, in Fosnot 1989:ix) that, if we fail to provide learners with the opportunity to explore their own ideas and see where they fall short, we are likely to leave their beliefs untouched and simply give them a language to cover them. In light of the above view, we propose that considerable teaching time should be spent on affording students the opportunity to examine the subject matter from their existing perspective and the discourse available to them at the time. Case-based teaching is an excellent way of invoking student teachers' existing knowledge.

Creating a supporting climate for learning

In true Vygotsky (1978) fashion, we argue for a learning environment that would scaffold the development of student teachers across the zone of proximal development. In this research, student learning was scaffolded during class discussions where student teachers shared varied points of view and provided peer mentoring. Class discussions in this intervention were further enhanced by using a Blackboard platform to establish an on-line community of practice.

Encouraging a deep approach to learning

Factors that encourage students to adopt a deep approach include the following (Candy 1991):

- Teaching by focussing on the main ideas of the knowledge domain and how these interrelate.
- Emphasising depth of learning rather than breadth of coverage.
- Intentionally aligning teaching and assessment to support the attainment of envisaged outcomes.

- Teaching by building on students' existing knowledge.
- Teaching by *engaging* students, rather than teaching to expound information.
- Confronting and eradicating students' misconceptions.
- Engaging students in authentic real-world tasks.
- Giving students opportunities to reflect.
- Using formative assessment to provide students with constructive feedback regarding their progress.
- Assessing for understanding and application rather than for facts. (n.p.)

Increasing the questions asked by students

Too many classrooms are characterised by a lack of dialogue between students (student teachers) and teachers (or teacher educators, in this context). If student teachers are encouraged to ask questions, it might result in fruitful learning at the 'margins' (Mackenzie 2013). Mackenzie mentions that the 'centre' of instruction (the lecture) is often sterile or predictable and inhibits diversity in thought and action whereas activity in the 'margins' (student ideas and questions) fosters excitement, improvisation and allows participants to take risks. Such margins should be seen as 'places where life is often riskier for its inhabitants' (Mackenzie 2013:102). Bhabha (1994:2) describes these margins as '… in-between spaces that provide the terrain for elaborating strategies of selfhood – that initiate new signs of identity, and innovative sites of collaboration'. In this chapter, we argue that case-based teaching – and student teachers' questions – could lead to meaningful learning 'at the margins'.

Developing critical thinking

Developing critical thinking (higher-order cognitive skills like analysis, synthesis and evaluation) is of the utmost importance as we show later on

in this chapter. We argue that case-based teaching holds much promise to develop critical thinking in student teachers.

Case-based teaching

The medicinal sciences sector was one of the first to start using case-based teaching as a pedagogy in the education of medicinal practitioners. Case-based teaching only found its way into pre-service teacher education much later (Merseth 1991). Case-based learning is described by Gade and Chari (2013:356) as a '… method where students are motivated to learn on their own so as to inculcate the habit of self-learning and integrating knowledge from different subjects to solve problems'. These authors (Gade & Chari 2013) list four reasons for using case-based learning:

- To provide students with a relevant opportunity to see theory in practice.
- To require students to analyse data to reach a conclusion.
- To develop analytic, communicative, and collaborative skills along with the content knowledge.
- To provide an opportunity for students to put themselves in the decision maker's shoes. (p. 358)

They conclude that case-based teaching assists students to become more self-directed learners and that it improves student motivation and the development of communication skills.

Lee Shulman (2004:474) describes a case as '… an account of an experience in which our intentions have been unexpectedly obstructed, and the surprising event has triggered the need to examine alternative courses of action'. Judy Shulman (2002) views cases as:

> … a way to bridge the abstract nature of principles and teaching standards to classroom practice … they tell vivid, often moving stories, and give life to abstract principles, and are more likely to be remembered. (p. 2)

Merseth (1996) describes cases as narratives that are imbued with dilemmas that can be analysed from various perspectives. She is of the opinion that it allows student teachers to '… explore the complex and messy problems of practice' (Merseth 1996:724). Case-based teaching fosters critical thinking, increases practical knowledge through reflection and provides a link between educational theories and practice (Gallucci 2008; Merseth 1996; Tal 2010).

Our own view is that a case is a narrative of an event that signals a dilemma and that asks for reflection and the utilisation of theoretical lenses to interrogate practice.

Next we would like briefly to describe how we used case-based teaching as pedagogy in the first-year module. In essence, our approach to case-based teaching is anchored in the principles provided by Donovan and Bransford (2005) in their book *How students learn*. The focus on students' prior understanding, the essential role of conceptual frameworks in understanding, the importance of self-monitoring and the role of conducive learning environments in learning form the theoretical basis for this work. We, firstly, subscribed to the flipped classroom, also known as an inverted classroom (Foldnes 2015; Lage, Platt & Tregalia 2000), which research has shown can lead to increased academic performance. Despite growing literature on the flipped classroom, several studies cast doubt on the effectivity of this approach. We would therefore like to acknowledge the fact that opinions on the flipped classroom vary. Instead of traditional lectures, student teachers were required to read the relevant learning material (and a case) prior to coming to class, and in class, an appropriate case was discussed. The teacher educator provided a short summary of the narrative of the case in class. The student teachers then

discussed the case in small groups (3–4 students), and after a while, groups were required to provide feedback to the larger group (of around 400 students). The teacher educator next discussed the theoretical notions related to the curriculum themes (that students were also required to read prior to class), and after this brief session, students were again requested to discuss the case in their small groups, this time using the theoretical lens(es) discussed in class or the relevant chapter from the prescribed text book to examine the case. Our approach to case-based teaching is therefore that student teachers use theoretical lenses (provided in the prescribed textbook) to interrogate practice (dilemmas portrayed by the cases), and it seems as if case-based teaching assists students in identifying the essence of each of the module themes.

These small-group discussions were followed by whole-group commentary. The class ended with a summary of the main practice points (the main considerations) that emerged. Students were requested to write reflective essays, which they posted on the university's on-line learning support system, Blackboard. Students could also engage fellow students in on-line discussions on the particular case. Later in the semester, during an excursion that all the first-year students attended, they were also requested, in groups, to dramatise one case, which was discussed and interrogated after the dramatisation or role play. The dramatisation of cases immediately puts student teachers in a *homo ludens* [playing human] mode (Huizinga 1955) and can provide the teacher educator with very useful information on their views (and often naive understanding) of educational matters – which links with the strategy proposed by Candy (1991) to invoke students' existing knowledge.

First-year student teachers as self-directed learners

The different components of self-directed learning as identified by Knowles (1975), namely diagnosing learning needs, formulating learning goals, identifying learning resources, choosing and implementing learning strategies and evaluating learning outcomes, should be considered when assessing student teachers as self-directed learners. Loyens, Magda and Rikers (2008) view self-directed learning (SDL) as an umbrella term for various processes such as goal setting, metacognition and self-assessment, all of which influence learning in various ways. They argue that SDL goes back to the existentialist perspective, which postulates freedom, responsibility and personal views. SDL should '… empower a student to become a free, mature, and authentic self' (Loyens *et al.* 2008:414).

We need to state upfront that we faced two problems related to the academic and professional development of first-year student teachers. Firstly, most first-year students are not self-directed learners, and secondly, they enter teacher education with doubts over whether they have made an informed career choice and often with a very naive understanding of what it means to be a teacher.

Many first-year students are not self-directed learners

First-year students starting their teacher education programmes need to possess a range of cognitive and meta-cognitive skills to enable them to define their own learning goals, follow effective approaches to solve problems and evaluate whether learning goals were achieved. Unfortunately, many students do not have these skills. Many first-year students are not self-directed learners, and this makes the transition to tertiary education difficult. Van Zyl, Gravett and De Bruin (2012) state

that students often find the transition from school to university a difficult task. Kuh (2005:438) describes the first-year experience at university 'like being in a foreign land'. In Van Zyl *et al.*'s (2012) study, both *previous study hours* (in school) and *intended study hours* (at university) are found to be statistically significant predictors of student academic performance. These researchers' findings (on a large sample of 7766 students) show that a large number of students who lacked an appropriate study attitude (studying less than five hours per week) failed their first-year modules. The statistics for the student teachers involved in Van Zyl's (2015) study indicated that 50.4% of student teachers studied for less than 10 hours per week in their Grade 12 year whereas 37.7% studied for between 11 and 20 hours per week. Only 11.9% of the students studied for more than 20 hours per week (Van Zyl 2015). Our experience with first-year students is that they favour 'spoon-feeding' approaches, which do not contribute to developing self-directed learning skills. At first, these students experienced case-based teaching as challenging.

First-year students often have very naive understandings of what it means to become a teacher

Kessels and Korthagen (1996:2) refer to the '… gap between our words and the students' experiences that we cannot bridge'. One of the reasons for the so-called theory-practice divide is what Lortie (1975) refers to as the 'apprenticeship of observation'. Student teachers often interpret the conceptual knowledge dealt with in their teacher-education programmes and their learning experiences from the images formed about teaching during their own school years as pupils. Gravett *et al.* (2016) show that student teachers often oversimplify the nature of teaching because of their supposed familiarity with a teacher's work. The student teachers therefore often view the conceptual knowledge in teacher education as irrelevant in preparing them for teaching.

We as teacher educators often fail to recognise these preconceived ideas and assumptions that student teachers hold in our programmes.[11] Warford (2011:254) advises that teacher-educators should first calibrate student teachers 'pedagogical dispositions' in order to support meaningful learning. Case-based teaching provides a good opportunity to do so.

In the discussion of the data below, we hope to show how case-based teaching addresses the above concerns. This research points to how case-based teaching could assist student teachers to develop cognitive and metacognitive skills that will make them more self-directed as learners and how it could provide them with a more nuanced understanding of the complexities of being a teacher. Lastly, we would like to highlight how theoretical lenses could be used to interrogate practice.

Research methods

This particular research, on the affordances of case-based teaching for self-directed learning, is part of a larger study on case-based teaching in pre-service teacher education. We collected data by means of two focus-group interviews that were conducted with two groups of 10 student teachers, in-depth interviews with teacher educators, the analysis of 50 reflective essays that were written by student teachers emanating from four different cases (therefore totalling 200 essays) and analysing mid-year examination scripts of student teachers. In the latter, we looked at how students related the conceptual knowledge in the module to the case they had to discuss in the examination paper. Finally, we also analysed video footage of four class meetings in order to observe the interaction, dynamics and behaviour of the student teachers.

11. See Candy's (1991) strategy of tapping into students' existing knowledge discussed earlier.

As a research lens, we decided to utilise elements of instruments that were developed to measure self-directed learning. We looked at three instruments: the Oddi Continuing Learning Inventory (OCLI) of Oddi (1986), the Self-Directed Learning Readiness Scale (SDLRS) of Guglielmino (1978) and the self-directed learning scale of Williamson (2007). We eventually decided to use the Williamson scale, albeit in a non-traditional way. Our decision was based on the fact that the latter is a free instrument whereas Guglielmino's instrument had cost implications. In addition, we were also guided by the work of Philip Candy (1991). We looked at our data through the lens of five strategies identified by Candy to foster self-direction and a deep approach to learning and in conjunction with items in the Williamson instrument. The Williamson scale comprises of 60 items categorised in five broad areas of self-directed learning, namely awareness, learning strategies, learning activities, evaluation and interpersonal skills. Usually students would complete the response sheet by responding to options on a Likert scale (5 = always; 4 = often; 3 = sometimes; 2 = seldom; 1 = never). We did not ask students to complete the Williamson instrument, but instead, we used some of the items as a rubric or checklist during data analysis.

Ethical clearance was obtained from the university's ethics committee (2012-039). The research was clearly explained to the student teachers. They all signed consent forms to indicate that they participated willingly and that they realised that they could withdraw from the research at any stage.

Data analysis

The interviews with student teachers and teacher educators, the reflective essays and the Blackboard discussions were analysed by using etic codes (namely the SDLRS of Williamson [2007], a valid and reliable instrument

in assessing levels of self-direction in learning). The etic approach is deductive in nature and is described as follows by Lett (1990:130): 'Etic constructs are accounts, descriptions and analysis expressed in terms of the conceptual schemes and categories regarded as meaningful and appropriate by the community of scientific observers'.

For the analysis of the videos of the case-based teaching classes, we also used this deductive approach. We started the video analysis by identifying episodes in the lessons. Where the teacher educator was addressing the student teachers or where representatives of the small groups gave feedback to the whole class, the sound quality was excellent, and the discourse was transcribed and coded using etic codes. Where the camera sometimes zoomed in on small-group discussions, the sound quality was too poor to transcribe the conversations, and in such cases, we analysed the visual material, looking at the facial expressions and body language of the student teachers and whether all students were engaged in the small-group discussions.

Presentation of the findings

We present our findings, using the five broad areas of self-directed learning described in the SDLRS instrument (Williamson 2007) and the five strategies identified by Candy (1991) to foster self-direction and a deep approach to learning.

Awareness

Identifying own learning needs

A dominant theme that emerged from our data is that case-based teaching helps to develop an appreciation of the complex nature of teaching. It prompts student teachers to identify their own learning needs and to set

learning goals for themselves. The following examples from our data illustrate this point:

> I found this particular case[12] harder than the previous ones mostly because the issue of religion was brought in. I found it difficult to put my own religious beliefs aside and not be biased against the case. I don't believe in evolution but I understand it's part of the curriculum. I will have to learn more about the theory of evolution, and will also have to reflect on how my own beliefs will one day impact on my teaching. (n.p.)

Another student reflected on this particular case as follows:

> 'There is not a "one size fits all" approach to evolution. It was interesting for me to hear that the Hindu lady did not have any problems whatsoever with evolution, and to learn how they see evolution as similar to reincarnation. On the other hand, the Muslim person who challenged her, had very strong ideas about how Allah created life. As a future Life Sciences teacher, I realised that this is a hard nut to crack, and that I will not only have Christian learners in my classroom. I also realised that I am not very knowledgeable to lead a discussion on this topic. I, as a life scientist, could not answer most of the questions posed by other students who do not major in life sciences'.

It is clear that case-based learning could lead to the desired state where students identify their own learning needs.

☐ Consider teachers as facilitators of learning rather than providing information only

Many of the first-year student teachers found it difficult at first to distil the essential learning content from the discussions, and a few students indicated in their first reflections that they were hoping that the teacher educators would provide answers to the dilemmas in the cases. Sadly for them, it did not happen. One of the student teachers wrote:

12. Case, 'Follow the road of least resistance', written by De Beer. It deals with a life-sciences teacher who taught the curriculum-prescribed topic of evolution, much to the dismay of a parent who complained to the principal about what he saw as an infringement of religious beliefs (Gravett, Merseth & De Beer 2013).

> Although I enjoyed the case discussion on homosexuality a lot, I was waiting for the lecturer to end the lecture with 'the answer'. I was a bit frustrated when this did not happen. Only when I wrote my reflection, it became clear that in cases there are often not right and wrong, or black and white perspectives, but often many shades of grey. And I realised that our lecturer wants us to think about these issues, and make up our own minds on where we stand on a particular issue. It also makes me realise that when I teach one day, I should follow a similar approach – be the guide on the side, rather than the sage on the stage. (n.p.)

This supports our earlier claim that the teaching environment has a significant effect on students' approaches to learning.

Identifying areas of deficit

A common category that emerged from our findings was that the cases encouraged students to learn more about an issue. A particular strong case that stimulated students to do their own independent research was the case by Whitaker and Heiliger[13] (2013). In their reflections, students indicated that they consulted (without any suggestion from the teacher educator) literature on the causes of homosexuality to see whether it is genetic or whether it is influenced by environment and context. Another case, investigating the malpractice of corporal punishment in schools, resulted in many student teachers realising that they will have to learn about alternatives (many of them indicated that corporal punishment was alive and well in the schools that they attended as pupils). For some students, their own lack of good communication skills or language proficiency was listed as a deficit:

> 'In school, we spoke mostly isiZulu, and I find it very difficult to express myself through the medium of English. I am embarrassed to voice my opinions during the group discussions'.

13. Case, 'Not in my school', written by Susan Whitaker and Bodo Heiliger. This case deals with a teacher who used a children's book, *And Tango makes three*, to sensitise Grade-3 learners about homosexuality.

Maintaining self-motivation

This is a strong theme that emerged from the data. One student teacher commented: 'I view cases as a practical; every time we go to class we know we will learn something new, and this motivates me'.

Another student reflected:

> 'The cases give me an adrenalin rush. It is so exciting, and it motivates me to work through chapters in our textbook, to find possible solutions to the dilemmas in the case. It also tells me that I have made the right career choice'.

The affective dimension was very prominent when we analysed the data. The engagement of the students was also visible when we analysed the video material.

Invoking student teachers' existing knowledge

We have already referred to Lortie's apprenticeship of observation, namely that student teachers enter their pre-service teacher education with many conceptions that were established during their own schooling careers. In some of the student-teacher reflections, it became clear that many students relate their own school experiences to the theoretical concepts dealt with in the module. One case that was particularly successful in achieving this was the case written by Gravett.[14] One student teacher wrote:

> This case made me think of two teachers that I had in school. Mr Chauke was a disciplinarian, who did not spare the rod. I always thought of him as a good teacher. Miss Mtombeni again was such a gentle soul, and the learners often took advantage of her kindness. I thought that she was a weak teacher. The case of Maria and how she was guided by the rule of respect made me think about this

14. Case, 'I have failed Veronica. I have failed as a teacher', written by Sarah Gravett. The case deals with a teacher whose motto is that respect is the rule that should guide all actions in the class and how she failed to live up to this rule in an incident with an obstructive learner, Veronica.

> again, and I realised that Mr Chauke ruled by creating fear, and he violated the human rights of the learners whereas Miss Mtombeni helped us in developing our self-esteem. It also made me think of how I would deal with disciplinary problems in my own classroom one day. (n.p.)

In one of the Blackboard discussions that followed case-based teaching, a student teacher wrote:

> I remember that my lecturer quoted Shulman during the first class, namely that teaching is the most frightening activity that people have invented. I did not agree at all. Quite frankly, I thought that I was ready to go and teach immediately! Now I know how complex and difficult teaching really is. (n.p.)

Our findings show that student teachers realise that, by using different theoretical lenses, one can delve much deeper into a situation that, at first sight, seems simplistic. It was also encouraging that students reflected on prior experiences, using new insights gained in the course.

Learning strategies

Participating in group discussions

Students perceived working in groups in different ways. For some of the student teachers, it was stressful whereas others commented on how it assisted them in their learning. The group discussions in class opened up new horizons to many students as they were exposed to diverse perspectives. It was especially the dramatisation of the cases (with which the students engaged during an excursion programme that was part of this module) where the social interdependence (Johnson & Johnson 1989) lead to meaningful group outcomes. One of the student teachers commented:

> 'The group discussions are amazing, and I often lie in bed at night, thinking about some of the opinions that were shared. Sometimes a view shared that I first outright rejected becomes much more plausible as you think about it'.

Another student teacher commented: 'In school, I was not subjected to meaningful group discussions, and the discussion of cases has opened new horizons for me and gives me wings as a teacher'.

Finding role play a useful method for complex learning

Role play was implemented as an approach during the excursion programme (part and parcel of this module), and the student teachers' feedback indicated that it assisted them in coming to an understanding of the complexity of teaching. One of the student teachers' comments that support this statement is:

> 'When we worked on our screenplay, the comments from members of my group made me realise how complex some of the issues we deal with in education are. We had to stage the case "Falling in love with my science teacher", and my group decided to add a twist to it. Instead of girl learners falling in love with the male teacher, we approached this from a gay angle where a boy fell in love with the teacher. In the play, we shed light on aspects such as stereotyping, the stigma that surrounds homosexuality and issues of social justice. In the process, I learned so much about myself – also about my own prejudice – and it energised me for the wonderful but demanding career as a teacher'.

Regarding problems as challenges

Case-based teaching, by definition, is a problem-based learning approach. The problems were regarded as challenges by student teachers, judging from many of the student teachers' responses:

> 'I felt a little bit like a FBI agent, who had to look at a problematic situation from various perspectives, and considering the views and actions of various stakeholders in the case. It is sometimes so tricky, as the different arguments all make sense. In the case of Mrs Mendes [*see footnote 4*] I agreed with the father that science is messy, and that children should be allowed the opportunity to make mistakes, but I also agreed with the teacher, that time is precious, and that a teacher cannot always waste time by allowing the learners to continue along a wrong path. This is the challenge that I as a teacher will one day face'.

Another student teacher wrote the following:

> I am not a very disciplined learner. If I have to work on an assignment, I would find a hundred other things to rather do. With cases it is so different. I enjoy thinking about how the different role players in the case acted, and to put on my cap as principal or judge, that need to decide for or against; who is right and who is wrong. I am quite surprised that, if an assignment challenges me, I actually approach it with a lot of enthusiasm. (n.p.)

Once again, this speaks to the affordances of case-based teaching for addressing affective outcomes.

Learning activities

Identifying important points when reading a chapter

The module in which case-based teaching is used has been structured in a way that will accompany the first-year students in the process of formulating (albeit a slightly naive) teaching-and-learning philosophy. The reflection on the cases seems to assist student teachers in identifying the 'toolbox items' (a student teacher's construction) that will shape this evolving philosophy as stated in the following comment:

> 'It is often tricky to identify the important aspects in a chapter. When we use cases, it is easier, as I ask myself which are the toolbox items that I need to identify, that will help me when I reflect on the case?'

Using information technology effectively

The case-based teaching made use of a blended approach, and student teachers did part of their reflections online, using a Blackboard platform. For many student teachers who were not very computer literate before coming to university, this was a meaningful learning curve. The following two comments are telling of this learning experience:

> 'I was quite scared that I would not master the Blackboard system, but I picked up the know-how quickly, and now I am very active posting comments'.
>
> 'I am too shy to raise a point in class, and feel intimidated by the hundreds of students, and therefore I like the idea that I am able to raise my opinions on the discussion platform on Blackboard'.

In future, we should also consider using Facebook and Twitter for the student teachers' discussions.

☐ Concentration intensifies and students becoming more attentive when reading complex study content

One of the strong themes that emerged is that case-based teaching elicits engaged learning. Student teachers indicated that they found the case-based teaching enjoyable, which caused them to be more focused than they would normally be in class. One of the student teachers said that case-based teaching:

> '… involves each student in the class and allows them to interact. It brings new ideas and different opinions to be discussed. To me, it keeps my mind alert because you are forced to defend your arguments …'.

Another student teacher commented: '… when I hear a story I can picture the situation, remember easier and learn better'. Another student stated: 'When the lecturer asks us to start discussing the case in the small groups, it is as if the class becomes alive, and you can feel the energy flowing'.

A last comment speaks to this etic code:

> 'I often lose focus in lectures, but with cases I am much more attentive. I think that I am intrigued by the complexity of the cases. I often think "Wow, it is hectic to be a teacher; one needs to always think on your feet, and expect the unexpected!".'

The teacher educators also commented on the fact that student teachers were very engaged and attentive when immersed in case-based learning. One of the teacher educators stated the following:

> 'I find it interesting how one can gauge students' involvement in the case, by looking at their body language and facial expressions. It is actually a tonic for a teacher educator, to see how emotionally involved the student teachers become'.

Relating knowledge to practice and encouraging a deep approach to learning

Data show that student teachers viewed the authentic real-life character of cases as powerful. They indicated that cases 'puts us in the workplace whilst in the lecture hall …', 'we learn from mistakes even before we get a chance to make them', and 'cases are valuable because we get to feel what it's like in practice'. Many student teachers hinted that case-based teaching assisted them in 'thinking like a teacher' (Feiman-Nemser 1990). One of the student teachers stated:

> 'I could so relate to the dilemma of the teacher in the case, where the learner fell in love with him. It brought back memories of a child in my Sunday School class that was in love with me. Now, however, I thought of what we learnt in class about Noddings, and keeping professional distance. Today I would probably handle the situation differently, to back then'.

Our research shows that case-based teaching is very effective in bridging the so-called theory-practice divide and in showing student teachers how theoretical constructs would one day serve them well as teachers in practice. One of the teacher educators commented: 'In the examination paper there was evidence of deep learning, where students could effectively interrogate practice by making use of theoretical lenses'.

Being able to analyse and critically reflect on new ideas and information

In the focus-group interviews, the student teachers mentioned that using the cases in conjunction with their textbook helped them to see the relevance of contextual knowledge. Examples of comments by the student teachers are as follows:

> 'When we did the case "But Ma'am, can't we do it our way first?",[15] the reason for studying behaviorism, Piaget, Vygotsky and Gardner suddenly made sense to me. When we did the theory, I was wondering how that is going to help me as a teacher. However, when we looked at the dilemma of Ms Mendez, it suddenly all made sense to me'.

Another student commented:

> 'Cases taught me that there is often more than one approach to a situation, and that one is not necessarily better than the other. The teacher need to critically reflect and analyse these options, and then decide upon the best action'.

One student teacher said: 'This course made me realised that you cannot just take a situation at face-value. You need to delve deeper and unpack its complexities'.

Evaluation

Identifying areas for further development

We mentioned earlier that student teachers engaged in the dramatisation of cases. This gave us as teacher educators' insight into their pre-conceived ideas, opinions and learning needs. One example was the discussion that followed the dramatisation by a group of student teachers of the case

15. Case written by Umesh Ramnarain (2013), in which the teacher started off a lesson in a constructivist fashion but then fell back on more transmission-mode teaching.

'What's the point?'[16] dealing with corporal punishment. Many of the student teachers were of the opinion that corporal punishment should be re-instated in schools. The facilitator asked the student teachers to consider better alternatives, and one of the student teachers commented:

> 'Corporal punishment was in the order of the day when I was a pupil in school. Most of my teachers used corporal punishment. I am not sure what feasible alternatives exist, and I will have to then learn more about better ways of maintaining discipline'.

Cases also showed us as teacher educators how we should adapt the module curriculum better to address the needs of the student teachers.

Identifying areas of strength and weakness

Case-based teaching presents the opportunity to identify strengths and weaknesses as a double-edged sword. By placing themselves in the shoes of the protagonist in the case, student teachers are able to reflect on how *they* would have handled the situation and take stock of their own strengths and weaknesses. During the discussions that follow the case and feedback from either peers or teacher educators, student teachers need to re-assess this inventory of attributes. The following reflection of a student teacher illustrates this point:

> 'When we discussed the case,[17] I was of the opinion that Maria was a bad teacher. I told my group that one of my strengths as a teacher is that I will tell the pupils on day one who the boss in class is! I will not tolerate any nonsense. I felt that Maria was weak to be so permissive. One of my group members then commented that I therefore will subscribe to ruling by fear and whether that would gain pupils' respect. It made me think, and I realised that I am often guided by the role models I had as a pupil. Perhaps what I thought is a strength is actually a weakness'.

16. Case written by Josef de Beer (2013), in which a teacher, in the heat of the moment, reverts to corporal punishment, which he later regrets.

17. 'I have failed Veronica. I have failed as a teacher', by Sarah Gravett (2013).

Valuing criticism as improving learning

Because of the rigorous debate during case-based teaching, student teachers become more open and less defensive about criticism as the semester progresses. One of the student teachers wrote:

> The first time another student questioned my opinion and suggestion, I felt humiliated and angry. Later on, I realised the value of these discussions as it opens your eyes for other possibilities. I realised that I was very narrow-minded and that there are other opinions as well that I should consider. (n.p.)

Another (Black) student posted this comment on Blackboard:

> When my idea was criticized yesterday, I felt angry as I saw that the comments were made by White students. When I thought about it later, I saw their points of view, and I realised that race does not play any role in this discussion. (n.p.)

Finding new learning challenging

The student teachers were required to reflect on a case in the examination, and they were required to invoke appropriate theoretical lenses. Analysis of the scripts showed that the student teachers were able to link conceptual knowledge to dilemmas of practice in unexpectedly nuanced ways – unexpected because they are first-year students with limited experience in utilising theoretical lenses to interrogate practice. One of the teacher educators commented:

> 'What we found very surprising is that students can, in fact, if you start with the concrete, with the practical, bring in the appropriate theoretical lenses … and they show remarkable insight into the problems of the classroom, which one wouldn't expect of first year students. So … we often underestimate what first-year students could bring to the classroom because we think they don't know anything. What we forget is that they have 12 years of experience of schooling …'.

The challenge that case-based teaching posed and the approach of prolepsis (Van Lier 2004) – assuming that the student teachers know more than they actually do – seem to support deep learning.

Interpersonal skills

The interpersonal skills discussed in this paragraph links with Candy's (1991) strategy of creating a supportive climate for learning.

Interaction with others assists in developing the insight to plan for further learning

One of the student teachers commented as follows:

> 'It is so refreshing to hear so many different opinions in class and not just the views of the lecturer. Although I often do not agree with some of the sentiments of other students, it does make you think. And more often than not, it made me to search the internet to read more about particular aspects'.

Another student reflected on how this interaction with other students assisted him in setting learning goals for himself:

> 'There is this one lady in our group that is so well spoken and wise. She has brilliant opinions about everything, and this made me realise that I should read more and keep up to date with what is happening in education'.

One of the student teachers said: 'Cases provide us the opportunity to ask critical questions. One often ends up in interesting places when we drift off from central ideas, based on students' questions'.

Maintaining good interpersonal relationships with others

Whitelaw, De Beer and Henning (2008) have shown that a sizable number of novice teachers leave the profession as a result of strained professional relationships with colleagues, often resulting from breakdown in communication. It was interesting to note how many student teachers commented on the lessons they have learnt in keeping good interpersonal relationships with their peers when discussing cases. Cases often address sensitive issues, and students often become emotional and say things that

they later regret. The following excerpt from the writing (on the online Blackboard system) of one of the student teachers illustrates this idea of sensitivity to maintaining good personal relationships:

> I read a comment made by a male student one evening just before going to bed after a very hectic day. I thought to myself, 'What a chauvinistic pig!', when I read how this guy blamed women, and the way they dress, for sexual harassment (the case, 'Falling in love with my science teacher'[18]). Without thinking, I wrote a response, and the next morning I felt terrible about what I wrote. I then posted an apology. To my surprise, the guy also rendered an apology and said that my scorching response made him to think and that he was wrong. I came to realise how important these discussions are. And that, when voicing opinions, you should take responsibility for what you say. And that you do not communicate in a way that will alienate people. (n.p.)

Another student wrote the following:

> When the lecturer negotiated the ground rules to follow when discussing cases, I thought it was silly. However, when we did the evolution case, people in my group became very angry at each other and were shouting and even cursing, and I was the one who had to remind them of the rules. I think it was a lesson for all of us: In the teaching business, one should communicate in a respectful tone. We will one day have to work in a respectful manner with colleagues in school. (n.p.)

Successful in communicating verbally

Case-based teaching, and the blended mode we followed, made it possible for student teachers to participate in both physical as well as on-line communities of practice. Some student teachers, being too shy to voice opinions in class, preferred to post comments on Blackboard. However, several student teachers referred to how the group discussions assisted them in improving their communication skills:

18. A case by Kudakwashe Mamutse (2013). In this case, girl learners flirt with their (male) science teacher, and the issue that the case raises is how a teacher should deal with such unwanted attention.

'I was scared when we started with cases, and we had to discuss it with the people sitting around us in the classroom. However, it became better, and now I actually enjoy sharing my opinions. The cases helped me to grow as a teacher. As a teacher, one needs to be a good communicator, and being shy is not helpful. Cases gave me more confidence to voice my opinions'.

Being able to express individual views freely

In the analysis of the video footage, it became clear that a high proportion of student talk happens between the student teachers and that the teacher educators' questions triggered individualistic and divergent modes of thinking. The following dialogue between two student teachers (from the video footage) illustrates this:

Student 1: 'I think that this teacher[19] is showing real care for his learners'.

Student 2: 'Yes, but you consider this from a privileged perspective. Care for the top achievers. How about care for the learners who struggle and who do not get the same opportunities as the learners who obtain distinctions?'

Student 1: 'I hear what you say, but it is often the learners who perform well who are the forgotten ones. Some teachers spend so much time on learners who struggle and forget to also encourage good performers to do even better'.

Student 2: '[*visibly emotional; speak with a higher pitch voice*] But this should not be done at the expense of the majority of the learners. Have you ever been in a Black school?'

Student 1: '[*also showing signs of anger and irritation*] I don't think we should make this a racial issue …'.

19. A case by Sarah Gravett (2013). In this case, the teacher developed a good rapport with a selected group of bright and motivated learners, and he started to affectionately call them the 'A Team'. He invited these learners to his home on Saturdays for extra classes, and as an English teacher, he also started to take these learners to the theatre to go and watch plays based on the prescribed texts.

Student 2: '[*interrupting student 1*] In South Africa, we cannot shy away from race and the marginalised'.

The above dialogue is but one example of the discourse between students on various issues such as social justice, homosexuality, gender, poverty and race.

Discussion: The affordances of case-based teaching for fostering self-direction in learning

Our approach to case-based teaching ensured that cooperative learning took place, and it effectively capitalised on the affordances of blended learning. We furthermore followed a problem-based approach, developed student teachers' reflection skills and metacognitive development, and all these outcomes collectively contributed to deeper learning and to acquiring the skills associated with self-directed learning. We would now like to discuss each of these aspects briefly.

Cooperative learning in case-based teaching

Foldnes (2015) states that cooperative learning occurs when students work together in a group to reach their learning goals through discussion and peer feedback. Several studies indicate that people involved in cooperative learning demonstrate greater effort to achieve than people learning on their own (Roseth, Johnson & Johnson 2008; Springer, Stanne & Donovan 1999). From research, it is clear that cooperative learning should meet certain criteria in order for it to contribute to self-directed learning (Johnson & Johnson 2009). These include positive interdependence, individual accountability and personal responsibility, promotive interaction, appropriate use of social skills and group processing.

Positive social interdependence

Social interdependence exists when the outcomes that the student teachers achieve are affected by their own and others' actions (Johnson & Johnson 2009). Johnson and Johnson's (2009:367) research shows that knowing that one's performance affects the success of peers seems to create *responsibility forces* that increase one's efforts to achieve. The group projects in which student teachers were requested to dramatise cases provide a good example of such social interdependence. Each of the student teachers had a specific task to complete (e.g. finalising the screenplay or being an actor or director), and they realised that the group's effort will be assessed as a collective effort. During the excursion, students were asked to do a reflection on a case as a group project (instead of the customary individual reflections on cases), and many of the groups approached this from very interesting perspectives. In one of the groups (where members clearly could not agree on a single stance), they used Edward de Bono's thinking hats in their reflections to accommodate different points of view, but in their discussion of the blue (holistic, overview) hat, they tried to come to a group opinion.

Appropriate use of social skills

Student teachers must be taught the interpersonal and small-group skills needed for high-quality cooperation. Members of the group need to get to know and trust each other, and they need to learn how to resolve conflicts unambiguously. Student teachers will be socialised into communities of practice when they enter the profession, and they will have to deal with conflict situations constructively. In our experience, case-based teaching contributed to this outcome in two ways: firstly some of the cases deal with interpersonal conflicts, and secondly, conflict arises amongst

members of the groups when discussing the case, because of differences of opinion.

Our finding concerning case-based teaching is similar to that of Levin (1995), who indicates that the social interaction during the discussion of a case appears to be the source of changes in teachers' thinking. She concludes that '… the conflicting ideas served as a catalyst for important changes in teachers' thinking' (Levin 1995:75).

The affordances of the blended-learning approach

Students discussed the cases in class in small groups but were also requested to further interrogate the cases on Blackboard. This lead to robust discussions. One of the limitations of our research is that we did not adequately explore the use of social media such as Facebook or Twitter.

Cases call for problem-based approaches

Problem-based learning was developed in the mid-1960s in medical education in order for medical students to see the relevance of first-year course material such as anatomy, physiology or biochemistry to their future career as medical practitioner (Loyens *et al.* 2008). In problem-based learning, small groups of students learn collaboratively in the context of meaningful problems that describe observable phenomena or events (Schmidt 1983). Problem-based learning aims to assist students to (1) construct an extensive and flexible knowledge base, (2) become effective collaborators, (3) develop effective problem-solving skills, (4) become intrinsically motivated to learn and (5) develop self-directed learning skills (Loyens *et al.* 2008). Our data on case-based teaching show that the above aims were definitely achieved.

Metacognitive development of the student teachers

One of the perennial questions in teacher education is how teacher-education programmes can best promote learning amongst student teachers – through practice or belief change? (Loughran & Russell 1997; Tillema 2000). Tillema (2000) shows that, since the 'reflective turn' in teacher education, the pendulum has swung towards reflective practice. Our approach to case-based teaching places emphasis on reflection. We wanted student teachers to develop personal theories, informed by practice (case studies). Hargreaves (1994) indicates that, very often, even well-articulated ideas about teaching that are embedded in personal belief systems can be challenged and overruled by the conditions set by practice. This 'primacy of practice' (Tillema 2000) creates an imbalance that may hamper the development of personal theories. We are therefore of the opinion that case-based teaching holds affordances that should be utilised from the first year of pre-service teacher education.

Metacognition is a term coined by Flavell (1979), and metacognitive knowledge could be seen as stored knowledge or beliefs about oneself and others as cognitive agents, tasks, actions or strategies. It also entails how all of these interact to affect the outcome of an intellectual undertaking (Dawson 2008). The use of case-based teaching can develop student teacher's metacognitive skills and so assist them in becoming better critical thinkers or problem solvers

Conclusion

Merriam Caffarella and Baumgartner (2007) state that the characteristics of a self-directed learner continue to provide the 'most-used operational

definition' of self-directed learning and identify the following characteristics of the self-directed learner. A self-directed learner exhibits independence and persistence in learning, accepts responsibility for own learning and views problems as challenges rather than obstacles. A self-directed learner is self-disciplined with a high degree of curiosity and is able to use basic study skills and organise time effectively. Another characteristic of self-directed learners is that they can develop a plan for completing work, enjoy learning and have a tendency to be goal-oriented. As the semester progressed, most, if not all, of these characteristics became more visible in the student teachers who were engaging with cases. We agree with Lundeberg, Levin and Harrington (1999) that it is not fruitful to compare case-based teaching to other forms of pedagogy, given the many variables that contribute to learning outcomes. We are aware that it is not possible to compare student achievement prior to introducing case-based teaching and after implementing cases as pedagogy. Nevertheless, the teacher educators who were interviewed stated that students who were subjected to case-based teaching showed an improved ability to use and apply conceptual knowledge in an integrated way and that they were also more disciplined in meeting submission dates of assignments. One of the most encouraging outcomes was to see how student teachers became more skilled in reflection. Our study supports the suggestions found in literature that case-based teaching promotes analytical and reflecting thinking (Kunselman & Johnson 2004; Schiller 2006) and improves student teachers' metacognitive skills.

We acknowledge the fact that we have used the Williamson scale in an unconventional way, and future research will include using the Williamson instrument in a pre- and post-intervention setting. We want to conclude by referring back to research on student learning discussed earlier and the fact that a student's learning approach is not necessarily a fixed characteristic

but dependent on the learning context. Case-based teaching provides opportunities for self-directed and deep learning in pre-service teacher education.

Chapter 2: Summary

In this chapter, we reflect on research that was carried out on case-based teaching in a first-year B.Ed module. Many student teachers enter their pre-service teacher education with a very naive understanding of the complexity of the profession, and our goal with this teaching intervention was to use cases to show them why Lee Shulman referred to teaching as probably the most frightening activity that humans have ever invented. Our assumption, based on literature, was that case-based teaching would assist in providing student teachers with a more nuanced understanding of the demands facing a teacher and assist them in their professional development. When we analysed our data, we realised that a secondary outcome of the case-based teaching was that it holds affordances for self-direction in learning and for deep approaches to learning (as opposed to surface learning) where student teachers engage with the meaning of phenomena and apply it in practice. The concept of self-directed learning originated in the field of adult education, and our experiences of (especially first-year) student teachers are that many of them lack the skills associated with self-directed learning. We argue for pedagogies and teaching environments (based on international learning research) that would enhance self-direction and deep learning, and we claim that case-based teaching could assist student teachers in becoming more self-directed learners – a quality that the teaching profession demands. In this chapter, we show how we used case-based teaching to foster a deep approach to learning as it is described in the literature. We collected data by means of

focus-group interviews with student teachers, individual interviews with teacher-educators, students' reflective essays, answers in examination scripts and video recordings of classroom discussions. We analysed the data using elements of one of the widely acknowledged self-directed learning scales as a lens to show what affordances case-based teaching hold for self-directed and deep learning. We argue that case-based teaching that implements cooperative learning effectively assists student teachers in developing effective problem-solving skills and assist with their metacognitive development. It also has affective outcomes in so far as it elicits engaged learning, and student teachers state that case-based teaching motivate them.

Chapter 3

Students' accountability and responsibility in problem-based learning: Enhancing self-directed learning

Marietjie Havenga
North-West University
South Africa

Introduction and problem statement

Problem-based learning (PBL) is a strategy that provides a real-life context for teaching and learning. It is based on a question of inquiry and enhances innovative and high-quality teaching and learning within a complex task-based environment (Bell 2010:39; Grant 2011:38; Helle, Tynjälä & Olkinuora 2006:288). Since the PBL strategy can be implemented in various ways, in this research it was organised around a project in computer programming. According to Kolmos and De Graaff (2007:5), a project is

How to cite: Havenga, M., 2016, 'Students' accountability and responsibility in problem-based learning: Enhancing self-directed learning', in E. Mentz & I. Oosthuizen (eds.), *Self-directed learning research*, pp. 72-98, AOSIS, Cape Town. http://dx.doi.org/10.4102/aosis.2016.sdlr14.03

planned and developed by students over time and it requires a high degree of self-direction.

One of the main characteristics of PBL is the ability to work in collaboration where students are actively participating in various learning activities (Bell 2010:39; Havenga 2015:138). PBL provides students with opportunities to work as part of a team in order to share knowledge, make decisions and think critically (Knowles 1975:18; Rotherham & Willingham 2010:17). Consequently, PBL is a collaborative endeavour where students are accountable and responsible for their learning activities and their collective contribution towards addressing the question of inquiry. Carrying out a joint assignment is therefore an intense task where goals, accountability, responsibility, knowledge and skills are shared amongst group members.

Although each group member has specific rights and hopes to share in incentives, rewards and successes (UNESCO 2014:20, 51), it is essential that a member is held accountable and responsible for specific tasks. *Accountability* relates to legal and organisational actions that are bound to a contractual obligation to perform tasks as expected (Heystek 2015:1; Solbrekke & Sugrue 2014:13). Being *responsible* involves trust, moral association, integrity, obligation and the ability to deploy various actions (Soanes & Stevenson 2004:1226; Solbrekke & Sugrue 2014:13). Moreover, Fisher, King and Tague (2001:516) argue that the amount of responsibility that individuals are willing to take regarding their own learning defines their self-directedness.

Self-directed learning (SDL) is seen as a personal, self-driven undertaking where a student manages all aspects involved in learning such as setting goals, making informed decisions, applying appropriate skills and strategies, reflecting on one's own learning and assessing the

predetermined goals with the aim of nurturing deep lifelong learning (Bagheri *et al.* 2013:15; Knowles 1975:18). Bagheri *et al.* (2013:15, 16) are also convinced that PBL might enhance students' self-directedness.

With reference to project development, research indicates that students found it difficult to develop programming projects (Havenga 2015:141). The main reasons for this were, firstly, that they had problems dealing with the demands of team work and, secondly, they experienced difficulties in attempting to direct their own learning processes toward solving the programming problem in hand. The interplay of accountability and responsibility in a PBL context, with the intention that it could lead to greater self-directed learning, constitutes the conundrum of this research. To address this issue, the question that directed this research was the following: how can programming students' accountability and responsibility in problem-based learning enhance their self-directed learning?

The remainder of the chapter is structured as follows: an overview is given of the conceptual-theoretical framework on which the empirical investigation was based. This is followed by a report on the empirical investigation and the results obtained. Finally, the results are discussed, and the research is concluded.

Conceptual-theoretical framework

This section outlines the philosophical approach and the theoretical overview that formed the basis of the empirical investigation.

Philosophical approach

Constructivists claim that multiple realities as well as equally valid accounts of the same phenomenon can exist (Onwuegbuzie, Johnson & Collins 2009:125).

Moreover, constructivism is value-bound (Onwuegbuzie *et al.* 2009:125–126) and may involve variable-oriented analysis (Van der Walt & Potgieter 2012:222). Such an approach may involve both quantitative and qualitative methods. Social constructivism extends constructivism and is based on a sociological theory that advocates the collaborative construction of knowledge (Lodico, Spaulding & Voegtle 2010:14; Patel *et al.* 2011:114). The nature of social constructivism requires that teaching activities focus mainly on students' responsibility to construct the learning content in a collaborative manner (Patel *et al.* 2011:114). Hence, the application of social constructivism in teaching and learning provides a focal point for shared accountability and responsibility within the context of an organised project in PBL.

Theoretical overview

This section outlines self-directed learning, problem-based learning, cooperation as well as accountability and responsibility as part of group work. The nature of programming projects is also briefly outlined.

Self-directed learning

According to UNESCO (2015:65, 156), higher education is responsible for providing opportunities for learners to build scholarly capacity during their academic journey. This can be done by empowering students through innovative and high-quality teaching and learning that are not limited to the classroom, requiring them to solve real-life problems, thereby enabling the incremental development of self-directed learning.

The 'self' in the term 'self-directed learning' is the object of introspection or the reflexive action, 'directed' means to put straight, and 'learn' involves acquiring knowledge or skill through real-life experiences (Shin 2011:607; Soanes & Stevenson 2004:406, 811, 1304). Self-directed learning therefore

refers to students' deliberate actions in making informed decisions to direct and manage their own learning. This involves setting learning goals, managing their learning activities and applying appropriate skills and strategies to achieve the learning aims (Knowles 1975:18).

The characteristics of highly self-directed learners include initiative and persistence in learning, acceptance of responsibility for their own learning, goal orientation, a strong ability to learn independently, self-discipline, viewing problems as challenges, a love of learning and a high degree of curiosity (Guglielmino 1978). According to Shin (2011:607), self-directed learning does not focus solely on knowledge accumulation, but it is rather developed as part of a process where students obtain real-life experiences in a specific domain. In this regard, Bagheri *et al.* (2013:15) claim that 'self-directed learning is one of the best ways to learn'.

Problem-based learning organised around projects

Problem-based learning (PBL) is an innovative instructional approach which requires intense human involvement and collaboration. Bell (2010:39) and Helle *et al.* (2006:288) are of the opinion that PBL entails students working mainly collaboratively to solve authentic problems, addressing a question of inquiry and/or developing an artefact. PBL can be implemented in various ways, and in this research, it was organised around the development of a programming project. Since a project involves uncertainty in terms of time, cost, scope, resources and risks (Schwalbe 2010:8), it is crucial to manage both project development and the participating group members. Whilst these management actions are interrelated, the emphasis in this research was primarily focused on the latter, namely on students' cooperation as part of PBL.

In a socially driven PBL context, students do not work in isolation as the effort has to be shared amongst group members. On this note, Sternberg and Sternberg (2012:457, 459) assert that groups make decisions differently from individuals. Therefore, working together as a group can enhance the effectiveness of decision-making and optimise problem solving.

The benefits of using group skills in a PBL setting are an enhanced understanding of the topic, the development of critical thinking and deeper learning, increased motivation and the development of independent, accountable and responsible learners (students) (Bell 2010:40). The value of collaborative PBL skills has also been demonstrated in engineering. Zou and Mickleborough (2015:148) found that these skills assist students in developing arguments, integrating ideas and generating a final solution.

Cooperative learning (CL), in turn, refers to a way of collaboration where students work together towards the same goal and accomplish a task in a particular way to share the benefits thereof (Gunter, Estes & Mintz, 2010:262, 263; Soanes & Stevenson 2004:314). Asensio *et al.* (2015:266) stipulate that one of the foundations on which CL is based implies that the sum of the work carried out by each individual is less than the work that should be performed as group members. Gunter *et al.* (2010:263) concur that a related set of goals, equal distribution of the work and close contact are the main characteristics of cooperative group work. In this regard, Johnson and Johnson (2013) encapsulate the following five key elements of CL: positive interdependence, individual and group accountability, promotive face-to-face interaction, personal interaction and communication, and group processing. Thus, the application of CL results in a more productive group where positive relationships amongst group members are developed (Johnson, Johnson & Holubec 2014:1). Accountability and responsibility are

important personal characteristics that may support cooperative learning in a PBL context, and these are outlined in more detail below.

Accountability and responsibility

Solbrekke and Sugrue (2014:13) argue that accountability is bound to a contractual obligation in terms of the specified task(s) that an individual is required to do. Accountability enriches a learning experience as it provides opportunities for a member of a group to own specific outcomes as part of the group. Responsibility, in contrast, has a moral dimension and involves trust, integrity and the ability to take part in various actions (Soanes & Stevenson 2004:1226; Solbrekke & Sugrue 2014:13).

Before a member or group can become accountable, the following conditions must be met when planning the development of software programs (Davidson 2014:n.p.). Members must have a clear understanding of what they should deliver, they need to understand how their success and/or the consequences of their decisions are assessed, both members and the group have decision-making authority (autonomy) to deliver what they are responsible for, there needs to be agreement on measures to be used to track progress, and group members need to agree on regular feedback to the group.

In object-oriented programming, the concept 'coupling' refers to the degree of interaction between two modules (a set of program segments) (Schach 2005:175). This term was used to refer to the degree of interaction and strength of association between accountability and responsibility, based on the postulate that the best case is where coupling between accountability and responsibility is high, in other words, where a group member is bound to a contractual obligation, and the member also has the moral obligation to carry out specific tasks. As a result, high coupling may have a tangible effect on group success and the achievement of the group.

The nature of programming projects

A programmer aims to convert problems into solutions by using specific syntax and semantics as defined by a specific programming language such as C# or Java (Sebesta 2013:182). Additional skills that are required involve error checking, making corrections, testing and executing the program. Computer programming requires precise planning of the solution and detailed coding of the program to solve the problem. Moreover, programming projects comprise phases such as detailed planning, design, development and implementation. According to Hughes and Cotterell (2009:2, 3), some of the main characteristics of a software (programming) project include the following: specific objectives are to be met, planning is the essence for thinking carefully about the project, non-routine tasks are involved, the project has a predetermined time span and people are formed into a work group to carry out the task. The use of PBL as a teaching-learning strategy may support students in the complex task of developing a programming project as part of team work.

To summarise, PBL is based on a question of inquiry and provides a context for high-quality teaching and learning in a multifaceted environment, for example, where it is organised around a project. Accountability and responsibility are important personal characteristics that might support team work and learning in a PBL context and hence provide an opportunity for students to develop their self-directed learning. The following section outlines the empirical investigation.

Empirical research

The aim of the investigation was to explore how programming students' accountability and responsibility in problem-based learning could enhance their self-directed learning.

Research design

A mixed-methods research approach was followed by employing both quantitative and qualitative methods. The research design involved a pre-test, an intervention and a post-test. Both the pre-test and post-test required the completion of questionnaires. During the intervention, students completed documents and developed a programming project and manual as deliverables (Table 1).

Participants

A population of 106 second-year BSc students majoring in computer science participated in this research by developing a programming project

TABLE 1: The research design used in this study.

Completed	Pre-test	Intervention	Post-test
Individual	1. Williamson's SRSSDL questionnaire (Williamson 2007) 2. Open questionnaire about: a) various database questions b) PBL questions		1. Williamson's SRSSDL questionnaire (Williamson 2007) 2. Open questionnaire about a) various database questions and b) PBL questions
Group (6 weeks)		1. Completion of a detailed time schedule 2. Submit weekly project sheets to indicate progress and development 3. Submit a programming project and electronic manual as deliverables 4. Submit some narrative reflections	

PBL, Problem-based learning; SRSSDL, self-rating scale of self-directed learning.

as part of the intervention. It was mandatory for them to participate since the marks that the students obtained were part of their semester mark for this course. They worked in a PBL setting consisting of mainly two members in a group. Students selected the group members themselves. Ethical approval was obtained from the university under whose auspices the study was carried out.

Programming project

The participants were required to develop an integrated C# and database programming project where they selected the topic themselves, for example the management and purchase of vehicles. Prior to project development, the lecturer provided students with the project requirements, assessment guidelines as well as a brief description of cooperative learning. The project was carried out outside of class time. The time span for project development was six weeks. Students were required to compile a detailed time schedule. They also formally completed 'a statement of authorship' and submitted various documents that outlined their progress, reflections and cooperation. They further submitted deliverables, namely a programming project and an electronic manual that explained the functioning of the program (Table 1). The project, manual and related documents were assessed according to specific rubrics based on the initial requirements for the project.

The manual consisted of an introduction explaining the purpose of the program, a brief literature overview regarding databases, the functionality of the program comprising snap shots of output on the computer screen, technical information and resources used as well as a summary and a complete list of references. Corresponding assessment criteria were used to determine whether these elements were included as part of the project.

The technical requirements of the project involved the following: application of various menus and at least four forms to display the information, searching and updating of data, performing four different queries and including message boxes for user-friendliness where applicable. In addition, students also obtained marks for their time schedules and weekly project sheets regarding the particular activities described.

Data collection and analysis methods

This subsection outlines the methods for both quantitative and qualitative data collection and analyses used in this study (see Table 1).

Quantitative methods and instruments

Williamson's self-rating scale of self-directed learning (SRSSDL) in higher education (Williamson 2007) was used where participating students were required to complete the questionnaire as a pre-test and post-test. The SRSSDL comprised 60 items categorised under five distinctive areas of self-directed learning, namely awareness, learning strategies, learning activities, evaluation and interpersonal skills. Responses for each item were rated by using a five-point scale. Statistical analysis included the use of both descriptive and inferential statistics (Tables 2–4).

Qualitative methods

Qualitative methods of data collection involved the completion of the following:

- Open-ended questions on databases and students' individual experiences with PBL (Table 1).
- A time schedule, prior to the start of the project.

- A section regarding 'a statement of authorship'.
- Weekly project sheets focussing on the following: the group's aims, responsibilities, communication, problems and challenges; pace of progress the previous week; weekly peer and self-assessment; individual and group responsibilities for the next week; and finally, a list of resources they have used.

Although a realistic amount of time had been allotted to enable students to complete the weekly project sheets, they were required to submit these on time as electronic locks were set for each week in the student learning environment. Students also submitted reflective narratives regarding the project after they had completed their programming project.

Qualitative data were analysed by manual coding of students' data and the development of subcategories and themes. Concept-driven coding (Gibbs 2010:44, 45) was mainly used where the thematic ideas came from the open questionnaire, time schedule, weekly project sheets and reflective narratives (Table 1). Additional ideas also emerged from the qualitative data.

Results

Both quantitative and qualitative results are outlined in this section.

Quantitative results

Although 106 students enrolled for the programming course, only 43 of them completed both Williamson's pre-test and post-test [the programming project was compulsory as part of the course, however, it was not compulsory to complete the Williamson's questionnaire and open questions (Table 1)]. According to students' answers on the Likert-type scale of 1 to 5 for 60 questions, the total scores were determined, as based

on Williamson's questionnaire, and the students were divided into three distinctive groups regarding their self-directed learning, namely low (60–140), moderate (141–220) and high (221–300). The focus of this research was on the results obtained by the moderate and high groups as there were no participants in the low group.

Five participants in the moderate group moved to the high group after completing the post-test (Table 2). This indicates that these students improved on their self-directed learning skills after the intervention. Only two participants in the high group moved to the moderate group after the post-test.

The moderate group's average on four of the five subscales had increased statistically and practically significant in the post-test as an indication that students might have improved their self-directed learning whilst developing the project (Table 3). The effect sizes were practically significant, indicating medium and large effect sizes (Ellis & Steyn 2003:

TABLE 2: Number of participants in a specific group in the pre- and post-test.

Pre-test	Post-test		
	Moderate	High	Total
Moderate	14	5	19
High	2	22	24
Total	16	27	43

TABLE 3: Dependent t-tests and practical significance: Moderate group.

Area	Pre-test (n = 19)		Post-test (n = 16)		Significance 2-tailed	Effect size
	Mean 1	SD 1	Mean 2	SD 2		
Awareness	3.61	0.41	3.61	0.45	p = 0.89	–0.03
Learning strategies	3.15	0.43	3.32	0.44	p = 0.07	0.41*
Learning activities	3.10	0.30	3.36	0.43	p = 0.01	0.85**
Evaluation	3.15	0.27	3.34	0.46	p = 0.07	0.73**
Interpersonal	3.36	0.51	3.58	0.68	p = 0.09	0.45*

Practical significance: *, Medium-effect size; **, Large-effect size.

TABLE 4: Dependent t-tests and practical significance: High group.

Area	Pre-test (n = 24)		Post-test (n = 27)		Significance	Effect size
	Mean 1	SD 1	Mean 2	SD 2	2-tailed	
Awareness	4.30	0.40	4.28	0.47	p = 0.88	–0.03
Learning strategies	4.03	0.27	4.08	0.42	p = 0.52	0.18
Learning activities	4.07	0.30	4.10	0.47	p = 0.80	0.08
Evaluation	4.13	0.42	4.17	0.47	p = 0.72	0.08
Interpersonal	4.08	0.41	4.11	0.57	p = 0.73	0.08

52–53), except for awareness. (Although p-values are not relevant, it is reported for completeness).

As displayed in Table 4, the high group's averages were more or less similar in both the pre-test and the post-test. None of the effect sizes had practical significance.

Qualitative results

Findings are outlined with reference to the following themes: statement of authorship, individual responsibility, group responsibility, mutual trust and assessment.

Statement of authorship

The lecturer required group members to complete a statement of authorship to acknowledge and indicate their contractual obligation and accountability regarding specific tasks. Members were required to write down their student number, initials and surname and sign the authorship statement formally. Although students wrote down their personal details, only 26 participants formally signed the authorship statement to acknowledge their accountability in this regard. By writing down their personal details (without a signature), students probably assumed this was an indication of their accountability towards specific tasks in the programming project.

Individual responsibility

This theme involved individual responsibility towards individuals themselves as well as individual responsibility towards the group. Participants 45, 51 and 92 mentioned the following:

> 'An individual needs to take own responsibility and does not wait until the end. Work must be divided carefully and evenly. If that is the case, we can easily hold one another responsible for things not done or done incorrectly.' (P45, P51, P92)

Individual responsibility was also referred to in the following exemplars:

> 'The tasks were divided between our group members … we tried not to overload one another with tasks.' (P23, P103)
>
> 'We divided the tasks based on our strengths and weaknesses'. (P35, P104)
>
> 'We divided the tasks and responsibilities between one another fairly. The team taking responsibility and choosing tasks for themselves, and deciding on how long it will take them to complete it'. (P54, P67)
>
> 'We need to divide the work … we both know what is required from us … divide and conquer'. (P46, P95)
>
> '[*My responsibilities*] are to do research on my own and be prepared for the group discussion'. (P44)

Five participants worked on their own (some of these students repeated this course). P1 preferred to work on her own:

> 'I am my own motivation and work on my own terms. Just to get the work done on time … The project … is a challenge. I am working on my own and I am responsible for [*all the work*]'. (P1, project mark 73%)

P99 also preferred to work alone. However, he mentioned that no aims had been set for the previous week:

> '… bad time allocation … no planning. I should lay out my project plan, and set some goals for myself.' (P99, project mark 55%)

Group responsibility

Group activities, responsibilities, problems and support are outlined in this theme. The feedback included the following:

> 'Team members support each other to achieve the aims. We plan and schedule our daily activities. Team members are required to discuss their weekly progress on WhatsApp'. (P11, P57)

> 'In my team, there is no shortage of support. Challenges, however, should be solved as a team'. (P45, P51, P92)

> 'Tasks were shared, and we supported one another. We set out our aims in a time schedule, good communication … we worked effectively together'. (P6, P14)

> 'Our feedback and support weakened this week [*due to tests*] … our progress was not so good … however we are working on it. We were required to divide [*tasks*] to enable us finishing on time'. (P40, P79)

> 'We have good communication and meet frequently. There is excellent support. We sometimes debated what should be the best method to use … and then select the most effective one'. (P35, P104)

> 'We were over-committed at first, but soon realised that we had to prioritise the tasks'. (P59, P88)

Some groups preferred to work together rather than focusing on individual tasks. After working individually for one week, P21 and P43 decided to work together: 'We do not have individual work and from now on we are working together'. P34 and P102 agreed: 'There is no individual work, we are working together'

Mutual trust

This theme emerged from students' feedback as an indication of mutual trust or a lack thereof: 'I find that when working together we get an effect of "synergy"' (P45, P51, P92).

'Synergy' here seems to refer to cooperation and interaction, and possibly also the trust existing amongst group members:

> 'We decided to give each member a task each week and send [email] it to the other team member to elaborate or make corrections. There was no personal interaction, as my partner [*P26*] did not respond to messages.' (P48)

Assessment

Group members were required to assess themselves as well as their peers every week as an indication of their contribution towards specific tasks over the project period of six weeks. The following scale was used: 0: made no contribution; 1: contribution was less than average; 3: made an average contribution; 5: provided an outstanding contribution. Although most students gave the same mark to their group members (P6 and P14 obtained an average weekly mark of 5 and a project mark of 99%), some groups' assessment differed: P7 obtained an average of 1.67 out of 5 whereas his group member (P80) had an average of 5 (project mark 52%). According to P80, 'there was not much personal interaction'. Whilst P80 provided an outstanding contribution to project development during the period of 6 weeks, his group member did not participate in specific tasks. This resulted in a low project mark for the group since the project mark was depended on the quality of the work performed by the group and not only by an individual student. Most of the groups obtained a shared mark. However, this was not always the case since five students worked individually and three group members did not take responsibility for specific tasks during project development. As a result, the last-mentioned group members obtained different project marks.

Discussion

This section addresses the research question: How can programming students' accountability and responsibility in problem-based learning enhance their self-directed learning?

Quantitative findings

With reference to the quantitative results based on Williamson's self-rating scale of self-directed learning, five participants in the moderate group moved to the high group after completing the post-test (Table 2) whereas only two participants in the high group moved to the moderate group after the post-test. These two students probably realised that they were not as self-directed as initially thought or they did not experience the intervention as a positive learning opportunity as indicated in some of the qualitative findings. Furthermore, the moderate's group's average had increased in four of the five subscales and was statistically and practically significant after the post-test. This could be an indication that these students might have enhanced their self-directed learning after developing the project (Table 3). The high group's average was more or less similar in both the pre-test and the post-test as shown in Table 4. Although only 43 students completed *both* Williamson's pre-test and post-test, the quantitative findings show that students in the moderate group enhanced their self-directed learning skills whereas most of the students in the high group (except for 2) indicated high self-directedness when starting with the project.

Qualitative findings

The participating students were required to complete a statement of authorship to indicate their contractual obligation and accountability

during project development. Only 26 of 106 participants formally signed the authorship statement, and the signatories were distributed into different groups. These participants obtained an average of 85.31% for the projects, which indicates their dedication and accountability in developing the project as group members. Some strategies are mentioned to indicate these students' responsibility as individuals and groups respectively. The project marks obtained by the group are shown in brackets:

> 'Each member worked on a task: …we supported one another. We set out our aims…' (P6, P14 – 99%)
>
> 'We divided the tasks based on our strengths and weaknesses'. (P35, P104 – 100%)
>
> 'Discussed how and when we will be working … who will be responsible for what'. (P13, P101 – 80%)
>
> 'We can easily hold one another responsible for things not done or done incorrectly'. (P45, P51, P92 – 67%).

These quotes indicate that individuals were accountable and responsible for specific tasks. They directed their own learning activities, supporting one another and dividing some of the tasks, since they were dependent (positive interdependence) on one another for the successful completion thereof.

Although no causal relationship was established between accountability and the achievement of high marks in a task, participants who were both accountable (as indicated by the formal signatures) and responsible for individual and group tasks may have obtained better marks than their peers who are not necessarily accountable and/or responsible. This is reflected, for example, in the case where both P6 and P14 as a group obtained a final mark of 99% for their project. With reference to the process of project development, their weekly assessment over a period of six weeks was an average of 5 out of 5, indicating that both P6 and P14 provided an outstanding contribution. In this regard, it could be argued that the best results occur where students are both

accountable and responsible, as individual members and as a group, to complete a task, thus indicating a high coupling between accountability and responsibility.

In contrast, some groups were not accountable and/or responsible and experienced problems to complete their weekly targets and finish their projects on time. (The remaining groups did not formally sign the authorship statement.) The average project mark obtained for this cohort was 65%, ranging from 0% to 89%. The lack of accountability and/or responsibility is reflected in some responses:

> 'There was not much personal interaction'. (P7, P80 – 52%)
>
> 'Time was a problem, we need to plan in detail …' (P12 – 78%; P32 – 0%) (P32 did not complete the course)
>
> 'The team taking responsibility and choosing tasks for themselves …' (P54, P67 – 69%)
>
> 'There was no personal interaction as my partner [P26] did not respond to messages'. (P26, P48 – 65%)

Participants 26 and 48 also experienced problems with personal interaction and communication. They obtained 65% for their project. P48 was required to 'do more in order to get more' since his group member was not accountable and responsible for individual tasks as indicated from feedback in their weekly projects sheets: 'There was no personal interaction as my partner [P26] did not respond to messages' (P48).

P26 was not individually responsible for specific tasks, which is an important element for effective cooperation (Johnson & Johnson 2013). Furthermore, mutual trust was not guaranteed, and as a result, this groups' progress slowed down.

These tensions within a group imply that the participants did not apply all the cooperative principles as part of teamwork and did not take accountability

and/or responsibility in developing the PBL project. Results are in line with Mentz, Van der Walt and Goosen (2008:249), who assert that working in groups without applying the five cooperative elements will most likely lead to non-effective learning in the group. Furthermore, Johnson and Johnson (2013) are of the opinion that the five elements as mentioned should be incorporated into group work to ensure the accomplishment of shared goals and maximal learning of every individual group member.

Integrated findings on group work

The integrated findings in Table 5 specify that there are various ways in which students could work on a task or project, and three of those ways emerged from the empirical study, namely working as an individual, as a cooperative member of a group and as a 'non-cooperative' group. The characteristics shown in Table 5 also emerged from this study.

Although the students were required to work on the project in a group, a few preferred to work individually. In such cases, individual students were accountable and responsible for all the activities and tasks involved. No formal interaction, communication and processing took place, and self-trust was required (Table 5, second column). Furthermore, the individuals needed to assess themselves. Participant 1 mentioned the following: 'I am my own motivation and work on my own terms. The project is a challenge'.

This is in line with Kolmos and De Graaff's (2007:5) assertion that working on a comprehensive task such as a full-scale project requires a high degree of self-direction. Clearly, P99 struggled to manage his time, to plan and to set out specific weekly goals (see Table 5). Thus, an individual needs to be dedicated and should have a high level of self-directedness to ensure that

TABLE 5: Integrated characteristics of individuals and group members when working on a task (project).

Characteristic	Individual	Cooperative group	Non-cooperative group
Positive inter-dependence (Johnson & Johnson 2013)	Independence	Positive interdependence; success of the group is dependent on the success of every group member.	Positive or negative interdependence
Individual and group accountability and ownership (Johnson & Johnson 2013, Solbrekke & Sugrue 2014:13)	Individually accountable for all tasks involved; Individual ownership.	Individual and group accountability. Individual and collective ownership	Group accountability. Individual and collective ownership cannot be guaranteed
Responsibility (Solbrekke & Sugrue 2014:13)	Individually responsible for all tasks involved	Individual and group responsibility	Group responsibility not necessarily shared amongst members
Promotive face-to-face interaction (Johnson & Johnson 2013)	No formal interaction	Promotive face-to-face interaction	Some group interaction is involved
Personal interaction and communication (Johnson & Johnson 2013)	No formal communication	Individual and group communication	Communication amongst group members cannot be guaranteed
Group processing (Johnson & Johnson 2013)	Individual processing	Individual and group processing	Group processing cannot be guaranteed
Trust	Self-trust	Mutual trust	Mutual trust cannot be guaranteed
Assessment	Self-assessment	Self-assessment and group assessment	Mainly group assessment.

Table 5 continues on the next page →

TABLE 5 (Continues ...): Integrated characteristics of individuals and group members when working on a task (project).

Characteristic	Individual	Cooperative group	Non-cooperative group
Examples that emerged from this study	*'I am my own motivation and work on my own terms'.* [P1 (73%)] '... no aims had been set for the previous week ... bad time allocation ... no planning ... should set some goals for myself'. [P99 (55%)]	'Tasks were shared, and we supported one another. We set out our aims in a time schedule, good communication ... we worked effectively together'. [P6; P14 (99%)]	'There was not much personal interaction. [P7; P80 (52%)] 'There was no personal interaction as my partner [P26] did not respond to messages'. [P26; P48 (65%)]

such an overwhelming task is completed on time and that all the project requirements are addressed.

Participating students also worked on the project in *cooperation,* meaning that both individuals and the group were accountable and responsible for specific tasks as shown in the third column (Table 5). The success of the group was therefore dependent on the successful cooperation of each member. Individual and group communication, interaction and processing as well as mutual trust are required. Participants 6 and 14 obtained 99% as a result of effective cooperation. They mentioned the following: 'Tasks were shared and we supported one another … we worked effectively together'.

This cooperation was also reflected in their individual and peer assessment. It is an example of a case where the coupling between accountability and responsibility was high. These findings underscore the importance of a group member to 'own' specific outcomes as part of the group as mentioned by Davidson (2014:n.p.).

The fact that students work in collaboration does not inevitably guarantee group success as indicated by some examples in Table 5 (fourth column). Since

'there was not much personal interaction', both P7 and P80 were members of an ineffective group, and they obtained a project mark of 52%. Similarly, P26 and P48 experienced communication problems and a lack of mutual trust – 'There was no personal interaction as my partner [*P26*] did not respond to messages'. Their problems were reflected in a project mark of 65%. These results further emphasise that students working in groups without applying cooperative learning will probably experience non-effective learning (Mentz *et al.* 2008:249).

Integrated findings on self-directed learning

Firstly, the quantitative results based on Williamson's self-rating scale of self-directed learning (SRSSDL) signify that five of the 19 participants, initially in the Moderate group, moved to the High group after completing the post-test (Table 2), and only two participants in the High group moved to the Moderate group after the post-test. Moreover, the Moderate group's average on four of the five subscales increased statistical and practical significantly in the post-test. The High group's averages were more or less similar in both the pre-test and post-test. This indicates that students in the High group had appropriate self-directed learning skills prior to the beginning of the project.

Secondly, the qualitative findings suggest that some students, especially those who applied all five elements of CL, enhanced their self-directedness since they addressed the main characteristics of self-directed learning as stipulated by Guglielmino (1978) and Merriam, Caffarella and Baumgartner (2007:121):

- Participating students therefore developed the project independently (lecturer only facilitates): 'Tasks were shared and we supported one another … we worked effectively together.' (P6, P14 – 99%)

- They accepted responsibility for their own learning: 'The team taking responsibility and choosing tasks for themselves …'. (P54, P67 – 69%)
- They viewed problems as a challenges: 'We discuss each problem, identify ideas and then select the best idea to be our project'. (P35, P104 –100%)
- They were persistent in learning: 'In my team there is no shortage of support … challenges, however, should be solved as a team'. (P45, P51, P92 – 67%)

They demonstrated a love of learning and a high degree of curiosity: 'We identified very interesting facts and requirements that we hope to implement in our project'. (P27, P44 – 89%)Finally, results from this research underscore the claim that PBL provides various experiences to students where they are accountable and responsible for specific tasks and, as a result, enhance their self-directed learning.

In the view of the above, the following seems to have emerged as a succinct answer to the research question that had been addressed in this investigation: How can programming students' accountability and responsibility in problem-based learning enhance their self-directed learning?

The five cooperative elements of Johnson and Johnson (2013) provide substantial ground in PBL for the integration of accountability and responsibility (Table 5) since the group is dependent on the successful cooperation of each member. Group members who formally signed the authorship statement, as an indication of their accountability, obtained a high average (85.31%) for the projects. This indicates that a high coupling between accountability and responsibility implies that a group member is bound to a contractual obligation and has the moral obligation to carry out specific tasks.

Participants who were accountable and responsible as part of cooperative learning enhanced their self-directedness since they addressed the main characteristics of self-directed learning as stipulated by Guglielmino (1978) and Merriam *et al.* (2007:121). Results from this research underscore the postulate that PBL provides various experiences to students to be accountable and responsible for specific tasks and, as a result, enhance their self-directed learning.

Based on the integrated literature and results, some recommendations, mainly aimed at students, are outlined regarding the application of PBL in a social context that may prepare students for professional practice:

- Cooperative learning should be an integral part of PBL.
- Group members should be held accountable and responsible by requiring of them to formally sign an authorship contract. They also need to have the moral obligation to do specific tasks.
- Work should be divided carefully and evenly and needs to be based on group members' strengths and weaknesses.
- Shared responsibility amongst group members should be managed, and frequent feedback is required.
- Group members should be required to assess each other on a weekly basis regarding their output.

Conclusion

This research explored individual and group accountability and responsibility in a cooperative PBL setting where students developed a programming project. The findings indicate that the best results occur where group members are bound to a contractual obligation, and members have a moral obligation to do specific tasks. Findings indicate that

cooperative PBL provides real-life experiences to students and, as a result, enhances their self-directed learning.

Chapter 3: Summary

A student-centred approach to learning requires students to demonstrate accountability and responsibility as individuals and as a group when addressing a problem of inquiry. This chapter reports on the application of problem-based learning (PBL) where second-year students were required to develop a programming project in small groups in order to provide opportunities for students to enhance their self-directed learning. The point of departure was social constructivism, and a mixed-method research methodology was employed. Since the group is dependent on the successful cooperation of each member, the findings indicate that characteristics such as accountability and responsibility provide substantial ground for effective group work in a PBL context. The best case of performing a task is where the coupling between accountability and responsibility is high, that is, where a group member is bound to a contractual obligation and has the moral obligation to carry out specific tasks. Results from this research underscore the postulate that PBL provides various experiences to students to be accountable and responsible for specific tasks and, as a result, enhance their self-directed learning.

Chapter 4

Student support through cooperative base groups and its contribution to the development of self-directed learning skills

Anitia Lubbe, Elsa Mentz & Neal Petersen
North-West University
South Africa

Introduction

The majority of educational systems have experienced minimal change this century despite the considerable changes brought about by technology over the last 15 years (Scott 2015). According to Tran (2007), students require skills that enable them to conduct and evaluate their own learning.

How to cite: Lubbe, A., Mentz, E. & Petersen, N., 2016, 'Student support through cooperative base groups and its contribution to the development of self-directed learning skills', in E. Mentz & I. Oosthuizen (eds.), *Self-directed learning research*, pp. 99-128, AOSIS, Cape Town. http://dx.doi.org/10.4102/aosis.2016.sdlr14.04

Furthermore, Roberts (2010) is of the opinion that the development of self-directed learning (SDL) skills is an important objective of higher education, particularly in the first year. This is no easy task, however, as the adjustment to university life requires that first-year students deal with the academic and emotional shock of moving to an unfamiliar university environment (Wilcox, Winn & Fyvie-Gauld 2005).

Contributing to the academic shock is students' lack of preparedness for university, which is exacerbated by large classes (Wilcox *et al.* 2005). For the purpose of this investigation, the term 'large classes' was used to describe a class in which the delivery of quality and equal learning opportunities to all the students in the group is influenced by the large number of students, that is, where the class is larger than what the majority of students are accustomed to. In practice, this means that classes consisting of more than 40 students were deemed to be large. Teaching in large classes is known to decrease students' motivation, gratification, class attendance, active participation and engagement in the learning process as well as their sense of belonging and community (Parè *et al.* 2015). As Tinto (1998) observes, students who feel academically and socially integrated and supported will be more likely to succeed and persist academically. In large classes, the provision of much-needed support structures will be less likely to occur as large classes tend to fail to provide rich learning experiences (Parè *et al.* 2015). As a result, students tend to shy away from active participation and engagement in such settings (Monks & Schmidt 2011).

In response to this hiatus in large classes, the use of cooperative base groups (CBGs) could be considered. CBCs are small, long-term groups of students with stable membership, instituted for the purpose of providing their members with academic and personal support (Johnson, Johnson & Johnson-Holubec 2008). The presence of the five basic elements of

cooperative learning (CL) (positive interdependence, individual accountability, face-to-face promotive interaction, small-group and social skills, and group processing) sets these groups apart from other long-term student groups such as study groups (Zevenbergen 2004), study teams (Davis 1993) and out-of-class academic collaboration (Jacobs 2013). Because it is vital to determine meaningful ways in which students can support one another on an academic and personal level in large classes, the aim of this investigation was to determine the value of CBGs in large first-year classes. To be able to achieve the research aim, the investigation focused on the following research questions:

- What is the perception of first-year students in Life Sciences (LS) of the academic and personal support provided by CBGs?
- To what extent does the participation of first-year LS students in CBGs contribute to their SDL skills?

The following section presents a discussion of the conceptual and theoretical framework that was adopted for this investigation.

Conceptual and theoretical framework

This century is characterised by rapid advances in technology, which means that students can access a plethora of resources through the internet in order to support their learning experiences (Nepal & Stewart 2010). According to Bullock (2013), students need to be prepared for an ever-changing world and should therefore be equipped with skills necessary for self-directed learning. These skills include effective communication and cooperative skills, inventive and creative thinking skills as well as problem-solving skills (Larson & Miller 2011). These are the abilities required for students to be self-directed learners (Lord *et al.* 2010; Patterson, Crooks

& Lunyk-Child 2002). Because it is of great importance to instil the much-needed SDL skills, universities need to engage students in SDL processes (Nepal & Stewart 2010), particularly from their first year (Roberts 2010). This, however, is not the only facet to which first-year students need to be exposed at university.

According to Arnett (2000), individuals between the ages of 18 and 25 are making the transition from adolescence to adulthood. Students embarking on their first year of post-secondary studies (that is, at colleges and universities) are mostly in a critical developmental phase when making the transition from high school to university and are often confronted with numerous new experiences and stressors (Morton, Mergler & Boman 2014). During this transition phase, most students do not only develop new relationships but also tend to modify existing relationships with parents and family members (Morosanu, Handley & O'Donovan 2010; Morton *et al.* 2014). They deal with the 'emotional shock of moving from the familiar home environment to the very different life at university' (Wilcox *et al.* 2005). The need to adapt their study habits for the new and challenging academic environment contributes to the emotional shock experienced by students (Clark & Dumas 2005) whilst they are undertaking the task of functioning as independent adults (Morton *et al.* 2014). According to Sharma (2012), it is not only academic adjustment which is a concern but also the social and emotional changes that must be dealt with. An increase in students' personal freedom compels them to '… make their own decisions and take the responsibility to maintain balance between various newfound demands' (Sharma 2013:32).

Large classes, that is, larger than the classes that students experienced in high school, is another stressor, contributing to the overall shock

experienced by numerous first-year students. According to the literature, large classes tend to be characterised by lower levels of student motivation, attendance, participation, engagement and a sense of belonging (Cuseo 2007). These may be related to the fact that large classes allow students to shy away from participation and engagement (Monks & Schmidt 2011), which in turn results in students not being actively involved in the learning process (Cuseo 2007). A decrease in the quality and quantity of the interaction and feedback between student and facilitator (the use of facilitator instead of lecturer emphasises the fact that the construction of knowledge in an active learning environment should be facilitated) lowers academic achievement and academic performance. It also lowers the levels of overall satisfaction with modules or courses (Cuseo 2007). Large classes have also been criticised for lowering the opportunity to provide students with rich learning experiences and therefore tend to make students feel isolated (Parè *et al.* 2015). This scenario could be problematic, seeing that Wilcox *et al.* (2005) state that students' successful adjustment to university life is dependent on the social support they experience. The social networks at university become students' main source of social support. Emotional support from friends as well as positive peer relationships provide a sense of belonging which is vital for first-year students (Shim & Ryan 2012; Wilcox *et al.* 2005). Indeed, as Tinto (1998) advocates, students should experience being integrated academically as well as socially by no later than the end of the first year.

The cooperative base-group (CBG) approach is one of the three cooperative learning (CL) approaches advocated and described by David and Roger Johnson (Johnson *et al.* 2008). CBGs are characterised by their small, heterogeneous composition and are formed as a long-term supportive arrangement for members (Johnson *et al.* 2008). These small

groups, composed of no more than four students each, meet on a regular basis in and outside of class. The regular meetings are aimed at re-establishing personal contact, checking to see that no one is experiencing unnecessary stress, checking to see whether members are keeping up with their academic work, reviewing the work that has been carried out and providing positive feedback to one another on the progress that has been achieved (Johnson *et al.* 2008). Although numerous other structures for long-term student group could be considered for this purpose, including study teams (Davis 1993) and study groups (Zevenbergen 2004), none of them comprehensively includes the five basic CL elements in their dynamics (Johnson *et al.* 2008; Lubbe 2015). To ensure that the five basic CL elements are in play as a means of providing for an effective form of communication between the facilitator and students, a CBG folder containing certain pre-selected administrative and academic tasks could be drafted to provide support for the cooperative process (Johnson *et al.* 2008). According to Johnson *et al.* (2008), the close relationships between CBG members will result in the group members supporting one another on an academic and personal level. Cooperative efforts amongst CBG members will result in a sense of belonging, acceptance and caring, without which students might harbour feelings of isolation and vulnerability (Johnson *et al.* 2008). The greater the academic and personal support provided within CBGs, the less the group members will perceive situations as being stressful. Johnson and Johnson (1999) believe that the larger the class and the more challenging the subject matter, the more essential the implementation of CBGs becomes.

According to the social-activity theory, interaction between individuals and their social environment results in learning (James 2006; Lantolf & Johnson 2007). Learning in this context can be viewed as a social and

collaborative activity during which thinking is developed in a social environment. In view of this, this research was performed and explored by making use of the social-activity learning theory: learning not only involves participation of students but also aims at leading to distributed cognition (James 2006). The collective knowledge of the CBG can therefore be considered to be greater than the sum of the knowledge contributed by each individual CBG member.

Research method

A mixed-methods approach (Johnson & Onwuegbuzie 2004) was utilised to determine the value of the implementation of CBGs in large first-year classes. This approach is utilised when both qualitative and quantitative data sets are regarded as valuable (Johnson & Onwuegbuzie 2004). Because one set of data was collected and analysed prior to the second dataset, an explanatory sequential follow-up design (Ivankova, Creswell & Stick 2006) was used in this investigation. This two-phased type of mixed-methods design is followed when the qualitative results help explain and clarify the quantitative findings (Ivankova *et al.* 2006). During the quantitative phase, a questionnaire for cooperative base-group perception (CBGP) was administered whereas semi-structured interviews with randomly selected students constituted the qualitative phase of the investigation.

This investigation was conducted at a South African higher-education institution. The target population consisted of first-year students in teacher education. By means of a convenience sample, all first-year LS students in teacher education (N = 89) were selected. The reason for selecting the first-year LS students is that one of the researchers was also the facilitator of the LS module and could therefore ensure the successful

implementation of the CBG intervention. According to McMillan and Schumacher (2006), convenience sampling occurs when the participants are selected on the basis of them being available. Although the use of one class as a unit of analysis limits the generalisability of the results (Creswell 2008), the results were still expected to provide useful information regarding the implementation of CBGs. Extensive verification procedures were used to establish the accuracy of the findings. For instance, the co-researchers, who were not involved in the scheduled LS class meetings audited all research procedures and data analysis. The facilitator administered the community-based growth promotion (CBGP) questionnaire and conducted the semi-structured interviews with seven randomly selected students.

The implementation of cooperative base groups

The implementation of CBGs required the facilitator to take on the following distinct responsibilities.

Planning

Pre-instructional decisions regarding the following aspects had to be planned: the size of each CBG, the composition of each CBG, the way in which students were to be assigned to their groups, documents needed in the CBG folder, ways to ensure the presence of the five basic CL elements as well as the way in which CBGs were to be introduced to the students. By making use of a numbering system, students were randomly assigned to the CBGs. Each group consisted of three or four students. A total of 23 CBGs were formed, of which 20 consisted of four students each and the rest of three students each. Each group had a CBG folder that contained pre-set documentation. These included forms to be

completed by the CBGs regarding the personal information of group members, individual learning contracts, group learning contracts, an attendance sheet, a mark sheet, a group membership grid, a checklist for social skills and a positive feedback form. The personal information form had to be completed by each student during the first CBG meeting. Every week, the students had to share something personal with the rest of their CBG members with the aid of this document. The individual learning contract had to be completed before each study unit began. The students completed this form individually, and after completing a study unit, the students had to reflect on whether or not they reached their individual goals. After the CBG members completed their individual learning contract, the members had to discuss their goals within their CBGs and complete the group-learning contract. After completing a study unit, the CBGs had to reflect on whether or not they had reached their group goals. Group members had to complete the mark sheet within their CBGs by keeping the mark sheet up to date. The mark sheet contained all the CBG members' marks on one document. Every week, the facilitator included an unfinished sentence on the agenda. The sentences were formulated in such a way that, in completing the sentence, students learned more about each other, for example, 'The person I respect the most, is … because …'. The checklist for social skills had to be completed by each student on specified occasions. Students had to tick next to the skill portrayed by each of the other group members. After ticking individually, CBG members had to discuss their checklist within their CBGs in order to reach consensus on which CBG member displayed the different social skills listed. Upon reaching consensus, the group's checklist was completed. The positive feedback form was completed every week by each individual CBG member,

TABLE 6: Methods by which the researcher ensured the presence of the CL elements (Lubbe 2015).

Cooperative learning elements	Ensuring the presence of CL elements within the CBGs
Positive interdependence	• Specific group goals were given to each group in terms of completion time, specific assignments and achievements of the groups, specific roles and tasks of each member • CBG members together had to decide on a group name and motto • Limited resources were given to each group • Self-disclosure and administrative tasks were done as a group • Group contracts were completed as a group
Individual accountability	• Limited resources were given to each group • Group contracts were completed as a group • Groups were small • Tests and examinations were written individually
Face-to-face promotive interaction	• Groups were small • A permanent meeting place was provided
Small-group skills	• Checklist for social skills was completed periodically
Group processing	• Time was allocated for reflection and group processing • Methods were suggested to enable group processing

CL, cooperative learning; CBG, cooperative base groups.

after which it had to be discussed within the CBGs. Table 6 outlines the methods used by the researcher to ensure that all the CL elements were present.

The facilitator was also responsible for setting the agendas for each base-group meeting. These agendas contained the tasks that the groups had to execute during that particular CBG meeting. Agendas included any of the following personal and academic tasks: complete the personal information sheet and also week two's 'share something personal', complete the attendance sheet, make sure the mark sheet is up to date, complete the group membership grid, compile the memorandum of the following activity, discuss the memorandum of …, share possible

resources and advice between one another regarding the following activity. Because each group had only one folder, members were dependent on one another for completing several of the tasks within the folder, thus strengthening positive interdependence and individual accountability.

A scheduled LS class per week was set aside for a CBG session in a venue where there was ample space for students to sit comfortably, facing one another, thereby promoting two-way communication.

A checklist for social skills, which the group members had to complete periodically, was compiled by the facilitator. This list reflected the behaviour and actions associated with the 14 relevant social skills. Each of the base-group members had to tick a box next to the social skill(s) observed in each of the other members in their group.

To ensure that the groups reflected on how well they were functioning as a CBG, the facilitator allocated time for group processing by placing it on the agenda of the CBG meetings. She also took time to read the documentation in each CBG folder, asked appropriate questions and prompted students to reflect on the functioning of their CBG.

Introducing CBGs to the students

Introducing CBGs to the students was an important step. During this introduction, the facilitator explained to students what was expected of them and what they could expect from the facilitator.

Observing and intervening

During each CBG meeting, the facilitator walked amongst the different groups to observe how they interacted. Much effort was put into learning

the names of the students and getting to know them better. This was accomplished by spending a couple of minutes with each CBG during each class. If the facilitator noticed that a group member was absent frequently or that a group was struggling, she had the opportunity to intervene, as a guide on the side, if necessary. The facilitator had an open-door policy, and the groups were free to schedule a meeting if a group felt that they needed help with communication or with a specific group member.

Assessment and evaluation

Apart from assessing the academic support, the facilitator took care to read the documents that the students had completed during each meeting for strengthening personal support. By doing so, the facilitator gained insight into each of the CBGs and came to know the students.

Data-collection procedures and measuring instruments

The CBGP questionnaire consisted of 20 items aimed at establishing the first-year LS students' perception of the CBGs. Students responded to the questionnaire after the implementation of CBGs by means of a four-point Likert-type scale. The frequency distribution and mean scores of the CBGP questionnaire were calculated. The face validity of the CBGP questionnaire was acquired through critical feedback from experts in the field of CL as well as statistical consultation services. A factor analysis was performed by means of principal-component analysis and oblimin rotation with Kaizer Normalization, yielding the following five factors: academic gain, social skills, promotive interaction, responsibility for own academic achievement and 'class-on-the-grass', that is, classes held in gardens when space in

classrooms was lacking. All factors demonstrated good internal reliability. The Cronbach alpha coefficient for factors 1, 2 and 3 were 0.912, 0.861 and 0.718 respectively. A high alpha coefficient is an indication that there is a strong correlation between the different items, and therefore, their internal reliability is high. Guidelines for the interpretation of Cronbach's alpha coefficients are as follows: 0.90 indicates high reliability, 0.80 indicates moderate reliability, and 0.70 is an indication low reliability (Pietersen & Maree 2010). According to the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, this investigation had a value of 0.872. According to Kaiser (1974), values greater than 0.5 can be accepted whilst Hutcheson and Sofroniou (1999) state that values between 0.8 and 0.9 are great. Therefore, the KMO value of 0.872 is an indication that enough data were obtained for factor analysis.

Face-to-face, semi-structured interviews were conducted at the conclusion of the LS module. During the interviews, each of the seven randomly selected students were asked the following four questions:

- Please tell me what the personal support that you may or may not have received within the base groups meant to you?
- Tell me about the degree to which you had the confidence to function within the base groups?
- What was your experience with the folders (How would you change them? Were they valuable? Could the base groups have functioned without them?)?
- Tell me what you think about the value of the base groups, if any?

The third question had follow-up questions aimed at enabling participants to elaborate on their answer. The transcribed interviews were coded with the aid of Atlas.ti (version 7). The results of this analysis are presented and discussed below.

Results

The results of this investigation are discussed on the basis of each of the research questions, the first of which is: What is the first-year LS students' perception of CBGs?

Table 7 below presents the frequency distribution of the students' responses to the CBGP questionnaire. The percentages listed in Table 7 relate to those students who answered the question.

The majority of the responses by first-year LS students to all questions were in the 'somewhat agree' and 'strongly agree' categories (highlighted in Table 2), and an average score of more than 2.5 was obtained on all questions. Although this is an indication of students' highly positive responses regarding CBGs, 26% of students indicated that they did not enjoy being part of a CBG (Item 9). 'Responsibility for own achievement' (Item 13) had the highest mean with a value of 3.87. 'Sharing something personal' (Item 2) and 'More out-of-class meetings' (Item 17) had the lowest mean (2.56) but were still above average on a four-point scale.

Regarding 'Responsibility for own achievement' (Item 13), none of the first-year LS students indicated that they strongly disagreed or disagreed somewhat with this statement. This is an indication that students realised that, although they worked in CBGs, they still had to take primary responsibility for their own achievement.

The items to which the students strongly agreed most were 'Responsibility for own achievement' (Item 13) and 'Respecting others' opinions' (Item 1).

No resistance was observed or sensed when the researcher assigned the students to their groups and explained the implementation process. The facilitator observed the participants' creativity and enthusiasm in coming up with group names and mottos, which also indicated their willingness to

TABLE 7: Frequency distribution of student responses to the questionnaire on perceptions regarding cooperative base groups (Lubbe 2015).

Item no.	Questions	1 (Strongly disagree)		2 (Somewhat disagree)		3 (Somewhat agree)		4 (Strongly agree)		Mean	Std. deviation
		f	%	*f*	%	*f*	%	*f*	%		
1	The base group helped me to respect other persons' opinions	1	2	9	10	23	26	54	62	3.49	0.73
2	Sharing something personal with the group each week has helped me to support my group members	15	17	25	29	32	37	15	17	2.56	0.97
3	Because I was in a base group, I regularly attended LIFE 111 classes	10	11	11	13	32	36	35	40	3.06	0.97
4	Because I shared my marks with the rest of the base group, I wanted to work harder	6	7	6	7	26	30	48	56	3.34	0.89
5	To be part of a base group made me less anxious about LIFE 111	12	14	15	17	24	28	36	41	2.99	1.06
6	Because I was part of a base group, I learned to receive help	3	3	12	14	31	36	41	47	3.26	0.83
7	Because I was part of a base group, I learned to be helpful	3	3	9	11	36	41	39	45	3.29	0.79

Table 7 continues on the next page →

TABLE 7 (Continues...): Frequency distribution of student responses to the questionnaire on perceptions regarding cooperative base groups (Lubbe 2015).

Item no.	Questions	1 (Strongly disagree)		2 (Somewhat disagree)		3 (Somewhat agree)		4 (Strongly agree)		Mean	Std. deviation
		f	%	*f*	%	*f*	%	*f*	%		
8	The base group provided me with academic support	10	12	16	18	30	34	31	36	2.97	0.98
9	I enjoyed being in a base group	10	12	12	14	29	33	36	41	3.06	1.02
10	To be in a base group is valuable	8	9	9	10	35	41	34	40	3.13	0.93
11	Because I was in a base group, I performed better in LIFE 111	7	8	23	27	31	36	25	29	2.81	0.93
12	In our base group, all members always worked together	18	20	17	20	25	29	27	31	2.71	1.12
13	Although I was in a base group, I was still responsible for my own achievement	0		0		12	14	74	86	3.87	0.34
14	To be part of a base group taught me to communicate better	6	7	11	13	36	42	32	38	3.14	0.91
15	Because the base group met weekly, we worked better together	6	7	18	21	29	34	33	38	3.05	0.94

Table 7 continues on the next page →

TABLE 7 (Continues...): Frequency distribution of student responses to the questionnaire on perceptions regarding cooperative base groups (Lubbe 2015).

Item no.	Questions	1 (Strongly disagree)		2 (Somewhat disagree)		3 (Somewhat agree)		4 (Strongly agree)		Mean	Std. deviation
		f	%	*f*	%	*f*	%	*f*	%		
16	By evaluating the effectiveness of the base group, I became more aware of what our group needed in order to function better	3	3	16	19	39	45	28	33	3.09	0.81
17	I feel that our base group must meet more outside of class time	17	20	26	30	23	26	21	24	2.56	1.05
18	The 'class-on-the-grass' was better than gathering in a lecture hall	6	7	12	14	18	21	49	58	3.31	0.96
19	Regularly giving and receiving feedback to the base group members helped me to focus on their positive aspects	5	6	13	15	35	41	33	38	3.12	0.89
20	I learned to handle conflict better because I was part of a base group	9	11	15	17	32	37	30	35	2.97	0.98

be part of CBGs. During the second semester of the year in which the investigation was conducted and after the disbanding of the CBGs, a number of students indicated that they missed the CBGs and wished that other disciplines and subjects would make use of CBGs as well. This observation confirms the perceived positive experience of the participants towards CBGs. The quite positive perception that first-year LS students had of CBGs was supported by the subsequent qualitative results gained from the semi-structured interviews that were held with seven students at the end of the LS module (Lubbe 2015).

The following themes concerning the students' perception of CBGs were identified in an analysis of the interviews: caring and committed relationships, academic value, interdependence, personal value, valuable and enjoyable, social skills, heterogeneity and CBG folder. Each of the identified themes will be discussed in order to demonstrate how students perceived being part of a CBG.

Caring and committed relationships

Students indicated that CBGs enabled friendships amongst group members. It was further indicated that their friendships continued beyond the CBG intervention. Respondent 4 said: 'It was not a base group; it was a group of friends'.

Academic value

Students were positive about the fact that CBGs provided them with academic support, especially before writing a test. They were of the opinion that being part of a CBG kept them calm and facilitated their integration into higher education. Respondent 2 said: 'You arrive as

a first-year student, you are so scared and don't know what to expect, and so it [*CBGs*] basically calmed me'.

The students also indicated that they had learned from one another. Sharing their marks with their CBGs played a role in their motivation and academic achievement. Respondent 3 said: '… we had to make graphs, and it was motivational because now everyone in the group could see your marks, and it motivates you to do better …'.

Interdependence

Students indicated that they felt responsible for their CBG members, that they trusted the other members and that they realised they had to work together in order to master the content. Respondent 7 said that she worked better alone but also indicated that she felt responsible for the other CBG members and that they worked together.

Personal value

Students indicated that they valued the personal support in their CBGs and that they felt comfortable and safe within their CBGs. Respondent 6 said: '[*a*]t least you know that you have somewhere to hide … it helped like … for LIFE [*Life Sciences*], it helped me'.

Respondent 4 said: 'Yes, I enjoyed it. I like group work [*CBGs*] because then I feel that I don't go through stuff alone'.

Various students indicated that they could ask for help within their respective CBGs. Respondent 2 said: 'We were free to ask one another anything in the group. When you didn't understand you could always ask. You felt free, you didn't feel scared or anything'.

Valuable and enjoyable

Students indicated that they enjoyed being part of a CBG and that it helped them personally as well as academically. Respondent 7 however indicated that she did not see the necessity of CBGs. Students pointed out that CBGs were disliked initially, but students also indicated that they valued being part of CBGs and explicitly mentioned that CBGs, as they experienced it, needed no change: 'I didn't like it at first because now you have to meet with new people and Ma'am just gave me like a number and that number was your group. And you like … OK … who are these people, and OK, I was in an awesome group'.

Social skills

Various students indicated that giving and receiving help was an important part of their CBGs. They also indicated that they had accommodated one another within their respective CBGs, with Respondent 4 saying: '… we took one another's opinions into account, which was nice …'

Respondent 7 stated that her CBG did not communicate well and that no one within the CBG had put in any effort to resolve the conflict. This perception was not shared by any of the other students who were interviewed.

Heterogeneity

The diversity brought to each CBG because of the heterogeneous nature of the groups was acknowledged by several students. Respondent 6 said: '[*f*]or me it was very valuable, someone else thinks of something else that you did not think of'.

CBG folder

Students thought that the CBG folder was an important part of CBGs. Although some students indicated that the number of documents within

the folder was daunting, several students stated that the CBG folder aided the development of relationships amongst group members. Respondent 4 said: 'Ok, fine, to be honest, I didn't like the folders [*CBG folder*]. It was just too much paperwork'.

She went on saying, however: '[*I*] think it is a good thing to have students work together [*on the CBG folder*], in that way we got to know each other'.

The participants perceived the CBG folders as a necessity for the optimal functioning of CBGs. Some CBGs re-arranged their CBG folders to meet the needs of their members. This might be an indication of their willingness to take initiative and their enjoyment of being part of the CBG.

It can be concluded, based on the above-mentioned findings of the quantitative and qualitative data, that the first-year LS students perceived being part of a CBG as a valuable and enjoyable experience and of academic and personal value. The students were of the opinion that caring and committed relationships were formed, social skills were developed and interdependence was experienced.

Next, we discuss the contribution of students' perception of CBGs with regards to their SDL skills, thereby dealing with the second research question: To what extent does the first-year LS students' perception of CBGs contribute to their SDL skills?

The following themes were identified from the data concerning the second research question about SDL skills: seeing peers as resources, giving and receiving help, taking initiative for own learning, taking responsibility, social skills and motivation.

Seeing peers as resources

Experiencing academic support (especially before writing a test), learning from fellow CBG members as well as acknowledging each group member's

unique contribution to the CBG are indications that the students recognised their CBG members as resources. Although most students indicated that they learned from their CBG members, Participant 7 stated that she had not seen the CBG members as resources as she preferred to work alone. Even though the majority of students who were interviewed indicated that the uniqueness of each CBG member was used as resource to strengthen the group, some of them said that the use of different languages in their groups was problematic. The students who indicated that language was a problem were Afrikaans-speaking students in CBGs composed of both Afrikaans and English-speaking students. In contrast, a number of students mentioned the value of having both Afrikaans and English-speaking students in the same CBG. An Afrikaans-speaking student (Participant 4) said: 'We spoke Afrikaans with them. They spoke English with us'.

Participant 4 also said that their group could ask for translations from the English group members and that the latter could assist them if required later on. It could be deduced from this that the language composition of some of the groups contributed to enriching the communication skills that are so much needed for self-directedness in learning (Lubbe 2015).

Giving and receiving assistance

Students indicated that they could ask for the assistance of their CBG co-members at any time. Several of them indicated that they valued the fact that they could provide and accept help from their fellow CBG members. Participant 4 said: '[*a*]nytime, we could ask one another any time questions, and … there was no time limit like 12 am lights out, no'.

Taking initiative

Students formed groups on WhatsApp (a communication application for smartphones) to stay in contact. No mode of communication had been specified by the researcher, which means that students took the initiative to form communication platforms in order to stay in touch so that 'everyone could share their thoughts'. The following response is an indication of how participants took initiative in this regard:

> '… we formed the [*WhatsApp*] group on that first day already, and sometimes irritated each other with all the questions that were asked. But we really supported each other. Especially before a test we would ask each other questions … we really supported one another'. (P2)

Taking responsibility

Several students stated that they felt responsible for their CBG members' academic achievement. Participant 2 said: '… we felt obliged to do something because we knew that how is it going to look if I come [*to class*] empty-handed …'.

Social skills

Although it seemed that group members had an initial problem with communication, students succeeded in accommodating one another, and some groups developed good communication systems. Participant 8 said: '[*w*]e didn't experience a lot of conflict, actually never'.

Another student (P7), who stated that her fellow group members did not communicate well, also indicated that none of the group members had to put in any effort into resolving conflict amongst the members.

Motivation

Respondents indicated that the sharing of marks within CBGs motivated students to work even harder and to perform better academically.

In summary, then, the findings revealed the following regarding the role that CBGs played in terms of academic and social support and in promoting SDL in this particular group of students.

Taking into account the aspects of CBGs, the results of the CBGP questionnaire as well as narratives gathered during the interviews, the majority of the students' perceptions of CBGs are predominantly positive, which contributed to an increased motivation for learning. The participants furthermore said that they had attended the LS classes more regularly because they were in CBGs. The improved class attendance amongst first-year LS students might well be attributed to their involvement in CBGs as suggested by Johnson *et al.* (2008).

The students were of the opinion that they had been motivated to work harder because they had to share their marks with the rest of the CBG, and they had to keep track of their own as well as their group's marks. According to Johnson *et al.* (2008), greater intrinsic motivation enables students to take on difficult tasks. It might be that sharing their marks with CBG members on a regular basis by means of the CBG folder motivated students to take on more challenging tasks. This was evident from the questionnaires, the interviews as well as general observations by the researcher.

It is furthermore evident from the qualitative data analysis that one participant did not experience her being part of a CBG positively. This correlates with the quantitative findings, which indicated that 26% of

students did not enjoy being part of a CBG. From the qualitative findings, it is clear that Participant 7 was a very individualistic individual who struggled with effective communication. This might be an indication that more attention could be given to prepare students for effective cooperation within CBGs.

There were clear indications that the participants accepted responsibility for their own learning. Care was taken during the implementation of the CBGs to ensure the presence of individual accountability through, for example, individual test taking. The participants noted that individual accountability could be attributed to the fact that social loafing was prevented, resulting in the participants being stronger individuals in their own right.

Participants stated that being in a CBG enabled them to learn to respect the CBG members' opinions, to give and receive help within their CBGs, to improve their communication skills and to deal with conflict within their CBGs efficiently. Being able to respect the opinion of others, giving and receiving help, good communication skills and conflict management are important interpersonal and small-group skills necessary for high-quality cooperation within a social activity theory (James 2006). Relating collaboratively to peers, seeing peers as resources for diagnosing needs and planning learning as well as being able to give and receive help, all of which necessitates good communication skills, are competencies required by self-directed learners (Guglielmino 1978; Knowles 1975; Warburton & Volet 2012). Heterogeneous cooperative groups assist the development of interpersonal and small-group skills (Jacobs 2013), promoting harmonious intergroup relations, establishing bonds amongst students from a variety of backgrounds and giving students access to a variety of perspectives (Baer 2003; Jacobs 2013). It can therefore be suggested that the

heterogeneous nature of the CBGs within the current research contributed towards participants perceiving their acquisition of interpersonal and small-group skills as positive. These small-group and interpersonal skills enable students to communicate effectively and accept and support each other (Johnson *et al.* 2008), thus enabling CBG members to respect one another's opinions as well as giving and receiving help, both of which are important SDL competencies.

Participants' perception of their increased academic achievement could be the result of their perceived academic and personal support. According to Johnson *et al.* (2008), academic and personal support will result in increased academic achievement, thus confirming this finding.

Participants also reported being able to provide their fellow CBG members with personal support as well having received personal support from their fellow CBG members. The participants were of the opinion that providing personal support was possible because they regularly had to share something personal within their CBGs. The participants increasingly came to know their fellow CBG members on a personal level because they had to complete regular self-disclosure tasks and formed caring relationships with fellow CBG members. CBGs provided group members with a 'base-group culture', enabling each CBG to form a new identity (Lubbe 2015). According to Johnson *et al.* (2008), sharing something personal helps to form caring and dedicated interpersonal relationships.

Discussion

Literature regarding students' perceptions of CBGs is scant. The findings that the students showed positive attitudes towards CBGs, that the CBGs elicited active participation amongst their members and that this method

successfully demonstrated the efficaciousness of the social activity theory lend support to Johnson *et al.* (2008) who state that positive attitudes towards cooperative efforts could be attributed to students' active participation in CL.

The participants' perception of CBGs furthermore contributed to several SDL skills. Seeing peers as resources, giving and receiving help, taking initiative and possessing social skills were the SDL competencies identified, and these are essential characteristics of a self-directed learner. Being able to see fellow CBG members as resources, being able to give and receive help and possessing social skills were skills that students had acquired after having been members of CBGs and are characteristics of SDL (Guglielmino 1978; Knowles 1975; Warburton & Volet 2012). The interviewees remarked that they had been able to share their ideas with the rest of their CBG, that they had been committed to their fellow CBG members' learning and that they had experienced and learned to respect their fellow CBG members' opinions. Participants were able to give and receive help and to develop social skills within their CBGs because positive interpersonal relationships had been formed amongst CBG members (Lubbe 2015). Positive interpersonal relationships are developed when students learn to share their ideas with peers, to be committed to one another's learning and to have respect for one another's opinions. This investigation discovered that caring and committed relationships had been present in the participants' respective CBGs. It is known (cf. Johnson *et al.* 2008) that caring and committed relationships provide academic and personal support, and this research therefore confirms that CBGs contribute to first-year students' academic and personal support.

Being able to take initiative when diagnosing own learning needs, formulating learning goals and identifying resources for learning are

other characteristics of a self-directed learner (Guglielmino 1978). The participants in this study took the initiative, not only in searching for additional resources for learning, but also in making use of additional communication platforms. The students employed additional communication platforms in order to support one another. It can therefore be concluded that CBGs enabled the participants to take the initiative in identifying resources for learning.

The following could be regarded as possible limitations of this investigation. It is unfortunate that the duration of this investigation could not be prolonged; a longer implementation of CBGs might have enriched the data. The investigation could not be extended to the second semester as a different facilitator was allocated for the second-semester module. This change could have had an influence on the research findings as all variables would not have been the same. It is also unfortunate that the study could not be expanded to other first-year modules. Because the first researcher was the facilitator responsible for the first-year LS module only, the expansion of this investigation to other first-year modules was not possible. The fact that a convenience sampling method was used meant that the results obtained cannot be generalised optimally.

Conclusion

The overarching aim of this investigation was to determine the role of student support within CBGs for the purpose of developing SDL skills. The findings of the quantitative research revealed that students indeed perceived CBGs as a valuable tool for providing both academic and personal support to their members. The results derived from this investigation seem to indicate that the increase in social interaction, the learning of social skills to facilitate such interactions as well as the

experience of a sense of belonging contributed to the first-year LS students' feelings of having been academically and personally supported. This conclusion was strengthened by the qualitative research. The qualitative research further showed that CBGs contributed towards specific SDL skills as the implementation of CBGs had an influence on the students' social skills and motivation as well as their ability to give and receive help, see peers as resources and take initiative and responsibility for their own learning.[21]

Chapter 4: Summary

Being successful in the 21st century depends on the ability to communicate effectively, share information and ideas and make use of information in order to solve complicated problems, all of which form part of a self-directed learner's toolkit. The need for self-directed learning skills has been widely researched, well documented and supported as an area of focus from a student's first year at university. In order to adjust to university life, first-year students not only have to deal with academic culture shock but also with the emotional shock of moving to an unfamiliar post-secondary environment. Providing academic and personal support to first-year students, especially in large classes, is therefore essential for students' successful adjustment to all facets of university life. The aim of the research on which this chapter reports was to determine the students' perception of academic and personal support within the cooperative base group (CBG) and whether working in a CBG contributed to the development of

21. Acknowledgement: This work is based on a research project supported by the National Research Foundation (NRF) of South Africa (Grant Number 90387). The grant holder acknowledges that opinions, findings and conclusions or recommendations expressed in any publication generated by the NRF-supported research are those of the author(s) and that the NRF accepts no liability whatsoever in this regard.

self-directed learning skills. This research was undertaken from the perspective of social-activity theory. It was assumed that learning involves students influencing and being influenced through social interaction within an active learning environment. A mixed-methods approach was followed, and data were gathered from a cooperative base-group perception questionnaire as well as from individual interviews. The research involved the first-year life-sciences (LS) students at a South African tertiary institution. The implementation of cooperative base groups was found to have been of value in providing academic and personal support in large first-year classes in that it contributed to the development of self-directed learning skills.

Chapter 5

A self-directed learning approach to large-group teaching: An evaluation

Hennie Steyn, Hannes van der Walt & Charl Wolhuter
North-West University
South Africa

Introduction

In South Africa (as elsewhere), an increased demand for admission to schools, colleges, universities and other institutions of teaching and learning has in the last four decades resulted from the combined effect of population growth, economic growth, the pressures of globalisation and the pressures associated with democratisation. The increase in the numbers of students, in many cases paralleled by a diminishing allocation in public funds for education (government funding in South Africa, as in most countries, is the main source of funding

How to cite: Steyn, H., Van der Walt, H. & Wolhuter, C., 2016, 'A self-directed learning approach to large-group teaching: An evaluation', in E. Mentz & I. Oosthuizen (eds.), *Self-directed learning research*, pp. 129-157, AOSIS, Cape Town. http://dx.doi.org/10.4102/aosis.2016.sdlr14.05

of universities; cf. Wolhuter *et al.* 2010:201, 208), has caused institutions of higher education to resort to teaching and learning strategies that might enable them to deal more effectively with the cost of a greater influx of students. This study focuses on one such strategy used by universities, namely a large-group teaching-learning strategy. In particular, it focuses on the degree to which this strategy gives expression to the tenets of a form of self-directed learning that is couched in and bolstered by the capability theory.

Problem statement

Self-directed learning is a teaching-learning approach that has been in existence for about four decades since the publication of Knowles' book entitled *Self-directed learning: A guide for learners and teachers* in 1975. It has, however, remained somewhat in the background of the development and praxis (theoretical practice) of educational theory for a number of years.[22] The increased participation rate in education, in higher education in particular, and the more recent work of Long *et al.* (2000) have, however, brought self-directed learning and its possibilities centre-stage.

As mentioned, increased student participation has compelled institutions of (higher) learning to explore various other teaching-learning strategies, including strategies that transfer the emphasis from a teacher-centred approach to a more learner-centred approach such as self-directed learning. An instance of such a learner-centred approach came to our attention in the form of a large-group teaching strategy[23] at higher-education level. As will

22. This does not imply that scholarship in this field has ever come to a standstill. A computer search will show that the notion of self-directed learning was kept alive by scholars in all fields of tuition, from the training of engineers to the teaching of teachers and nurses (cf. Merriam 2001:9–12 for a review of the first two decades of scholarship after Knowles' contribution).

23. This concept will be clarified in the section on research method below, and the details of the case will be supplied.

be seen below, this approach to teaching and learning was primarily developed for the pragmatic purpose of educating a large group of students as cost-effectively as possible (that is, for the purpose of obtaining the maximum learning outcomes at the lowest cost, especially in terms of human resources and finances). Closer examination of the praxis associated with this project (as reported in reputable scholarly journals[24]) raised the possibility that, although its aim was basically pragmatic, it might display some of the features of self-directed learning. We decided to subject this particular exemplar of large-group teaching to closer scrutiny to see to what extent it was indeed aligned with the principles of self-directed learning. For purposes of this closer examination, we formulated the research problem as follows:

- To what extent is this particular instance of large-group teaching aligned with the principles of a self-directed learning approach to teaching and learning?

Research method

We first developed a conceptual and theoretical framework in terms of the principles of *self-directed learning*. As will be explained below, since we found self-regulated learning to not yet possess the status of a fully developed theory, we bolstered its central tenets with those of a more mature theory that could reinforce the notion of self-directed learning, namely the *capability theory* as conceived by economist Amartya Sen and legal expert Martha Nussbaum and expounded by other theorists to whom we refer. In the process, we show how the main tenets of the capability approach tie in with those of a self-directed learning approach. This refurbished framework provided us with a set of guidelines on the basis of which we could determine to what extent this particular large-group teaching strategy indeed gave expression to the core ideas of self-directed learning cum capability theory.

24. References are made to these publications in the discussion of the case below.

The next step was to examine the published case study mentioned above, namely a large-group teaching strategy that was followed at North-West University, South Africa (Wolhuter *et al.* 2012). This study was conducted through the lens of a theoretical framework consisting of joint perspectives about the self, directedness and learning provided by self-directed learning and capability theory. In doing so, we hope to contribute to the discourse about self-directed learning as well as to that of the application of capability theory in pedagogical contexts.

In order for this chapter to reach the aim outlined above, we structured it as follows. After stating the research problem and the aim of the chapter, we attend to the exposition of the theoretical framework that formed the normative lens through which we viewed the large-group teaching strategy in question (see the next section). The norms and guidelines formulated in the section where we stipulate the pedagogical implications of self-directed learning as reinforced by capability theory are then applied in an analysis and critique of this particular large-group teaching strategy. In the final section, we draw some conclusions about the extent to which this large-group teaching strategy could be regarded as having embodied the principles as outlined.

Theoretical framework

Research orientation

The argument and conclusions in this chapter are based on a constructivist-interpretivist approach to the problem (Merriam 2009:8–9). The purpose of the application of this approach, as Duffy and Jonassen (1992:3) explain, is to understand the world of human experience by giving meaning to it. We do not go as far as Duffy and Jonassen to say that no meaning exists independently in reality, that all meaning depends on the human being as

meaning-giver. We are convinced that, in some cases, meaning actually exists in the world 'out there' and that the researcher is charged with the task of discovering and formulating such meaning. The purpose of constructivism-interpretivism is, nonetheless, to understand an action that takes place as well as its meaning and purpose (Cohen, Manion & Morrison 2011:17–18). In the research discussed below, the application of constructivism and interpretivism was in turn rooted in a post-post-foundationalist orientation, that is, an epistemological approach that allows the researcher to raise relevant pre-theoretical and theoretical views, convictions and norms as the argument develops (Van der Walt 2014 *passim*; Van der Walt & Steyn 2014:822).

Outline of the selected large-group teaching strategy

As explained, a first step was to find an exemplar of a large-group teaching strategy that had supposedly been followed successfully for a number of years. We were also looking for a strategy, the efficiency and effectiveness of which had been assessed and published in respectable scholarly journals and which was accessible in the public domain. Such an instance was discovered in a case outlined and discussed by Steyn (2010), Steyn and Van der Walt (2014) and Wolhuter *et al.* (2012). The following is an outline of that particular large-group teaching strategy as described in these three publications. The three publications provided the factual material on which we performed the critical appraisal in terms of the core principles of self-directed learning as bolstered by capability theory. Additional sources are invoked along the way for the purpose of filling in the background and context.

Rapidly increased student enrolment is one of the typical characteristics of education in South Africa, as in the rest of the world. Higher education

enrolments worldwide have increased by more than 50% during the first decade of the current millennium, from 94.7 million in 2000 to 142.1 million in 2010. Globally, the gross enrolment ratio for higher education has also increased by more than 50%: from 19% in 2000 to 30% in 2010 (UNESCO 2011). In South Africa, higher-education enrolments have increased from 550 666 in 2000 to 887 346 in 2010 (RSA 2012:38; Wolhuter *et al.* 2010). This increase in numbers at the level of higher education is indicative of the wider student participation that has already occurred in primary as well as secondary education.

The neoliberal economic viewpoint (or 'revolution') has introduced business principles such as the profit motive, efficiency and productivity into institutions of education such as schools, colleges and universities. Increased productivity in education institutions such as schools and universities was also a result of decreased government spending on higher education on a worldwide scale (cf. Wolhuter *et al.* 2010:202, 208). Generally speaking, the term 'productivity' refers to the relationship between input and output – the conversion of input into output. In this study, it means the ratio of output (production of graduates) to input costs (mainly the cost of infrastructure and the salaries of teaching staff). The aim of many education institutions such as universities has become to increase productivity by increasing output (delivery of graduates) whilst at the same time reducing input costs (expenses to maintaining lecturing staff) (Hatry 1978:28–29; Hoxby 2004:219). It is generally accepted that productivity in the South African education system, as in several other national education systems, is not high. This means that the return on investment is not satisfactory (Steyn & Wolhuter 2008:24–30; Wolhuter 2014).

In modern times, technology is often looked upon as a means to raise productivity (Steindel & Stiroh 2001:1). Although it was already remarked

in 1998 that education is one of the few professions that do not largely rely on technology to improve its productivity (Müller 1998:10), the quality of communication to an extent determines the level of effectiveness of education. The vast possibilities of information and communication technology are available for the enrichment of education. Information and communication technology should, however, not be included for its own sake but should always support the quality of teaching and learning. The use of information and communication technology for the teaching of large groups of students can, therefore, only be justified if it is carried out in a manner that is reconcilable with the context – in this case, the characteristics of the education institution, the teachers, the students and the subject being taught.

The case study of a large-group teaching strategy that we examined as a typical example of a multimodal teaching strategy (Dreyer 2005; Garrison & Kanuka 2004:96; Osguthorpe & Graham 2003:227) was developed to meet the challenges related to the increase in class sizes in an attempt to increase the productivity of teaching. Multimodal teaching strategies use more than one mode of teaching. In this case study, besides the lecturer lecturing to the class, other modes of teaching included a study guide, a teaching team (consisting of the lecturer and two graduate students as teaching assistants), the digital book disc, a web platform, group-assignments and group or peer assessment.

In this particular set-up, the class meetings changed from the traditional lecturer-dominated monologue to the following general structure. The students were provided with study guides, a variety of paper-based learning materials, digital book disks (DBDs) and teaching applications (teaching Apps) and access to a web-based learning-management system to guide them in their preparation for each weekly class. The class hour commenced

with students answering ten multiple-choice questions on a computer sheet. That was followed by the lecturer giving an introduction to the topic for the meeting. The introduction was then followed by group assignments. These assignments, after having been peer assessed, were handed back to the original authors for their perusal and reflection, allowing for their comments and questions of clarification regarding the assessment and mark allocation, if necessary. Assessed assignments were then submitted for moderation by the assistant lecturers and for official recording of the marks on the official student-record database (Wolhuter *et al.* 2012:95).

The development of the academic and professional competence that education students are supposed to acquire, including problem-solving skills, formed the focal point of scheduled classes. The focus in these meetings was on the mastery of specific learning outcomes through the communal practice of selected learning activities, based on group work as cooperative learning strategy. A learning-management system in the form of a web-based instrument was used to guide students time-wise and to assist them with supporting information and continuous communication. Email, SMSs and other kinds of 'free' digital message system such as WhatsApp were also used in order to modernise and enrich communication with the students (Steyn & Van der Walt 2014:359).

In courses where this large-group teaching had been implemented, student achievement increased by an average of 15%, compared to achievement levels in the same courses prior to the implementation of the strategy (that is, when the conventional lecturer-centred method of teaching was used) (Steyn & Van der Walt 2014:347). At the same time, cost savings in terms of human resources was 40% as less lecturer time was required, compared to the conventional teaching method (Steyn & Van der Walt 2014:347).

This particular large-group teaching strategy was founded on the understanding that education refers to the planned activities of the teacher to support the students to acquire commonly agreed-upon competence in terms of knowledge, skills and attitudes (Steyn *et al.* 2002:34–35). It meant that the teacher had to be able to provide different types of support in accordance with the anticipated learning activities of a diverse group of students with the aim of empowering them to acquire a certain competence as outcome of the learning activities. This also meant that the students had to be actively involved in the teaching and learning activities. Another motivation for the introduction of the large-group teaching strategy was to find ways by which to lower the cost of assessment. Information and communication technology seemed particularly relevant for this purpose.

This particular large-group teaching strategy was furthermore built on the notion of self-managed interactive learning. This approach intends to empower students to execute the management tasks of planning, organising, leading and controlling in their own learning. In addition to this, students had to be allowed to learn in an active manner, individually as well as in collaboration with one another, in accordance with the unique characteristics of each individual (Mentz 2011:11–12; Schanks 1994:11). Teaching-and-learning principles were taken into consideration in putting together the teaching strategy. For example, the teaching had to be learner-directed, learners had to be able to study in accordance with their individual needs in terms of time and place, visual and auditory information had to be closely linked (in line with cognitive learning theory) and the learners had to be able to form their own understanding of the learning content (in line with the tenets of constructivism).

Besides the measures of productivity discussed above, the success of the large-group teaching strategy was also determined by means of a survey of

the experiences of students (Steyn & Van der Walt 2014; Wolhuter *et al.* 2012). In total, 3600 students from first to fourth year completed a questionnaire, surveying their experiences of the large-group teaching strategy. Approximately 81% of respondents indicated that they preferred the large-group teaching strategy to traditional teaching (Wolhuter *et al.* 2012:99). Follow-up focus-group interviews revealed that the students favoured the large-group teaching strategy because it provided them with different types of support which suited their individual study preferences (Steyn & Van der Walt 2014:361). The rest of the respondents did not support the large-group teaching strategy because they felt insecure when not working under the constant guidance of a teacher.

The e-books on digital video disc served as a means to increase the productivity of class teaching. Short presentations by the lecturer were placed on the digital book disc instead of presenting them in class. The presentations consisted of text pages (visual information) combined with a video (auditory information). The advantage of the digital book discs was that the students could access the presentations when and wherever they needed them. In the questionnaire, 74% of respondents reported that it was important for them to use the digital book discs, 87% expressed the opinion that the use of the digital book discs helped them obtain a better understanding of the learning contents, and 83% reported that they used the digital book discs on a weekly basis (Steyn & Van der Walt 2014:361). Interviews with lecturers that probed their (the lecturers') experience of the method were also conducted. (The published literature does not mention the number of lecturers interviewed.) The lecturers also expressed their satisfaction with the use of the digital book discs because it meant that, instead of presenting a lecture or lesson during the class, they could

focus on promoting the learning activities of students (Steyn & Van der Walt 2014:363).

Assessment in the large-group teaching strategy consisted of class tests (every class commenced with 10 multiple-choice questions, marked electronically), group assignments (peer assessed) and individual assignments and a semester test (both marked by the assistant lecturers) (Wolhuter *et al.* 2012:96–97). As the multiple-choice question tests were electronically marked, the assessment load of the teaching team and hence the cost of teaching was reduced. Seventy-one percent of the respondents supported the use of multiple-choice questions whilst 86% of them agreed that the regular class tests helped them gain an improved understanding of the subject matter (Wolhuter *et al.* 2012:99). During the focus-group discussions, the same positive responses regarding the use of the multiple-choice question in class tests were recorded.

Respondents also indicated that they experienced other elements of the large-group teaching strategy positively. For example, 80% of the students valued the presence and availability of the teaching team (Steyn & Van der Walt 2014:361). In the focus-group interviews, the participants indicated that they found the structure of the class meetings to be positive in that several of the widely recognised learning aspects were fully realised (Steyn & Van der Walt 361–362). They also welcomed the integration of teaching-learning technology with other teaching methods and techniques according to the principles of multi-mode teaching (Steyn & Van der Walt 361–362).

It was clear from the responses of most of the students that they were of the opinion that the large-group teaching strategy helped them improve their academic achievement. This view is confirmed by the 15% increase in

the performance of the cohort compared to the cohorts of previous years when conventional lecture methods were used and other factors were constant (age of students, selection criteria for access to the course, the degree programme, the fact that there was not a corresponding improvement in performance in the university overall, that is, in courses where the conventional lecture method was still in use). The implementation of the large-group teaching strategy was also supported by the tutors involved.

An evaluation of the value of an academic project in terms of mainly measurable cost-benefit efficacy would have been patently reductionist. This project therefore also had to be subjected to a much more encompassing evaluation, for example, with reference to the extent that it was consonant with the tenets of modern-day learning theories. In view of this, we attempted to establish the extent to which this particular large-group teaching strategy, as reported in scholarly publications, also displayed the tenets of self-directed learning.

Self-directed learning:[25] Conceptual clarification

According to Malcolm Knowles (1975:18), one of the pioneers in the field of self-directed learning, self-directed learning in its broadest meaning describes a process in which students take the initiative, with or without the help of others, in (1) diagnosing their own learning needs, (2) formulating learning goals, (3) identifying human and material resources

25. Some readers might need a more exhaustive overview of the scholarship associated with self-directed learning and practice in this section. We nonetheless decided not to include such an overview in this chapter in view of the fact that several of the other chapters in this volume contain such overviews.

for learning, (4) choosing and implementing appropriate learning strategies and (5) evaluating learning outcomes. The emphasis in self-directed learning, according to Knowles, is on 'self' as in self-planning, self-education, self-instruction, self-teaching, self-study, autonomous learning and – as Long (2000:11) indicates – autodidaxy and self-regulated learning. The problem with most of these labels is that they seem to imply learning in isolation, whereas self-directed learning usually takes place in association with various kinds of helpers such as instructors, teachers, tutors, mentors, resource people and peers. There is 'a lot of mutuality amongst a group of self-directed learners', according to Knowles (1975:18). The point is, as Long (2000:13) emphasises, that self-directed learning is characterised by the fact that the learner as an individual is conscious of at least some of the important parts of the learning process and is able to apply self(-consciousness) to those elements for purposes of controlling the process.

Self-directed learning is characterised, according to Long (2000:14 et seq.), by four aspects (to which he refers as conceptualisations). The sociological aspect emphasises the student as individual, but someone who is assisted by mentors, teachers and experts or whoever is recruited to assist the learner in the learning process, persons who are not superordinate to the student. Their influence is limited to their content or skill competence, and they are expendable when they have served their purpose. The second aspect is technique, namely the fact that the learners are humans learning in groups. This aspect is founded upon ideas of a leader, teacher, tutor, mentor or facilitator in designing a format in which learners can effectively direct their learning. A technique which could be considered in this context is small-group discussions in which the groups are provided with very little information or instruction

and are expected to work through various ideas and agendas related to the problem under discussion. Another technique is the learning contract. The third and fourth aspects are the methodological and psychological aspects (as these two are not relevant to the aim of this research, they will not be discussed here).

A comparison of self-directed learning 'theory' with other fully fledged theories reveals that the former is not (yet) a fully developed theory in the sense that it possesses its own unique set of theoretical (scientific) and pre-theoretical (philosophical) precepts in the form of assumptions, convictions and points of departure. In view of this, Fisher, King and Tague (2001) referred to it as a *method* of instruction, and according to Abraham, Upadhya and Ramnarayan (2005:3), it is a *process* in which students take the initiative for their learning. Merriam (2001:8) refers to it as 'a form of study' and 'a type of learning'. Blumberg (2000) follows Candy (1991) in referring to it as a 'model of self-directed learning'. Merriam's (2001) observation at the turn of the century seems to be as valid today as the day she wrote, namely:

> … we have no single answer, no one theory or model of [*adult*] learning that explains all that we know about adult learners, the various contexts where learning takes place, and the process of learning itself. What we do have is a mosaic of theories, models, sets of principles, and explanations that, combined, compose the knowledge base of adult learning. Two important pieces of that mosaic are andragogy and self-directed learning. (p. 3)

As a result of the pre-theoretical and theoretical paucity of self-directed learning, scholars in the field (still) draw perspectives regarding the self from (educational) psychological theory, regarding directedness from the (educational) management sciences and regarding learning from the field of learning theory and epistemology.

An alternative way of escaping from this dilemma of pre-theoretical and theoretical paucity is for scholars and practitioners in the field of self-directed learning to draw from the theoretical perspectives of another, already more developed theory (and hence also from its pre-theory or philosophical assumptions and preconditions), in other words, to join forces with another more mature theory so as to compensate for the apparent theoretical and pre-theoretical shortcomings of self-directed learning. We opted for this alternative by attempting to couple and reinforce the key precepts of self-directed learning with those of capability theory. To show how we did this, we will now delineate the key concepts of the latter and then show how, in our opinion, they could reinforce the precepts of self-directed learning. We then apply the results of this exercise to the selected case of large-group instruction and draw conclusions regarding the extent to which this case of large-group tuition seemed to comply with the tenets of self-directed learning as bolstered by capability theory.

Capability theory: Conceptual clarification

Capability theory is a philosophy of which the major protagonists are economist Amartya Sen and legal expert Martha Nussbaum. It is a philosophy emphasising individual emancipation in the shape of personal choice and freedom. The concept of capability in this philosophy is not the narrow understanding associated with skills such as numeracy or literacy. Capabilities are defined as the functions, opportunities and freedoms people possess to pursue goals they value and to bring about change that is meaningful to them. In an age of criticism against globalisation (at least in its present form) and neo-liberal economics and the impact of these on

education, scholars often grasp at the capability approach as an alternative approach (e.g. Phillips & Schweisfurth 2014:90–91; Rizvi & Lingard 2010:149). Whilst they eulogise the capability approach as a counter-philosophy, the education-wise operationalization thereof, that is, how it could find embodiment in teaching-learning strategies in classrooms and lecture halls, has not yet been worked out in full. This chapter embodies a contribution to that end.

Self-directed learning as bolstered by the capability approach

A close scrutiny of the tenets of self-directed learning and capability theory in pedagogical context reveals that there is a measure of congruence between their core ideas and that they seem to support and reinforce each other mutually. This can be illustrated as follows.

Both self-directed learning and capability theory are concerned with the individual well-being of all stakeholders in the teaching-learning community and hence also with the social arrangements in the classroom, the design of the teaching-learning process and the goals that should be achieved with the learners in terms of the unfolding of their capabilities (cf. Dang 2014:460; Robeyns 2005:94). They both differ from a utility-based approach (that is, an approach that attaches value to the instrumental aspect of education only, for example, as an instrument to produce human capital) and from a resource-based approach (that is, an approach measuring education in terms of input-output or cost-benefit ratios) in that they are both freedom-based (the freedom of individuals to choose is regarded as of the greatest value) (Sen 2010:231; also see Bessant 2014:138; Cockerill 2014:14). Teachers with a self-directed learning cum capability approach will therefore be hesitant to employ teaching aids merely to

help the learners pass a course. Instead, they will rather base their approach on an intuitive idea of a life that is worthy of the dignity of individual learners as human beings (Nussbaum 2000:5) who should be assisted to unfold their potential and who have to be guided, led and enabled to perform as persons in their own right. These teachers see each student's capabilities as attributes of the student as an individual and not as attributes of a collective such as a classroom full of students (Sen 2010:244).

Teachers intent upon employing self-directed learning cum capability-approach principles see their learners' capabilities as opportunities for the learners to reflect, choose and do (Sen 2010:245), and they constantly ask themselves whether the learners have effective opportunities to undertake the actions and activities in which they want to engage and to be who they want to be. These 'beings' and 'doings', which Sen describes as 'functionings', together constitute what makes a life valuable (Dang 2014:461; Robeyns 2005:95). Promoting justice in the classroom or amongst a cohort of learners requires from teachers to ensure that there is freedom for every learner to identify, choose and pursue their own objectives, namely the goods that they value (Bessant 2014:143). Put differently, in the words of Nussbaum (2000:5), these teachers see 'each person [*that is, learner*] as an end'. They provide, as far as possible, freedom and space for all learners to develop optimally in terms of their abilities (Cockerill 2014:16). A large-group teaching strategy rooted in self-directed learning cum capability theory therefore treads the fine line between what is expected by the teacher and the educational authorities behind him or her (such as a Department of Education) and what the learner finds meaningful. Learners' capabilities are developed in this relatively confined space.

Freedom to choose is a central tenet of both self-directed learning and capability theory. The idea of capability is concerned with freedom and opportunities, that is, the ability of people to choose to live different kinds of lives within their reach rather than confining attention only to what may be described as the culmination – or aftermath – of choice (Sen 2010:237) or that which has been achieved through choice. Teachers with a self-directed learning cum capability orientation therefore strive, within the constraints of the contexts of the education system, but also through ingeniously circumnavigating contextual constraints, to allow all learners the freedom and space maximally to explore their own talents and different futures. Students are not expected to merely accept the definitions of others (e.g. their teachers) with regard to what they should be and what they should do with their lives. All students are allowed to live and study in accordance with their true self in terms of gifts, talents and capabilities. All are allowed the freedom to achieve well-being, if the students are to have the opportunities and capabilities to do and be what they value (Bessant 2014:139). These teachers constantly ask: what is needed for this particular student to be free to choose what he or she values? Once that choice has been made, a second-order question arises (Dang 2014:465; Sen 2010:240–241): what does it take to achieve the 'beings and doings' that the individual values?

The application of the self-directed learning cum capability approach as teaching theory requires that the students be supported to make informed choices. In exercising such freedom, the students would learn of the available alternatives, the consequences of each and the paths to achieve them. In such an environment, the students are active choosers who have some say over their studies and not just recipients of information,

guidelines and criticism that others determine they need or ought to value (Gilabert 2013:307).

Cockerill (2014:13–14, 19–20) is quite clear about what the ethical dimension of the self-directed learning cum capability approach might entail:

> Teachers who are oriented towards the self-directed learning cum capability approach assist their students to flourish as engaged actors in the teaching-learning process, capable of making good judgments individually and with others. (n.p.)

Their teaching is underpinned by the notion of a basic shared human capacity of care, affiliation and deliberation which is of intrinsic value and forms an essential part of the moral imperative which the student cohort as a community should work to realise. The students, together with their teacher, become contributors to quality of life in the classroom by fostering a healthy, caring and cohesive community.

Teachers oriented towards a self-directed learning cum capability approach accept that students possess the moral competence and cognitive capabilities to make rational choices. They treat the students in accordance with their needs and things they can do (Bessant 2014:150). The term 'agency' in the capability approach refers to the ability of students to achieve the goals that they value (Dang 2014:464). Teachers afford real opportunities to each student to live the life that the individual learner values and hence chooses, by attending to three sets of 'conversion factors', namely personal (physical conditions, age and gender), social (institutional, cultural and social norms) and environmental (including climate, pollution and facilities) factors. The degree to which available resources in the classroom are applied for the well-being of the student is dependent on how these conversion factors are managed (Dang 2014:462). Teachers of

this persuasion focus on helping each student reach 'agency achievement': to be successful as a person in the pursuit of the totality of his or her considered goals and objectives (Dang 2014:464).

Furthermore, teachers oriented towards a self-directed learning cum capability approach also recognise the social and environmental factors in the teaching-learning environment that might affect students in their functioning. They take into account the influence of societal structures and the concomitant constraints of such structures on the choices that students make to function with or within their capabilities (Robeyns 2005:98, 108, 109). They realise that the options that a student has depend largely on relationships with others and on what others do and allow (Robeyns 2005:108).

According to teachers oriented towards a self-directed learning cum capability approach, all evaluations and policies in a large-group teaching classroom focus on the quality of the students' lives and hence on removing obstacles in their lives so that they can have more freedom to live the kind of lives they value and to do the kind of learning that they have reason to value (Robeyns 2005:94). In short, determining whether a student is living a good life and whether a society or institution such as a classroom is just is evident from the extent to which the people involved in the teaching-learning situation are free to choose between viable alternatives and the degree to which they can pursue the ends they value (Bessant 2014:144).

Having teased out the main tenets of a self-directed learning cum capability approach to teaching-learning, the next step is to determine the extent to which the large-group teaching strategy in this particular case study seem to be consonant with this approach.

☐ Does this particular large-group teaching strategy give expression to the features of self-directed learning as bolstered by the capability approach?

The discussion above yielded the following list of criteria from the self-directed learning cum capability approach with which to evaluate the large-group teaching strategy in question:

- Have the students been allowed to determine their own learning needs?
- Have the students been allowed to formulate their own learning goals and to identify, choose and pursue their own learning objectives?
- Have the students been allowed to identify the relevant human and material learning resources?
- Have the students been allowed to choose the appropriate learning strategies?
- Have the students been allowed to evaluate their own learning outcomes?
- Did the students have the freedom of informed choice?
- Are the students self-consciously aware of the important points of their own learning processes, and have they been allowed to control those processes?
- Have the students been allowed to learn with the help and association of various kinds of helpers and instructors, and do these helpers and instructors comply with the following sub-criteria: do they understand the application of the conversion factors mentioned above, do they treat the learners in accordance with their needs and abilities, did they effectively direct the learning process, were they not superordinate to the learners and were they expendable when having served their purpose?

- Did the students learn in groups?
- Did their learning commence with very little information, and were they allowed and inspired to search for new knowledge and to explore various sources and ideas?
- Were distance-learning techniques applied, such as information and communication technology?
- Did the metacognition of the students come into play in the learning process?
- Were the students intrinsically motivated to learn?
- To what extent did self-regulated learning take place?
- Did the students achieve agency, competence, control and confidence?
- Was the learning process focussed on developing the capabilities of the students and not just on them passing the course?
- Was the entire learning process focussed on enhancing the well-being, dignity and quality of life of each individual and group?
- Did the large-group training project tread the fine line between what is expected to be taught (as formulated in a prescribed curriculum) and what the learners found meaningful?

The following discussion contains our findings regarding whether the large-group teaching strategy described above complied with these criteria. The phrases in italics reflect the extent to which we thought that the large-group training project complied with the criteria listed above.

We, firstly, deduced from the exposition above that the teaching strategy for self-managed interactive learning (Steyn 2010) that formed the basis of the question concerning the large-group teaching strategy was intent upon addressing the learning needs of students in large classes at tertiary level.

The large-group teaching strategy also clearly focused on aspects of the 'self' of the learners, which is one of the characteristics of self-directed learning (Long 2000:11). From the literature about this particular large-group teaching strategy (as described above), we concluded that all students were allowed and encouraged to become independent learners, and all were expected to take responsibility for managing their own learning and to plan, organise, guide and control their learning process in order to realise the expected results of their own learning. What complicated matters, however, was the fact that the students had to comply with the requirements of a nationally recognised qualification and the concomitant quality-assurance measures. The students could therefore not be allowed to determine their own learning outcomes in a completely free way. Such ideal situation (of students being completely free to determine their own learning outcomes) does not exist anywhere, not even in extreme cases such as A.S. Neill's Summerhill School or Ivan Illich's teaching-learning organisations. In this case study, students were allowed to determine for themselves the extent to which they found the stated outcomes of the learning process (and the learning module) meaningful. They were also allowed to determine for themselves the manner in which they would go about reaching the outcomes (Steyn 2010). As stated in the criteria above, this enabled them to *tread the fine line* between what each individual student wished to achieve and what was expected of each of them in terms of complying with the requirements of a nationally recognised qualification.

The large-group teaching strategy also fulfilled the two other criteria of self-directed learning cum capability theory, namely the emphasis on individual responsibility to learn combined with the opportunity of receiving support from lecturers, teaching assistants and co-students in the learning process (Mentz 2011:11–12). The students were supported by

their lecturers and the teaching assistants during classes. After class, individuals received support as and when required.

The support given by the team was highly valued by the students involved in the large-group teaching strategy as can be observed from the responses to the relevant items of the questionnaire completed after the learning process. Eighty percent of the respondents declared that they had found the assistance of the teaching team to be of great value.

The *group work* that was carried out in class also tied in with the criteria of the self-directed learning cum capability approach. According to the research feedback as reported in the article 85% of respondents approved of the group-work component in the strategy (Steyn & Van der Walt 2014:361). This was corroborated by comments made in the follow-up interviews by Steyn and Van der Walt (2014). The group-work assessments as well as the class tests provided learners with many opportunities to make informed choices about what to learn and how to master the subject material. It also allowed them to *test their choices* during qualitative and quantitative assessment and the feedback on the assessments (Gilabert 2013:307).

Also in line with the principles of a self-directed learning cum capability approach (Long 2000:15), the large-group teaching strategy made use of integrated technology for the purpose of enabling the students to learn when and where they wished to (Steyn 2010). Technology was not employed merely for the sake of technology itself. It served an auxiliary purpose in that it formed part of a clearly formulated teaching strategy aimed at providing quality teaching (Young 2004:1). The stimulation flowing from the application of appropriate technology increased the levels of both the extrinsic and intrinsic motivation of the students. This could be linked to the use of sophisticated technology that has become an inherent part of the world of 21st-century students. The students' interest

in the learning material seemed to be piqued by the application of suitable technology, that is, technology with which they are familiar and which they use in their everyday academic and social lives. According to feedback as reported in the published article (Steyn & Van der Walt 2014:361) the students particularly attached value to the fact that they could repeatedly consult the digital book disc as it gave them a sense of being in control, of being able to prove their competence and of becoming more confident during the learning activities. Hence, they felt more in charge of their learning outcomes. Nearly three-quarters of all respondents (74%) regarded the digital book disc as an important technological learning aid whilst 87% of respondents declared that the digital book disc helped them obtain a better understanding of the learning material and outcomes (Steyn & Van der Walt 2014:361). The qualitative feedback during focus-group interviews lent support to these results. One participant stated 'The use of the digital book disc is tantamount to taking your lecturer home for support and explanations whilst you are studying'.

Another said that she found it valuable that she '… could pause and rewind the lecturer …', and yet another student stated that she '… watch [*ed*] the digital book disc when washing the dishes …', which is indicative of the fact that the digital book disc could also be used for auditory learning (Steyn & Van Walt 2014:361). It is clear from the above that this large-group teaching strategy was in line with the relevant criterion of the self-directed learning cum capability approach regarding the application of technology in the teaching-learning process.

Access to the learning-management system, an internet-based information system through which important learning content and other relevant information was made available, was likewise received positively by the vast majority of the learners. Over 80% of students responded

favourably to each of the three items in the questionnaire that were probing their experience of the learning-management system. They indicated that they found it necessary to use the system on a regular basis, that they needed the information provided in the learning-management system to meet the demands of mastering the learning content and that they did not find it difficult to use the learning-management system (Steyn & Van der Walt 2014:362). The aim with using the learning-management system (cf. Robeyns 2005:94; Sen 2010:231) was to respect the well-being, dignity, autonomy and quality of life of all the stakeholders, particularly those of the students. The development of a healthy, caring and cohesive learning community was encouraged as envisaged in a self-directed learning cum capability approach orientation to teaching and learning (Cockerill 2014:13–20).

By providing each student with sufficient opportunities to manage their own learning regarding place and time (choosing, for example, where and when to study the digital book disc) and to develop their own understanding (through, for example, the group work together with opportunities to reflect on the work) and insight of their own and others' work during the peer assessment and reflection phase, the large-group teaching strategy corresponded with the claim of the self-directed learning cum capability approach that learners should be able to reflect, choose and do (Sen 2010:245).

In addition to the fact that this particular large-group teaching strategy seems, in general, to be aligned with the criteria emanating from the self-directed learning cum capability theory, our evaluation revealed that it also displays other theoretical points of departure. It displays, for example, aspects of cognitive learning theory in that it aims to provide for the integration of the visual and auditory paths of acquisitioning information. It also provides opportunities for concept formation in accordance with

the interpretivist-constructivist approach where it is assumed that students should be supported to attain their own unique understanding of the learning content. It also leaves room for the different learning styles of students by noting how they combine visual and auditory learning styles. It furthermore attempts to lower the cost of teaching and learning (in terms of lecturer costs, as explained above) whilst intent on adhering to all the principles of sound teaching and quality improvement.

The following two points of criticism against this large-group teaching strategy seem to militate against a conclusion that it is fully aligned with the principles of the self-directed learning cum capability approach.

Although the large-group teaching strategy correctly takes the achievement levels of the learners as an indicator of success (although this cannot be the only or even the main indicator to measure the success of a teaching-learning approach), its achievement indicators are essentially rooted in the directives of the education system and hence prescribed by other parties (Departments of Basic and Higher Education) rather than by the learners themselves.

The objectives of the large-group teaching strategy furthermore seem to have been based upon a rather narrow conception of the aims of education in that it refer, according to descriptions in literature, to academic achievement only. Education has (or ideally should have) more noble and wide-reaching (*paideia*) aims and should not be reduced to academic achievement only. In fact, to see academic achievement as the (main) objective of education is to miss the whole point of education (cf. Steyn 2014). Dore's (1976) concept of 'the diploma disease in modern society' refers to this problem, namely 'credentialism'. This problem entails the pursuit of education in order to obtain a qualification as a passport to a good income and life rather than to achieve character formation and

serving society by, for example, the creation of social capital by means of education.

Conclusion

In the current age where the principles of neo-liberal economics (such as efficiency, performativity and the profit-motive) prevail, education practitioners (teachers and lecturers) find themselves with the dilemma of, on the one hand, being forced to do more (attain better results) with less (resources) whilst, on the other, they are being challenged by modern-day teaching-learning theories such as self-directed learning and philosophies such as capability theory to attend to a greater extent to the needs, goals and objectives of individual learners for the sake of enhancing their (the students') personal well-being and improving the quality of their lives. The discussion in this chapter revealed that this particular large-group teaching strategy made it possible to pursue both these ends, namely the pursuit of a cost-efficient teaching-learning strategy combined with the realisation of the precepts of self-directed learning bolstered by those of capability theory. Educators have to be aware of the fact, however, that a large-group teaching strategy based on a self-directed learning cum capability theory orientation should always be guided by a conception of education in the most profound – *paideia* [the formation of the soul and character of each student (learner) as framed by the social objectives of education].

Chapter 5: Summary

This chapter contains an evaluation of an innovative, large-group, teaching project developed and applied over a few years at a university as part of

the university's effort to improve student performance whilst at the same time attempting to limit financial expenses in terms of staff and resources. The purpose of the evaluation was to determine whether, in attempting to meet these two aims, this exemplar of a large-group teaching strategy also succeeded in reflecting the main features of and meeting with the requirements of self-directed learning. After applying a set of criteria flowing from the notion of self-directed learning bolstered by capability theory, it is concluded that, whilst the verdict is positive, generally speaking, the project seems to fall short on two counts: it seems to have failed to account for education in the fullest (*paideia*) meaning of the word and to do justice to the social objectives of education.

Chapter 6

Geography student tutors' facilitative skills in a problem-based learning environment

Aubrey Golightly
North-West University
South Africa

Introduction

Teacher-education institutions are entrusted with providing student teachers with high-quality pre-service initial training. One of the important roles of lecturers in geography education is to introduce student teachers to the implementation of learner-centred pedagogies in their classrooms so as to assist their learners in developing the knowledge and skills necessary for the 21st century. This is precisely the reason why fourth-year geography

How to cite: Golightly, A., 2016, 'Geography student tutors' facilitative skills in a problem-based learning environment', in E. Mentz & I. Oosthuizen (eds.), *Self-directed learning research*, pp. 158-183, AOSIS, Cape Town. http://dx.doi.org/10.4102/aosis.2016.sdlr14.06

students were employed as student tutors in problem-based learning environments. In this way, these students were given knowledge and skills about facilitating small-group learning. In these learner-centred environments, the learner is placed at the centre of the teaching and learning process, and the teacher has to guide and facilitate this learning process (Vavrus, Thomas & Bartlett 2011). Literature in a South African context indicates that teacher-centred instruction is still the dominant approach in most classrooms (Grosser & De Waal 2008; Mtika & Gates 2010; Rambuda & Fraser 2004; Vavrus *et al.* 2011; Warnich & Meyer 2013). Schulze (2003) points out that formal education in South Africa has for many years consisted of teaching via rote learning and according to certain subject requirements. Heritage and Thomas (2006) state that the skills required to successfully facilitate student-centred learning are very different to those required for more traditional lecturer-centred approaches. Some of the most important skills are mentioned in the 'Teacher Feedback Questionnaire', compiled by Dolmans *et al.* (2003).

With reference to the implementation of learner-centred pedagogies, Russel (1999) emphasises that, for real change to occur in schools, these changes must first occur in teacher education. It is therefore important that lecturers and student teachers understand the theories and methods associated with learner-centred pedagogies as teachers' pedagogical skills significantly affect learners' learning and the acquisition of higher-order skills (Vavrus *et al.* 2011). It is understandable that Grosser and De Waal (2008) recommend that student teachers' mediation and facilitation skills be developed in the teacher-training programmes of South African education institutions. Therefore, I decided to involve fourth-year students in geography education in the subject-didactic module in a B.Ed. programme to act as student tutors in tutorial sessions for problem-based learning for first and second-year students in geography education.

The purpose of this study was to explore and differentiate the way in which geography tutors rate themselves as far as their facilitation skills are concerned compared to the way in which first and second-year students rate those tutors' facilitation skills in PBL tutorial sessions. In the literature, it is pointed out that the tutor's gender as well as the subject knowledge of the tutor can play a role in the facilitation of learning in PBL (Batarfi & Bin-Gouth 2007; Fletcher, Jordan & Miller 2000; Kassab *et al.* 2005). It was therefore decided to explore, in this study, the differences in student tutors' facilitative skills according to their gender and academic performance in geography. To reach the abovementioned goals, the remainder of this chapter is structured as follows: a conceptual and theoretical framework is outlined. This is followed by an exposition of the research method that was applied. The results are then reported, followed by a discussion in view of the conceptual and theoretical framework. The chapter concludes with several recommendations.

Conceptual-theoretical framework

This study is founded on the social-constructivist learning theory. Social constructivism functions on the premise that the construction of individual meaning always occurs within social context as learning activities are socially and contextually bound (Gravett 2001; Njenga 2014). Learners should play an active role in constructing knowledge as learning is collaborative and learners learn from teachers and fellow learners (Woolfolk 2007:481). Doolittle and Hicks (2003) point out that, in a social-constructivist learning environment, the teacher facilitates the interaction between the individual and the environment in learners' knowledge-construction processes which are embedded in a particular context. The teacher's role is to create experiences within which learners will learn and then guide the learners through those experiences. Social constructivists

believe that learners should deal with complex real-life situations. Learners must therefore engage in meaningful, problem-based activities (Collins, Brown & Holum 1991).

The education system in South Africa emphasises learner-centred education (South Africa 2003, 2010), which, according to Van Harmelen (1999), is based on the social-constructivist approach to teaching and learning. This format was prescribed by the South African government, more specifically the South African Qualification Authorities (SAQA), in the form of educational outcomes. This was reiterated with the implementation of the new Curriculum and Assessment Policy Statements (CAPS) for Social Sciences (Grade R to 9) and Geography (Grade 10 to 12) in 2011. In the Specific Aims for Geography, it is clearly stated that learners must be able to work effectively as members of a team or as individuals (South Africa 2011). This implies, amongst others, that South African teachers have to base their teaching on constructivist and social-constructivist principles that will provide learners with the opportunity to develop as problem-solvers and thinkers. In this learning environment, Aldridge, Frazer and Sebela (2004) emphasise that teachers, as facilitators in their own classrooms, have to use a range of instructional strategies such as cooperative learning, experiential learning, inquiry or investigation, direct instruction, deductive and inductive learning, problem-solving and problem-based learning.

Against this background, it was decided to implement PBL experiences in the traditional first and second-year geography education curriculum and use fourth-year geography students to act as tutors during the PBL tutorial session in a BEd programme. PBL learning as a learning strategy stimulates students to learn through engagement with a real problem and enhances democratic ways of negotiating and interacting within student

teams and between students and tutors (Du, Stentoft & Dahms 2007). Park and Ertmer (2008) find that student teachers in a PBL group change their intended practices in teaching, learning and technology to a learner-centred pedagogy more readily than the control group. It is therefore important to briefly discuss PBL as a teaching-and-learning strategy in teacher education and to highlight the role of the tutor in the PBL environment.

Problem-based learning and geography teacher training

Compared to other professional fields, PBL has had little impact on teacher education (Hmelo-Silver 2004). Kwan (2008) confirms that little has been done in the related field of initial teacher education. She points out that problem-solving using authentic problems and scenarios seems to be the more sensible direction to take to prepare young professional teachers. Pawson *et al.* (2006) confirm this and point out that '… there is little information available regarding the scope of use of PBL and PBL hybrids in Geography courses and curricula'. Only a few studies (Van Loggerenberg-Hattingh 2000; Golightly & Muniz 2013; Golightly & Raath 2015) could be found on the implementation and integration of PBL in existing teacher-training programmes within a South African context. As a result of this shortage of literature in geography and geography education regarding the implementation of PBL and tutors' facilitation of the PBL process, it is necessary to refer to studies and findings in other disciplines such as medicine, pharmacy and engineering.

PBL process

In PBL, real problems form the focus of the learning experience (Major & Palmer 2001). The facilitator should formulate a problem based on desired module outcomes, student characteristics and compelling problematic

situations from the real world (Fournier 2002). The students are organised into small tutorial groups where the students learn collaboratively by sharing their newly-acquired knowledge (Dolmans *et al.* 2001). The students begin to work on the problem and re-conceptualise their problem into more specific learning issues. These learning issues are then conceptualised into different learning tasks and delegated to different team members who have to do individual self-study. Using library resources, articles, text books as well as field-studies tools, techniques and procedures, they argue and debate to find answers to and perspectives on their problems and learning needs. Everyone returns to the next tutorial with new information to share, peer teach and work on the problem together (Lam 2009). After the students have discussed and analysed the problem in their separate tutorial groups, they develop a resolution or response to the problem (Tick 2007).

The role of the tutor in PBL

It is clear that PBL as teaching-and-learning strategy requires a different kind of educator (Maudsley 1999) – or at least a change in teaching practice. Tick (2007) and Das *et al.* (2002) point out that the tutor in PBL tutorial sessions is not an instructor but a cognitive trainer, a coach who facilitates the process of active learning by students and fosters skills of critical and self-directed learning. Groves, Rego and O'Rourke (2005) therefore emphasise that it is important that the tutor allow students to take responsibility for identifying and addressing their own learning needs. Tutors are required to facilitate this rather than adopting the position of content experts. Tutors are not passive observers; they must be active and directive about the learning process to ensure that the group stays on target and makes reasonable choices on what issues to study (Donnelly & Fitzmaurice 2005).

In PBL tutorials, one tutor works with one group of students to facilitate the learning process. Initially, the tutors take a more active role as students learn how to identify learning issues arising from the 'problems' and how to set goals and objectives. The tutors assist students in understanding the objectives of each theme, identifying learning resources and collecting information using a variety of resources. They have to be aware of the students' learning needs in order to stimulate learning and encourage their efforts and contributions (Das *et al.* 2002). Tutors evaluate the progress and monitor the extent to which each group member contributes to the group's work. They should engage actively with the students in didactic conversations and provide appropriate scaffolding by asking questions, pushing for explanations, checking for consensus, making suggestions and clarifying matters where necessary (Moore & Kain 2011). Maudsley (2002) emphasises that an effective PBL tutor knows how and when to intervene. The tutors should demonstrate interpersonal actions to stimulate an adequate effective learning environment amongst students (Dolmans *et al.* 2003). Roux (2009) states that tutors' continuous support is important but recommends that the tutor's approach should foster independence and critical thinking, rather than dependence on the tutor, and the creation of shared knowledge. From the literature, it is clear that implementing effective tutoring is a challenge. Tutors must therefore be trained for the task and exposed to practical situations.

Empirical investigation

Research design

In this one-shot experimental case study, the fourth-year geography-student tutors rated their own facilitative skills after which the first and second-year geography-education students rated their respective tutors'

facilitative skills in PBL tutorial sessions (Leedy & Ormrod 2001:234). The quantitative data originated from a structured standardized questionnaire survey conducted at the end of the PBL learning experiences (six weeks). A survey is particularly suitable in quantitative research to collect data regarding respondents' personal views, opinions and experiences to determine the particular status of a phenomenon in relation to the research problem (Creswell 2009:177).

The evaluation method

Several evaluation questionnaires that measure key aspects of tutors' performance in PBL have been described in literature (De Grave, Dolmans & Van der Vleuten 1999; Dolmans *et al*, 2003; Leung, Lue & Lee 2003). For the purpose of this study, the questionnaire of Dolmans *et al.* (2003) was used. It is based on the theoretical notions underlying contemporary constructivist approaches to learning and instruction on which PBL is based. Common principles utilized by constructivists include active or constructive learning, self-directed learning, contextual learning and collaborative learning (Goh 2014). The specific questionnaire has been validated and implemented in several PBL curricula. Therefore, the results of this study can be compared to other studies where tutors facilitated PBL tutorial sessions.

The tutors (n = 27) as well as the first and second-year geography students (n = 145) completed the standardised 'Teacher Feedback Questionnaire' after they had finished the PBL experience. The respondents had to specify the tutors' behavioural characteristics with regard to facilitating and guiding small groups in PBL tutorials. The questionnaire contained 21 statements underlying five different factors: constructive learning (five items), self-directed learning (three items), contextual learning (four items), collaborative learning (four items) and the teacher's

interpersonal behaviour (five items). The respondents had to indicate to what extent they agreed with each statement on a scale from 1 to 5 (1 = fully disagree to 5 = fully agree) (Dolmans *et al.* 2003).

A novelty of the study was that the instrument was used in a teacher-training programme in a South African context and that the geography-student tutors as well as the geography-education students completed the questionnaire. The results indicate that the internal consistency per factor was higher for the geography-education students than for tutors (see Table 8). A possible reason for the lower Cronbach alpha value could be the tutors' small sample size (n = 27). The results, especially regarding the students, compare well with the coefficient Cronbach alpha of a comparable study by Dolmans *et al.* (2003) that was computed for each factor for the total instrument.

Statistical analysis

In this research, I compared the perceptions that geography-student tutors and student teachers formed of the tutors' facilitative skills. The practical significance of the difference between the perceptions of geography-student tutors and student teachers of the tutors' facilitative skills was calculated with Cohen's d-values. Practical significance indicates whether the differences are large enough to have an effect in practice

TABLE 8: Cronbach alpha values of tutors and students for the factors of the questionnaire.

Factors	Cronbach alpha coefficient	
	Tutors	Students
Constructive learning	0.65	0.88
Self-directed learning	0.62	0.75
Contextual learning	0.76	0.83
Collaborative learning	0.57	0.87
Tutor's interpersonal behaviour	0.81	0.87

(Ellis & Steyn 2003). The following guidelines for the interpretation of the practical significance of results (*d*-value) were used (Cohen 1988): small effect: $d \leq 0.2$; medium effect: $d > 0.2 - < 0.8$ = medium effect; and $d \geq 0.8$ large effect).

In the study, hierarchical linear models (HLM) were applied to analyse differences in quantitative data. In these analyses, HLM group membership is used as primary unit of measurement so that the opinions of student teachers in a group can be compared to their own tutor's opinions. An unstructured covariance matrix was used to analyse difference where the *p*-value ($p < 0.05$) is an indication of statistical significance (Ellis & Steyn 2003; Cramer & Howitt 2004).

Respondents

The geography tutors ($n = 27$) consisted of fourth-year undergraduate BEd students in geography education at a university in South Africa. The tutors' ages ranged between 22 and 23 years, and the group comprised 10 male and 17 female geography students. The rationale for using fourth-year geography-student teachers in this study was that, in the fourth-year module geography didactics, emphasis is placed on learner-centred pedagogies, including the facilitation of cooperative learning environments and group work. These student teachers were also involved as students in a PBL experience in their third-year geography module, namely Population and Urban Geography. Their involvement as tutors in the PBL tutorial sessions gave them the opportunity to put theory into practice. All the student tutors, except for one, were Afrikaans-speaking. Afrikaans, the medium of instruction at the university, is one of the official languages of South Africa and the home language of most of the respondents.

All the first and second-year students in geography education (n = 145) formed part of the embedded PBL experiences and evaluated the tutors' facilitative skills during the PBL tutorials. In total, 57 male and 88 female students took part in the study.

Study contexts

The on-campus, fourth-year, geography-education students acted as tutors for the first and second-year geography-education students during the PBL tutorials, which lasted for six weeks. These fourth-year students were involved in previous PBL experiences as part of their training to be tutors in the PBL tutorial sessions. In their third year, these student tutors were also involved in PBL activities as students in the module on Population and Urban Geography. In the fourth year, as preparation, the students were also involved in a PBL activity where, as future geography teachers, they had to offer solutions to teachers who were struggling to act as facilitators or tutors in PBL tutorial sessions. The different PBL groups therefore focused in particular on facilitation skills which a successful PBL tutor has to possess. In both the abovementioned PBL activities, the geography lecturer acted as facilitator. Nesargikar (2010) states that prior exposure to PBL can assist a tutor in facilitating PBL tutorials. Fourth-year students in geography education also received training in the didactics of geography in the form of a 3-hour workshop about the role of tutors in PBL tutorials and, as recommended by Hendry (2009), worked through various journal articles about effective small-group facilitation. Special reference was made to Azer's article (Azer 2005) in which the author discusses the challenges facing PBL tutors and gives tips for successful group facilitation. Some of the important tips mentioned to the tutors include: discuss with your group the different roles they may play, promote

group dynamics, build trust and encourage bonding of group members, do not dominate the group discussion as a tutor but rather facilitate the process, encourage understanding and provide positive feedback.

During the ensuing PBL experiences, the first and second-year students in geography education had three weeks per module to formulate solutions to the stated problems. They also participated in two scheduled PBL tutorial sessions per week (each tutorial comprising 90 minutes) to assimilate information and undertake group work in order to present solutions to problems. The themes of the PBL experiences integrated in the geography modules in the first two years of the BEd programme are presented in Table 9.

Ethical considerations

This study took place within the PBL sub-project as part of the project on Self-directed Learning (SDL) at the university. The SDL project

TABLE 9: Geography modules and PBL experiences in the BEd programme.

Module code	Module name	PBL theme
GEOE 111	Physical, economic, and population background of Africa and South Africa	Water management and the use of local authorities and households
GEOE 121	Planetary geography, Climatology and Oceanography	Planning of social-constructivist learning activities for school learners with reference to the following geography topics: axis rotation and revolution of the earth, insolation differences on earth, the origin of seasons and time calculations on earth
GEOE 211	Urban and Economic Geography	Agricultural-land reform in South Africa
GEOE 221	Geomorphology and Environmental Geography	Water quality of the Mooi River in the Potchefstroom area

PBL, problem-based learning.

complied with all the ethical regulations of the university and was approved by the university's ethics committee. The respondents had to give written consent for the information they provided to be used in this study. Participation was voluntary, and any respondent could withdraw at any time.

Results

In the following section, specific reference is made to the geography tutors' and students' evaluation of the tutors' facilitative skills in the PBL tutorial sessions. The differences between the two groups' perceptions of the tutors' facilitative skills are also highlighted. The differences relating to the students' gender as well as their perceptions about tutors' facilitative skills according to the latter's gender and academic performance in geography are also discussed.

Perceptions of tutors' facilitation skills

The mean scores and standard deviation for each factor and the items are indicated in Table 3. Despite the fact that the role of the tutors was complex, sophisticated and different from what they had experienced in their training on campus and their work-integrated experiences at schools in South Africa, the geography-student tutors received average to high scores regarding all the factors pertaining to their facilitative skills. In the five factors measured, the tutors themselves as well as students gave the highest average scores to tutors stimulating self-directed learning (mean scores of 4.09 and 4.10) and the lowest scores to tutors stimulating contextual learning (mean scores of 3.61 and 3.62).

According to Table 10, the tutors and students indicated that the student tutors possessed the highest skills in the facilitation of self-directed

TABLE 10: Tutors' and students' perceptions of tutors' facilitative skills.

facilitative skills	Factors	$\ddot{X}$		MSE.	p	d
		Tutors (n = 27)	Students (n = 145)			
Constructive learning	The tutor stimulated us to ...					
	Search for explanations during discussion.	3.96	4.01			
	Summarise what we had learned in our own words.	3.81	3.87			
	Search for links between issues discussed in the tutorial group.	3.78	3.88			
	Understand underlying mechanisms/theories.	3.48	3.82			
	Pay attention to contradictory explanations.	3.70	3.94			
	Average	3.74	3.90	0.30	< 0.17	0.53*
Self-directed learning	The tutor stimulated us to					
	Generate clear learning issues (research objectives) by ourselves.	4.07	4.09			
	Search for various resources by ourselves.	4.33	4.24			
	Evaluate our understanding of the subject matter by ourselves.	3.89	3.85			
	Average	4.09	4.10	0.31	< 0.75	0.12
Contextual learning	The tutor stimulated us to					
	Apply knowledge to the problem discussed.	4.11	3.95			
	Apply knowledge to other situations/problems.	3.67	3.69			
	Ask sophisticated questions.	3.22	3.35			
	Reconsider earlier explanations.	3.44	3.50			
	Average	3.61	3.62	0.36	< 0.94	0.03

Table 10 continues on the next page →

TABLE 10 (Continues ...): Tutors' and students' perceptions of tutors' facilitative skills.

facilitative skills	Factors	$\ddot{X}$		MSE.	p	d
		Tutors (n = 27)	Students (n = 145)			
Collaborative learning	The tutor stimulated us to					
	Think about strengths and weaknesses concerning our function in the tutorial group.	3.52	3.58			
	Give constructive feedback about our group work.	3.93	3.76			
	Evaluate our group cooperation regularly.	3.59	3.82			
	Arrange meetings with him/her to discuss how to improve our functioning as a group.	3.63	3.91			
	Average	3.67	3.77	0.43	< 0.48	0.23*
Tutor's interpersonal behaviour	The tutor had a clear picture about his/her strengths/weaknesses as a facilitator.	3.63	3.71			
	The tutor was willing to accept feedback from students.	4.07	3.98			
	The tutor was clearly motivated to fulfil the role of facilitating small group learning.	3.93	3.95			
	The tutor was clearly able to recognise students' problems.	3.85	3.79			
	The tutor showed commitment to the students in the tutorial group.	4.19	4.01			
	Average	3.93	3.89	0.35	< 0.71	0.13

$d \leq 0.2$ = small effect; *, > 0.2 – < 0.8 = medium effect; and **, ≥ 0.8 large effect.
$p > 0.05$ indicates no difference between the groups.

learning in the PBL tutorial session. It is interesting to note that the same items in four of the five factors received the highest and the lowest mean scores from both the tutors and the students. The tutors and students scored the item in self-directed learning, 'The tutor stimulates us to search for various resources by ourselves', with a mean of 4.33 and 4.24 respectively. Other items that received high scores include 'The tutor showed commitment to the students in the tutorial group' (Tutor's personal behaviour) as well as 'The tutor stimulated us to apply knowledge to the problem discussed' (Contextual knowledge). The lowest-scored item, 'The tutor stimulated us to ask sophisticated questions', received a mean of 3.22 and 3.35 (Table 10) respectively.

Table 10 summarises the difference between tutors' and students' perceptions of the different factors measured in the questionnaire. With regard to the *p*-values of the different factors, there were no statistically significant differences between the tutors' and students' perceptions of the tutors' facilitative skills. When referring to effect size, small to medium practically significant differences ($d = 0.53$ and 0.23) occurred with specific reference to the tutors' facilitation of constructive and collaborative learning. With reference to the mean, the geography-education students assessed the tutors' facilitation of the two factors higher than the tutors did themselves.

Gender differences in the geography education students' rating of the tutors' facilitative skills

I calculated the *p*-value and effect size for male and female students' ratings of tutors' facilitative skills for the different factors. No significant statistical differences occurred between the two groups when referring to the

p-values. The effect size however shows that small to medium practically significant differences did occur between the groups. The male geography-education students' perception of the facilitative skills of tutors, with specific references to collaborative learning, was higher than the perception held by the female students (d = 0.26) (see Table 11).

Students' ratings of gender differences in tutors' facilitative skills

Table 12 indicates that, in the geography-education students' assessment of the tutors' facilitative skills, highly significant statistical and practical

TABLE 11: Male and female students' ratings of tutors' facilitative skills.

Sections of the questionnaire	$\ddot{X}$		MSE	p	Effect size (d)
	Male students (n = 57)	Female students (n = 88)			
Constructive learning	3.86	3.92	0.310	< 0.53	0.19
Self-directed learning	4.07	4.05	0.321	< 0.78	0.08
Contextual learning	3.62	3.62	0.364	< 0.97	0.01
Collaborative learning	3.84	3.72	0.479	< 0.30	0.26*
Tutor's interpersonal behaviour	3.89	3.88	0.380	< 0.91	0.03

$d \leq 0.2$ = small effect; *, > 0.2 – < 0.8 = medium effect; and **, ≥ 0.8 large effect.
$p > 0.05$ indicates no difference between the groups.

TABLE 12: Students' perceptions of male and female tutors' facilitative skills.

Factors in the questionnaire	$\ddot{X}$		MSE	p	Effect size (d)
	Male tutors (n = 10)	Female tutors (n = 17)			
Constructive learning	3.66	4.02	0.285	< 0.001	1.28**
Self-directed learning	3.88	4.17	0.307	< 0.003	0.96**
Contextual learning	3.28	3.80	0.305	< 0.001	1.74**
Collaborative learning	3.46	3.94	0.429	< 0.001	1.16**
Tutor's interpersonal behaviour	3.62	4.03	0.350	< 0.001	1.17**

$d \leq 0.2$ = small effect; *, > 0.2 – < 0.8 = medium effect; and **, ≥ 0.8 large effect.
$p > 0.05$ indicates no difference between the groups.

differences occurred between the gender groups of the tutors in all the factors. The geography-education students held the perception that the female tutors possessed better facilitative skills for all the different factors.

Students' perceptions of tutors' academic performance and their facilitative skills

I calculated the tutors' average academic results for the geography modules completed during the previous three academic years. Before completion of the questionnaire, I provided the tutors with the average results of their geography modules since the tutors had to enter these averages on the questionnaire. The averages were organised within the following four categories: 50%–59%; 60%–69%; 70%–79%; 80% >. This information was relevant since I wanted to determine whether academic results in geography, in other words content expertise of the tutor, would influence tutors' facilitative skills in PBL tutorial sessions. The results in Table 13 indicate a statistically and practically significant difference between the students' perceptions of the tutors' facilitative skills for all five factors and the tutors' academic performance in geography. It is clear from the average means that the higher the academic performance of tutors in the geography modules in the B.Ed. programme, the higher the students evaluated the tutors' facilitative skills.

Discussion

This study addressed the lack of research regarding geography-teacher education on tutors' facilitative skills in an embedded PBL format. The first goal of this case study was to determine how geography tutors and

TABLE 13: Students' rating of tutors' (Tutors' academic performance in the geography modules in the BEd programme) facilitative skills as a function of tutors' academic performance.

Factors in the questionnaire	%	$\bar{X}$	SME.	p	d		
					50%–59%	61%–69%	70%–79%
Constructive learning	50%–59%	3.64			-		-
	60%–69%	4.04	0.236	< 0.001	1.73	-	-
	70%–79%	4.27			2.66	0.93	-
	80% >	4.40			3.22	1.49	0.56*
Self-directed learning	50%–59%	3.90			-	-	-
	60%–69%	4.14	0.293	< 0.002	0.88	-	-
	70%–79%	4.26			1.26	0.38	-
	80% >	4.41			1.76	0.88	0.50*
Contextual learning	50%–59%	3.35			-	-	-
	60%–69%	3.72	0.287	< 0.001	1.31	-	-
	70%–79%	3.96			2.14	0.83	-
	80% >	4.13			2.76	1.45	0.62*
Collaborative learning	50%–59%	3.44			-	-	-
	60%–69%	3.89	0.380	< 0.001	1.17	-	-
	70%–79%	4.13			1.79	0.62	-
	80% >	4.42			2.56	1.39	0.77*
Tutor's interpersonal behaviour	50%–59%	3.60			-	-	-
	60%–69%	4.04	0.292	< 0.001	1.54	-	-
	70%–79%	4.27			2.29	0.75	-
	80% >	4.38			2.68	1.15	0.39*

$d \leq 0.2$ = small effect; *, > 0.2 – < 0.8 = medium effect; and * *, ≥ 0.8 large effect.
$p > 0.05$ indicates no difference between the groups.

students rate the tutors' facilitative skills in PBL tutorial sessions. My initial concern was that the first encounter between the student tutors and education students in PBL would hinder effective tutor facilitation in the PBL tutorial sessions. This fear proved to be unfounded with both the tutors and students rating the tutors' facilitative skills highly, although Mayer (1999) warns that, when tutors are asked to do a self-report or self-assessment of their teaching or facilitative skills, they usually inflate their

individual measures. The reasonable level of agreement between tutors and students on the tutors' facilitative skills in this study suggests, according to Williams (2011), an accurate measure of the facilitative skills of tutors in tutorial sessions. This study differs from Williams' (2011) findings where the tutors overrated themselves compared to how students rated them. The study also differs from Solomon and Crowe (2001), who report that student tutors struggled with facilitative skills and had difficulty separating the student and tutors roles. The findings of this study definitely support the view of De Rijdt *et al.* (2012) that student tutors who are carefully selected and well trained can be effective as student tutors and thus play a vital role in undergraduate programmes.

Tutors' and students' positive perceptions of geography tutors' facilitative skills in PBL tutorials are reflected in the words of Hmelo-Silver and Barrows (2006): '… [*they were*] able to shift from being transmitters of information to being enablers of learning'. The results may indicate that, during their first effort, geography tutors displayed good facilitative skills in an embedded PBL environment. The tutors' involvement in the PBL experiences as students and the training received in the workshop and modules of geography didactics as well as working through additional learning material about effective facilitation served them well in preparation of their tutoring. It is also possible that the behaviour of the geography tutors with reference to social congruence and the use of subject-matter expertise and cognitive congruence with geography-education students assisted in the creation of a powerful learning experience (Williams, Alwis & Rotgans 2011). In this regard Benè and Bergus (2014) emphasise that the student tutors may not penalise students as a motivation technique and therefore rather rely on connectedness with students.

In this study, the lower rating by both tutors and students of tutors' skills to stimulate students' contextual, constructive and collaborative learning may be ascribed to the fact that it was the tutors' first encounter with this new learning environment. Interestingly, Dolmans *et al.* (2003), using the same questionnaire, found that the factors 'The tutor stimulates self-directed learning' and 'Collaborative learning' received the lowest scores. In a shortened version of the questionnaire used by Chung *et al.* (2011), the students' perceptions of the tutors' facilitative skills for all the factors received very high scores. In the literature, reference is pertinently made to the fact that one of the most important facilitation skills which a tutor has to possess is the stimulation of self-directed learning. It is therefore encouraging that the student tutors and students in the study indicated that the student tutors possessed the necessary skills to facilitate self-directed learning. It is also important to note that Dolmans, Wolfhagen and Van der Vleuten (1996) mention that it takes time to develop as PBL tutors whilst Hendry *et al.* (2002) are of the opinion that the more a tutor facilitates tutorial sessions, the more highly the students rate the tutor's effectiveness in all aspects. Setterud *et al.* (2010) further state that all new tutors need time and space to explore their own beliefs about how we learn, to get insight into different theories of learning and to understand the key elements of PBL.

I found that the higher the tutor's academic performance in geography, the better the students rated the tutors' facilitative skills in PBL tutorial sessions. In a way, the study concurs with other findings that suggest that content experts are better facilitators in both process and outcome measures (Eagle, Harasym & Mandin 1992). The researcher therefore agrees with Boon *et al.* (1993) as well as Ates and Eryilmaz (2010) that the tutor's expertise in the subject matter does play a role in

student learning, particularly when it is the students' first encounter with PBL as a teaching-and-learning strategy or, as Schmidt (1994) points out, when students' prior knowledge of a topic or theme is lacking. Hmelo-SiIver and Barrows (2006) state that the tutors use their expertise by asking pertinent questions that scaffold student learning through modelling and coaching. The researcher also agrees with Das *et al.* (2002), Groves *et al.* (2005) and Hmelo-Silver and Barrows (2006) that the tutors' subject knowledge is an important factor in students' knowledge construction. The researcher furthermore concurs with the view of AlHaqwi (2014) that the tutors must have both content and process expertise to achieve the best outcomes from PBL tutorial sessions.

This study did not reveal any difference between male and female students' perceptions of the tutors' facilitative skills. These results differ from the findings of Das *et al.* (2002) that used the same questionnaire as in this study. In their study they found that female students giving higher scores for all tutor skills, except for stimulating SDL amongst group members. However, with reference to the tutors' gender in this study, the geography-education students held the perception that female tutors have better facilitative skills. Fletcher, Jordan and Miller (2000) argue that a possible reason for female tutors being better facilitators is that women are more sensitive to interpersonal dynamics in the classroom than men and that their motivation and performance depend largely on a positive connection with others. This study's results concur with Kassab *et al.* (2005) and Hendry *et al.* (2002) that female tutors have better facilitative skills. However, Batarfi and Bin-Gouth (2007), Williams (2011) and Gilkison (2003) found that, according to the students' perceptions, there was no difference between male and female student tutors' facilitative

skills. The implication of the above findings is that, in the training of the Geography students, tutors should take note of the differences between male and female tutors as pointed out in the literature. Male tutors, in particular, should be made aware that women, or female tutors, as Reynolds (2003) states, are more inclined to be '*connected learners*' who value the social aspects of learning contexts. This can explain why female student tutors work better in collaborative learning environments such as PBL.

Conclusion and recommendations

The study indicates that fourth-year students in geography education who were trained in facilitating small-group learning and who acted as tutors in PBL tutorials are able to facilitate learning by guiding the group process. The student tutors and education students rated the tutors as relatively skilled in facilitation of the PBL tutorials. The findings of the study can be used as feedback for lecturers in geography education to help their students improve their facilitative skills in PBL tutorials. Where tutors' performance is average in some of the factors tested in the questionnaire, such as stimulating collaborative learning and contextual learning, the lecturer can in future focus on the training of the education students to assist them in developing these facilitative skills. Involving geography students as tutors in PBL experiences will help develop their facilitative skills in cooperative learning environments. Hopefully they will be more willing to implement problem-based learning, cooperative learning and group work as part of a learner-centred pedagogy in South African geography classrooms and foster meaningful learning. I believe that students who are involved in active

learning environments such as PBL will be more inclined as future teachers to implement teaching and learning strategies to facilitate active knowledge construction.

With regard to the implementation of PBL in geography education and the employment of geography tutors, the following recommendations are made on the development of tutors' facilitation skills:

- More time must be allowed between facilitator, student tutor and fellow student tutors for reflection on practice. In future, the training and supporting of the tutors to stimulate students in contextual learning, constructive and collaborative learning need to be emphasised. One way of doing this is to videotape some of the tutors whilst they are facilitating a PBL tutorial session. Afterwards, the tutor, the fellow tutors and the facilitator can reflect and give feedback on how the tutor can improve her or his facilitative skills.
- During the training sessions, special attention and assistance need to be paid to developing the geography facilitation skills of male tutors and tutors with low academic performance so as to provide appropriate scaffolding to facilitate PBL tutorial sessions. A possible strategy to assist tutors in the transition towards facilitating PBL tutorial sessions, as suggested by Williams (2011), is to involve the tutors in 'Communities of Practice'. According to her, it can assist all potential tutors, male and female, to improve the kinds of complex facilitative skills described through cognitive skills. I am therefore of the opinion that the fourth-year geography students who act as tutors in PBL tutorials will, with the necessary support from their mentors and fellow tutors, display the competence to effectively facilitate learning in their geography classrooms as future teachers.

- PBL should be integrated as a teaching and learning strategy in other subjects, and fourth-year students should be used in these subjects as tutors during the PBL tutorial sessions.
- Student tutors should be challenged to also implement PBL as a teaching-and-learning strategy during practical teaching or work-integrated learning at schools and where they act as tutors and facilitate the tutorial sessions with school learners. Some of the student tutors have already on their own initiative implemented PBL during work-integrated learning in geography classrooms. Afterwards, the lecturer, subject teacher and fellow student tutors can reflect on the student tutors' facilitative skills in this learner-centred environment and thus provide the latter with practical knowledge and skills for professional development in learner-centred pedagogy. For this purpose, the 'Teacher Feedback Questionnaire' of Dolmans can be used to provide feedback to students.

Chapter 6: Summary

To develop the facilitation skills of fourth-year students in geography education at a South African university, these students were employed as student tutors as part of their training to facilitate learning, in first and second-year geography modules where experiences in problem-based learning (PBL) were implemented. Student tutors' subsequent self-ratings of their facilitative skills and the students' ratings of the student tutors' facilitation skills were determined by using Dolmans' 'Teacher's Feedback Form'. The results show that student tutors and students rated the student tutors' facilitative skills as 'moderate'. There was no significant difference between tutors' self-rating and education students' rating of the student tutors'

facilitative skills. Education students rated female tutors and tutors with higher academic performances in geography as possessing better facilitative skills in PBL environments. Finally, recommendations are made as to how student tutors' facilitation skills can improve further in the implementation of PBL.

Chapter 7

The enactment of problem-based approaches in pre-service mathematics and the levels of performance of teacher students in problem projects

Judah P. Makonye
University of Witwatersrand
South Africa

Background

Many studies have been carried out on successful entrepreneurs and famous people (Collins & Moore 1970; Csikszentmihalyi & Beattie 1978). These studies found that the majority of the successful people, whilst

How to cite: Makonye, J.P., 2016, 'The enactment of problem-based approaches in pre-service mathematics and the levels of performance of teacher students in problem projects', in E. Mentz & I. Oosthuizen (eds.), *Self-directed learning research,* pp. 184-212, AOSIS, Cape Town. http://dx.doi.org/10.4102/aosis.2016.sdlr14.07

enjoying inspiration and support from others, were largely self-driven by an unyielding motivation to achieve. It is reported that most of them experienced disheartening failures and made serious mistakes on the way. Instead of giving up, they learnt from these. The challenges provided them with the impetus for new efforts. These distinguished persons showed flexibility, persistence and resilience in the face of hardship. One asks: do the achievements mentioned above and the problem-solving capacities of members in the community of practice of mathematics educators have anything in common? This question is important because problem solving, as performed by people referred to above, is at the heart and core of mathematics education. What lessons, if any, could be learned from the behaviour of successful people as far as teaching and learning, in general, and pre-service education for mathematics teachers, in particular?

The research problem

South African learners' underachievement in mathematics is well documented (Taylor & Taylor 2013). Many learners do not pass this subject in high-school examinations with far-reaching consequences on their future career as they are denied access to many courses at tertiary institutions. Performing well in international comparison tests, for example Trends in Mathematics and Science Study (TIMSS), seems to be correlated to PBL mathematics curricula (Taylor & Taylor 2013). For example, the mathematics curricula of Singapore and Japan, countries that do well in comparison tests, are problem based (Cheng 2015). In contrast, the South African mathematics curriculum is not explicitly problem based. Could that explain why South African learners are not competitive internationally? Even though the advantages of SDL are known, many mathematics educators do not know how SDL may be incorporated in schools to empower learners.

It is advantageous to explore how SDL may be incorporated in mathematics education so that student teachers in mathematics can become good problem solvers.

A study reported by Shin, Haynes and Johnston (1993) examines SDL in 'keeping up-to-date after graduation'. They note that medical graduates who learn by means of PBL are more inclined to keep up to date in their practice than those who study by means of a non-PBL medical curriculum. Would the same tendency hold for pre-service teachers exposed to a PBL curriculum and a non-PBL curriculum?

Statement of the problem

Traditional mathematics pedagogy in South Africa seems to have had little impact in affecting learners' mathematical achievement. This is attested by international comparison tests such as TIMSS that has ranked South Africa at the bottom for the past 20 years. At home, recent Annual National Assessment (ANA) tests have shown that fewer than 15% of learners pass mathematics in Grade 9. Countries at the top of international achievement lists such as Singapore and Japan base their mathematics curricula on problem-based learning (PBL). I think that it is worthwhile to investigate to what extent current student teachers in mathematics exhibit PBL and SDL capabilities when they solve authentic mathematics problems.

Aims of the research

This research explores the extent to which features of problem-based learning (PBL) and self-directed learning (SDL) manifest in pre-service student teachers in mathematics when they solve authentic mathematics problems and projects. The study also discusses ways of enhancing PBL

and SDL in Initial Teacher Education Institutions (ITEIs') mathematics courses.

Research questions

- To what extent do PBL and SDL capabilities for mathematics manifest in student teachers when they solve authentic mathematics problems and projects (the empirical question)?
- What teaching approaches may help pre-service student teachers to cultivate PBL and SDL competencies at ITEIs (the theoretical question)?
- Why augment traditional teaching approaches with PBL and SDL in South African mathematics-teacher education?
- How is mathematics currently taught to teacher students in South Africa, and to what end?

Traditional pedagogy, which is mainly used in South African initial teacher-education institutions (ITEs), holds that the instructor, called a lecturer or professor, chooses learning material at the beginning of an academic year. This person provides students with a course outline that shows topics which will be covered in the academic year as well as dates for writing assignments, tests and examinations. The lecturer also sets out the goals of learning in the course outline and suggests reading material. Then the lecturer presents the material to student teachers in lecturers with the lecturer as an authority. Often students are given exercises to practice and consolidate their understanding of the taught material. In the mathematics lectures, students have minimum input as the lecturers often talk down to them. The aim would be to expose students to as many mathematics concepts and techniques as possible. There are also tutorial sessions in which students interact further with themselves and the lecturer as they inquire about any concepts they did not understand in the lectures. Because students' learning behaviour differs some students often

enquire by themselves in the library or internet and learn by themselves with little help from the lecturer. This may be viewed as self-regulated learning (SRL). Students who take their learning success in their own hands in this way tend to obtain higher grades.

The key feature in the pedagogy described above is that the lecturer decides what is to be learnt and what is to be assessed. This pedagogy is not without gain as it is geared towards students learning the mathematics subject matter they need to be effective mathematics teachers. However, such traditional approaches need to be extended by encouraging teacher students to decide how to study in such a way that they increasingly become less dependent on their tutors. This helps them to prepare for survival when they are out there on their own.

Regarding SRLK, South African policymakers should compare their education curriculum for mathematics with that of other countries. The countries leading in mathematics performance and achievement, such as Singapore and Japan, base their mathematics curricula on problem solving (Cheng 2015). Ang (2001) explains that problem-based learning (PBL) is an umbrella term that encompasses other learning approaches such as self-regulated learning (SRL) and self-directed learning (SDL). This chapter is written to appraise and explore SDL as part of PBL for pre-service mathematics teachers in South Africa. Why? Boaler (1998, 2002) and Guglielmino (2013) argue that the traditional teaching approaches, notwithstanding their proven advantages depicted through their survival for decades, need to be augmented now. The reason is that education must prepare learners[26] for learning demands beyond school.

26. In this chapter, 'learner' mainly refers to a young person who is under the tutelage of an educator in a school situation. This can be compared to a 'student', who is older and usually attends a post-school institution. However, these distinctions are not exclusive. They must be read and understood in context.

Bolhuis and Voeten (2001) regard self-directed learning as an important learning strategy and goal. They argue that teachers must alternate between being transmitters of knowledge and activators of process-oriented learning. They point out that the traditional examinations-based teaching approaches do not adequately prepare learners to negotiate the learning demands they will meet throughout their lives. These educationists propose that highly structured teacher-led approaches ought to work together with pedagogies that give students more control over what they learn and how they learn. In mathematics education, Boaler (2002) and Davis (1997) advocate for the use of open mathematics tasks with a high cognitive demand, which they believe would prepare students for the particular problem-solving conditions for mathematics which exist outside of school.

Comparing PBL, SDL and SRL

To a certain extent, PBL, SDL and SRL are similar approaches. These similarities refer to the greater responsibilities that students assume in learning situations. In all three approaches, students assume varying levels of control over the learning situation. The differences between the approaches mainly relate to the amount of freedom that learners have in a learning setting. Loyens, Magda and Rikers (2008) regard PBL as an umbrella term. PBL is broader than SDL whilst SDL is broader than SRL (see Figure 1).

PBL is not an alternative to traditional teaching because teachers can still use PBL within a traditional pedagogy. Loyens *et al.* (2008) propose that PBL makes problems the starting point in the learning process. These problems can be given to learners by teachers, or learners can become aware of them by themselves. In PBL, small groups of learners work collaboratively to solve meaningful problems with observable and measurable attributes. Once the features of a problem are understood,

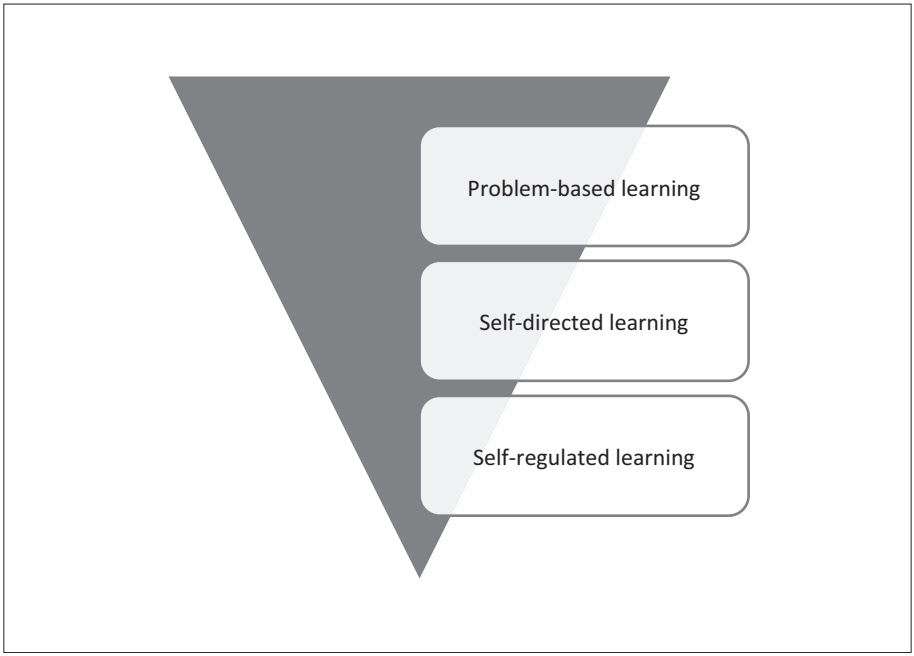


FIGURE 1: The funnel relationship between PBL, SDL and SRL.

learners use SDL to search for the knowledge, concepts and skills required to solve the problem.

Following PBL, the features of SDL may now be discussed. One of the key features of SDL is that the learning environment is to some extent determined by the learners. In pure SDL as existing outside the school, people choose what they want to learn as well as how they learn it and how they self-assess their learning.

Radical SDL is succinctly summarised by Gibbons *et al.* (1980):

> In self-directed education, the individual masters all the activities usually conducted by the teacher: selecting goals, selecting content, selecting and organizing learning experiences, managing one's time and effort, evaluating progress and redesigning one's strategies for greater effect. In addition, the student of self-directed learning must have

> the initiative to launch these processes as well as the personal motivation to continue learning, even when there is no pressure, guidance, or extrinsic reward. (p. 43)

The difference between SDL and SRL though is that, in SRL, learners are not free to choose what they want to learn. Rather, their lecturer or teacher chooses for them what to learn. Accordingly, SRL would occur in normal classrooms, but SDL will more likely occur in settings outside of school such as when adults want to learn something to improve their occupational competence. Once work has been selected by the teacher in SRL, learners have the freedom to select personal learning strategies and resources to learn the material given to them. Paris and Paris (2001) find that, in school settings, SRL is a good predictor of better academic performance.

SDL in education

Various scholars hold different views on SDL [for example Gibbons *et al.* (1980) above]. For Tough (1979), SDL is learning that is directed by one's own initiative. Some scholars regard SDL as a process, and yet others regard it as an attribute. Pintrich and Schunk (2002) regard SDL as composed of three components. Firstly, they regard it as a *self-initiated process* of learning cognisant of an individual's capability to set own learning goals and to strategize how these can be realised. Secondly, they view SDL as a *characteristic, an attribute* of learners who exercise autonomy over their own learning. Thirdly, they view SDL as a way of *organizing* instruction in traditional educational settings that allow learners greater freedom and control over what they learn and how they learn it (Brockett & Hiemstra 1991). In contrast, Knowles (1975) indicates that SDL occurs when learners evaluate their learning needs; identify learning goals; develop strategies for learning, including mobilising resource for learning; engage with the learning materials to effect learning as well as evaluate the outcomes and learning processes with an eye to improving the attainment

of set objectives. Despite these somewhat different views, we may conclude that, above all, individuals' will to learn, their motivation, propels SDL.

Self-directed learning is goal-directed behaviour (Pintrich & Schunk 2002). The learners and students who practice it are driven by the motivation to achieve. To the behavioural school of thought, the two motivation types are external and internal. External motivation is goal-oriented behaviour driven by perceived sanctions for not achieving the goal or by rewards upon completion of a goal. Intrinsic motivation is based on mastering goal-oriented behaviour as it is driven by innate curiosity, by a student's internal drive to understand and be in control and by the drive to control themselves or a discipline.

Gibbons *et al.* (1980) note that self-education requires high levels of motivation directed at success in a field of expertise. Those high levels of motivation sustain the learner even when surmounted by difficulties. This focus, high drive and high motivation explain the success of famous people referred to at the beginning of this chapter. These features link SDL in both in-school and out-of-school situations.

In ITEIs students cannot choose what they want to learn because it will lead to chaos. However, once they have been given the learning goals and material, they can use SRL to learn what they have been asked to learn. SDL only works outside the school set-up, as when adult learners independently set learning goals for themselves to study skills they assume can improve their lives.

PBL in education

Problem solving is considered a leading approach in the teaching and learning of mathematics. Problem solving does not only help learners of mathematics to witness mathematics in action, but it is also one of the best ways to help learners to learn mathematics. In short, problem solving is a phenomenon that helps learners simultaneously to learn and to apply mathematics.

Loyens *et al.* (2008) argue that PBL sets several aims for learners. Firstly, it builds a formidable disciplinary knowledge base for learners. In a problem-solving milieu when learners do not know what to do, they can always check if their current knowledge would give them some inroads into the problem. Secondly, students are also expected to learn to collaborate with others, which is aimed at building teamwork to solve tough and arduous problems. Students are expected to share their methods and insights and discuss solutions with colleagues, thereby illustrating the truism that the whole is greater than the sum of its parts. Thirdly, learners are supposed to develop effective problem-solving skills. The fourth important aim for PBL is to inculcate in learners the pursuance of knowledge for its own sake.

Scholars propose that one of the most beneficial mathematics curricula in one based on PB (Loyens *et al.* 2008). In this regard, Tandogan and Orhan (2007) argue that the PBL model shifts a learner from being passive receiver of information to one who is a free and active self-learner; one who is a problem solver. This shift implies that the focus of education moves from teaching to learning. In this vein, the purpose of learning moves from the acquisition of knowledge to learning as a live and active process for solving problems. In this way, students are no longer burdened by content, the use of which they are uncertain about. Rather, they are part of an approach that enables them to acquire new knowledge through engaging with problems to be solved.

SDL or SRL in formal-education systems

In line with constructivism, Gibbons *et al.* (1980:4) argue that '… all education is self-education'. The corollary of this statement is that SDL is not the preserve of 'teacher-less', no-contact, distance-education students.

All students at formal-education institutions become engaged in self-regulated study at one time or another, if not all the time. Caffarella (1993) argues that, in formal institutions, the teachers must act as guides and facilitators to promote students' self-directed learning. Further, Freire (2000:33) argues: 'What the educator does in teaching is to make it possible for the students to become themselves'. Freire (2000) sees education through the lens of the critical perspective where people learn in order to change their social conditions for the better and unshackle themselves from ignorance.

In formal-educational institutions, students might have difficulties in understanding subject matter taught in class. Even if they understand, lectures in formal institutions can and might often not cover all there is to know about a subject. Students are expected to research, to acquire knowledge through SRL efforts. Students are often directed to study more material such as readings or other library sources for them to increase their expertise in a course. Those students who only refer to class notes become just 'C' students.

Students with high SRL are driven by an orientation to master certain goals (Schultheiss 2008). Such students would make use of extra learning recourses that help them to further comprehend their field of study. They may consult more knowledgeable others such as the lecturers and tutors or other students. They may harness ICT resources such as Google, You Tube and so forth to help them enquire and understand material better. ICT resources are particularly important in that they are available 24 hours a day by means of the handy smart phone. Now knowledge is at the students' finger tips 24/7. Resources such as You Tube are multi-media resources, combining pictures and the spoken and written word that can be played again and again until a student grasp hard concepts.

Student-teacher beliefs and the locus of control of learning

The beliefs of members of a community of practice such as educators are very important in influencing their actions (Makonye 2012). In this case, the beliefs of practitioners have a bearing on their attitudes and effectiveness towards PBL and SDL in mathematics education (Ertmer *et al.* 2012). Do lecturers believe that it is worthwhile to develop PBL and SDL capabilities in their student teachers? If they think these are important, they will make concerted efforts to help inculcate them in their students. If they think these capabilities are not important, they will not put any efforts into helping their students develop them. Also, do student teachers believe that they have the competence to solve problems through mathematical modelling with little help from their lecturers? If they do, they have high *internal locus of control* of their learning (Caliendo, Cobb-Clark & Uhlendorff 2015). If they believe that they cannot solve mathematical problems without the help of their lecturers, then they have an *external locus of control*, meaning that they have low SDL competence. I believe that one of the major aims of teaching mathematics must be to inculcate in students an internal locus of control on mathematics problem solving. Paris and Paris (2001) find that in, school settings, SRL, a correlate of internal locus of control in a student's learning, is a good predictor of better academic performance.

Literature review

Caffarella (1993) suggests that students who engage in SDL identify their learning needs and decide which activities, methods, and techniques they will use to enable them to learn what they want to learn. According to Pratt (1993), learner control over learning occurs on a spectrum. On one

end, there are learners highly dependent on the teacher. This group of learners expect the lecturer to be the primary provider of what to learn and how that material may be learnt. At the other end of the spectrum are learners who are highly independent. These learners are capable of directing their own learning as well as sourcing support material to cater for their learning needs.

Paris and Newman (1990) find that, unlike children starting high school, children starting primary school hardly reflect on or control their learning. They find that secondary-school children are capable of metacognition. As such, they regarded strategies based on metacognitive knowledge as more helpful in promoting meta-cognitive learning in high-school learners. Primary-school children need motivation to help them to be involved in SDL.

Zimmerman (2002) proposes a model for the development of self-regulated learning. He argues that, at the beginning, learners learn through modelling and imitating others. At higher developmental levels, learners will have gathered experience to be autonomous learners independent of others.

Wilcox (1996) argues that the effective teacher of adults channels learning towards material that the adults regard as important. Such teachers understand that '… the power for growth and development is in the learner's hands' (p. 167). Therefore, such teachers would see their role as facilitators rather than as a sage on the stage.

Theoretical framework

In my view, constructivist, socio-cultural and behaviourist learning theories come to play in developing SDL amongst student teachers in

mathematics. Behaviourism (Skinner 1972) explains the motivation towards achievement of student teachers in SDL. It is student teachers' intrinsic motivation that propels them to put in extra effort and to have the self-drive to search or use learning resources that result in learning.

SDL may also be understood in terms of constructivism (Piaget 1964). Constructivists argue that the belief that a teacher can cause learners to learn by telling is mistaken. Rather than student teachers taking in the knowledge delivered by the lecturer in a direct way, constructivists explain that students first organise taught material in terms of their existing knowledge for it to be understandable to them. Thus constructivists presume that learning is self-regulated although a teacher may be a facilitator to the learning experience. Constructivism comes into play in that, for student teachers to understand, to make meaning of learning experiences, they use their current knowledge. Thus, as new learning experiences structure present schema, student teachers' understanding of a discipline increases not only in quantity but in quality as well. In my view, a student's current knowledge is not the only factor that drives learning. It is only one type of readiness to learn new material. Students must also be ready in terms of their innate state, which is explained by goal-oriented behaviour, their pre-inclination to learn. Students motivated to learn are in a state of readiness. When a learning opportunity presents itself, such students are likely to take advantage of it. Even so, such learners would not depend on chance learning opportunities. They are actively on the lookout for learning opportunities to increase their knowledge. Vygotsky (1986) explains that learning first take place on the social plane. He argues that there is no knowledge that exists in a learner's mind that at first did not exist in society. So students learn socio-historical knowledge mediated to them by learning resources: books, internet or the teacher. This also explains the role of students learning in conjunction with others.

With respect to this theoretical framework, pre-service mathematics teachers need to be exposed to PBL and SDL so that they can learn to solve mathematics problems through mathematical modelling. This framework helps in analysing how far curricula help student teachers in cultivating PBL and SDL. It is critical for student teachers to be adept at solving mathematics problems and to be able to adapt to any changes in the mathematics curriculum in future.

Methodology

A qualitative research design, based on the analysis of scholarly papers on SDL and the reform of mathematics education, was used. According to Bowen (2009), content analysis is a systematic procedure for evaluating both printed and electronic documents. Data are '… examined to elicit meaning and gain understanding and develop empirical knowledge' (Bowen 2009:27).

Furthermore, the principles, guidelines and suggested practices extracted from literature were 'tested' in an empirical sense. To do that, 30 final-year student teachers, majoring in mathematics, were put in groups of five. They were asked to solve mathematical tasks on Sierpiński gasket, doing math, an architectural project, weather forecasting and ice-cream sales to determine their PBL, SDL and SRL capabilities (see Appendix 1). These students were drawn from a class of 38 consenting fourth-year students, majoring in mathematics, of both sexes. The students were studying to teach mathematics at high school after they graduated.

I assessed the students' work for completeness once a week over a period of three weeks. Students were allowed to work on their own without any interference by the lecturer, but those who came for assistance were given the minimum, indirect, help.

Documents analysed

Three widely read documents on mathematics education were analysed for their contribution to SDL in mathematics. The first one was from a book by Boaler (2002) entitled *Experiencing school mathematics: Traditional and reform approaches to teaching and their impact on student learning.* In June 2016, Google Scholar showed that this book had been cited by more than 1000 researchers. Another article analysed was Davis's (1997) paper entitled 'Listening for differences: An evolving conception of mathematics teaching' from the *Journal for Research in Mathematics Education.* The third document was a book by Stein, Grover and Henningsen (1996) entitled *Building student capacity for mathematical thinking and reasoning: An analysis of mathematical tasks used in reform classrooms.* In June 2016, Google Scholar showed that this book had been cited by more than 700 researchers. These documents are written by world-class researchers on mathematics education and are geared towards giving more autonomy to students in learning mathematics. The article is from a highly reputable journal in the mathematics-education fraternity. I also analysed Ang's (2001) *Teaching mathematical modelling in Singapore schools* and Cheng's (2015) *Mathematical modelling in Singapore schools: A framework for instruction.*

The first generic SDL paper in education was by Gibbons *et al.* (1980) entitled 'Toward a theory of self-directed learning: A study of experts without formal training', published in the *Journal of Humanistic Psychology.* A second article was by Dignath and Büttner (2008) entitled 'Components of fostering self-regulated learning amongst students: A meta-analysis on intervention studies at primary and secondary school level', published in *Metacognition and Learning.* The third article was by King (2011), entitled 'Fostering self-directed learning through guided tasks and learner reflection', published in *Studies in Self-Access Learning.* The fourth article

was by Grow (1991), entitled 'Teaching learners to be self-directed', published in *Adult Education Quarterly*. In June 2016, Google Scholar showed that this book had been cited by more than 800 researchers.

I believe that the analysis of a hybrid of generic SDL-education articles and mathematics-education articles gives a balanced view of how to promote SDL in mathematics students.

Document analysis

How can we foster SDL in student teachers?

I support Grow's model for promoting SDL in students (see Figure 2). Grow (1991) explains that, in promoting SDL it is important to avoid mismatches. Such mismatches would disrupt the process of developing SDL.

Stage	Student	Teacher	Examples
Stage 1	Dependent	Authority Coach	Coaching with immediate feedback. Drill. Informational lecture. Overcoming deficiencies and resistance
Stage 2	Interested	Motivator, Guide	Inspiring lecture plus guided discussion. Goal-setting and learning strategies.
Stage 3	Involved	Facilitator	Discussion facilitated by teacher who participates as equal. Seminar. Group projects
Stage 4	Self-Directed	Consultant, Delegator	Internship, dissertation, individual work or self-directed study-group.

FIGURE 2: Four stages of a self-directed learning model (adapted from Grow 1991).

In the same way, Zimmerman (2002) agrees that, at first, a learner is teacher dependent at lower levels of schooling and then gradually grows to be an independent learner at higher levels of schooling. The same would apply in developing SDL amongst mathematics students.

Also, Gibbons *et al.* (1980) argue that learning must begin by being led by the teacher, but as the years go by, the teacher's role in directing learning must gradually be relaxed so that the learner increasingly becomes independent of the teacher. Learners establish the role of setting and self-guiding learning experiences for themselves as in adult life. This suggestion is comparable to Vygotsky's (1978) proposal that learning is first supported by a more knowledgeable other in an inter-psychological plane until the learner can actively use what they have learnt independently of the more knowledgeable other.

Gibbons *et al.* (1980) regard the role of teaching as the promotion of self-education. They argue that the ultimate goal of teaching is having students who possess an internal locus of control as far as their own learning is concerned. In particular, adults have been seen to learn to solve immediate practical problems.

I argue that one of the best ways to promote SDL in mathematics-student teachers is the use of authentic project tasks. The use of projects in mathematics pedagogy increases learners' internal locus of control.

In mathematics SDL as in other disciplines, students assume a high level of autonomy in controlling their own learning. In effect, SDL students have a high degree of self-efficacy and an internal locus of control. That means that they believe that the success of their learning is a result of their own efforts. This can be contrasted with students with an external locus of control (Hill 1978). Such students believe that their success in learning is a

result of forces beyond their control, forces acting on them. In particular, if they do not do well, they blame their teachers or other factors. In real life, both loci of control have an effect on a student's success in learning. Outside and internal factors affect learning. In my opinion, high SDL correlates with a strong internal locus of control for learning.

Another observation is that self-education develops in warm, sympathetic and supportive conditions. Students are supposed to be active and work with others for social support. Teaching for self-education involves creating an active environment in which a student's self-directed activities are supported by at least one other person who shares the same interest and conviction.

Guglielmino (2013) advises that teachers must expect and respect individual effort and input. Mistakes, errors and misconceptions must also be accepted as they act as milestones in students' learning (Luneta & Makonye 2011). They are transition points in learning. When students resolve their misconceptions, they experience a cognitive shift which makes for greater understanding in the field. The growth of scientific knowledge is driven by doubts on our existing beliefs and the detection of errors in our thinking.

Particularly in mathematics teaching and learning, Guglielmino (2013)'s recommendation focusses on problem-based learning, project-based learning and field-based learning to develop organisation and analytic skills that sustains SDL in mathematics. In relation to problem solving, Van de Walle (1990) argues that it (problem solving) is not only one of the chief means of teaching and learning mathematics but also the best way to help learners understand the nature of mathematics. This is in line with recommendations by Stein *et al.* (1996) that the level of mathematical competence that students develop is a function of the level of the mathematics tasks provided to learners. They (Stein *et al.* 2000) advocate for highly demanding mathematics tasks,

which they believe will help students to develop high-level mathematics competence. If students are given low-level memorisation tasks or procedures without a connection to context and meaning, they operate at low levels of mathematical competence and cannot mathematise in complex situations that are prevalent beyond the school.

I argue that authentic mathematics tasks maintain a highly demanding competence similar to novel problems in everyday and work problems. This is because projects do not have a single attack point but multiple entry points which are not immediately apparent to students. Moreover, if a mathematics project is good, students work on it for longer periods. Students search for applicable ideas from different mathematics topics or other subjects. The solutions to mathematics projects are dependent on the solutions strategies. Students need to justify their solution paths and their final results. In doing so, their answers are both quantitative and qualitative. Their solutions are both numerical and explanatory. They use both numbers and words. As projects are carried out in groups, projects promote the enactive production of knowledge. According to Davis (1997), such productions are ecological and evolutionary as they concern the socio-intellectual development of the students. In this way, students begin to see mathematical knowledge as living knowledge that provides tools to solve problems of interest. If mathematics is not studied in the realistic contexts of children, it is regarded as cold, which is why South African learners underachieve in mathematics.

The mathematics problems and modelling tasks (see appendix) have multiple entry points to their solutions. This makes students think about mathematics in and outside of the classroom, that is, about the formal mathematics they can apply. It also invites trial-and-error techniques as students search for meaning in mathematical situations so that the problems can be solved. Stein *et al.* (1996) and Boaler (1998) regard

mathematics problems as open questions which engender problem solving and a culture of self-directed learning.

In my opinion, the adoption of SDL strategies by lecturers and students does not render immediate success. Dignath and Büttner (2008) point out that, as students gain experience with the use of a strategy, their strategic behaviour shifts both quantitatively and qualitatively. The students' strategies become less self-conscious and automated. It is clear that, at first, developing a new learning strategy such as SDL consumes a lot of time. It is a slow process, the results of which might seem inconsequential to begin with. In the end, when successful, this learning is automated and lasts a lifetime. The fruits of SDL are the real goals of any education system: independent citizens and experts who are problem solvers not only in mathematics but in other problems in life.

Mathematical modelling in promoting PBL and SDL

Many educators argue that mathematical modelling supports authentic learning. Mathematical modelling is a technique in aid of PBL and SDL and is core to Singapore's mathematics curriculum (Ang 2001). There is a difference between problem solving (PS) and PBL. Problem solving needs not refer to the outside world at all, and even if it does, it sometimes uses idealised problems from the world. In contrast, mathematical modelling (MM) and PBL begin in the 'unedited' real world, requires problem formulating before problem solving and, once the problem is solved, moves back into the real world where the results are considered in their original context (Gould, Murray & Sanfratello 2012). Mathematical modelling thus ends up with generalised laws on phenomena studied. But how can mathematical modelling in aid of PBL and SDL be enacted?

Cheng (2015) proposes levels of learning experiences in teaching mathematical modelling.

At Level 1, learners learn mathematical knowledge or ICT skills rather independent of a problem. This could be referred to as learning mathematical procedures without connection to contexts.

At Level 2, the focus is on developing modelling competence such as identifying variables and patterns in a problem. A well-known mathematical model such as an exponential function may be used to describe population growth in a bacteria colony.

At Level 3, learners tackle a real-life problem. In most cases, there is no clear solution route nor one clear answer to the problem. At this level, group work is often necessary. These tasks may take a few days for a group of learners to solve.

Analysis of student performance on PBL and SRL mathematics tasks

As part of the research on the PBL and SDL competence of mathematics-student teachers at an ITE, 30 student teachers in work groups of five solved the problem tasks in the appendix. The following competencies were recorded when their solutions were scrutinised:

From this data presentation (Tables 14, 15 and 16), it is noted that the mathematics problems given to the group of learners were of varying difficulty. Some tasks were solved fairly rapidly, but some continue to be unsolved after long periods of time. The problems of weather forecasting and ice-cream sales were of authentic learning type and required students to think in multi-faceted ways. It is the problem closest to PBL and SDL in real life outside the classroom.

TABLE 14: Performance after 1 day.

Task	Completeness of solution/Gr				
	1	2	3	4	5
Problem 1 (Sierpiński gasket)	50%	40%	70%	60%	60%
Problem 2 (Doing math)	60%	70%	70%	60%	90%
Problem 3 (Architectural project)	10%	30%	40%	30%	30%
Problem 4 (Weather forecasting and ice-cream sales)	10%	30%	10%	20%	10%

The students were encouraged to continue working on their solutions.

TABLE 15: Performance after 7 days.

Task	Completeness of solution/Gr				
	1	2	3	4	5
Problem 1 (Sierpiński gasket)	80%	90%	100%	90%	100%
Problem 2 (Doing math)	100%	90%	100%	100%	100%
Problem 3 (Architectural project)	30%	50%	70%	100%	100%
Problem 4 (Weather forecasting and ice-cream sales)	30%	40%	20%	30%	30%

TABLE 16: Performance after 14 days.

Task	Completeness of solution/Gr				
	1	2	3	4	5
Problem 1 (Sierpiński gasket)	100%	100%	100%	100%	100%
Problem 2 (Doing math)	100%	100%	100%	100%	100%
Problem 3 (Architectural project)	90%	100%	100%	100%	100%
Problem 4 (Weather forecasting and ice-cream sales)	40%	50%	40%	40%	60%

Discussion

The data on ways of developing PBL, SRL and SDL in pre-service mathematics courses are at present of theoretical interest. The content analysis of PBL, SDL and SRL literature (Ang 2001; Cheng 2015; Loyens *et al.* 2008) showed that authentic problems and mathematical modelling are the most useful approaches in promoting PBL, SDL and SRL in the mathematics learning of student teachers. In effect, these approaches are powerful because they help student teachers learn through exploration

and inquiry. Learning through enquiry and exploration are features of the constructivist learning theory as students create their own knowledge (Smith, DiSessa & Rosehelle 1993).

Lecturers should start with tight control over teaching and learning and gradually release that control to the student by means of scaffolding (Vygotsy 1986). PBL, SDL and SRL approaches enhance students' interpretation of situations, processing of data, using trial and error, and inductive and deductive reasoning. All of these skills are constructivist oriented and compel students to create knowledge as well as structure their hard-won knowledge (Piaget 1964; Smith *et al.* 1993). It is hard won because they sought it for a purpose, which means that they value it. Furthermore, students who engage in these projects to their final end have achievement motivation (Pintrich & Schunk 2002), which keeps them trying even if they meet challenges. The students are always supported by the teacher who selects problems for them and also give them academic support (Vygotsy 1986) if they are not sure of mathematical concepts and techniques to use. The teachers also boost the students' morale in their endeavours. Thus the constructivist, behaviourist and socio-cultural theories of learning all come into play in the promotion of PBL, SDL and SRL in mathematics.

It noted that the selected problems to measure student teachers' PBL and SRL capabilities (see appendix; Boaler 1998) were challenging and had varying degrees of difficulty. The doing maths task (Problem 2) was fairly easy to learners as they completely solved it fairly quickly. The modelling problem related to weather forecasting and ice-cream sales (Problem 4) was by far the most challenging as the students could still not completely solve it after 14 days of trial. The student teachers had to gather skills and knowledge which were not readily available in textbooks. They had to consult the

weather station to understand weather patterns for their city. They had to visit an ice-cream company in order to learn about ice cream sales over a year or two. They had to look at sales reports, interview employees, negotiate permission to access the ice-cream company and study weather information from newspapers or other sources. Most of these skills are not mathematical per se but rather are inter-personal and general analytic skills. Participants had to analyse documents and select relevant information. Later they had to draw on their mathematical knowledge and judge which variables, techniques, equations and functions made sense of the data that they have collected in relation to the original problem. Learning at this stage involves a great deal of trial and error. There is a great deal of uncertainty. It is a slow process but one which is eventually rewarding and enriching. When students were asked why they were not able to solve this problem, they said that it required of them to do so many things. Some thought that it was not a mathematics problem. If students succeed in solving such a problem, they are immensely satisfied and realise that mathematics is a powerful language for understanding the world (Cheng 2015).

In the process of mathematical modelling as in Problem 4, students had to be motivated in order to continue investigating when no solution path was clear. They needed to show more behaviour that was oriented towards achieving the goal (Pintrich & Schunk 2002). They also had to consult the lecturers or other resources if they were not clear about mathematical knowledge embedded in the task. This was learning on the social plane (Vygotsky 1978) from a coach and also from group members. As students gathered information about their problem, they ought to have constructed understanding of how different sets of information, mathematical and non-mathematical, help to advance the solution of a problem. All these features are vital in promoting learning of mathematical modelling and

SDL amongst mathematics learners (Ang 2001). They go a long way in promoting independent learners who learn to solve a range of problems independent of a teacher.

The data on students' performance on varying tasks show that, if problems are relatively well structured (Problems 1 and 2 in appendix), students coped. In Problem 4, students could not cope after two weeks of trying. This shows that student teachers need to be taught mathematics modelling skills as suggested by Ang (2001) and Cheng (2015). If South African mathematics teachers cannot solve authentic problems, they cannot pass on those skills to learners, which means that learners will continue to underachieve in mathematics.

Conclusion

Some of the effects of traditional approaches to mathematics teaching that are common in South African ITEIs have been learners' underperformance in mathematics achievement tests such as TIMSS and ANA assessments, not mentioning the matric examinations. It has been noted that some countries that do well in international comparison tests such as Singapore and Japan have problem–based mathematics curricula. I wondered what could be learnt from Singapore's and Japan's mathematics curricula to help South African pre-service teachers to develop PBL and SDL capacities so that South Africa can emulate Singaporean success in our learners. Two research questions were posed:

- To what extent do PBL and SDL capabilities manifest in student teachers in mathematics when they solve authentic problems tasks?
- What mathematics approaches may help pre-service student teachers at ITEIs to cultivate PBL and SDL competence?

With regard to the first research question, I found that the teacher-education curriculum at the sample ITEI develops PBL and SDL in mathematics-student teachers to a limited degree. This was evidenced by student teachers finding it very hard to solve authentic mathematics problems posed to them. Students in the study did show some capabilities in solving some mathematics problems when they worked in small groups. However, when students were faced with authentic learning tasks such as the forecasting the weather and ice-cream sales, they did not do well. This shows that the present teacher-education curriculum at the sample ITEI is failing to foster the PBL and SDL competence that student teachers need to pass on to their learners so that they too can be problem solvers. Solving authentic mathematics problems moves the locus of control for solving problems from teachers and lecturers to learners and students.

Regarding teaching approaches to cultivate PBL and SDL competence in student teachers, it is necessary to adopt Cheng's (2015) three-level model for teaching mathematics modelling to student teachers. The best way to promote SDL and PBL is through authentic learning via mathematical modelling. As literature in this chapter advises, learning can first be lecturer dependent, but in time as students mature, lecturers must begin to withhold their support so that learners become independent. At this level, lecturers become consultants to their students and work as resource persons.

Recommendations

Mathematical modelling is the most useful approach in promoting PBL and SDL in student teachers. The study recommends that lecturers must strive to inculcate in their mathematics-student teachers an internal

locus of control regarding their problem-solving capabilities. Student teachers must believe that, given enough time, they can solve any mathematics problem and that it is worthwhile to do so. To promote PBL and SDL capabilities, and therefore student teachers' internal locus control for problem solving, teacher education must be geared towards mathematical modelling and solving of authentic tasks. To that end, a hands-on mathematical modelling course for pre-service mathematics-student teachers needs to be introduced in the teacher-education curriculum. This has the potential to improve South African teachers' competencies in mathematics. It will expose student teachers to enquiry and exploration approaches to learning, which can later be on passed to their learners.

Chapter 7: Summary

This chapter explores the levels that current teacher-education courses in mathematics at a selected Initial Teacher Education Institution (ITEI) in South Africa promotes problem-based learning (PBL) and self-directed learning (SDL). PBL and SDL are linked to learning through enquiry and exploration. The chapter also discusses approaches for enacting mathematics PBL and SDL in ITEIs. Thirty final-year student teachers in mathematics were divided into groups of five and asked to solve authentic mathematics problems and projects suggested in literature to promote PBL and SDL. Their work was assessed three times in three weeks. Further, content analysis on PBL and SDL literature was carried out. The study found that student teachers showed limited PBL and SDL competencies particularly on the authentic learning problem task. This suggests that the current mathematics teacher education curriculum may not sufficiently help students develop these learning strategies. The study recommends

that to promote PBL and SDL capabilities and therefore an internal locus of control for problem solving in student teachers, teacher education should be geared towards mathematics modelling and authentic tasks. Implications of the study are that a course by that name should be introduced in the teacher-education curriculum to inculcate PBL and SDL competence in student teachers.

Chapter 8

Pre-service teacher students' expectations of self-directed learning in an undergraduate blended-learning course

Adri du Toit & Jessica Pool
North-West University
South Africa

Introduction

Blended learning is gaining popularity as a mode of delivery in tertiary institutions (Andrews & Tynan 2015:86; Ching & Lung 2005:18; Vaughan 2010:10). Garrison and Vaughan (2008:5) define blended learning as the thoughtful fusion of face-to-face and online learning experiences and emphasise the need for redesigning learning and teaching in such a manner

How to cite: Du Toit, A. & Pool, J., 2016, 'Pre-service teacher students' expectations of self-directed learning in an undergraduate blended-learning course', in E. Mentz & I. Oosthuizen (eds.), *Self-directed learning research*, pp. 213-238, AOSIS, Cape Town. http://dx.doi.org/10.4102/aosis.2016.sdlr14.08

that the strengths of each are blended into a unique learning experience. Hoic-Bozic, Mornar and Botici (2009:20) describe blended learning as a merge of classical face-to face lectures, learning by using the internet and learning sustained by other technology aimed at creating the most efficient learning environment. Alonso *et al.* (2005:218) add to the above the combination of event-based activities such as self-paced learning and live e-learning. Furthermore, the literature also refers to blended learning as a hybrid format of delivery (Bleed 2001:18, 83).

Given the on-going expansion of blended-learning environments, it is crucial that we gain insight into successful student engagement in online environments in order to develop a profile of how students learn online (Shea & Bidjerano 2013:430). According to Banerjee (2011:10), student satisfaction is perceived as a decisive factor in determining whether blended-learning environments are beneficial to students' learning.

Student satisfaction within a blended-learning context largely depends on the degree to which self-directed learning is required in an online and blended-learning environment (Banerjee 2011:11). It is well-documented that online education requires a greater degree of self-directedness and self-reliance than 'standard' face-to-face modes of delivery (Dynan, Cate & Rhee 2008:97; Shea *et al.* 2013:429). Transferring self-directed learning readiness to online distance education means directly addressing the fact that online and blended-learning instruction requires a high level of motivation, the capacity to multi-task, goal-directedness as well as the ability to work independently and cooperatively (Banerjee 2011:11; Brunner *et al.* 2015:119).

Given that self-directed learning is a crucial competence for students in a blended-learning course, their expectations regarding online tools and learning approaches may have consequences for the planning, structuring and implementation of such courses (Brunner *et al.* 2015:118). This study

reports on students' expectations of self-directed learning in blended learning before they had been exposed to such a mode of delivery and compares it to their experiences after the conclusion of the course in which blended learning was implemented.

Problem statement

There are limited research and rich descriptions on what students expect before attending blended-learning courses (that is, preconceived expectations) and how their expectations are shaped as the blended-learning course progresses (that is, informed expectations) (Pinto & Anderson 2013:3). Designers of blended-learning courses should consider the expectations of students working in a blended-learning environment and should critically reflect on the planning, structuring and implementation of such courses in order to address students' expectations. This is important, especially when redesigning existing curricula and courses to include blended learning in order to enhance and support students' learning.

Though considerable research has been conducted regarding the development and structuring of blended-learning courses (Garrison & Vaughan 2008:5; Lee *et al.* 2014:427; Picciano 2009:4), little information could be found regarding the role that students' self-directed learning processes play in blended course design. Also, little information is available on how (or if) students' expectations regarding self-directed learning within blended courses are considered or addressed when designing such courses. Clarifying students' expectations is, therefore, an important way for researchers to assess students' satisfaction with blended-learning courses (Banerjee 2011:10).

Higher education is typically characterised by complex and concurrent achievement tasks as well as significant autonomy with respect to the

organisation of learning, learning materials, learning goals and learning procedures. The responsibility for own learning, the increased transferability of learned knowledge and the fostering of lifelong learning are some of the benefits gained from self-directed-learning (Dresel *et al.* 2015:456). Fostering self-directed learning is therefore a major educational objective in establishing lifelong learners for the 21st century (Dynan *et al.* 2008:96; Lee & Teo 2010:15).

Realising this educational goal, the Faculty of Education Sciences (where the study was conducted) finalised a curriculum-development plan (CDP) for the inclusion of self-directed learning (as part of the meta-curriculum) in the curricula of all subjects. The CDP requires that self-directed learning purposely be included in the Faculty's curricula to incorporate aspects such as students taking ownership of learning, the extension of own learning and the management of own learning. Self-directed learning has several potential benefits for 21st-century students in formal learning settings, the workplace as well as in their personal lives (Guglielmino 2013:2), which have been taken account of in the curriculum-development plan.

In blended-learning environments, the importance of self-directed learning skills such as self-motivation and self-management increases due to reduced face-to-face interaction (So & Brush 2008). Research suggests that a lack of self-directed learning skills in students may be a significant obstacle in blended-learning courses (Bonk *et al.* 2002:99; Lupshenyuk & Adams 2009:428). Once again, this points to the importance of investigating students' expectations regarding self-directed learning in the online environment of blended learning. The emphasis on including self-directed learning in curricula is relatively new in the Faculty mentioned above, and therefore, questions arose about students' expectations and experiences regarding self-directed learning. The course,

which implemented blended learning, was new and was still being refined. It was designed to expect self-directed learning from its students. However, it was unclear what the students expected in turn regarding self-directed learning in the blended course.

Thus, the aim of this investigation was to answer the following research questions:

- What are students' expectations regarding self-directed learning in a blended mode of delivery?
- Has the first blended-learning course to which students were exposed met their expectations regarding self-directed learning?

Research orientation

A cognitivist approach was utilised in this qualitative investigation. Cognitive theory reflects on thought processes and mental activities that result in specific behaviour. According to cognitive theory, behavioural changes are observed and used as indicators of what is happening in students' minds. Cognitivists believe that learning is the processing of information in the student's mind where different types of mental activities occur during the learning process (Ahmad 2010:32). In this study, the focus was on how students think about self-directed learning, for example, how they organise and retrieve information as part of learning, which is important in cognitivism (Merriam, Caffarella & Baumgartner 2007:287). Meta cognition (that is, the students' understanding of their own learning and learning processes) therefore becomes more significant (Ashworth *et al.* 2004:7). Cognitivism focuses on student-centred strategies (as opposed to teacher-centred strategies) that allow more freedom for students to think about and choose the type of learning that suits them best (Ashworth *et al.* 2004:7). Self-directed learning would be important in

such learning circumstances. The expectations of students regarding self-directed learning in their first exposure to a blended course would give insight into how they thought about and 'directed' their own learning experiences during the teaching and learning in such a course.

The purpose of this chapter is to report on qualitative research that was conducted to explore what students expected regarding self-directed learning in a blended mode of delivery and whether the first blended-learning course to which they were exposed indeed met those expectations.

Theoretical framework

Blended learning designates a range of possibilities presented by combining internet and digital media with established classroom practices that require the physical co-presence of a lecturer and students (Friesen 2012). Blended learning emerges from an understanding of the relative strengths of face-to-face and online learning, and it replaces aspects of face-to-face learning such as practical work in laboratories, simulations, tutorials and assessment with appropriate online learning. Blended learning presents an alternative approach to teaching and learning through a mixture of classroom and online interaction or activities, consistent with the goals and outcomes of programmes (Garrison & Kanuka 2004:97; Garrison & Vaughan 2008:5; Hoic-Bozic *et al.* 2009:20).

Several other descriptions of the concept blended learning have emerged over time. According to Driscoll (2003), blended learning suggests the combination of the following:

- Modes of web-based technology (live virtual classroom, self-paced instruction, collaborative learning, streaming video, audio and text) to accomplish an educational goal.

- Various pedagogical approaches (constructivism, behaviourism) to produce optimal outcomes with or without instructional technology.
- Any form of instructional technology (video tape, CD-ROM, web-based training, film) with face-to-face, instructor-led training.
- Instructional technology with actual practical tasks in order to create a harmonious effect of learning and working.

As is evident from the above discussion, blended learning means different things to different people, and although there are various definitions of blended learning documented in the literature, those most commonly used recognise some combination of virtual and physical learning environments. For the purpose of this study, blended learning was defined as a combination of face-to-face instruction and online learning, implying a redesign of courses and the adaptation of pedagogy to meet students' self-directed learning experiences.

Students are not always fully engaged in online instruction or online learning experiences, unless such students are committed, self-motivated, organised and active learners (Pool & Du Toit 2014:92). Fostering self-directed learning is a main educational goal related to the refinement of lifelong learners in the 21st century (Dabbagh & Kitsantas 2012:4; Dynan *et al.* 2008:97; Voogt & Roblin 2012:300). According to Knowles (1975) self-directed learning:

> Is a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources, choosing and implementing appropriate learning strategies and evaluating learning outcomes. (p. 18)

Long (1994:15) added to this the students' mental processes for the purpose of gaining knowledge and understanding, solving problems and developing or strengthening a skill. That being said, self-directed learning demands a

higher level of self-management and a selection of alternative learning strategies to be employed when solving problems (Lee & Teo 2010).

Self-directed learning is an ambitious form of learning that is more challenging and requires more active participation in the learning process than just being passive students in the transmission of well-organised knowledge. Students' perceptions of their learning may differ substantially across blended-learning contexts, affecting their motivation, which poses concerns for environments intended to motivate and empower students to be self-directed through the use of information and communications technology (ICT) (Lee *et al.* 2014:427).

The personal learning environment (PLE) is a fairly new concept in online learning that utilises social media as an effective platform for student learning (Dabbagh & Kitsantas 2012:4). The EDUCAUSE Learning Initiative (ELI) defines PLEs as tools, communities and facilities that constitute the individual educational platforms that students use to direct their individual learning and pursue educational outcomes (EDUCAUSE 2007). According to McLoughlin and Lee (2010:30), PLEs empower students to take charge of their own learning by motivating them to select tools and resources to create, organise and package learning content to improve their own learning. A study conducted by Harrison (2011) reports that PLEs such as blogging, Facebook and Twitter help students direct their own learning, increase engagement with course material and promote the development of learning communities. The communication aspect of ICT in the online environment greatly enhances students' opportunities to engage in both face-to-face and online contexts. In online contexts, students can join online communities to gain needed knowledge and also share their personal expertise (Thomas & Brown 2011:52). In addition, collaborative online learning can drive self-directed learning, for example,

when groups can help individuals become aware of the gaps between personal knowledge and group members' knowledge (Dabbagh & Kitsantas 2012:4). A key feature of a PLE is that the student develops an online identity where the PLE provides possibilities for collaborative actions. This confirms the notion of PLEs as a promising pedagogical perspective when using social media in higher-education contexts to support learning (Dabbagh & Kitsantas 2012:5).

With this in mind, it is important that the development of PLEs focuses on the application of self-directed skills (McLoughlin & Lee 2010:31) and that this process of developing self-directed learning skills must be considered as an act of instructional design when constructing the blended-learning course (Turker & Zingel 2008). Facilitators of blended-learning courses should first assist students to acquire self-directed learning processes and skills before expecting them to function effectively within an ICT-supported learning environment. Improving self-directed learning skills as a priority is also mentioned by Dynan *et al.* (2008:99) and Geduld (2014:13), who suggest that a structured environment provides a more suitable climate for improving students' readiness for self-directed learning.

Other research (Lee & Teo 2010; Robertson 2011:1631; So & Brush 2008:322) also reports on the use of various ICTs to support self-directed learning in the online component of blended learning. For example, self-directed students tend to search the internet and other resources for online knowledge and content. Such students organise and demonstrate what they have learned through a variety of ICT software, which function as cognitive tools and learning strategies that they can adopt to help them gain understanding of the learning content (Jonassen *et al.* 2008). Access to online resources helps students to identify their own learning

requirements, select their own learning paths and support them to independently deepen their knowledge and understanding (Lee *et al.* 2014:431; Lin 2008:130).

In order to plan, design and structure a teaching and learning environment that focuses on delivering students who are able to learn independently and self-directly within a blended-learning environment, it is important to take into account students' expectations regarding self-directed learning.

Empirical investigation

The aim of the investigation was to explore what students expect in a blended mode of delivery, particularly regarding self-directed learning, and whether the first blended-learning course to which they were exposed indeed met those expectations. No specific focus or emphasis was placed on self-directed learning processes in the course. This qualitative case study was conducted from a cognitivist point of view. Case studies take place in a bounded system with delimitations or boundaries to indicate what would be considered relevant (or not) to the case being studied in a particular setting (Harling 2002:2). The case for this study was bound by course specification and time limitations. The students who were enrolled for the course in which the study was carried out (during the first semester, February to June 2014) were selected by means of convenience sampling. Of the total population of 58, 37 students chose to participate in the research. This course formed part of a teacher-preparation programme and was these exit-level (fourth-year) students' first exposure to blended learning. The course was adapted from a full-time, face-to-face course to a course utilising a blended mode of delivery.

The blended course utilised a purposely developed e-guide, hosted on the preferred teaching-learning platform (called eFundi, which is similar to the renowned Blackboard platform) of the university where this study was conducted. The e-guide provided guidance regarding the requirements, prescribed activities and group work for each study unit in the course and had a structured schedule detailing which sessions would be face-to-face and which would be online. This structuring was purposely included to facilitate the unknown mode of combining face-to-face with online learning for students who had never been exposed to this mode of delivery. Online resources, such as additional reading material and extension activities, were also made available on the teaching-learning platform to expressly support the use of ICTs by students. To facilitate online interaction and PLEs, a Facebook group was created for the course, online office hours were set, and students were given the lecturer's cell phone number, which they could use to stay in contact with her by means of WhatsApp (a free mobile communication application). Students were divided into heterogeneous groups that each included at least one subject-specialist student. It emerged that the students also created their own smaller WhatsApp groups to keep in touch with students in their own and other groups. Face-to-face sessions were conducted at prescribed times in a venue on campus.

Ethical approval was acquired from the Ethics Committee of the university where the study was conducted. Participation in the study was voluntary, and all students signed a letter of consent, which set out the general aims and details of the intended research.

In keeping with Nieuwenhuis' (2010:75) prescriptions for qualitative research, data in this study were collected within students' natural context

without any manipulation thereof. Several qualitative methods were used for data collection: two questionnaires, focus-group interview sessions, individual interviews as well as field notes made by the lecturer during face-to-face contact sessions. The two questionnaires consisted of open-ended questions and were completed and submitted anonymously by students enrolled for the course. The purpose of the first questionnaire was to collect data regarding students' expectations regarding aspects of blended learning before commencing with the course (see Table 17). A follow-up questionnaire, structured around the same questions as the first questionnaire, was used to collect information regarding students' experiences and perceptions of blended learning in the course after its conclusion (see Table 17). Focus-group sessions and individual interviews were held at regular intervals throughout the study to gain a deeper understanding of students' expectations regarding self-directed learning in the blended-learning module. This led to the acquisition of rich, deep data. The lecturers' field notes served to expand details about the context in which data were collected; it also contained notes regarding observations during face-to-face contact sessions. Thirty-seven students completed the first questionnaire, and 34 students completed the follow-up questionnaire. The lower number of student participants in the second round was probably due to the second questionnaire being completed after the completion of the blended-learning course when students were preparing for formal examinations.

Data analysis was inductive and included a detailed description of the students in the research setting, followed by memoing, coding and thematic analysis. *A priori* codes, derived from the literature, as well as *a posteriori* codes that emerged from the data were utilised in the analysis. For the purpose of this paper, the data analysis focused only on students' statements, expectations and experiences regarding self-directed learning and closely

TABLE 17: Open-ended questions used to collect data.

No.	Questions used prior to onset of course	Questions used after completion of course
1	What are your expectations of this blended-learning experience? Please provide a detailed description.	Did this blended-learning course match your expectations of blended learning? If yes, how? If no, why do you think this was the case? Please provide a detailed answer.
2	What challenges do you think you might encounter during this blended-learning course? Please provide a detailed description.	What challenges did you encounter during this blended-learning course? Please provide a detailed answer.
3	What support (lecturer, peer, technical, etc.) do you expect to receive during the course of this blended-learning course? Please list all.	What support did you receive during this blended-learning course? Please provide a detailed answer.
4	What positive experiences do you expect to gain from participating in a blended-learning course? Please provide as much detail as possible.	What positive experiences did you gain from participating in a blended-learning course? Please provide a detailed answer.
5	In your opinion, what should a lecturer's role be in facilitating a blended-learning course as opposed to a traditional face-to-face mode? Please provide as much detail as possible.	In your own opinion, how did the lecturer's role change in facilitating this blended-learning course compared to a traditional face-to-face course? Please provide a detailed answer.
6	How do you think your role as student will change when you are participating in a blended mode of delivery as opposedto a traditional face-to-face mode? Please provide as much detail as possible.	How did your role as student change while participating in the blended mode of delivery compared to a traditional face-to-face mode? Please provide a detailed answer.

related procedural matters (e.g. learning management, planning and time management) in the blended course.

The codes that emerged from the data were used to generate patterns, categories and themes regarding self-directed learning from students' responses in interviews and questionnaires. The process of data analysis was systematic and iterative in an effort to clarify and refine themes arising

from the data. The interpretation of data relied heavily on the language that students used to describe their expectations and experiences relevant to the issue of self-directed learning as part of the blended-learning module.

Data analysis was conducted in parallel by the course facilitator (that is, the lecturer) as well as two other independent researchers, after which triangulation was employed to support the validity and trustworthiness of the findings. In addition, member checking, reflective practice and peer debriefing were employed to add to the credibility and trustworthiness of the research. Generalisability was not deemed an issue in this case study as the findings were pertinent to the specific context in which the study was conducted.

The interpreted data led to the formulation of tentative findings that were reviewed on an on-going basis.

Findings and discussion

The following findings emerged about students' expectations regarding self-directed learning prior to the onset of the blended course as well as students' experiences of self-directed learning after the completion of the blended course. The study's two research questions were employed to guide the search for the main themes and to present and discuss the findings. The research questions were:

- What are students' expectations regarding self-directed learning in a blended mode of delivery?
- Has the first blended-learning course to which students were exposed met their expectations regarding self-directed learning?

A number of quotes by students have been included (translated verbatim in cases where responses were originally in Afrikaans) to elucidate the findings.

Theme 1: Students' expectations regarding self-directed learning in a blended mode of delivery

Four sub-themes were discovered in this theme, which delineate the findings and discussion of students' expectations regarding self-directed learning in a blended mode of delivery. These sub-themes cover (1) students' comprehension of what self-directed learning entails, (2) students' expectations about organisational aspects regarding self-directed learning in blended learning, (3) students' expectations regarding autonomy in blended learning and (4) students' affective expectations regarding self-directed learning.

Sub-theme 1.1: Students' comprehension of what self-directed learning entails

Students held wide-ranging expectations that they would have to become more self-directed learners in the blended course and that this transition from dependant learner to self-directed learner would happen 'quickly'. General expectations regarding self-directed learning in the blended course were predominantly positive and revealed that most students had a good grasp of what self-directed learning entails:

> 'I expect that I will quickly learn to be self-directed and to think independently. I look forward to this experience since it will allow me to manage my own time and to complete activities according to my own schedule'.

This quote indicated the participant's grasp that independent thinking, time management and completing activities according to an individual schedule would be required as part of self-directed learning in the

blended mode. Students expected to 'learn to think for themselves', that the learning would be 'interesting and not boring' and that they would be more involved and participate more in their own learning than in a face-to-face module. Students understood that they would 'do their own research', 'take responsibility for their own learning', improve their time management skills and 'learn to utilise technology better to support learning' as part of self-directed learning in blended learning. These students' comprehension of what self-directed earning entails aligns well with Geduld's (2014:16) description of self-directed learning, namely that such students can identify their own learning needs, are motivated by internal factors (such as their own learning needs and interests) and are actively engaged in interaction between lecturers and other students. Therefore, despite the fact that no emphasis was placed on self-directed learning as such in the blended module, the students had a good grasp of what it entails.

Sub-theme 1.2: Students' expectations about organisational aspects regarding self-directed learning in blended learning

After the completion of the blended course, most students mentioned that their biggest challenge had been to get started – figuring out where to begin and what to do. This finding indicates a need for some organisational aspects regarding self-directed learning and blended learning to be clarified in more detail, especially in cases where students are exposed to such a mode of delivery for the first time.

Students were not used to employing an *e-guide* (as part of ICT), and a number of them mentioned that they struggled to effectively utilise electronic resources (ICTs such as devices, internet and software programs)

to support their learning. This finding contrasts with other findings of the study, which indicated that clear guidance was provided as inferred from the following quotes:

> 'The outcomes of each study unit were given and formed the base of each assignment, learners always knew what was expected of them'.
>
> '... the electronic study guide where all the instructions were given to us. The support material was very good'.

These statements dovetail well with the suggestions of Dresel *et al.* (2015:457), Dynan *et al.* (2008:99) and Geduld (2014:13) that a structured environment will provide a more suitable learning climate for improving students' readiness for self-directed learning. The finding also aligns with Pool and Du Toit's (2014:107) statement that it would be prudent to gain input from students about their experiences with e-guides in order to implement those suggestions when developing e-guides for blended modules. This is also true in cases where self-directed learning is an intended learning outcome, and the finding underscores the useful role that e-guides can play in supporting self-directed learning in blended learning.

It emerged that *collaborative online learning* contributed to students' self-directed learning. A number of students mentioned that they had 'learned a lot' from their peers within their groups and from students in other groups. This echoes findings by Lee *et al.* (2014:427), who found that self-directed learners joined online learning communities to help them achieve their learning goals. Though students in this study were purposely placed in groups, they also sought out the WhatsApp groups of others and utilised the closed Facebook group to help them attain their learning goals. This finding emphasises the importance of PLEs in blended-learning courses.

A number of students also mentioned that the *feedback* they received during the module was useful and supported the scaffolding of subsequent assignments and portfolios, 'support in the form of evaluation and assessment was thorough and informative [*regarding assignments*]'.

Feedback from their peers was also reported to contribute to their learning experiences. This links with a statement from Silén and Uhlin (2008:462) that students need support and feedback in their struggle to become self-directed learners. The importance of prompt and meaningful feedback as a purposely incorporated element when designing blended-learning courses therefore emerged.

Students also experienced the *role of the lecturer* as positive and appropriately supportive without being overtly prescriptive, as reflected in the following two quotes:

> 'Our lecturer really made us enjoy the course; she facilitated us very good [*sic*] and gave us suggestions on how to do something in a different way, more appropriate perhaps. She didn't just give the work to us, but facilitated in helping us to get the work [*sic*]'.
>
> 'I think the lecturer got to be one of the students, giving support online and not being in front of the class giving the lecture [*sic*]'.

It was interesting that this student perceived the lecturer as being more approachable (like an equal and/or fellow student) in the blended course than in a face-to-face course. The same sentiment was repeated by other students who mentioned that there was a '… more comfortable atmosphere between the student and lecturer because the student uses technology and can more easily say what they think about certain topics'. Armstrong (2010:19) notes that the roles of facilitators include clarification of the learning process as well as enabling students to evaluate their self-directed learning efforts. The roles that the lecturer or course facilitator fulfil in a

blended course should therefore be carefully scaffolded to ensure that the required self-directed learning (and other) skills develop in students without hindrance.

Sub-theme 1.3: Students' expectations regarding autonomy in blended learning

One of the definitive goals of the blended-learning course was that students would realise the importance of taking ownership of their learning, becoming more self-directed. It was therefore seen as significant when a number of students mentioned that it was unusual to 'feel this free' and that students felt that they were supported to 'take ownership of their own learning'.

A few students expected that they would have to move out of their own 'comfort zone' and that they would have to apply more self-discipline and better time management in their studies. Several students expected the increase in self-discipline required in self-directed learning and blended learning to be a challenge. A few students mentioned that '… it was a challenge to work independently and take responsibility for achieving outcomes' as they were not used to do it themselves.

A recurrent response was that 'It was also good to not be spoon fed [*sic*]' and to 'have the opportunity to work at our own pace'. One student said:

> 'My role as student did change. I was more dependent on myself and trusted my opinion more as I worked. I was motivated to investigate different methods of research and communication which helped me to be more versatile in my role as a student'.

Other participants noted:

> 'Although it was more work [*than in other courses presented only face-to-face*], I think I will remember it longer because I was allowed to come to my own conclusions about

> the information. You get the opportunity to choose the best from all the data and to differentiate what is relevant and what not'.
>
> 'I was more involved [*in my own learning*] than before. I did more self-investigation in this course than in other courses. I feel I was organised and involved in the achievement of the learning aims'.

These responses are in line with the remarks of Geduld (2014:16) as well as James and Clarke (cited in Hewitt-Taylor 2001:498) that students enjoy the autonomy of self-directed learning but that they do not necessarily enjoy the increased responsibility and effort that it requires. The finding also indicates that the self-directed learning, as part of the blended approach, was student-centred and allowed students more freedom to choose the type of learning that suited them best, which supports the suitability of cognitive theory in the study.

Sub-theme 1.4: Students' affective expectations regarding self-directed learning

The generally positive experiences of students in the blended course are mirrored in the following quote, 'It [*blended learning*] was different, which made it appealing and forced me to take control of my own learning'.

Students enjoyed the blended mode of delivery and appreciated the opportunity to be able to work independently and at their own pace. Enjoyment of the learning experience contributed to the positive affective factors that support self-directed learning as suggested by Mok and Lung (2005:22).

A number of students seemed to have discovered their own learning strength in self-directed learning. This is evident in the following quote:

> 'I've learned that there is no need for one to be in a class and get lectured, thus this blended learning made me realize that as an individual you are supposed to get used to self-directed learning and start thinking and doing things for yourself'.

Another participant stated:

> 'I actually learned to manage my time effectively and learn to do research if there was something that was not clear enough for me. This will be beneficial to me in the future. My knowledge about the content expanded'.

This participant expressed appreciation for the advantages that she or he had experienced with self-directed learning in the blended-learning course. Several other students shared the view that they would use self-directed learning as a skill in future. The finding gave insight into how the students thought about and 'directed' their own learning experiences during the course and was therefore in line with the cognitive theory used in the research.

Theme 2: Meeting students' expectations regarding self-directed learning in the first blended-learning course to which they were exposed

The following quote seems to answer this research question almost directly:

> 'It [*blended learning*] totally exceeded my expectations. I did not think it would work so well… we learned in an interesting manner and not only in the old boring way'.

Prior to the start of the blended course, students expected that they would have to communicate more. They also expected to take more responsibility for participating in class and online to ask questions – especially if anything was unclear and to voice their own opinion. It was gratifying to note that several students felt that their 'own voice was heard' and that they seized the opportunity to participate more in their own learning. They were afforded this opportunity in the online interaction as a number of them noted that they would not have had the self-confidence to participate as

freely in a face-to-face context. The use of PLEs therefore contributed to the development of the students' online identity. The students' increased understanding of their own learning and learning processes supports the cognitive theory used in the research.

A comparison of students' experiences after the conclusion of the course with their expectations held prior to its onset revealed that they predominantly experienced the blended mode of delivery as an improvement with more perceived advantages than 'standard' face-to-face courses. Specific advantageous elements related to the self-directed learning that students mentioned included trusting their own opinion and reflecting more, investigating and applying different research methods, evaluating and selecting information, and being more organised. These are all essential elements of self-directed learning and roles expected of self-directed learners (Guglielmino 2013:8; Pilling-Cormick & Garrison 2007:14; Thornton 2010:160). Therefore, these elements and roles need to be purposely embedded in blended-learning courses as skills that students need to develop. It also shows how the students thought about self-directed learning, that is, how they organised and retrieved information as part of learning, indicating the suitably of the cognitivist theory utilised for the research.

Limitations of the study

This study reported on students' expectations of self-directed learning within blended learning before and after being exposed to such a mode of delivery. The degree to which students' expectations have been met in this blended-learning context was largely influenced by the degree to which self-directed learning was required in the online and blended-learning environment.

The evidence revealed that students held positive expectations regarding this new way of learning. They expected the blended-learning approach to be more informative than traditional face-to-face learning, and they expected to save time and to work more independently. Students also expected the lecturer's role as well as their own roles as students to change – that they would become more self-directed and independent in their learning and that the lecturer would fulfil a facilitating and supporting role (as opposed to teaching).

The blended-learning course met most students' expectations regarding self-directed learning, probably because the course was planned to support particular outcomes, including self-directed learning. Specific advantageous elements related to self-directed learning include the following: students increasingly trusting their own opinion and reflecting more on their own learning, investigating and applying different research methods, evaluating and selecting information and being more organised toward their own learning. Self-directed learning was therefore reinforced by the application of the blended-learning mode. Students experienced self-directed learning and blended learning as contributing constructively to their learning and believed that it would be useful in their future. Cognitive theory fittingly supported the research and findings about students' thinking about their (self-directed) learning in blended learning.

However, this study also identified a couple of challenges that need to be addressed in order to further support the design and development of blended-learning courses. These include that clear organisational elements should be provided to help scaffold the work (especially if it is students' first introduction to blended learning). This should be done in such a way that self-directed learning remains enabled. Appropriate ICT is necessary to facilitate effective online interaction. ICT should be structured to support, and not hinder, blended learning.

Recommendations

Scaffolding blended courses should purposely include skills and elements required in self-directed learning such as time management, reflection, communication and collaboration with peers – especially when it is students' first exposure to blended learning. These are all essential elements of self-directed learning that contribute to students' positive experiences in blended learning and will support students' learning in blended courses.

The changing roles of the lecturer as well as that of the student in blended learning should be clarified and carefully considered. This will ensure that self-directed learning is not impaired. In this regard, consideration should be given to the amount of structured guidance made available to students in blended learning. It is recommended that progressively more autonomy be provided in the students' learning process in order to help them to develop self-directed learning skills in blended courses.

Effective ICT support is recommended as part of blended learning to further enhance and support self-directed learning as well as to overcome negative experiences of students. Providing effective support (e.g. reliable, affordable internet connections and initial guidance in the effective use of social media as a learning support tool) would contribute to experiences in blended learning that are more positive. Furthermore, developing and increasing the use of PLEs, including social media, can contribute to the development of self-directed learning skills in a higher-education context.

Conclusion

The crucial role that self-directed learning plays in blended learning should not be underestimated. Self-directed learning does not only imply that

students have to learn with more autonomy, but it contributes to students' satisfaction in blended-learning courses as well as to their motivation to learn. Designers of blended-learning modules should take students' expectations regarding self-directed learning into consideration in order to develop blended courses that will contribute to students' motivation to learn and their satisfaction with such courses. Meticulous planning and purposeful inclusion of self-directed learning as a core element of blended learning will foster the development of lifelong learning, a crucial skill for students in the 21st century.

Chapter 8: Summary

Blended modes of delivery are becoming considerably more prevalent in higher education. A blended course requires a combination of face-to-face and online interaction for the attainment of course outcomes. Particularly the online interaction and learning taking place outside of the classroom necessitates a degree of self-direction from students to support the successful attainment of outcomes. Existing course curricula need to be adapted and strategies need to be developed to enhance and support students' learning in a blended approach to teaching and learning. This case study explored students' expectations regarding the self-directed learning required by a blended mode of delivery for a pre-service undergraduate course for teachers. Data were collected from pre-service teacher students at a South African university by means of questionnaires with open-ended questions (given to students before and after their first exposure to a blended-learning course). Focus-group sessions, individual interviews and field notes were also used to collect data. The qualitative data analyses and interpretation provided insight into students' expectations and experiences regarding self-directed learning and related aspects in this

blended-learning course. The findings indicated that students expected and experienced self-directed learning as a positive gain in the blended course. Most of the students' expectations regarding self-directed learning in a blended-learning module were met in their first exposure to this mode of delivery. Recommendations are made regarding the scaffolding of blended courses to foster self-directed learning based on students' experiences.

Chapter 9

Academic writing supported by digital technologies and the *INcwadi-Mkhaphi* (book-guide) in isiZulu folk-poetry education

Thabisile Buthelezi & Paulinah Phahamane
University of KwaZulu-Natal
South Africa

Introduction

At universities, undergraduate students are required to write at a level meeting academic standards. This means that the essays that students produce should present coherent arguments with acceptable grammatical

How to cite: Buthelezi, T. & Phahamane, P., 2016, 'Academic writing supported by digital technologies and *INcwadi-Mkhaphi* (book-guide) in isiZulu folk-poetry education', in E. Mentz & I. Oosthuizen (eds.), *Self-directed learning research*, pp. 239-270, AOSIS, Cape Town. http://dx.doi.org/10.4102/aosis.2016.sdlr14.09

structure, correct orthography, accurate spelling and the correct use of punctuation marks. In addition, as Wheeler and Wheeler (2009:2) argue, students are expected to demonstrate critical awareness of their subject knowledge by presenting ideas in a logical and cohesive argument and showing relevant focus in their writing. Furthermore, students are also required to support their arguments and reference accurately from literature. Such academic writing skills are cognitively demanding as they require students to engage with a deep kind of learning, and therefore, some students find the task of academic writing challenging (Wheeler & Wheeler 2009:2).

Research reports (Bettinger & Long 2009:736; Boughey 2000:281; Burch *et al.* 2007:345; Granville & Dison 2009:56; Greene & Foster 2003:1–2) show that many students who enter into higher education are unprepared academically for university studies and that students find the task of academic writing problematic. The dropout rates are attributed to, amongst other things, a lack of academic writing skills amongst students (Chokwe 2011:2). Several universities have implemented interventions that attempt to support the students' academic development (Chokwe 2011:2; Coffin *et al.* 2003:8). Research reports about academic writing courses and language centres that are established in universities across the world to support students in their academic writing are well documented in the literature (Salamonson *et al.* 2009:410; Storch 2009:104–105; Wingate 2007:393). However, this body of literature shows that students who speak English as a second language are the worst affected and in need of support; thus academic-writing interventions target mostly these students. Such reports also attest to the difficulties of accessing education through a second language.

A body of research (Khubchandani 2003:240; Mashiya 2011:28–29; Zuma & Dempster 2008:31–46) shows that success in education is

significantly influenced by language problems, especially when students learn in their second language. As a result, scholars (Alexander 1989:4–14; Batibo 2009:30–33; Dempster & Zuma 2010:55–57; Mashiyi 2014:5–7) argue that African languages should be used as languages of learning and teaching in education. Maseko *et al.* (2010:314) argue that these languages are capable of expressing any concept as they were used to '… express knowledge in complex fields such as astronomy and medicine in pre-colonial times'. Buthelezi (2008:189–196) and Buthelezi, Mhlongo and Hlongwa (2014:199–205) show how terminology extension can be achieved to enrich these languages and promote them as languages of education and research. In this study, a book-guide that is written in isiZulu indicates that the isiZulu language can be used as a language through which to attain academic literacy and as a way of developing self-directed learning amongst students.

Problem statement and study purpose

At the South African university where the study was conducted[27] in the School of Education and within the Bachelor of Education programme, student numbers have increased to about 4000. Consequently, since 2012, courses in isiZulu education have seen soaring numbers of students enrolled in the 11 specialisation modules. The enrolment figures range between 160 and 250 students in each module of the major. In the isiZulu communication modules, the enrolment figures range between 100 and 850. The set of isiZulu modules is inclusive of content knowledge and modules on teaching methodology. The increase in enrolment figures can be attributed to the increase in the number of students who come from rural KwaZulu-Natal

27. The application for the research protocol was approved with an undertaking by researchers that the identity of the institution will not be revealed in reporting about the study.

and who thus like to increase their knowledge of isiZulu as it is valued in their background. Additionally, the nationwide promotion of African languages in South Africa, coupled with the inclusion of African languages in the priority areas for awarding the Department of Education's Funza Lushaka bursary scheme, has also generated interest amongst students to enrol for specialisation modules in isiZulu (Bursaries South Africa 2015:1). Some students who come from economically disadvantaged communities and families choose to take isiZulu as one of their specialisations in order to be considered for the Funza Lushaka bursary scheme that fully pays for their studies whilst they are at university. The bursary pays for accommodation, tuition, books, meals and other allowances.

However, the number of academic staff teaching in these modules has remained stagnant (only five permanent academics with three vacant posts). Besides, most students who enrol in the Bachelor of Education programme come from disadvantaged rural backgrounds where they experienced a poor quality of education in the schooling system (Spaull 2013:3–7). They therefore require intense support, particularly in developing their academic writing skills. In their first year of the Bachelor of Education degree, all the students enrolled for the degree are required to take a compulsory semester module called Academic Learning in English (ALE) wherein academic literacy is taught. The aim is that, after experiencing this ALE module, students will have acquired the required academic reading and writing skills, and they are expected to apply these skills in their core and specialisation modules.

However, there has been little evidence that students enrolled in the specialisation modules in isiZulu are able to apply the academic writing skills learnt in the ALE module when they write their isiZulu essays.

This has caused staff teaching in the isiZulu education modules to spend enormous amounts of time giving detailed feedback on academic writing skills to individual students. With the increase in the number of students enrolled in each isiZulu education module and with stagnant numbers of academic staff teaching in isiZulu education, the one-on-one support in academic writing has become nearly impossible even with additional contract tutors and markers employed by the university. Hence, the lecturers intend introducing the self-directed learning approach to developing academic writing. They intend using a self-help book titled *INcwadi-Mkhaphi*. This book is written in isiZulu and is available to students on the course management system (CMS) that is on university's internet-learning platform, called Moodle 3.1. The CMS allows the academic to set up the module on the internet and to perform various activities. For example, the academic can add students and tutors who are involved in the module, upload files, write notices and create a forum for discussions. Notices written on the CMS are immediately routed to the emails of all participants in the module whilst remaining on the CMS.

This approach to developing academic writing was used in 2015 with 161 fourth-year students enrolled in the second semester of an isiZulu-education module. Therefore, the purpose of the study was to establish, through the students' own voices, their experiences and views about the use of digital technology and *INcwadi-Mkhaphi* as support material for developing academic writing.

Research questions

The main research question for the study was: how can digital technology and *INcwadi-Mkhaphi* be used to support students' academic writing in isiZulu folk-poetry education?

The following two subsidiary research questions guided the study:

- How did students experience digital technology as support material for academic writing in isiZulu folk-poetry education?
- How did students experience *INcwadi-Mkhaphi* as support to academic writing in essay writing in isiZulu folk-poetry education?

Context of study: *INcwadi-Mkhaphi* and CMS

The students who participated in the research were all enrolled in the isiZulu-education module for 16 credits. They received two weekly classes, one on language and linguistics and another on folklore. They were to write an assignment on the folklore part. To support them with academic writing skills, they were given *INcwadi-Mkhaphi* that was posted on the university's course management system (CMS) which is available on the internet learning site.

The term *INcwadi-Mkhaphi* can be translated into an English equivalent such as 'book-guide'. However, this English translation does not accurately capture the meaning of the word because the isiZulu term *umkhaphi* means more than a guide. It refers to a person who takes you along the journey, ensuring your safety and security as well as comfort and subsistence. The term therefore indicates the purpose of the material. The material was aimed to sensitise students to key features of the organisational structure of an essay. *INcwadi-Mkhaphi* also includes suggestions for exercises that prepare one for the organising the contents of the essay by breaking down the essay question into finer features, including the following:

- Identifying structures to construct a section of a text.
- Identifying the type and ordering of information in each subsection.
- Understanding how each subsection relates to previous subsections.

TABLE 18: Guidelines for developing self-directed learning skills (adopted from Gugliemilno 2013:11–12).

No.	Action step
1	Introduce problem-based learning, project-based learning and field-based learning and build the skills to analyse and address problems
2	Problem identification
3	Planning
4	Resource identification
5	Evaluation of strategies and results
6	Identification of new questions
7	Provide support systems
8	Other appropriate sources – human or material

In developing *INcwadi-Mkhaphi,* we adopted part of Guglielmino's (2013:11–12) guidelines for developing self-directed learning skills that has eight action steps (see Table 18).

We integrated these action steps in the essay question, *INcwadi-Mkhaphi* and CMS. The essay entailed both project-based and field-based learning that aimed to build basic skills in research and analysis. Students had to provide two pieces of folklore that are used in their families and/or communities: one piece of folk poetry and one folk song. They then recorded these using the correct style that was taught in class. The students were expected to analyse these by applying the literary devices and the knowledge and skills that were taught in class. However, they were required to augment their discussions with knowledge from other sources, which they could search for on the internet and in the university library. In their analysis, they were asked to evaluate the two pieces that they have written in terms of the indigenous-knowledge systems and transformation agendas of the South African context. The students were expected to utilise the support systems that were provided to them for this work, *INcwadi-Mkhaphi*, a 20-page booklet that explains the process of academic

writing that students needed to follow as they were writing their essays. The contents of *INcwadi-Mkhaphi* include a reading list of other sources that students had to consult, information on how to analyse the assignment topic to identify the nature of sources to consult and information on how to determine the structure of their responses to the question. The booklet provided brief information on the different aspects of an essay and a number of linking words and tips to avoid common orthographical errors.

The material was posted on the CMS together with class notes. Students used the CMS and the book-guide that was posted on the CMS as learning-to-write support material for their studies in this module for one semester of four months. After submitting their essays for marking, students were then invited to report on their experiences by completing a written set of open-ended questions.

Literature review

The concept of self-directed learning has mostly been referred to in adult-learning research and discussions. Literature (Canipe & Fogerson 2006:34; Garrison 1997:18; Grow 1991:125; Marsick & Watkins 2001:25–26; O'Shea 2003:62–63; Schugurensky 2000:3–4; Towle & Cottrell 1996:357) discusses self-directed learning as one of the three forms of informal learning – the other two being incidental learning and socialisation (Schugurensky 2000:3–4). The most cited definition of self-directed learning, developed by Knowles (1975:18), states that self-directed learning occurs when the learner takes responsibility for identifying learning needs, developing learning goals, preparing a learning plan, locating learning resources and implementing the plan, and evaluating the results and the process. In this view, the learner directs his or her own life and learning without the support of a teacher. Explaining informal learning, Schugurensky (2000:2) states: 'It takes place outside the curricula provided by the formal and

non-formal educational institutions and programmes'. Thus, by categorising self-directed learning as one of the three forms of informal learning, Schugurensky (2000) takes self-directed learning out of the ambit of educational institutions and is explicit about this when he states:

> Self-directed learning refers to 'learning projects' undertaken by individuals (alone or as part of a group) without the assistance of an 'educator' (teacher, instructor, facilitator), but it can include the presence of a 'resource person' who does not regard herself or himself as an educator. (p. 3)

However, Gugliemilno (2013:10–13) has a different view and makes a case for promoting self-directed learning in institutions of formal education. Whilst acknowledging that, in institutions of formal education, there is '… rarely an opportunity for fully self-directed learning', Gugliemilno (2013:10) argues that '… opportunities exist for varying instructional approaches [*and that*] every learning situation has the potential to develop the skills and attitudes supportive of self-directed learning'. She bases her argument on her observation of rapid change that has occurred in recent years and has manifested itself through the '… massive, escalating proliferation of information and technology' (Gugliemilno 2013:3). The volume of information production that is accompanied by changes in new technology, resulting in an increase in the speed of communication across the world, means that students need to be prepared for an unpredictable future. We agree with Gugliemilno (2013:4) that, in this context of the proliferation of information, self-directed learning is necessary for personal and professional survival. The initial teacher training is inadequate to prepare students for maintaining competence in the teaching profession. As Gugliemilno (2013:4) argues, in formal educational settings, strategies should be used to develop students' skills and attitudes for moving toward self-directed learning.

Gugliemilno (1978:73) argues that a learner's readiness for self-directed learning can 'be determined through the extent to which the learner exhibits personal characteristics' such as 'initiative, independence and persistence … self-discipline, self-confidence, goal-orientedness'. However, Gugliemilno (2013:3) realises that learners can be self-directed even when they do not embody all these characteristics. She thus argues that the levels of readiness for self-directed learning '… also exist along a continuum, with some learners having very high self-directed learning readiness levels and others showing a strong preference for direct instruction'. Furthermore, she argues that readiness for self-directed learning is a developable capacity (Gugliemilno 2013:6). This view of a continuum of self-directed learning readiness provides flexibility for the concept of self-directed learning to be applicable in institutions of formal education where fully self-directed learning might not be possible. It is within this understanding of self-directed learning that we used *INcwadi-Mkhaphi* and the CMS to support fourth-year isiZulu-education students in developing their academic writing skills. Additionally, in line with this view that readiness for self-directed learning skills can be developed within formal-education contexts, at the university where this study was carried out, the approved template for the isiZulu education module provides 98 notional hours for contact-based learning, which includes lectures, tutorials and seminars. The template provides 62 notional hours for self-directed learning, which includes reading (self-study), revision and assignments or projects.

Research methodology

Rationale for the research methods

This study aimed to explore students' experiences and views of the use of digital technology and *INcwadi-Mkhaphi* as support material for academic writing in isiZulu folk-poetry education. Exploring the students' experiences

and views required an insider perspective, and this type of perspective is best achieved using a qualitative approach within the interpretive paradigm (Babbie & Mouton 2002:28–33; Bertram & Christiansen 2014:25; Creswell 2014:8; Henning 2004:19; Tshabangu 2015:40–55). A set of open-ended questions was used to access the participants' feelings, thoughts and reflections (their inner world), that which cannot be measured or observed.

Inviting the participants and ethical considerations

A cohort of fourth-year, Bachelor of Education students, comprising 161 students registered for a major module in isiZulu education, was invited to participate in the study. Inviting this large group of students aimed to provide access to a wider range of experiences and views. Information about the study was given in class, and voluntary participation was explained. Informed consent was obtained after telling students about their rights, which included the right not to be recorded and the right to withdraw from participating in the study at any time without giving a reason and with no negative consequences. In adherence to the research-ethics guidelines of the university, we applied for approval to conduct research, and the Humanities Research Ethics Committee of the institution where the research was conducted granted the ethical clearance certificate prior to the data-collection process. In accordance with the ethical requirements of anonymity and confidentiality (Mouton 2002:157), we provide the names of participants in numerical form, for example, P1, P2, where 'P' represents participant, and the name of the institution is not used.

Processes of data collection and analysis

An instrument containing 17 open-ended questions was used to generate data. Although initially all students consented to participate and voluntarily collected the instrument, only 62 eventually returned the completed

instruments. The returned instruments were all fully completed, and this provided rich data that were transcribed for analysis. The data captured from students' responses were used to map students' experiences and views concerning the usefulness of the learning site and *INcwadi-Mkhaphi* in support of their academic writing skills.

The set of post-essay questions that students answered were structured broadly to cover the following topics:

- Academic writing skills that students acquired prior to enrolling for the isiZulu-education module.
- Their use of the CMS and *INcwadi-Mkhaphi* as well as other learning materials posted on the CMS.
- The role played by learner-support material in developing their academic writing skills.
- The specific academic writing skills and other skills and knowledge that students obtained through using the CMS and *INcwadi-Mkhaphi.*

Included in the set of questions were questions that invited participants to reflect on this approach to providing students with support for academic writing. We also asked if they had any suggestions to improve the approach to academic writing used in isiZulu-folklore education. The set of questions was vetted with two prospective participants and piloted with four Bachelor of Education Honours students who are doing isiZulu-language education.

In addition to the empirical data that were generated, the students' essays formed part of the data that were analysed. After the essays were marked and returned to students, upon request, 85 students voluntarily re-submitted their marked essays for analysis. The mark sheet with all the students essay scores also formed part of the data.

In line with qualitative-research methods (Babbie & Mouton 2002:73; Bertram & Christiansen 2014:117), we used analytic induction to analyse the

qualitative data. As suggested by this approach, we read and re-read the data and developed codes through open coding. We coded and re-coded data, identifying patterns. We then re-grouped related codes to form categories that were analysed and compared and thereafter re-grouped them into themes under headings that emerged from the data. We then selected extracts from the transcripts for inclusion as a chain of evidence in the 'Findings and discussion' section in this chapter. We selected the excerpts that best demonstrated the identified themes. Furthermore, we also aimed at foregrounding the participants' perceptions that had a recurring frequency as well as those that had a sentimental expression of ideas.

Research rigour and limitations

In qualitative research, the issue of internal and external validity is important to address. Although 62 participants, which is not a small number, were involved in the study, the fact that they were all enrolled in the same isiZulu-education course limits the scale of the research. The research also involved only one genre, namely isiZulu folklore, and one aspect of the genre, namely folk poetry and songs. Whilst in qualitative studies, transferability is the responsibility of the reader (Babbie & Mouton 2002:277; Bertram & Christiansen 2014:124), findings may be limited. Given the scale of the research, the findings cannot be compared and generalised, and this decreases the study's external validity.

The decision to use a set of written questions that required participants to answer in writing instead of conducting face-to-face interviews enhanced the anonymity of responses as the data provided were not linked to the participants' identity. Additionally, the researchers and students were familiar with one another since the researchers also lectured and tutored for this group of students. The lecturer-student and tutor-student

roles have power differences embedded in them. Thus, the face-to-face interviews would potentially be affected by the differences of power rooted in the different role relationships. Therefore, a data production method whereby students would respond in writing enhanced the internal validity of the study as it acknowledged the power dynamics between lecturer-student and tutor-student.

Findings and discussion

The data sources that were analysed to arrive at the findings included transcripts from students' written responses and selected marked essays. Generally, the findings identified a number of benefits and a few limitations in the use of *INcwadi-Mkhaphi* and the CMS. The themes that emerged from the data analysis are presented below under the following subheadings:

- Students' prior knowledge and skills concerning academic writing.
- Students' use of *INcwadi-Mkhaphi* and the CMS.
- Students' experiences and views about specific skills learnt concerning academic writing.
- Students' views about their overall success.

These themes are also loosely structured around the research questions that underpin this study. The discussion of the themes is substantiated with examples excerpted from study transcripts.

Students' prior knowledge and skills concerning academic writing

In explaining their prior knowledge about academic writing skills, with certainty and as Table 19 shows, most participants claimed that they did

TABLE 19: Students' prior knowledge and skills.

Attributes	Participant	Xhosa: Original responses	English: Translated responses
Participants with no prior knowledge of academic writing skills	P24	*Cha, ngangingakwazi kodwa ngikufunde ngoba sengenza lesi sifundo.*	No, I did not know but I learnt [*it*] because I am doing this course.
	P28	*Cha, ngangingenalwazi nje noluncane.*	No, I did not have any knowledge, even a little one.
	P33	*Cha, ngangingazi ukuthi kubhalwa kanjani, kwangisiza ukwenza lesi sifundo.*	No, I did not know how to write. It helped me to do this course.
	P13	*Cha, zaziyime emthumeni, ngangingaqondi nqindi nasibhakela.*	No, I was stuck. I did not understand fist and the fist-blow (*this saying means I did not know anything*).
	P56	*Cha, empeleni ngangingazi ukuthi nasesiZulwini kuyareferenswa uma ubhala.*	No, in fact I did not know that in isiZulu referencing is done when you write.
	P18	*Ukuthi kuqalwe ngonyaka wokuqala enyuvesi ukufundiswa ngokubhala kwezifundiswa.*	That it must begin in the first year, the teaching of academic writing.
	P57	*Ukuhlela isifundo kusukela ngonyaka wokuqala kuze kube sekugcineni esiqondene nalokho.*	To plan a course from the first year to the last year which is focused on that [*academic writing*].
Participants with some prior knowledge of academic writing skills	P34	*Yebo, ngase ngike ngachazeleka kafushane phambilini ngendlela yokubhala.*	Yes, it had been explained briefly to me before, the way of writing.
	P5	*Yebo, ngoba ngase ngike ngafunda ezifundweni ezedlule.*	Yes, because I had learnt in previous courses.
	P8	*Yebo, kodwa kukhona okwabe kungidida futhi ngikuphambanisa.*	Yes, but there were aspects that confused me, and I caused those to cross.
	P14	*Yebo, ngase ngifundile ngonyaka wokuqala ngifika.*	Yes, I learnt in the first year when I arrived.

not have any knowledge of academic writing skills prior to registering for the module in question. This is despite the fact that all of them have taken the compulsory ALE module in their first year of study. Only one participant explained specifically that he learnt academic writing skills in his first year of study. A very small number of students mentioned that they had learnt some academic writing skills before, but these were inadequate and without mentioning the ALE first-year module. Some of the few students who indicated that they had learnt academic writing skills before, mentioned explicitly that they did not think that the academic writing skills also apply to isiZulu.

Students' use of *INcwadi-Mkhaphi* and the CMS

The participants unanimously reported that they used the content of *INcwadi-Mkhaphi* to help them plan and write their essays. They reported that their academic writing skills had improved through participation in the continuous use of *INcwadi-Mkhaphi* whilst writing their essays. They expressed that they found the book-guide helpful as it assisted them step-by-step. It is interesting to note that the content in *INcwadi-Mkhaphi* did not

TABLE 20: The use of *INcwadi-Mkhaphi*.

Attributes	Participants	Xhosa: Original responses	English: Translated responses
The helpful book-guide	P2	*INcwadi-Mkhaphi idlala indima enkulu*	The book-guide plays a big role.
	P24	*Yenza kube lula ukubhala ama-asayinimenti.*	It makes writing assignments easy.
	P13	*Iyasicathulisa impela.*	It helps us walk step-by-step indeed.
	P7	*Ilusizo kakhulu ngoba siyithola sonke.*	It is very helpful because we all get it.

Table 20 continues on the next page →

TABLE 20 (Continues ...): The use of *INcwadi-Mkhaphi*.

Attributes	Participants	Xhosa: Original responses	English: Translated responses
Understanding and structuring the essay	P1	*Yebo, ngiyisebenzisile INcwadi-Mkhaphi ukuhlela imvusangqondo yami.*	Yes, I used the book-guide to organise my essay.
	P15	*Iyona engisize ukuba ngazi umumo wemvusangqondo.*	It is this [*book*] that helped me know the structure of the essay.
	P3	*INcwadi-Mkhaphi yaba lusizo kimi ekuqondeni imvusangqondo.*	The book-guide was a of great help to me to understand the essay.
Knowledge obtained, was used in other subjects	P19	*Yebo, nakwezinye izifundo ulwazi olutholakala lapha lusetshenzisiwe.*	Yes, and in other courses, the knowledge obtained here was used.
Reference material	P6	*Ngiyakusebenzisa uma sengifuna ulwazi olunqala ngengisuke ngikwenza.*	I used them when I want important knowledge about what I am doing.
	P20	*Ibe lusizo kakhulu. Ngiqale ngayo ngisahlela umsebenzi, ngaphinda ngayibheka ukuhlola umsebenzi.*	It was a big help. I started from it when I was organising my work, and I again referred to it to assess the work.
	P21	*Ibingigada.*	It was escorting me (meaning it guided me).
Participants' views	P24	*Ukuthi INcwadi-Mkhaphi inikezwe abafundi besenza isiZulu 210 ukuze basheshe bajwayele.*	That the book-guide should be given to students who are enrolled in isiZulu 210 so that they are quickly familiar [*with it*].
	P53	*Yebo, kunezimo zokukhuluma ebengingazazi; Kumele abafundisi bethu bafundise ngakho emakilasini; Kumele le ndlela ifakwe ezincwadini zokufunda.*	Yes, there were ways of expressing that I did not know. Our lecturers must teach about this [*academic writing*] in class. This method must be put in books for learning.

provide for research skills, yet some participants reported that it helped them with their research. They recommended it for earlier modules in the degree and for other subjects, and Table 20 provides examples from the data.

In the era of digital technology, young people spend most of their time on the internet, which has become part of their lives. Taking advantage of this digital culture and using the internet as a repository for reading resources, learning tools attracts students back to a culture of reading. Similarly, almost all participants indicated that they frequently visit the CMS. As examples in Table 21 show, most participants visit the site not less than three times a week to check if there are messages or documents posted on the site. Apparently, accessing the internet is not a problem for most students who use their own cell phones and/or computers to access the CMS. The frequent use of digital technology by students greatly influenced their use of the support material that was posted on the CMS such as *INcwadi-Mkhaphi,* class notes, reading articles and a reference list of reading. However, some participants pointed out that the university computers are inadequate. Probably, the students who had difficulty were those who rely on university computers because they do not have personal computers, and their cell phones do not allow them to open and/or download documents.

As Table 21 also shows, students expressed the need for more information to be posted on the CMS for them. However, whilst this indicates a developed appetite for reading, it might also be an indication for developed reliance on digital technology.

All participants mentioned specific academic writing skills that they had gained from using *INcwadi-Mkhaphi* and the CMS. Students' notions of the academic writing skills that they had learnt were categorised into the following themes: academic writing; thinking and preparing to write;

TABLE 21: Use of the CMS.

Attributes	Participants	Xhosa: Original responses	English: Translated responses
Easy access and regular use	P40	*Kulula ukungena kule nkundla futhi nokuyisebenzisa; inkundla yokufunda iwusizo kakhulu futhi inolwazi olubalulekile kuthina njengabafundi.*	It is easy to get into this site and to use it. The learning site is very helpful and has important knowledge to us as students.
	P38	*Azikho izingqinamba ngoba uma besithumelela kuvela kuma-email.*	There are no challenges because if they post for us it shows by emails.
	P1	*Ngiyakwazi ukungena ngekhompyutha nomakhalekhukhwini wami.*	I can access with the computer and my cell phone.
	P19	*Kuba yizikhathi eziningi [ukuyivakashela] ngingasho ukuthi iviki lonke.*	It is several times [*to visit the site*], I can say the entire week
	P23	*Cishe kashumi ngoba emini ngiyayivakashela [le nkundla] kanjalo futhi ebusuku.*	Approximately ten times [*a week*] because during the day I visit [*the site*] and also at night.
The challenges encountered	P42	*Lezi zinkundla ziguquka njalo indlela yokufinyelela kuzo.*	The sites change all the time the way of visiting them.
	P7	*Inkinga amakhompyutha ahlezi egcwele kodwa kumakhalekhukhwini akuvezi kahle.*	Computers are always full but with the cell phone it does not show clearly.
	P16	*Kwesinye isikhathi sihlushwa ubuhixihixi bobuchwepheshe.*	Sometimes we are troubled by problems of technology.
	P21	*Ibuye ilahleke i-network amakhompyutha ahluphe angasebenzi kahle.*	At times the network is lost, computers give problems and do not work well.
	P5	*Amakhompyutha awakwazi ukubona amaphutha esiZulu. Futhi yona iphinde yenze amaphutha kumsebenzi obhalwe ngesiZulu.*	Computers cannot read errors in work written in isiZulu. It again makes errors in the work written in isiZulu.

Table 21 continues on the next page →

TABLE 21 (Continues ...): Use of the CMS.

Attributes	Participants	Xhosa: Original responses	English: Translated responses
Students' views	P38	*Ngiphakamisa ukuthi wonke amamojuli atholakale ezinkundleni.*	I suggest that all modules can be accessed on the site.
	P35	*Kumele kuqhakambiswe ezobuchwepheshe kakhulu ngoba intsha incike kakhulu kuzona.*	It is a must to promote technology greatly because youth relies on them greatly.
	P34	*Ukuze kuthuthuke ikusasa leNyuvesi kufanele yona yandise amakhompyutha.*	So that the future of the university prospers, it [*the university itself*] should increase [*the number of*] computers.

logical writing, structuring the work and checking it; referencing as well as researching and analysis skills. Each theme is discussed below with excerpts from data given as examples.

Academic writing

Data indicate that most students raised their skills levels. Students reported that their academic writing skills had improved and that they had gained self-confidence through their constant participation in the use of *INcwadi-Mkhaphi* and the CMS. Excerpts from the data are presented in Table 22 below.

Thinking and preparing to write

Students also said that *INcwadi-Mkhaphi* helped them to think about what they had to write and prepare to write their essays before embarking on the actual writing activity. Excerpts from students' data are presented in Table 23 below.

TABLE 22: Academic writing.

Participants	Xhosa: Original responses	English: Translated responses
P6	*Ukubhala imibhalo yezifundiswa ngendlela eyiyo.*	To write academic texts in the correct way.
P13; P18	*Ukukwazi ukubhala ngendlela yezifundiswa.*	To be able to write in an academic way.
P23; P35	*Ikhono lokubhala.*	The skill of writing.
P32	*Ukubhala akhademikhali.*	To write academically.
P8; P41; P62	*Ukubhala imvusangqondo ngendlela eyamukelekile.*	To write an essay in an acceptable way.
P4; P25; P26; P33	*Ukubhala ngendlela eyiyonayona.*	To write in the correct way.

TABLE 23: Thinking and preparing to write.

Participants	Xhosa: Original responses	English: Translated responses
P2	*... nokucabangisisa.*	And thinking deeply
P3	*Ukucubungula isihloko semvusangqondo.*	To analyse the topic of the essay.
P24	*Ukubona izinto okumele uzibheke ngaphambi ubhale indaba.*	To identify things you need to check before writing the discussion.
P37	*... nokuthi kumele ufune ulwazi olwenele ngaphambi kokuthi ubhale.*	And that you need to search for adequate knowledge before you write.
P58	*Ukuba ngicubungule kahle ngaphambi kokuthi ngiphendule umbuzo.*	To analyse carefully before I answer the question.

Logical writing

Students said the use of *INcwadi-Mkhaphi* helped them in developing their logical writing skills. It helped them to structure their points and check their work. Excerpts from students' data are presented in Table 24 below.

Referencing

A theme running through the data was referencing. Students said that their referencing knowledge and skills had improved. The essays showed that the

TABLE 24: Logical writing, structuring the work and checking it.

Participants	Xhosa: Original responses	English: Translated responses
P12	*Ukuhlukanisa umsebenzi ngezigaba.*	To arrange the work in sections.
P1	*Ukuhlela umsebenzi nokuwuhlolisisa.*	To structure the work and check it thoroughly.
P14	*Ukubhala ngendlela ulandelanise amaphuzu.*	To write appropriately and arrange points.
P21	*Ukumisa kahle i-essay.*	To structure the essay appropriately.
P22	*Ukwenza uhlaka lomsebenzi ngendlela ezokwenza kube lula ukubhala i-asayinimenti.*	To create a structure of the work in a way that will make it easy to write the assignment.
P39	*Ukwenza umsebenzi uhleleke ngezihlokwana.*	To make the work arranged in subheadings.
P50	*Ukungenisa i-eseyi.*	To introduce the essay.
P42	*Ukubeka inkulumo ngendlela eqondile.*	To put the discussion in the right way.
P9; P30; P46; P55	*Ukubhala ngendlela ehlelekile.*	To write in a structured way.
P43	*Ukusebenzisa izimpawu zokuloba ngendlela.*	To use punctuation marks correctly.

TABLE 25: Referencing.

Participants	Xhosa: Original responses	English: Translated responses
P53	*Ukuthi uma ubhala kumele ureferense ekugcineni.*	That when you write, you need to reference at the end.
P42; P61	*Ukureferensa ngendlela.*	To reference appropriately.
P57	*Ukwazisa imisebenzi yabanye abantu engiyisebenzise kowami umsebenzi.*	To acknowledge works of other people that I used in my own work.
P45	*Indlela yokusebenzisa amazwi omunye umuntu.*	The way of using another person's words.
P36	*Ukuthi ngibhale imithombo yolwazi engikusebenzisile.*	That I write the sources of knowledge I used.
P33	*Ukucaphuna ulwazi lwabanye ababhali ngendlela okuyiyonayona.*	To excerpt knowledge of other authors in a way that is appropriate.
P10	*Ukuveza lapho ngicaphune khona.*	To show where I have extracted [*the work*].
P15	*Ukungakopeli imisebenzi yabanye abantu kepha uyiqhakambise.*	That I do not copy works of other people but highlight them.

Table 25 continues on the next page →

TABLE 25 (Continued...): Referencing.

Participants	Xhosa: Original responses	English: Translated responses
P5	*Ukukwazi ukusebenzisa imisebenzi yabanye uma ngenza i-asayinimenti.*	To know how to use works of others if I do the assignment.
P47	*Ukureferensa i-asayinimenti yesiZulu.*	To reference the assignment of isiZulu.
P28	*Ukureferensa ngendlela yesiZulu.*	To reference in a way of isiZulu.
P34	*Ikhono lokureferensa emubhalweni nasekugcineni.*	The skill of referencing in-text and at the end.

students' in-text referencing was mostly correct whilst the reference lists still showed errors. The students' perceptions that they had learnt this skill might indicate their confidence and the conviction that, even if they are still not perfect, they are making progress compared to their previous lack of knowledge. As Table 25 shows, students had confidence that their understanding of referencing and their skills of doing it had improved.

Whilst most assignments showed the correct style of referencing in-text, some assignments had errors in the reference lists. There were also language errors that were identified in students' essays. The common errors that were identified in students' essays were mostly typing errors, orthographical errors, use of non-standard variations of language and contractions. There were fewer errors of sentence construction, paragraphing, logical reasoning, arrangement of the work and in-text referencing. More errors were found on the use of demonstrative pronouns where, at times, students were not consistent in writing these according to the new orthography for isiZulu. The contractions in writing folk songs were also problematic for most students. This could be attributed to the nature of folk songs and folk poetry, which mostly uses a number of contractions. Some students slipped to the use of dialect and/or spoken isiZulu. Table 26 shows a few examples of the types of errors extracted from selected students' essays.

TABLE 26: Common errors in students' work.

Error	Correct form	English version
Loluhlobo lomculo	Lolu hlobo lomculo	This type of music
Kulengxoxo	Kule ngxoxo	In this discussion
Ngokuthi bezifundise	Ngokuthi bazifundise	That they teach them
Hamba ogqoka	Hamba uyogqoka	Go and wear...
Wena nogida ngobambo ...	Wen'ogida ngobambo	You who dance with a rib
Awbheki nkomo zami	Aw'bhek'inkomo zami	You see my cattle

However, we do not want to focus much on error analysis in this chapter. We are presenting a few types of errors that students made in their essays to highlight that most students erred on the language aspect of their essays rather than on the content aspect and the logic of writing. This might also indicate students' lack of proofreading skills, particularly because the computer's spellchecker cannot assist them in highlighting language errors in isiZulu.

Researching and analysis skills

Students also said that their research skills improved through using the book-guide and the CMS. Table 26 shows excerpts from students' data.

Students' perceived overall success

The students thought that *INcwadi-Mkhaphi* helped them to succeed. They repeatedly mentioned the extent to which they appreciated this support as it taught them academic writing. The students said that they were successful in writing essays even though they submitted their responses to the research instrument long before they received their essay results. These claims of success were based solely on their self-assessment where they self-evaluated their final essays, using *INcwadi-Mkhaphi* as their assessment

TABLE 27: Researching and analysing.

Participants	Xhosa: Original responses	English: Translated responses
P4	*Ingifundisile indlela yocwaningo.*	It helped me with the method of research.
P17	*Ukuzitholela ulwazi ngokucwaninga.*	To self-get knowledge by researching.
P23	*Ikhono lokwenza ucwaningo.*	The skill of researching.
P25	*Ukuqaphela ukucwaninga.*	To be aware of research.
P56	*Ukuhluza nokucwaninga.*	To analyse and research.

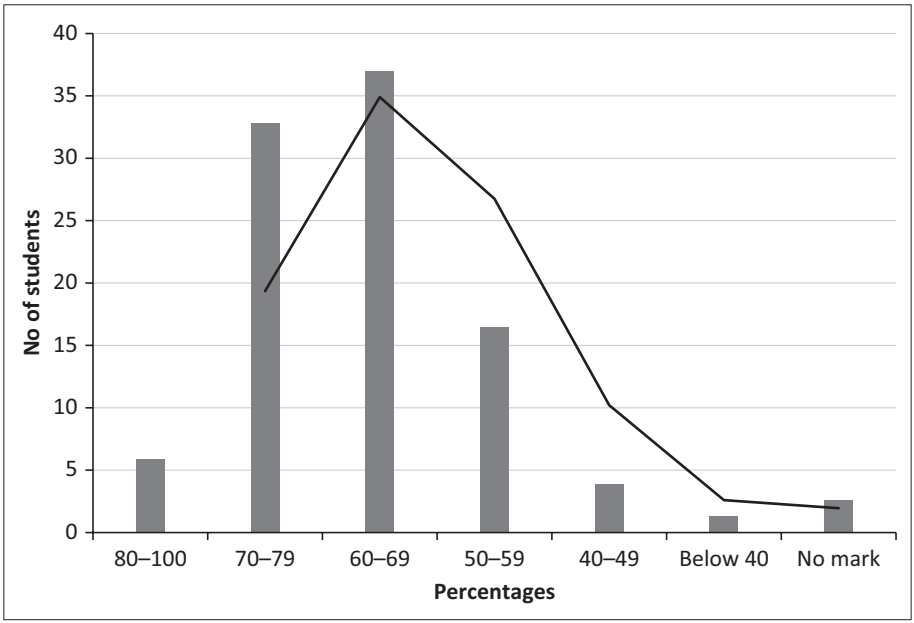


FIGURE 3: Mark distribution for the essay results in percentages.

guide to gauge the standard of their work. Table 27 shows excerpts from students' data.

The students' statements were confirmed by the essay marks, which showed a 92% pass rate in the essays with the majority of marks between 60% and 79% (see Figure 3).

TABLE 28: Overall success and interest.

Attributes	Participants	Xhosa: Original responses	English: Translated responses
Success	P50	*Indlela engibhala ngayo manje ayifani nakuqala.*	The way I write now is different from before
	P19	*Ikhono lokubhala selisezingeni ngoba nemiphumela ikhomba khona.*	The skill of writing is of a [*good*] standard because the results show that.
	P20	*Ngiyazigqaja ngokuphelele ngokuba uthisha manje.*	I am fully proud for being a teacher now.
	P22	*Ngicabanga ukuthi konke sekulele kumina manje sekwenziwe konke.*	I think everything lies with me now; all has been done.
Generated interest	P55	*Ukuthi nginikezwe imisebenzi eyevile kwemibili yokubhala.*	That I am given works that are more than two for writing.
	P45	*Ukuthi nginikezwe imisebenzi eminingi yokwenza ucwaningo.*	That I am given works that are many to do research.
	P4	*Nami sengiziqalele obami ubuciko bomlomo.*	And me I have started [*to create*] my own folklore.
	P9	*Indlela ibigqugquzela ukusebenza ngokuzikhandla nokuzimisela.*	This method was encouraging [*us*] to work hard and to be determined.

As Table 28 also shows, the good work that students produced generated intrinsic interest in writing academically. Students had a feeling that they could be given more work in which to research, analyse and write.

Synthesis of findings: Issues and implications

In this section, we synthesise the findings by using the research questions as set out earlier on as a rough framework. Our purpose is to extract some issues and concerns that emerged from the study and discuss the pedagogical implications for self-directed learning and academic writing as well as the use of technology.

The findings indicate that the fourth-year students had inadequate knowledge of academic writing skills when they enrolled for their isiZulu-education module. This occurred despite the fact that they had performed an ALE module in their first year of study, which was aimed at developing academic reading and writing skills for students to apply in the disciplinary and core modules that they take in the Bachelor of Education degree. Apparently, the students did not see the links between the skills that they learnt in the ALE module and the isiZulu modules that they had to take in their area of specialisation as a few students said that they did not think that the skills they learnt earlier in their studies applied to isiZulu.

This perceived disconnection between the ALE, which is a dedicated academic-writing course for first-year students, and the disciplinary courses that students take is not unique. It echoes a body of research (Jones 2011:2; Lea & Street 1998:467; Mbirimi 2012:67; Wingate 2006:459;), reporting that, when academic writing skills are taught in courses other than the disciplines, students are unable to connect the writing they did in those courses to their activities in their disciplinary courses. Hence Coffin *et al.* (2003:8) report a growing movement to include writing across the curriculum and in disciplines pedagogies. These approaches acknowledge that learning academic writing skills cannot occur separately from meaning making and knowledge construction that is developed within disciplinary courses.

Furthermore, the students' data showed a recurring theme of integrating academic writing across all the isiZulu-education modules and all modules of the degree. Besides the fact that this finding supports the ideas of 'writing across the curriculum' and 'writing in disciplines' (Coffin *et al.* 2003:7; Wingate 2006), it also confirms that the learning of academic writing is a lifelong endeavour (Jalongo & Sarocho 2016:xv).

However, the current realities in higher education where academics are overwhelmed with the work of teaching large classes, coupled with other pressures such as the pressure to publish and participate in community engagement, might cause this idea to remain utopian unless self-directed learning is integrated into the formal educational curriculum (Gugliemino 2003:11).

If opportunities are created in institutions of formal education to enhance students' readiness for self-directed learning, students will take responsibility for identifying their learning needs as far as academic writing is concerned and direct their lives and learning towards satisfying those needs. It will lessen the burden of responsibility on already overworked academics. The crux of the matter is that academics themselves should work on developing and enhancing the students' readiness for self-directed learning.

The data showed that students were confident that they had gained skills through the learning approach and the material provided for the course. As a result, they had developed interest in academic writing to the extent that some would welcome additional work. However, whilst the essay results show an improvement in students' performance, some of the students' essays were still riddled with language, spelling and orthographical errors. Some essays even had some typing errors, which indicate that those students did not proofread their work thoroughly. The book, *INcwadi-Mkhaphi,* that was provided did indeed provide guidance on the proofreading of an essay before final submission. Therefore, the question can be asked: why did students omit to follow this aspect of the book-guide?

Although we cannot claim to have an answer to this question, the continuum of readiness for self-directed learning that Gugliemilno

(2013:3) introduces explains that levels of self-directed readiness '… exist along a continuum with some learners having very high self-directed learning readiness and some showing a strong preference for direct instruction'. Therefore, the readiness levels at different points on the continuum may correspond to the number and nature of characteristics that the learners exhibit. Similarly, the characteristics that the learners exhibit may translate into the extent of learning that the learner acquires through self-directed learning. It can also be argued that, in essay writing through self-directed learning, the quality of work that the student produces through self-directed learning may be related to the number and nature of characteristics that the learner exhibits.

In reflecting on their progress, students revealed the significant transformation which had taken place because of engaging with the new approach – *INcwadi-Mkhaphi* and the CMS. Interestingly, when asked about what they have learnt, the students pointed to different aspects of the knowledge and skill that they had learnt such as research, and analysing skills, logical writing and referencing; this despite the fact that they were all provided with the same support material to do the same assignment.

Gugliemilno (2013:2) argues that, in institutional contexts, there is '… rarely an opportunity for fully [*implementing*] self-directed learning'. This means that, in such contexts, self-directed learning will occur within certain parameters. In this study, the essay question and *INcwadi-Mkhaphi* provided such parameters within which students identified their needs and self-directed their learning according to their individual needs. Hence when asked about what they had learnt, they pointed out different aspects of knowledge and skill. Therefore, we argue that the

guided learning by using support material such as *INcwadi-Mkhaphi* and CMS created self-directed learning in students. This is in contrast to the teacher-centred methods that promote passive learning on the part of the students.

Conclusion

In conclusion, the findings of this study offer insights into the students' experiences and views on the use of *INcwadi-Mkhaphi* and the CMS as support tools for academic writing. The study highlights the adaptability of the students to a different educational approach. Students' beliefs and values about academic writing were foundational for perceived learning competence that was acquired through the use of *INcwadi-Mkhaphi* posted on the learning site as a tool for self-directed learning. The longstanding view that academic writing is highly discipline-specific and thus better promoted when integrated with students' academic learning in the discipline or subject field is echoed in this chapter. Additionally, the findings generally support the literature, which identifies self-directed learning as important to develop students so that they continue to learn even in the absence of a teacher. Again, arguments for incorporating self-directed learning within educational institutions are endorsed by students' views included in this chapter. As the student population is increasing and diversifying in higher education, the academic environment should broaden parameters and create more valid and conducive channels for developing academic writing.

In this study, the students developed an interest in learning when they saw their mother tongue used in academic writing. This emphasises the need to introduce indigenous African languages into education as

languages of learning and teaching. Further exploratory studies need to be conducted to determine how these languages can be used in teaching, learning and research in the different fields of knowledge in higher education. Furthermore, the students' academic writing improved when they used *INcwadi-Mkhaphi* that is written in the students' home language, isiZulu, as support material for writing their essays. Further research needs to be carried out on the use of isiZulu and other indigenous African languages to teach academic literacy.

Chapter 9: Summary

This chapter reports on a study that was conducted to explore students' experiences and views of the use of digital technologies and booklet, *INcwadi-Mkhaphi,* as support material for academic writing in isiZulu folk-poetry education at a South African university. This approach to academic writing was used as an initial way of introducing students to the development of self-directed learning. A qualitative design within the interpretive paradigm was used and 62 fourth-year students, enrolled in the Bachelor of Education programme, participated in completing a post-essay open-ended set of questions. The students' essays also formed part of the data. All ethical considerations were adhered to before the data-collection process began. Data generated through responses to written open-ended questions as well as students' essays were analysed using qualitative methods. Data were coded and re-coded to develop categories, and finally, themes emerged. The findings support the longstanding notion that academic writing is highly discipline-specific and thus better promoted when integrated with students' academic learning in a discipline or subject field. Additionally, the findings also support the literature, which argues for

mother-tongue education and the use of African indigenous languages for learning in education. The study also specifically focuses on self-directed learning as appropriate for academic writing, which is a lifelong endeavour, and arguments for incorporating self-directed learning within educational institutions are endorsed by students' views.

Appendix 1

Mathematical problems

Problem 1

Consider the Sierpiński gasket made by progressively cutting pieces off triangle/s from the original black triangle. In the first diagram, we have a full triangle. In the second, one triangle is cut, and three black triangles remain. In the third diagram, a white triangle is cut from each of the three triangles that remained in the second diagram. The cutting pattern continues in that manner. Find the fraction occupied by black triangles in the 35th diagram.

(Note: The sixth diagram and those that follow are not shown here.)

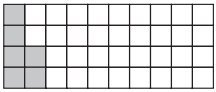
Problem 2

(Adapted from Stein *et al.* 1996)

Doing Mathematics

Shade 6 small squares in a 4 x 10 rectangle. Using the rectangle, explain how to determine each of the following:
(a) the percent of area that is shaded, (b) the decimal part area that is shaded, and (c) the fractional part of area that shaded.

One Possible Student Response



(a) One column will be 10% since there are 10 columns. So four squares is 10%. Then 2 squares is half a column and half of 10% which is 5%. So the 6 shaded blocks equal 10% plus 5% or 15%.

(b) One column will be .10 since there are 10 columns. The second column has only 2 squares shaded so that would be one half of .10 which is .05. So the 6 shaded blocks equal .1 plus .05 which equals .15.

(c) Six shaded squares out of 40 squares is $\frac{6}{40}$ which reduces to $\frac{3}{20}$.

Problem 3: Project task

An architectural activity (Adapted from Boaler 1998:53–54)

Consider a model and a plan of a proposed house. You must solve two problems related to local-authority design rules. You are given a scale plan that shows different cross sections of a house and a scale model of the same house. To solve the problems, you need to find information from different sources, choose your own methods, plan routes through the task, combine different areas of mathematical content and communicate information. The architectural activity comprises two main sections. In the first section, you need to decide whether the proposed house satisfies a council rule about proportion. The rule states that the volume of the roof of a house may not exceed 70% of the volume of the main body of the house. You may use either the scale plan or the model to help you. The second council rule states that roofs may not have an angle of less than 70°. What dimensions of the house can you propose?

Problem 4: Mathematical modelling

(Adapted from https://www.mathsisfun.com/algebra/mathematical-models.html, viewed 04 February 2016)

Prediction of future sales: An ice-cream company keeps track of how many ice creams are sold on different days. By comparing this to the weather on each day, they can create a mathematical model of sales versus weather. They can predict future sales based on the weather forecast and decide how many ice creams they need to make ahead of time. Produce such a model for an ice-cream company in your city.

References

Foreword

Carr, N., 2011, *The Shallows: what the internet is doing to our brains*, WW Northon & Company, New York, NY.

McLuhan, M., 1962, *The Gutenburg Galaxy: the making of typographic man,* University of Toronto Press, Toronto.

Chapter 1

Abraham, R.R., Upadhya, S. & Ramnarayan, K., 2005, 'Self-directed learning', *Advances in Physiology, Education* 29(2), 135–136. http://dx.doi.org/10.1152/advan.00008.2005.

Agran, M., Blanchard, C. & Wehmeyer, M.L., 2000, 'Promoting transition goals and self-determination through student self-directed learning: The self-determined learning model of instruction', *Education and Training in Mental Retardation and Developmental Disabilities* 35(4), 351–364.

Anderson, P., 1999, 'Complexity theory and organisation science', *Organisation Science* 10(3), 216–232. http://dx.doi.org/10.1287/orsc.10.3.216.

Bagheri, M., Ali, W.Z.W., Abdullah, M.C.B. & Daud, S.M., 2013, 'Effects of project-based learning strategy on self-directed learning skills of educational technology students', *Contemporary Educational Technology* 4(1), 15–29.

Banerjee, G., 2011, 'Blended environments: Learning effectiveness and student satisfaction at a small college', *Journal of Asynchronous Learning Networks* 15, 8–19.

Bass, L., 2015, 'A socio-political eclipse: The surrendering of two super systems to promote equity in US Education', *Peabody Journal of Education* 90(5), 711–728. http://dx.doi.org/10.1080/0161956X.2015.1087781.

Bell, S., 2010, 'Project-based learning for the 21st century: Skills for the future', *The Clearing House* 83, 39–43. http://dx.doi.org/10.1080/00098650903505415.

Bessant, J., 2014, 'A dangerous idea? Freedom, children and the capabilities approach to education', *Critical Studies in Education* 55(2), 138–153. http://dx.doi.org/10.1080/17508487.2014.873368.

Bleed, R., 2001, 'A hybrid campus for a new millennium', *Educause Review* 36, 16–24.

Blumberg, P., 2000, 'Evaluating the evidence that problem-based learners are self-directed learners. A review of literature', in D.H. Evensen & C.E. Hmelo (eds.), *Problem-based learning: A research perspective on learning interactions,* pp. 199–226, Lawrence Erlbaum Associates Publishers, Mahwah, NJ.

Bower, C., 2005, *Open minds, closed minds and Christianity*, Aardvark, Valyland.

Bronfenbrenner, U., 1979, *The ecology of human development. Experiments by nature and design*, Harvard University Press, Cambridge, MA.

Cloud, H., 1992, *Changes that heal*, Zondervan Publishers, Grand Rapids, MI.

Cockerill, M.P., 2014, 'Beyond education for economic productivity alone: The capabilities approach', *International Journal of Educational Research* 66, 13–21. http://dx.doi.org/10.1016/j.ijer.2014.01.003.

Cohen, L., Manion, L. & Morrison, K., 2011, *Research methods in education*, Routledge, London.

Coletto, R., 2008, 'When "paradigms" differ: Scientific communication between scepticism and hope in recent philosophy of science', *Koers* 73(3), 445–467. http://dx.doi.org/10.4102/koers.v73i3.169.

Coletto, R., 2009, 'Strategies towards a reformation of the theology-based approach to Christian scholarship', *In die Skriflig* 43(2), 291–313. http://dx.doi.org/10.4102/ids.v43i2.225.

Dang, A.-T., 2014, 'Amartya Sen's capabilities approach: A framework for well-being, evaluation and policy analysis?' *Review of Social Economy* 72(4), 460–484. http://dx.doi.org/10.1080/00346764.2014.958903.

Deci, E.L. & Ryan, R.M., 1985, *Intrinsic motivation and self-determination in human behavior*, Plenum Press, New York.

Deci, E.L., Vallerand, R.J., Pelletier, L.G. & Ryan, R.M., 1991, 'Motivation and education: The self-determination perspective', *Educational Psychologist* 26(3 & 4), 325–346. http://dx.doi.org/10.1080/00461520.1991.9653137.

Dekker, S., Cilliers, P. & Hofmeyr, J.-H., 2011, 'The complexity of failure. Implications of complexity theory', *Safety Science.* http://dx.doi.org/10.1016/j.ssci.2011.01.008, viewed 09 November 2014, from www.elsevier.com/locate/sci.

Du Toit, A. & Pool, J., 2015, 'The design and development of an e-guide for a blended mode of delivery in a teacher preparation module', *Progressio* 26, 90–109.

Fisher, M., King, J. & Tague, C., 2001, 'Development of a self-directed learning readiness scale for nursing education', *Nurse Education Today* 21(7), 516–525. http://dx.doi.org/10.1054/nedt.2001.0589.

Freire, P., 2005, *Pedagogy of the oppressed*, Continuum, New York.

Guglielmino, L.L., 2008, 'Why self-directed learning?', *International Journal of Self-Directed Learning* 5(1), 1–15.

Guglielmino, L.M., 1978, '*Development of the self-directed learning readiness scale*', PhD dissertation, University of Georgia.

Knowles, M.S., 1975, *Self-directed learning. A guide for learners and teachers*, Prentice Hall Regents, Englewood Cliffs.

Kubow, P.K., 2011, 'The creative spirit and comparative education', in P.L Schneller & C.C. Wolhuter, *Navigating the Cs. An introduction to comparative education*, pp. 155–168, Keurkopié, Potchefstroom.

Larson, L. & Miller, T., 2011, '21st century skills: Prepare students for the future', *Kappa Delta Pi Record* 47, 121–123. http://dx.doi.org/10.1080/00228958.2011.10516575.

Lategan, L.O.K., 2010, "n Raamwerk vir intellektuele vakmanskap – 'n filosofiese benadering', *Journal for Christian Scholarship* 46(3 & 4), 143–156.

Lee, C. & Teo, T., 2010, 'Fostering self-directed learning with ICT', in C.S. Chai & Q. Wang (eds.), *ICT for self-directed and collaborative learning*, Pearson, Singapore, pp. 39–51.

Lee, K., Tsai, T., Chait, C.S. & Koht, J.H.L., 2014, 'Students' perceptions of self-directed learning and collaborative learning with and without technology', *Journal of Computer Assisted Learning* 30, 425–437. http://dx.doi.org/10.1111/jcal.12055.

Liddell, T.N., 2008, 'Executive women's self-directed learning and leading in charitable foundations', *International Journal of Self-Directed Learning* 5(1), 15–29.

Long, H.B., 2000, 'Understanding self-direction in learning', in H.B. Long & Associates, *Practice & theory in self-directed learning*, pp. 11–24, Motorola University Press, Schaumberg.

MacDonald, S., 2012, 'The United States: Multiple polities and the shaping of educational assessment', *SA-eDUC* 9(1), 1–14.

Merriam, S.B., 2001, 'Andragogy and self-directed learning: Pillars of adult learning theory', *New Directions for Adult and Continuing Education* 89, 3–14.

Merriam S.B., 2009, *Qualitative research*, Jossey-Bass, San Francisco, CA.

Mohammadi, P. & Mahdi Araghi, S., 2013, 'The relationship between learners' self-directed learning readiness and their English for Specific Purposes course accomplishment at distance education in Iran', *Studies in Self-Access Learning Journal* 4(2), 73–84.

Mohler, A., 2008, *Atheism remix*, Crossway Books, Wheaton, IL.

Nepal, K. & Stewart, R., 2010, 'Relationship between self-directed learning readiness factors and learning outcomes in third-year project-based engineering design course', Australasian Association for Engineering Education Conference, Sydney, pp. 496–503.

Niemiec, C.P. & Ryan, R.M., 2009, 'Autonomy, competence, and relatedness in the classroom. Applying self-determination theory to educational practice', *Theory and Research in Education*, 7(2), 133–144. http://dx.doi.org/10.1177/1477878509104318.

Nussbaum, M.C., 2000, *Women and human development: The capabilities approach*, Cambridge University Press, Cambridge.

Olthuis, J.H., 2012, 'A vision of and for love. Towards a Christian post-postmodern worldview', *Koers* 77(1), Art #28, 7 pages. http://dx.doi.org/10.4102/koers.v77i.28.

Peck, M.S., 2006, *The road less travelled*, Random House, London.

Reeve, J., 2012, 'A self-determination theory perspective on student engagement', in L. Christensen (ed.), *Handbook on research on student engagement*, pp. 149–172, Springer, Dordrecht.

Robeyns, I., 2005, 'The capabilities approach: A theoretical survey', *Journal of Human Development and Capabilities* 6(1), 93–117. http://dx.doi.org/10.1080/146498805200034266.

Rorty, R., 1982, *Consequences of Pragmatism, (Essays: 1972–1980)*, University of Minnesota Press, Minneapolis, MN.

Ryan, R.M. & Deci, E.L., 2000, 'Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being', *American Psychologist* 55(1), 68–78. http://dx.doi.org/10.1037/0003-066X.55.1.68.

Schach, S.R., 2005, *Object-oriented and classical software engineering*, 6th edn., McGraw-Hill, Boston, MA.

Schwalbe, K., 2010, *Managing information technology projects*, 6th edn., Cengage Learning, Canada.

Sen, A., 2010, *The idea of Justice*, Penguin Books, London.

Server, R., 2015, 'A multi-faceted model for assessing collaborate learning in higher education', *Procedia – Social and Behavioral Sciences* 174, 3322–3329. http://dx.doi.org/10.1016/j.sbspro.2015.01.1000.

Shin, G.W., 2011, 'An inquiry into the learning principles based on the objectives of self-directed learning', *Communications in computer and information science*, vol. 257, pp. 604–612.

Sinclair, J.M., 1999, *Collins concise dictionary*, HarperCollins Publishers, Glasgow.

Staker, H. & Horn, M.B., 2012, *Classifying K-12 blended learning*, Innosight Institute, San Franciso, CA.

Strauss, D.F.M., 2009, *Philosophy: Discipline of the disciplines*, Paideia Press, Grand Rapids, MI.

Strauss, D.F.M., 2010, 'Die sentrale plek van 'n lewens- en wêreldbeskouing'. *Koers* 75, 53–77. http://dx.doi.org/10.4102/koers.v75i1.72.

Thornton, K., 2010, 'Supporting self-directed learning: A framework for teachers', *Language Education in Asia* 1, 158–170. http://dx.doi.org/10.5746/LEiA/10/V1/A14/Thornton.

Tripp, T. & Tripp, M., 2008, *Instructing a child's heart*, Shepherd Press, Wapwallen, PA.

Turker, M.A. & Zingel, S., 2008, *Formative interfaces for scaffolding self-regulated learning PLEs*, viewed 06 December 2015, from http://www.elearningeuropa.info/files/media15975.pdf.

Van der Walt, B.J., 1999, *Visie op die werklikheid*. PUCHO, Potchefstroom. Scholarly Publications, Series F3, number 48.

Van der Walt, J.L., 2014, Opvoeding vanuit 'n post-postfundamentistiese perspektief [Education from a post-postfoundationalistic perspective]. *LitNet Akademies* 11, 2.

Van der Walt, J.L. & Potgieter, F.J., 2012, 'Research method in education: The frame by which the picture hangs', *International Journal of Multiple Research Approaches* 6(3), 220–232. http://dx.doi.org/10.5172/mra.2012.6.3.220.

Van der Walt, J.L. & Steyn, H.J., 2014, 'Recognition of minority groups, their general and educational ideals: Is there another way out?' *Journal of Humanities* 54(4), 820–834.

Victori, M. & Lockhart, W., 1995, 'Enhancing metacognition in self-directed language learning', *System* 23(2), 223–234. http://dx.doi.org/10.1016/0346-251X(95)00010-H.

Von Bertalanffy, L., 1969, 'General systems theory and psychiatry – An overview', in W. Gray, F.J. Duhl & W.D. Rizzo (eds.), *General systems theory and psychiatry*, pp. 33–50, Little, Brown and Company, Boston, MA.

Vygotsky, L., 1978, *Interaction between learning and development, From: Mind and Society*, Harvard University Press, Cambridge, MA, pp. 79–91. Reprinted in: Gauvain, M. & Cole, M. (eds.), 1979, *Readings on the development of children*, pp. 29–36, W H Freeman and Company, New York.

Wells, T., 2015, *Sen's capability approach. Internet encyclopedia of philosophy*, viewed 11 December 2015, from www.iep.utm.edu/sen-cap/.

Wright, A., 2010, 'Dancing in the fire: A deconstruction of Clive Erricker's Postmodern Spiritual Pedagogy', *Religious Education: The Official Journal of the Religious Education Association* 96(1), 120–135. http://dx.doi.org/10.1080/00344080121331.

Yusof, K.M., Hassan, S.A.H.S., Jamaludin, M.Z. & Harun, N.F., 2012, 'Cooperative problem-based learning (CPBL): Framework for integrating cooperative learning and problem-based learning', *Procedia – Social and Behavioral Sciences* 56, 223–232. http://dx.doi.org/10.1016/j.sbspro.2012.09.649.

Zimmerman, B.J. & Bandura, A., 1994, 'Impact of self-regulatory influences on writing course attainment', *American Educational Research Journal* 31(4), 845–862. http://dx.doi.org/10.3102/00028312031004845.

Zou, T.X.P. & Mickleborough, N.C., 2015, 'Promoting collaborative problem-solving skills in a course on engineering grand challenges', *Innovations in Education and Teaching International* 52(2), 148–159.

Chapter 2

Ausubel, D., 1963, *The psychology of meaningful verbal learning*, Grune & Stratton, New York.

Barnett, R. & Hallam, S., 1999, 'Teaching for super-complexity: A pedagogy for higher education', in P. Mortimore (ed.), *Understanding pedagogy and its impact on learning*, pp 137–154, Paul Chapman Publishing Ltd, London.

Bhabha, H., 1994, *The location of culture,* Routledge, New York.

Biggs, J., 1999, *Teaching for quality learning at University Buckingham: Society for Research into Higher Education,* Open University Press, Berkshire, UK.

Bowden, J.A. & Marton, F., 1998, *The university of learning: Beyond quality and competence in higher education,* Taylor and Francis Group, London.

Candy, P., 1991, *Self-direction for lifelong learning: A comprehensive guide to theory and practice,* Jossey-Bass Publishers, San Francisco, CA.

Dawson, T.L., 2008, *Metacognition and learning in adulthood,* Developmental Testing Service, Northampton, MA.

De Beer, J., 2013, 'Follow the road of least resistance', in S. Gravett, K. Merseth & J. De Beer (eds.), *Being a teacher: A book of cases,* pp. 66–68, Pearson, Cape Town.

Donovan, M.S. & Bransford, J.D. (eds.), 2005, *How students learn: Science in the classroom*, National Research Council, Washington.

Duckworth, E., 1987, *The having of wonderful ideas*, Teachers College Press, New York.

Feiman-Nemser, S., 1990, 'Teacher preparation: Structural and conceptual alternatives', in W.R. Houston, M. Huberman & J. Sikula (eds.), *Handbook of research in teacher education,* pp. 212–233, Macmillan, New York.

Flavell, J.H., 1979, 'Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry', *American Psychologist* 34, 906–911. http://dx.doi.org/10.1037/0003-066X.34.10.906.

Foldnes, N., 2015, *The flipped classroom and cooperative learning: Evidence from a randomised experiment*, viewed from http://brage.bibsys.no/bi. Viewed on 20 January 2016.

Fosnot, C.T., 1989, *Enquiring teachers, enquiring learners: A constructivist approach for teaching*, Teachers College Press, New York.

Gade, S. & Chari, S., 2013, 'Case-based learning in endocrine physiology: An approach toward self-directed learning and the development of soft skills in medical students', *Advances in Physiology Education* 37, 356–360. http://dx.doi.org/10.1152/advan.00076.2012.

Gallucci, K., 2008, 'Learning concepts with cases', *Journal of College Science Teaching* 36(2), 16–20.

Gibson, J., 1979, *The ecological approach to visual perception*, Houghton Mifflin, Boston, MA.

Gravett, S., 2013, 'I have failed Veronica. I have failed as a teacher', in S. Gravett, K. Merseth & J. De Beer (eds.), *Being a teacher: A book of cases*, pp. 66–68 Pearson, Cape Town.

Gravett, S., De Beer, J., Odendaal-Kroon, R. & Merseth, K., 2016, 'The affordances of case-based teaching for the professional learning of student teachers', *Journal of Curriculum Studies,* 0(0), 1–22. http://dx.doi.org/10.1080/00220272.2016.1149224.

Gravett, S., Merseth, K.K. & De Beer, J., 2013, *Being a teacher: A book of cases*, Pearson, Cape Town.

Guglielmino, L.M., 1978, 'Development of the self-directed learning readiness scale', Doctoral thesis, University of Georgia.

Hargreaves, A., 1994, *Changing teachers, changing times: Teachers' work and culture in the postmodern age*, Cassell, London.

Huizinga, J., 1955, *Homo Ludens: A study of the play element in culture*, Beacon Press, Boston, MA.

Johnson, D.W. & Johnson, R.T., 1989, *Cooperation and competition: Theory and research*, Interaction Book Company, Edina, MN.

Johnson, D.W. & Johnson, R.T., 2009, 'An educational psychology success story: Social interdependence theory and cooperative learning', *Educational Researcher* 38(5), 365–379. http://dx.doi.org/10.3102/0013189X09339057.

Kessels, P. & Korthagen, F., 1996, 'The relationship between theory and practice: Back to the classics', *Educational Researcher* 25(3), 17–22. http://dx.doi.org/10.3102/0013189X025003017.

Knowles, M., 1975, *Self-directed learning: A guide for learners and teachers*, Follett, Chicago, IL.

Kuh, G.D., 2005, 'Student engagement in the first year of college', in M.L. Upcraft, J.N. Gardener & B.O. Barefoot (eds.), *Challenging and supporting the first year student: A handbook for improving the first year of college*, Jossey-Bass, San Francisco, CA.

Kunselman, J. & Johnson K., 2004, 'Using the case method to facilitate learning', *College Teaching* 52(3), 87–92. http://dx.doi.org/10.3200/CTCH.52.3.87-92.

Lage, M.J., Platt, G.J. & Treglia, M., 2000, 'Inverting the classroom: A gateway to creating an inclusive learning environment', *The Journal of Economic Education* 31(1), 30–43. http://dx.doi.org/10.1080/00220480009596759.

Lett, J., 1990, 'Emics and etics: Notes of the epistemology of anthropology', in T.N. Headland, K.L. Pike & M. Harris (eds.), *Emics and etics: The insider/outsider debate, Frontiers of anthropology V.7*, pp. 127–142 Sage Publications, Thousand Oaks, CA.

Levin, B., 1995, 'Using the case method in teacher education: The role of discussion and experience in teachers' thinking about cases', *Teaching and Teacher Education* 11, 63–79. http://dx.doi.org/10.1016/0742-051X(94)00013-V.

Lortie, D., 1975, *Schoolteacher*, University of Chicago Press, Chicago, IL.

Loughran, J. & Russell, T., 1997, *Teaching about teaching purpose, passion and pedagogy in teacher education*, Falmer Press, London.

Loyens, S.M., Magda, J. & Rikers, R.M.J., 2008, 'Self-directed learning in problem-based learning and its relationships with self-regulated learning', *Educational Psychology Review* 20, 411–427. http://dx.doi.org/10.1007/s10648-008-9082-7.

Lundeberg, M.A., Levin, B.B. & Harrington, H.L., 1999, *Who learns what from cases and how? The research base for teaching with cases*, Lawrence Erlbaum Associates, Mahwah, NJ.

Mackenzie, A.H., 2013, 'A metaphorical analysis of the ecology of the classroom', *Education as Change* 71(1), 101–113. http://dx.doi.org/10.1080/16823206.2013.773931.

Marton, F. & Saljö, R., 1976, 'On qualitative differences in learning: Outcome as a function of learner's conception of the task', *British Journal of Educational Psychology* 46, 115–127. http://dx.doi.org/10.1111/j.2044-8279.1976.tb02304.x.

Marton, F. & Svensson, L., 1979, 'Conceptions of research in student learning', *Higher Education* 8, 471–486. http://dx.doi.org/10.1007/BF01680537.

Merriam, S., Caffarella, R. & Baumgartner, L., 2007, *Learning in adulthood*, Jossey-Bass, San Francisco, CA.

Merseth, K., 1991, 'The early history of case-based instruction: Insights for teacher education today', *Journal of Teacher Education* 42(4), 243–249. http://dx.doi.org/10.1177/002248719104200402.

Merseth, K., 1996, 'Cases and case methods in teacher education', in J. Sikula (ed.), *Handbook of research on teacher education,* 2nd edn., pp. 722–744, Simon & Schuster, New York.

Oddi, L.F., 1986, 'Development and validation of an instrument to identify self-directed continuing learners', *Adult Education Quarterly* 36(2), 97–107. http://dx.doi.org/10.1177/0001848186036002004.

Prosser, M. & Trigwell, K., 1997, 'Relations between perceptions of the teaching environment and approaches to teaching', *British Journal of Educational Psychology* 67, 25–35.

Prosser, M. & Trigwell, K., 1999, *Understanding learning and teaching: The experience in higher education*, Open University Press, Buckingham.

Roseth, C.J., Johnson, D.W. & Johnson, R.T., 2008, 'Promoting early adolescents achievement and peer relationships: The effects of cooperative, competitive, and individualistic goal structures', *Psychological Bulletin* 134(2), 223–246. http://dx.doi.org/10.1037/0033-2909.134.2.223.

Schiller, N., 2006, 'Teaching with cases: Let me count the ways', *Journal of College Science Teaching* 36(2), 4–6.

Schmidt, H.G., 1983, 'Problem-based learning: Rationale and description', *Medical Education*, 17, 11–16. http://dx.doi.org/10.1111/j.1365-2923.1983.tb01086.x.

Shulman, J.H., 2002, 'Happy Accidents: Cases as opportunities for teacher learning', paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA, April 2002.

Shulman, L.S., 2004, *The wisdom of practice*, Jossey-Bass, San Francisco, CA.

Springer, L., Stanne, M.E. & Donovan, S.S., 1999, 'Effects of small-group learning on undergraduates in science, mathematics, engineering and technology: A meta-analysis', *Review of Educational Research* 69(1), 21–51. http://dx.doi.org/10.3102/00346543069001021.

Tal, C., 2010, 'Case studies to deepen understanding and enhance classroom management skills in preschool teacher training', *Early Childhood Education* 38, 143–152. http://dx.doi.org/10.1007/s10643-010-0395-z.

Tillema, H.H., 2000, 'Belief change towards self-directed learning in student teachers: Immersion in practice or reflection on action', *Teaching and Teacher Education* 16(2000), 575–591. http://dx.doi.org/10.1016/S0742-051X(00)00016-0.

Van Lier, L., 2004, *The ecology of language learning*, viewed 21 January 2016, from http://uccllt.ucdavis.edu/events/ULCCTPP/ leo.php.

Van Zyl, A., 2015, 'First year research: Faculty of Education', University of Johannesburg, Unpublished Report.

Van Zyl, A., Gravett, S. & De Bruin, G.P., 2012, 'To what extent do pre-entry attributes predict first year student academic performance in the South African context?' *South African Journal of Higher Education* 26(5), 1095–1111.

Vygotsky, L.S., 1978, *Mind in society*, Harvard University Press, London.

Warford, M.K., 2011, 'The zone of proximal teacher development', *Teaching and Teacher Education* 27, 252–258. http://dx.doi.org/10.1016/j.tate.2010.08.008.

Whitaker, S. & Heiliger, B., 2013, 'Not in my school!' in S. Gravett, K. Merseth & J. De Beer (eds.), *Being a teacher: A book of cases*, pp. 23–28, Pearson, Cape Town.

Whitelaw, S., De Beer, J. & Henning, E., 2008, 'New teachers in a pseudocommunity of practice', *Education as Change* 12(2), 25–40. http://dx.doi.org/10.1080/16823200809487205.

Williamson, S.N., 2007, 'Development of a self-rating scale of self-directed learning', *Nurse Researcher* 14(2), 66–83. http://dx.doi.org/10.7748/nr2007.01.14.2.66.c6022.

Chapter 3

Asensio, F.J., Oleagordia, I.J., San Martín, J.I. & Barrón, M., 2015, 'Approach of an active learning activity in engineering through PBL', 13th Active Learning in Engineering Education (ALE) workshop, Mondragon University, Aalborg University Press, Denmark, July 06–10, pp. 263–274.

Bagheri, M., Ali, W.Z.W., Abdullah, M.C.B. & Daud, S.M., 2013, 'Effects of project-based learning strategy on self-directed learning skills of educational technology students', *Contemporary Educational Technology* 4(1), 15–29.

Bell, S., 2010, 'Project-based learning for the 21st century: Skills for the future', *The Clearing House* 83, 39–43. http://dx.doi.org/10.1080/00098650903505415.

Davidson, W., 2014, *Principles of accountability for agile organizations*, viewed 08 August 2015, from https://www.scrumalliance.org/community/articles/2014/september/principles-of-accountability-for-agile-organizatio.

Ellis, S.M. & Steyn, H.S., 2003, 'Practical significance (effect sizes) versus or in combination with statistical significance (*p*-values)', *Management Dynamics* 12(4), 51–53.

Fisher, M., King, J. & Tague, G., 2001, 'Development of a self-directed learning readiness scale for nursing education', *Nurse Education Today* 21, 516–525. http://dx.doi.org/10.1054/nedt.2001.0589.

Gibbs, G., 2010, *Analyzing qualitative data*, Sage, London.

Grant, M.M., 2011, 'Learning, beliefs, and products: Students' perspectives with project-based learning', *Interdisciplinary Journal of Problem-based Learning* 5(2), 37–69. http://dx.doi.org/10.7771/1541-5015.1254.

Guglielmino, L.M., 1978, 'Development of the self-directed learning readiness scale', PhD dissertation, University of Georgia, Athens, GA, Dissertation Abstracts International 38, 6467A.

Gunter, M.A., Estes, T.H. & Mintz, S.L., 2010, *Instruction: A models approach*, 5th edn., Pearson, Boston, MA.

Havenga, H.M., 2015, 'Project-based learning in higher education: Exploring programming students' development towards self-directedness', *South African Journal of Higher Education* 29(4), 135–157.

Helle, L., Tynjälä, P. & Olkinuora, E., 2006, 'Project-based learning in post-secondary education: Theory, practice and rubber sling shots', *Higher Education* 51(2), 287–314. http://dx.doi.org/10.1007/s10734-004-6386-5.

Heystek, J., 2015, 'Principals' perceptions of the motivation potential of performance agreements in underperforming schools', *South African Journal of Education* 35(2), 1–10. http://dx.doi.org/10.15700/saje.v35n2a986.

Hughes, B. & Cotterell, M., 2009, *Software project management*, 5th edn., McGraw-Hill, Boston, MA.

Johnson, D.W. & Johnson, F.P., 2013, *Joining together: Group theory and group skills*, 11th edn., Pearson, Boston, MA.

Johnson, D.W., Johnson, R.T. & Holubec, E., 2014, 'Cooperative learning', *The Cooperative Link* 28(1), 1–4.

Knowles, M.S., 1975, *Self-directed learning: A guide for learners and teachers,* Association Press, New York.

Kolmos, A. & De Graaff, E., 2007, 'History of problem-based and project-based learning', in E. De Graaff & A. Kolmos (eds.), *Management of change: Implementation of problem-based and project-based learning in engineering*, pp. 1–43, Sense, Rotterdam.

Lodico, M.G., Spaulding, D.T. & Voegtle, K.H., 2010, *Methods in educational research: From theory to practice*, 2nd edn., Jossey-Bass, San Francisco, CA.

Mentz, E., Van der Walt, J.L. & Goosen, L., 2008, 'The effect of incorporating cooperative learning principles in pair programming for student teachers', *Computer Science Education* 18, 247–260. http://dx.doi.org/10.1080/08993400802461396.

Merriam, S.B., Caffarella, R.S. & Baumgartner, L.M., 2007, *Learning in adulthood*, 3rd edn., Jossey-Bass, San Francisco, CA.

Onwuegbuzie, A.J., Johnson, R.B. & Collins, K.M.T., 2009, 'Call for mixed analysis: A philosophical framework for combining qualitative and quantitative approaches', *International Journal of Multiple Research Approaches* 3, 114–139. http://dx.doi.org/10.5172/mra.3.2.114.

Patel, C.J., Gali, V.S., Patel, D.V. & Parmar, R.D., 2011, 'The effects of information and communication technologies (ICTs) on higher education: From objectivism to social constructivism', *International Journal of Vocational and Technical Education* 3(5), 113–120.

Rotherham, A.J. & Willingham, D.T., 2010, '"21st-century" skills. Not new, but a worthy challenge', *American Educator* 34(1), 17–20.

Schach, S.R., 2005, *Object-oriented and classical software engineering*, 6th edn., McGraw-Hill, Boston, MA.

Schwalbe, K., 2010, *Managing information technology projects*, 6th edn., Cengage Learning, NJ.

Sebesta, R.W., 2013, *Concepts of programming languages*, 10th edn., Pearson, Boston, MA.

Shin, G.W., 2011, 'An inquiry into the learning principles based on the objectives of self-directed learning', T.-H. Kim *et al.* (eds.), *Communications in computer and information science*, vol. 257, pp. 604–612. Springer-Verlag, Berlin, Heidelberg.

Soanes, C. & Stevenson, A. (eds.), 2004, *Concise Oxford English Dictionary*, 11th edn., Oxford University Press, Oxford.

Solbrekke, T.D. & Sugrue, C., 2014, 'Professional accreditation of initial teacher education programmes: Teacher educators' strategies – Between "accountability" and "professional responsibility?"', *Teaching and Teacher Education* 37, 11–20. http://dx.doi.org/10.1016/j.tate.2013.07.015.

Sternberg, R.J. & Sternberg, K., 2012, *Cognition*, 6th edn., Wadsworth Cengage Learning, Australia.

UNESCO, 2014, *Teaching and learning: Achieving quality for all,* EFA Global Monitoring Report, Paris, France.

UNESCO, 2015, *The role of higher education in promoting lifelong learning.* UNESCO Institute for Lifelong Learning, Hamburg, Germany.

Van der Walt, J.L. & Potgieter, F.J., 2012, 'Research method in education: The frame by which the picture hangs', *International Journal of Multiple Research Approaches* 6(3), 220–232. http://dx.doi.org/10.5172/mra.2012.6.3.220.

Williamson, S.N., 2007, 'Development of a self-rating scale of self-directed learning', *NurseResearcher* 14(2), 66–83. http://dx.doi.org/10.7748/nr2007.01.14.2.66.c6022.

Zou, T.X.P. & Mickleborough, N.C., 2015, 'Promoting collaborative problem-solving skills in a course on engineering grand challenges', *Innovations in Education and Teaching International* 52(2), 148–159. http://dx.doi.org/10.1080/14703297.2013.866591.

Chapter 4

Arnett, J., 2000, 'Emerging adulthood: A theory of development from the late teens through the twenties', *American Psychologist* 55, 469–480. http://dx.doi.org/10.1037/0003-066X.55.5.469.

Baer, J., 2003, 'Grouping and achievement in cooperative learning', *College Teaching* 51, 169–175. http://dx.doi.org/10.1080/87567550309596434.

Bullock, S., 2013, 'Using digital technologies to support self-directed learning for preservice teacher education', *Curriculum Journal* 24, 103–120. http://dx.doi.org/10.1080/09585176.2012.744695.

Clark, M. & Dumas, G., 2005, 'Negotiating the freshman year: Challenges and strategies among first-year college students', *Journal of College Student Development* 46, 296–316. http://dx.doi.org/10.1353/csd.2005.0022.

Creswell, J.W., 2008, *Educational Research. Planning, conducting, and evaluating quantitative and qualitative research*, 3rd edn., Pearson, Upper Saddle River, NJ.

Cuseo, J., 2007, 'The empirical case against large class size: Adverse effects on the teaching, learning, and retention of first-year students', *Journal of Faculty Development* 21, 5–21.

Davis, B., 1993, *Tools for Teaching*, Jossey-Bass, San Francisco, CA.

Guglielmino, L., 1978, 'Development of the self-directed learning readiness scale', Doctoral thesis, University of Georgia.

Hutcheson, G.D. & Sofroniou, N., 1999, *The Multivariate Social Scientist: Introductory statistics using generalized linear models*, Sage, London.

Ivankova, N., Creswell, J. & Stick, S., 2006, 'Using mixed-methods sequential explanatory design: From theory to practice', *Field Methods* 18, 3–20. http://dx.doi.org/10.1177/1525822X05282260.

Jacobs, G., 2013, *And, out of class too: The who, what, when, where, why, and how of students learning together outside of class*, viewed 22 August 2014, from http://independent.academia.edu/GeorgeJacobs.

James, M., 2006, 'Assessment, teaching and theories of learning', in J. Gardner (ed.), *Assessment and learning*, pp. 47–60, Sage, London.

Johnson, D. & Johnson, R., 1999, 'Making cooperative learning work', *Theory into Practice* 38, 67–73. http://dx.doi.org/10.1080/00405849909543834.

Johnson, D., Johnson, R. & Johnson-Holubec, E., 2008, *Cooperation in the classroom*, Interaction Book Company, Edina, MN.

Johnson, R. & Onwuegbuzie, A., 2004, 'Mixed methods research: A research paradigm whose time has come', *Educational Researcher* 33, 14–26. http://dx.doi.org/10.3102/0013189X033007014.

Kaiser, H., 1974, 'An index of factorial simplicity', *Psyhometrika* 39, 31–36. http://dx.doi.org/10.1007/BF02291575.

Knowles, M., 1975, *Self-directed learning: A guide for learners and teachers*, Association Press, New York.

Lantolf, J. & Johnson, K., 2007, 'Extending Firth & Wagner's ontological perspective to L2 classroom praxis and teacher education', *The Modern Language Journal*, 91, 875–890.

Larson, L. & Miller, T., 2011, '21st century skills: Prepare students for the future', *Kappa Delta Pi Record* 47, 121–123. http://dx.doi.org/10.1080/00228958.2011.10516575.

Lord, S.M., Chen, J.C., Stolk, J., Nottis, K., Stefanou, C. & Prince, M., 2010, *Role of faculty in promoting lifelong learning: Characterizing classroom environments*, Education Engineering (EDUCON), Madrid.

Lubbe, A., 2015, 'Cooperative base groups in higher education: The impact on life sciences students' self-directed learning readiness', Dissertation – M.Ed, NWU, Potchefstroom.

Mcmillan, J. & Schumacher, S., 2006, *Research in education: Evidence-based inquiry*, Pearson, London.

Monks, J. & Schmidt, R., 2011, 'The impact of class size on outcomes in higher education', *The BE Journal of Economic Analysis and Policy* 11, 1–17. http://dx.doi.org/10.2202/1935-1682.2803.

Morosanu, L., Handley, K. & O'Donovan, B., 2010, 'Seeking support: Researching first-year students' experiences of coping with academic life', *Higher Education Research & Development* 29, 665–678. http://dx.doi.org/10.1080/07294360.2010.487200.

Morton, S., Mergler, A. & Boman, P., 2014, 'Managing the transition: The role of optimism and self-efficacy for first-year Australian university students', *Australian Journal of Guidance and Counselling* 24, 90–108. http://dx.doi.org/10.1017/jgc.2013.29.

Nepal, K. & Stewart, R., 2010, 'Relationship between self-directed learning readiness factors and learning outcomes in third-year project-based engineering design course', AaeE Conference, 05–08 December, Sydney, N.S.W., Engineers Australia, pp. 496–503.

Parè, D., Collimore, L., Joordens, S., Rolheiser, C., Brym, R. & Gini-Newman, G., 2015, *Put students' minds together and their hearts will follow: Building a sense of community in large-sized classes via peer- and self-assessment*, Higher Education Quality Council of Ontario, Toronto.

Patterson, C., Crooks, D. & Lunyk-Child, O., 2002, 'A new perspective on competencies for self-directed learning', *Journal of Nursing Education* 41, 25–31.

Pietersen, J. & Maree, K., 2010, 'Standardisation of a questionnaire', in K. Maree (ed.), *First steps in research*, pp. 215–223, Van Schaik, Pretoria.

Roberts, J., 2010, *Promoting self directed learning skills in first-year students*, Watt University, Herriot.

Scott, C., 2015, *The futures of learning 1: Why must learning content and methods change in the 21st century?* UNESCO Education Research and Foresight, Paris. [ERF Working Papers Series, No. 13].

Sharma, B., 2013, 'Adjustment and emotional maturity among first-year college students', *Pakistan Journal of Social and Clinical Psychology* 10, 32–37.

Shim, S. & Ryan, A., 2012, 'What do students want socially when they arrive at college? Implications of social achievement goals for social behaviors and adjustment during the first semester of college', *Motivation and Emotion* 36, 504–515. http://dx.doi.org/10.1007/s11031-011-9272-3.

Tinto, V., 1998, 'Colleges as communities: Taking research on student persistence seriously', *Review of Higher Education* 21, 167–177.

Tran, A., 2007, 'A learning-center vocabulary reading activity for English-language learners', *The Clearing House* 81, 61–62. http://dx.doi.org/10.3200/TCHS.81.2.61-62.

Warburton, N. & Volet, S., 2012, 'Enchancing self-directed learning through a content quiz group learning assignment', *Active Learning in Higher Education* 14, 9–22. http://dx.doi.org/10.1177/1469787412467126.

Wilcox, P., Winn, S. & Fyvie-Gauld, M., 2005, 'It was nothing to do with the university, it was just the people': The role of social support in the first-year experience of higher education', *Studies in Higher Education* 30, 707–722. http://dx.doi.org/10.1080/03075070500340036.

Zevenbergen, R., 2004, 'Study groups as a tool for enhancing preservice students' content knowledge' *Mathematics Teacher Education and Development* 6, 3–18.

Chapter 5

Abraham, R.R., Upadhya, S. & Ramnarayan, K., 2005, 'Self-directed learning', *Advances in Physiology Education* 29(2), 135–136. http://dx.doi.org/10.1152/advan.00008.2005.

Bessant, J., 2014, 'A dangerous idea? Freedom, children and the capability approach to education', *Critical Studies in Education* 55(2), 138–153. http://dx.doi.org/10.1080/17508487.2014.873368.

Blumberg, P., 2000, 'Evaluating the evidence that problem-based learners are self-directed learners. A review of literature', in D.H. Evensen & C.E. Hmelo (eds.), *Problem-based learning: A research perspective on learning interactions*, pp. 199–226, Lawrence Erlbaum Associates Publishers, Mahwah, NJ.

Candy, P.C., 1991, *Self-direction for lifelong learning. A comprehensive guide to Theory and Practice*, Jossy-Bass, San Francisco, CA.

Cockerill, M.P., 2014, 'Beyond education for economic productivity alone: The capability approach', *International Journal of Educational Research* 66, 13–21. http://dx.doi.org/10.1016/j.ijer.2014.01.003.

Cohen, L., Manion, L. & Morrison, K., 2011, *Research methods in education*, Routledge, London.

Dang, A-T., 2014, 'Amartya Sen's capability approach: A framework for well-being, evaluation and policy analysis?' *Review of Social Economy* 72(4), 460–484. http://dx.doi.org/10.1080/00346764.2014.958903.

Dore, R., 1976, *The Diploma Disease: Education qualification and development*, The University of California Press, Berkeley, CA.

Dreyer, C., 2005, 'Attacking the digital divide – Designing electronic-mobile learning environments for improved teacher training in developing countries', paper presented at the International Congress for School Effectiveness and Improvement, January 2–5, Barcelona, Spain.

Duffy, T.M. & Jonassen, D.H., 1992, 'Constructivism: New implications for instructional technology', in T.M. Duffy & D.H. Jonassen (eds.), *Constructivism and the technology of instruction. A conversation*, pp. 1–16, Lawrence Erlbaum and Associates Publishers, Hove.

Fisher, M., King, J. & Tague, C., 2001, 'Development of a self-directed learning readiness scale for nursing education', *Nurse Education Today* 21(7), 516–525. http://dx.doi.org/10.1054/nedt.2001.0589.

Garrison, D.R. & Kanuka, H., 2004, 'Blended learning – Uncovering its transformative potential in higher education', *The Internet and Higher Education* 7(2), 95–105. http://dx.doi.org/10.1016/j.iheduc.2004.02.001.

Gilabert, P., 2013, 'The capability approach and the debate between Humanist and Political perspectives on Human Rights. A critical survey', *Human Rights Review* 14, 299–325. http://dx.doi.org/10.1007/s12142-013-0269-z.

Hatry, H.P., 1978, *The status of productivity measurement in the Public Sector*, Blackwell Publishing, London.

Hoxby, C.M., 2004, 'Productivity in education: The Quintessential Upstream Industry', *Southern Economic Journal* 71(2), 208–231. http://dx.doi.org/10.2307/4135289.

Knowles, M.S., 1975, *Self-directed learning. A guide for learners and teachers*, Prentice Hall Regents, Englewood Cliffs, NJ.

Long, H.B., 2000, 'Understanding self-direction in learning', in H.B. Long & Associates, *Practice & theory in self-directed learning*, pp. 11–24, Motorola University Press, Schaumberg.

Mentz, E., 2011, *'n Sosiaal-konstruktiwistiese benadering tot die aanleer van programmeringsvaardighede: Implikasies vir die praktyk*, Scientific Contributions, Series H: Inaugural Speech no. 241, North-West University, Potchefstroom.

Merriam, S.B., 2001, 'Andragogy and self-directed learning: Pillars of adult learning theory', *New Directions for Adult and Continuing Education,* no. 89, pp. 3–14. Merriam, S.B., 2009, *Qualitative research*, JossyBass, San Francisco, CA.

Müller, P., 1998, 'Tegno-onderwys is hier', *Insig*, 10–11 March, pp. 10–11.

Nussbaum, M., 2000, *Women and human development: The capability approach,* Cambridge University Press, Cambridge.

Osguthorpe, R.T. & Graham, C.R., 2003, 'Blended learning environments – Definitions and directions', *The Quarterly Review of Distance Education* 4(3), 227–233.

Phillips, D.P. & Schweisfurth, M., 2014, *Comparative and International Education: An introduction to theory, method and practice,* 2nd edn., Bloomsbury, London.

Republic of South Africa (RSA) Department of Higher Education, 2012, *Green paper for post-school education and training*, Department of Higher Education and Training, Pretoria.

Rizvi, F. & Lingard, B., 2010, *Globalizing education policy*, Routledge, London.

Robeyns, I., 2005, 'The capability approach: A theoretical survey', *Journal of Human Development and Capabilities* 6(1), 93–117. http://dx.doi.org/10.1080/146498805200034266.

Schanks, R.C., 1994, 'Active learning through multi-media', *IEEE Multimedia* 1(1), 69–78. http://dx.doi.org/10.1109/93.295270.

Sen, A., 2010, *The idea of Justice*, Penguin Books, London.

Steindel, C. & Stiroh, K.L., 2001, 'Productivity: What it is, and why do we care about it?', *Business Economics* 36(4), 13–31. http://dx.doi.org/10.2139/ssrn.923421.

Steyn, H.J., 2010, *Handleiding vir mede-werkers aan die strategie vir grootgroeponderrig*, North-West University, Potchefstroom.

Steyn, H.J., 2014, 'The education system: Structure and determinants', in H.J. Steyn & C.C. Wolhuter (eds.), *The education system: A comparative education perspective*, Keurkopie, Noordbrug.

Steyn, H.J., Steyn, S.C., De Waal, E.A.S. & Wolhuter, C.C., 2002, *The education system: Structure and issues*, Keurkopie, Noordbrug.

Steyn, H.J. & Van der Walt, J.L., 2014, 'Grootgroeponderrig ter wille van die verhoging van onderwysproduktiwiteit in hoër onderwys', *LitNet Akademies* 11(3), 344–371.

Steyn, H.J. & Wolhuter, C.C., 2008, 'The education system and probable societal trends of the twenty-first century', in H.J. Steyn & C.C. Wolhuter (eds.), *Education systems: Challenges of the 21st century,* Keurkopie, Noordbrug.

UNESCO, 2011, *Enrolment in tertiary public and private institutions. 2011*, UNESCO Institute for Statistics, Montreal, QC, Canada, viewed 15 March 2015, from http://www.uis.unesco.org.

Van der Walt, J.L., 2014, 'Opvoeding vanuit 'n post-postfundamentistiese perspektief'. *LitNet Akademies* 11, 2.

Van der Walt, J.L. & Steyn, H.J., 2014, 'Recognition of minority groups, their general and educational ideals: Is there another way out?', *Journal of Humanities* 54(4), 820–834.

Wolhuter, C.C., 2014, 'Weaknesses in South African education in the mirror-image of international education development', *South African Journal of Education* 34(2), 196–214. http://dx.doi.org/10.15700/201412071120.

Wolhuter, C.C., Higgs, P., Higgs, L. & Ntshoe, I.M., 2010, 'How Affluent is the South African higher education sector and how strong is the South African Academic Profession in the Changing International Academic landscape?', *South African Journal of Higher Education* 24(1), 196–214.

Wolhuter, C.C., Steyn, H.J., Mentz, E. & Potgieter, F.J., 2012, 'Innovative learning support for teaching large classes', in R. Clothey, Li-S. Austin & J.C. Weidman (eds.), *Post-secondary education and technology: A global perspective on opportunities and obstacles to development*, Palgrave Macmillan, New York, pp. 83–109.

Young, J.R., 2004, *When good technology means bad teaching. The chronicle of higher education: Information technology*, viewed 15 January 2016, from http://chronicle.com/free/v51/i12/12a03101.htm.

Chapter 6

Aldridge, J.M., Frazer, B.J. & Sebela, M.P., 2004, 'Using teacher action research to promote constructivist learning environments in South Africa', *South African Journal of Education* 24(4), 245–253.

AlHaqwi, A., 2014, 'Learning outcomes and tutoring in problem-based learning: How do undergraduate medical students perceive them?' *International Journal of Health Sciences, Qassim University* 8(2), 125–132. http://dx.doi.org/10.12816/0006078.

Ates, O. & Eryilmaz, A., 2010, 'Factors affecting performance of tutors during problem-based learning implementations', *Procedia Social and Behavioral Sciences* 2, 2325–2329. http://dx.doi.org/10.1016/j.sbspro.2010.03.330.

Azer, S.A., 2005, 'Challenges facing PBL tutors: 12 tips for successful group facilitation', *Medical Teacher* 27(8), 676–681. http://dx.doi.org/10.1080/01421590500313001.

Batarfi, A.M. & Bin-Gouth, A.S., 2007, 'Exploring the opinions of students about role of tutor in small group discussion in Hadhramout University College (HUCOM)', *Suez Canal University Medical Journal* 10(2), 199–202.

Benè, K.L. & Bergus, G., 2014, 'When learners become teachers: A review of peer teaching in medical student education', *Family Medicine* 46(10), 783–787.

Boon, L., Moust, J.H., Van Der Arend, A., Kokx, I. & Schmidt, H.G., 1993, 'Influence of tutor' subject-matter expertise on student effort and achievement in problem-based learning', *Academic Education* 68(10), 784–791.

Chung, E., Hitchcock, M.A., Oh, S., Han, E. & Woo, Y., 2011, 'The relationship between student perceptions of tutor performance and tutors' background in problem-based learning in South Korea', *International Journal of Medical Education* 2, 7–11. http://dx.doi.org/10.5116/ijme.4d38.d07e.

Cohen, J., 1988, *Statistical power analysis for the behavioral sciences,* rev. edn., Academic Press, Orlando, FL.

Collins, A., Brown, J.S. & Holum, A., 1991, 'Cognitive apprenticeship: Making thinking visible', *American Higher Educator* 31(2), 117–118.

Cramer, D. & Howitt, D., 2004, *The SAGE dictionary of statistics. A practical resource for students in the social sciences,* SAGE, London.

Creswell, J., 2009, *Research design: Qualitative, quantitative, and mixed methods approaches*, 3rd edn., SAGE, Thousand Oaks, CA.

Das, M., Mpofu, D.J.S., Hasan, M.Y. & Stewart, T.S., 2002, 'Student perceptions of tutor skills in problem-based learning tutorials', *Medical Education* 36(3), 272–278. http://dx.doi.org/10.1046/j.1365-2923.2002.01148.x.

De Grave, W.S., Dolmans, D.H.J.M. & Van Der Vleuten, C.P.M., 1999, 'Profiles of effective tutors in problem-based learning: Scaffolding student learning', *Medical Education* 33, 901–906. http://dx.doi.org/10.1046/j.1365-2923.1999.00492.x.

De Rijdt, C., Van der Rijt, J., Dochy, F. & Van Der Vleuten, C., 2012, 'Rigorously selected and well-trained senior student tutors in problem-based learning: Student perceptions and study achievements', *Instructional Science* 40, 397–411. http://dx.doi.org/10.1007/s11251-011-9173-6.

Dolmans, D.H.J.M., Wolfhagen, H.A.P., Scherpbier, A.J.J.A. & Van Der Vleuten, C.P.M., 2003, 'Development of an instrument to evaluate the effectiveness of teachers in guiding small groups', *Higher Education* 46, 431–446. http://dx.doi.org/10.1023/A:1027388806218.

Dolmans, D.H.J.M., Wolfhagen, H.A.P. & Van Der Vleuten, C.P.M., 1996, 'Long-term stability of tutor performance', *Academic Medicine* 71(12), 1344–1347. http://dx.doi.org/10.1097/00001888-199612000-00017.

Dolmans, D.H., Wolfhagen, I.H., Van der Vleuten, C.P. & Wijnen, W.H., 2001, 'Solving problems with group work in problem-based learning: Hold on to the philosophy', *Medical Education* 35(9), 884–889. http://dx.doi.org/10.1046/j.1365-2923.2001.00915.x.

Donnelly, R. & Fitzmaurice, M., 2005, 'Collaborative project-based learning and problem-based in Higher Education: A consideration of tutor and student roles in learner-focused strategies', in G. O'Neill, S. Moore & B. McMullin (eds.), *Emerging issues in the practice of university learning and teaching*, pp. 87–98, AISHE, Dublin.

Doolittle, P.E. & Hicks, D., 2003, 'Constructivism as a theoretical foundation for the use of technology in social studies', *Theory and Research in Social Education* 31(1), 72–104, viewed 14 September 2013, from http://www.editlib.org/p/103612.

Du, X., Stentoft, D. & Dahms, M., 2007, 'Power, democracy and problem-based learning', in *Proceedings of the International Problem-Based Learning Symposium: Re-inventing PBL*, 07-09 March,Singapore, pp. 271–284.

Eagle, C.J., Harasym, P.H. & Mandin, H., 1992, 'Effects of tutors with case expertise on problem-based learning issues', *Academic Medicine* 67(7), 465–469. http://dx.doi.org/10.1097/00001888-199207000-00012.

Ellis, S.M. & Steyn, H.S., 2003, 'Practical significance (effect sizes) versus or in combination with statistical significance (*p*-values)', *Management Dynamics* 12(4), 51–53.

Fletcher, J.K., Jordan, J.V. & Miller, J.B., 2000, 'Women and the workplace: Application of a Psychodynamic theory', *American Journal of Psychoanalysis* 60(3), 243–261. http://dx.doi.org/10.1023/A:1001973704517.

Fournier, E.J., 2002, 'World regional geography and problem-based learning: Using collaborative learning groups in an introductory-level world geography course', *Journal of General Education* 51(4), 293–305. http://dx.doi.org/10.1353/jge.2003.0011.

Gilkison, A., 2003, 'Techniques used by "expert" and "non-expert" tutors to facilitate problem-based learning tutorials in an undergraduate medical curriculum', *Medical Education* 37, 6–14. http://dx.doi.org/10.1046/j.1365-2923.2003.01406.x.

Goh, K., 2014, 'What good teachers do to promote effective student learning in a problem-based learning environment', *Australian Journal of Educational & Development Psychology* 14, 159–166.

Golightly, A. & Muniz, O., 2013, 'Are South African geography education students ready for PBL?' *Journal of Geography in Higher Education* 37(3), 432–455. http://dx.doi.org/10.1080/03098265.2013.794332.

Golightly, A. & Raath, S., 2015, 'Problem-based learning to foster deep learning in pre-service geography teacher evaluation', *Journal of Geography* 14(2), 58–68. http://dx.doi.org/10.1080/00221341.2014.894110.

Gravett, S., 2001, *Adult learning. Designing and implementing learning events: A dialogic approach*, JL van Schaik, Pretoria.

Grosser, M. & De Waal, E., 2008, 'Recentering the teacher: From transmitter of knowledge to mediator of learning', *Education as Change* 12(2), 41–57. http://dx.doi.org/10.1080/16823200809487206.

Groves, M., Rego, P. & O'Rourke, P., 2005, *Tutoring in problem-based learning medical curricula: The influence of tutor background and styles on effectiveness*, viewed 15 May 2012, from http://www.biomedcentral.com/1472-6920/5/20.

Hendry, G.D., 2009, 'Problem-based learning tutors' conceptions of their development as tutors', *Medical Teacher* 31, 145–150. http://dx.doi.org/10.1080/01421590802146026.

Hendry, G.D., Phan, H., Lyon, P.M. & Gordon, J., 2002, 'Student evaluation of expert and non-expert problem-based learning tutors', *Medical Teacher* 24, 544–549. http://dx.doi.org/10.1080/0142159021000012603.

Heritage, G.L. & Thomas, A.D., 2006, 'The importance of effective facilitation in student-centred learning: An example from physical geography', *Planet* 16, 36–40. http://dx.doi.org/10.11120/plan.2006.00160036.

Hmelo-Silver, C. & Barrows, H.S., 2006, 'Goals and strategies of a problem-based learning facilitator', *The Interdisciplinary Journal of Problem-Based Learning* 1(1), 21–39. http://dx.doi.org/10.7771/1541-5015.1004.

Hmelo-Silver, C.E., 2004, 'Problem-based learning: What and how do students learn?' *Educational Psychology Review* 16(3), 235–266. http://dx.doi.org/10.1023/B:EDPR.0000034022.16470.f3.

Kassab, S., Abu-Hijleh, M., Al-Shboul, Q. & Hamdy, H., 2005, 'Gender-related differences in learning student-led PBL tutorials', *Education of Health* 18(2), 272–282. http://dx.doi.org/10.1080/13576280500148577.

Kwan, T., 2008, 'Evaluation of the learning experiences of using different modes of problem-based learning in an initial teacher education programme', *Asia-Pacific Journal of Teacher Education* 36(4), 323–343. http://dx.doi.org/10.1080/13598660802375933.

Lam, D.O.B., 2009, 'Impact of problem-based learning on social work students: Growth and limits', *British Journal of Social Work* 39, 1499–1517. http://dx.doi.org/10.1093/bjsw/bcn073.

Leedy, P.D. & Ormrod, J.E., 2001, *Practical research: Planning and design*, 7th edn., Merrill Prentice Hall, Upper Saddle River, NJ.

Leung, K.H., Lue, B.H. &. Lee, M.B., 2003, 'Development of a teaching style inventory for tutor evaluation in problem-based learning', *Medical Education* 37(5), 410–416. http://dx.doi.org/10.1046/j.1365-2923.2003.01493.x.

Maudsley, G., 1999, 'Roles and responsibilities of the problem-based learning tutor in the undergraduate medical curriculum', *British Medical Journal* 318, 657–661. http://dx.doi.org/10.1136/bmj.318.7184.657.

Major, C.H. & Palmer, B., 2001, 'Assessing the effectiveness of problem-based learning in higher education: Lessons from the literature', *Academic Exchange Quarterly* 5(1), 4–9.

Mayer, R.H., 1999, 'Designing instruction for constructivist learning', in C.M. Reigeluth, (ed.), *Instructional design theories and models: A new paradigm of instructional theory*, pp. 141–159, Lawrence Erlbaum Associations, Mahwah, NJ.

Moore, T. & Kain, D.L., 2011, 'Student tutors for problem-based learning in dental hygiene: A study of tutor actions', *Journal of Dental Education* 75(6), 805–816.

Mtika, P. & Gates, P., 2010, 'Developing learner-centred education among secondary trainee teachers in Malawi: The dilemma of appropriation and application', *International Journal of Educational Development* 30(4), 396–404. http://dx.doi.org/10.1016/j.ijedudev.2009.12.004.

Nesargikar, P.N., 2010, 'From student to tutor in problem based learning: An unexplored avenue', *British Journal of Medical Practitioners* 3(2), 313–317.

Njenga, K., 2014, 'The impact of social-construction on ERP systems security. A critical review', Proceedings of the 12th Australian Information Security Management Conference, Perth, pp. 39–47. This Conference Proceeding is posted at Research Online. http://ro.ecu.edu.au/ism/168

Park, S.H. & Ertmer, P.A., 2008, 'Impact of problem-based learning (PBL) on teachers' beliefs regarding technology use', *Journal of Research on Technology in Education* 40(2), 247–267. http://dx.doi.org/10.1080/15391523.2007.10782507.

Pawson, E., Fournier, E., Haigh, M., Muniz, O., Trafford, J. & Vajoczki, S., 2006, 'Problem-based learning in Geography: Towards a critical assessment of its purposes, benefits and risks', *Journal of Geography in Higher Education* 30(1), 103–116. http://dx.doi.org/10.1080/03098260500499709.

Rambuda, A.M. & Fraser, W.J., 2004, 'Perceptions of teachers of the application of science process skills in the teaching of geography in secondary schools in the Free State Province', *South African Journal of Education* 24(1), 10–17.

Reynolds, F., 2003, 'Initial experiences of interpersonal problem-based learning: A comparison of male and female students' views', *Journal of Interprofessional Care* 17(1), 35–44. http://dx.doi.org/10.1080/13561820210000044148.

Roux, C., 2009, 'Holistic curriculum development: Tutoring as a support process', *South African Journal of Education* 29, 17–32. http://dx.doi.org/10.1590/S0256-01002009000100002.

Russel, T., 1999, 'The challenge of change in (teacher) education', Keynote address to 'The challenge of change in education' conference, 05-06 February, University of Technology, Sydney.

Schmidt, H.G., 1994, 'Resolving inconsistencies in tutor expertise research: Lack of structure causes students to seek tutor guidance', *Academic Medicine* 69, 656–662. http://dx.doi.org/10.1097/00001888-199408000-00015.

Schulze, S., 2003, 'The courage to change: Challenges for teacher educators', *South African Journal of Education* 23(1), 6–12.

Setterud, H., Johansson, M., Edgren, G., Amnèr, G., Persson, E., Segersen, U. *et al.*, 2015, 'Courses for tutors in problem-based learning. Current challenges at four Swedish universities', *HögreUtbildning* 5(1), 47–64.

Solomon, P. & Crowe, P., 2001, 'Perceptions of student peer tutors in a problem-based learning program', *Medical Teacher* 23(2), 181–186. http://dx.doi.org/10.1080/01421590020031101.

South Africa, Department of Education, 2003, *National curriculum statement grades 10–12*, Department of Education, Pretoria.

South Africa, Department of Education, 2011, *Curriculum and assessment policy statements*, Government Printing Works, Pretoria.

Tick, A., 2007, 'Application of problem-based learning in classroom activities and multimedia', 25–26 January, 5th Slovakain Hungarian Joint Symposium on Applied Machine Intelligence and Informatics, Poprad.

Van Harmelen, U., 1999, 'Where has all the geography gone? A social constructivist perspective of curriculum 2005', *South African Geographical Journal* 81(2), 80–85. http://dx.doi.org/10.1080/03736245.1999.9713666.

Van Loggerenberg-Hattingh, A., 2003, 'Examining learning achievement and experiences of science learners in problem-based learning environments', *South African Journal of Education* 23(1), 52–57.

Vavrus, F., Thomas, M. & Bartlett, L., 2011, *Ensuring quality by attending to inquiry: Learner-centered pedagogy in Sub-Saharan Africa*, UNESCO: International Institute for Capacity Building in Africa, Addis Ababa.

Warnich, P. & Meyer, L., 2013, 'Trainee teachers' observation of learner-centred instruction and assessment as applied by History and Social Sciences teachers', *Yesterday & Today* 9, 13–44.

Williams, J.C., 2011, 'Beliefs, behaviours, and professional development of tutors in problem-based learning', Masters dissertation, Erasmus University, Rotterdam.

Williams, J.C., Alwis, W.A.M. & Rotgans, J.I., 2011, 'Are tutors behaviors in problem-based learning stable? A generalizability study of social congruence, expertise and cognitive congruence', *Advances in Health Sciences Education* 16, 505–515. http://dx.doi.org/10.1007/s10459-011-9295-2.

Woolfolk, A., 2007, *Educational Psychology*, 10th edn., Pearson, New York.

Chapter 7

Ang, K.C., 2001, 'Teaching mathematical modelling in Singapore schools', *The Mathematics Educator* 6(1), 63–75.

Boaler, J., 1998, 'Open and closed mathematics: Student experiences and understandings', *Journal for Research in Mathematics Education* 29(1), 41–62. http://dx.doi.org/10.2307/749717.

Boaler, J., 2002, *Experiencing school mathematics: Traditional and reform approaches to teaching and their impact on student learning*, Routledge, New York.

Bolhuis, S. & Voeten, M.J., 2001, 'Toward self-directed learning in secondary schools: What do teachers do?' *Teaching and Teacher Education* 17(7), 837–855. http://dx.doi.org/10.1016/S0742-051X(01)00034-8.

Bowen, G.A., 2009, 'Document analysis as a qualitative research method', *Qualitative Research Journal* 9(2), 27–40. http://dx.doi.org/10.3316/QRJ0902027.

Brockett, R.G. & Hiemstra, R., 1991, *Self-Direction in adult learning: Perspectives on theory, research, and practice*, Routledge & Kegan Paul, New York.

Caffarella, R.S., 1993, 'Self-directed learning', *New Directions for Adult and Continuing Education* 1993(57), 25–35. http://dx.doi.org/10.1002/ace.36719935705.

Caliendo, M., Cobb-Clark, D.A. & Uhlendorff, A., 2015, 'Locus of control and job search strategies', *Review of Economics and Statistics* 97(1), 88–103. http://dx.doi.org/10.1162/REST_a_00459.

Cheng, A.K., 2015, 'Mathematical modelling in Singapore schools: A framework for Instruction', *Mathematical Modelling: From Theory to Practice* 8, 57.

Collins, O.F. & Moore, D.G., 1970, *The organization makers; A behavioral study of independent entrepreneurs*, Appleton-Century-Crofts, New York.

Csikszentmihalyi, M. & Beattie, O.V., 1979, 'Life themes: A theoretical and empirical exploration of their origins and effects', *Journal of Humanistic Psychology* 19(1), 45–63. http://dx.doi.org/10.1177/002216787901900105.

Davis, B., 1997, 'Listening for differences: An evolving conception of mathematics teaching', *Journal for Research in Mathematics Education* 27(4), 355–376. http://dx.doi.org/10.2307/749785.

Dignath, C. & Büttner, G., 2008, 'Components of fostering self-regulated learning among students. A meta-analysis on intervention studies at primary and secondary school level', *Metacognition and Learning* 3(3), 231–264.

Ertmer, P.A., Ottenbreit-Leftwich, A.T., Sadik, O., Sendurur, E. & Sendurur, P., 2012, 'Teacher beliefs and technology integration practices: A critical relationship', *Computers & Education* 59(2), 423–435. http://dx.doi.org/10.1016/j.compedu.2012.02.001.

Freire, P., 2000, *Pedagogy of the oppressed*, Bloomsbury Publishing, New York.

Gibbons, M., Bailey, A., Comeau, P., Schmuck, J., Seymour, S. & Wallace, D., 1980, 'Toward a theory of self-directed learning: A study of experts without formal training', *Journal of Humanistic Psychology* 20(2), 41–56. http://dx.doi.org/10.1177/002216788002000205.

Gould, H., Murray, D.R. & Sanfratello, A., 2012, Teachers college mathematical modeling handbook. Consortium for Mathematics and Its Applications (COMAP), Bedford, Massachusetts.

Grow, G.O., 1991, 'Teaching learners to be self-directed', *Adult Education Quarterly* 41(3), 125–149. http://dx.doi.org/10.1177/0001848191041003001.

Guglielmino, L.M., 2013, 'The case for promoting self-directed learning in formal educational institutions', *SA-eDUC Journal* 10(2), 1–18.

Hill, R., 1978, 'Internality; an educational imperative', *Journal of Humanistic Psychology* 18(3), 43–57. http://dx.doi.org/10.1177/002216787801800306.

King, C. 2011. 'Fostering self-directed learning through guided tasks and learner reflection', *Studies in Self-access Learning Journal* 2(4), 257–267. Retrieved from https://sisaljournal.org/archives/dec11/king

Knowles, M., 1975, *Self-directed learning: A guide for learners and teachers*, Association Press, New York.

Luneta, K., & Makonye, J. P. 2011. 'Undergraduate Students' Preferences of Knowledge to Solve Particle Mechanics Problems', *Journal of science and mathematics education in Southeast Asia* 34(2), 237–261.

Makonye, J. P. 2012. *Learner mathematical errors in introductory differential calculus tasks: a study of misconceptions in the senior school certificate examinations.* P.hD. dissertation, University of Johannesburg, South Africa.

Paris, S.G. & Newman, R.S., 1990, 'Development aspects of self-regulated learning', *Educational Psychologist* 25(1), 87–102. http://dx.doi.org/10.1207/s15326985ep2501_7.

Paris, S.G. & Paris, A.H., 2001, 'Classroom applications of research on self-regulated learning', *Educational Psychologist* 36(2), 89–101. http://dx.doi.org/10.1207/S15326985EP3602_4.

Piaget, J., 1964, 'Development and learning', *Journal of Research in Science Teaching* 40, S8–S18.

Pintrich, P.R. & Schunck, D.H., 2002, *Motivation in education. Theory, research and applications*, Merrill Prentice Hall, Ohio.

Pratt, D.D., 1993, 'Andragogy after twenty-five years', *New Directions for Adult and Continuing Education* 57, 15–23. http://dx.doi.org/10.1002/ace.36719935704.

Schultheiss, O.C., 2008, 'Implicit motives', in O.P. John, R.W. Robins & L.A. Pervin (eds.), *Handbook of personality psychology: Theory and research*, pp. 603–633, Guilford Press, New York.

Shin, J.H., Haynes, R.B. & Johnston, M.E., 1993, 'Effect of problem-based, self-directed undergraduate education on life-long learning', *Canadian Medical Association Journal* 148(6), 969.

Skinner, B.F., 1972, *Beyond freedom and dignity*, Bantam Books, New York.

Smith, J.P., DiSessa, A.A. & Rosehelle, J., 1993, 'Misconceptions reconceived: A constructivist analysis of knowledge in transition', *The Journal of the Learning Science* 3(2), 115–163.

Stein, M.K., Grover, B.W. & Henningsen, M., 1996, 'Building student capacity for mathematical thinking and reasoning: An analysis of mathematical tasks used in reform classrooms', *American Educational Research Journal* 33(2), 55–488. http://dx.doi.org/10.3102/00028312033002455.

Stein, M.K., Smith, M.S., Henningsen, M.A. & Silver, E.A., 2000, *Implementing standards-based mathematics instruction: A casebook for professional development*, Teachers' College Press, New York.

Tandogan, R.O. & Orhan, A., 2007, 'The effects of problem-based active learning in science education on students' academic achievement, attitude and concept learning', *Online Submission* 3(1), 71–81.

Taylor, N. & Taylor, S., 2013, 'Teacher knowledge and professional habitus', in N. Taylor, S. Van der Berg & T. Mabogoane, *What makes schools effective? Report of the National Schools Effectiveness Study*, pp. 202–232, Pearson Education South Africa, Cape Town.

Tough, A., 1979, *The adult's learning projects: A fresh approach to theory and practice in adult learning,* Ontario Institute for Studies in Education, Toronto, Ontario.

Van de Walle, J.A., 1990. *Elementary School Mathematics, Teaching Developmentally*. Addison-Wesley/Longman, Reading, Massachusetts.

Vygotsky, L.S., 1978. *Mind in society.* Harvard University Press, Cambridge, Massachusetts.

Vygotsky, L. S. 1986. *Thought and Language*. Harvard University Press, Cambridge, Massachusetts.

Wilcox, S., 1996, 'Fostering self-directed learning in the university setting', *Studies in Higher Education* 21(2), 165–176. http://dx.doi.org/10.1080/03075079612331381338.

Zimmerman, B.J., 2002, 'Becoming a self-regulated learner: An overview', *Theory into Practice* 41(2), 64–70. http://dx.doi.org/10.1207/s15430421tip4102_2.

Chapter 8

Ahmad, A., 2010, 'Constructivism based blended learning in higher education', Masters thesis, Universiteit Hasselt, Fakulteit Toegepaste Econmische Wetenschappe.

Alonso, F., Lopez, G., Manrique, D. & Vines, J.M., 2005, 'An instructional model for web-based e-learning education with a blended learning process approach', *British Journal of Educational Technology* 36(2), 217–235. http://dx.doi.org/10.1111/j.1467-8535.2005.00454.x.

Andrews, T. & Tynan, B., 2015, 'Learner characteristics and patterns of monline learning: How online learners successfully manage their learning', *European Journal of Ppen Distance and E-learning*, viewed 23 June 2015, from www.eurodl.org/materials/special/2015/Andrews_Tynan.pdf.

Armstrong, K., 2010, 'Self-directed learning in athletic training education', *Athletic Therapy Today* 15(1), 19–22.

Ashworth, F., Brennan, G., Egan, K., Hamilton, R. & Saenz, O., 2004, 'Learning theories and higher education', *School of Electrical and Electronic Engineering* 3(2), 1–16.

Banerjee, G., 2011, 'Blended environments: Learning effectiveness and student satisfaction at a small college transition', *Journal of Asynchronous Learning Networks* 15(1), 8–19.

Bleed, R., 2001, 'A hybrid campus for a new millennium', *EDUCAUSE Review* 36(1), 16–24.

Bonk, C.J., Olson, T.M., Wisher, R.A. & Orvis, K.L., 2002, 'An examination of blended learning', *Journal of Distance Education* 17, 97–118.

Brunner, S., Brendenlier, S., Stoter, J., Hohlfeld, G. & Von Ossietzky, C., 2015, *'Are they ready?' Self-derected learning readiness and acceptance of e-learning tools: Comparing non-traditional and tradisional students*, viewed 23 June 2015, from www.eurodl.org/materials/special/2015/Bruneretal.pdf.

Ching, M.C. & Lung, C.L., 2005, 'Developing self-directed learning in student teachers', *International Journal of Self-directed Learning* 2(1), 18–39.

Dabbagh, N. & Kitsantas, A., 2012, 'Personal learning environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning', *Internet and Higher Education* 15(1), 3–8. http://dx.doi.org/10.1016/j.iheduc.2011.06.002.

Dresel, M., Schmitz, B., Scholber, B., Spiel, C., Ziegler, A., Engeslchalk, T. *et al.*, 2015, 'Compencies for successful self-regulated learning in Higher Education: Structural model and indications drawn from expert interviews', *Studies in Higher Education* 40(3), 454–470. http://dx.doi.org/10.1080/03075079.2015.1004236.

Driscoll, M., 2003, *Blended Learning: Let's get beyond the hype,* viewed 12 September 2012, from http://www.07.ibm.com/services/pdf/blended_learning.pdf.

Dynan, L., Cate, T. & Rhee, K., 2008, 'The impact of learning structure on students' readiness for self-directed learning', *Journal of Education for Business* 84(2), 96–100. http://dx.doi.org/10.3200/JOEB.84.2.96-100.

EDUCAUSE, 2007, *Learning Initiative (ELI). The seven things you should know about*, viewed 26 June 2015, from http://www.educause.edu/7things.

Friesen, N., 2012, *Report: Defining blended learning,* viewed 12 September 2012, from http://learningspaces.org/papers/Defining_blended_learning_NF.PDF.

Garrison, D.R. & Kanuka, H., 2004, 'Blended learning: Uncovering its transformative potential in higher education', *Internet and Higher Education* 7, 95–105. http://dx.doi.org/10.1016/j.iheduc.2004.02.001.

Garrison, D.R. & Vaughan, N.D., 2008, *Blended learning in Higher Education: Framework, principles, and guidelines*, Jossey-Bass, San Francisco, CA.

Geduld, B., 2014, 'Re-thinking the value of learning theories to develope self-directedness in open-distance students', *Journal of Edcuational Social Research* 4(6), 11–18.

Guglielmino, L.M., 2013, 'The case of self-directed learning in formal educational institutions', *SA-eDUC Journal* 10(2), 1–18.

Harling, K., 2002, 'An overview of case study', paper presented at the American Agricultural Economics Association, Long Beach, CA, 27 July 2002, viewed 08 July 2014, from http://www.farmfoundation.org/projects/documents/1_harling.pdf.

Harrison, D., 2011, 'Can blogging make a difference?', *Campus Technology,* viewed 8 May 2015, from http://campustechnology.com/articles/2011/01/12can-blogs-make-a-difference.

Hewitt-Taylor, J., 2001, 'Self-directed learning: Views of teachers and students', *Issues and Innovations in Nursing Education* 36(4), 496–504.

Hoic-Bozic, N., Mornar, V. & Boticki, I., 2009, 'A blended learning approach to course design and implementation', *IEEE Transactions on Education* 52(1), 19–30. http://dx.doi.org/10.1109/TE.2007.914945.

Jonassen, D.H., Howland, J., Marra, R. & Chrismond, D., 2008, *Meaningful learning with technology,* 3rd edn., Peasonr, Upper Saddle River, NJ.

Knowles, M.S., 1975, *Self-directed learning: A guide for learners and teachers*, Association Press, New York.

Lee, C. & Teo, T., 2010, 'Fostering self-directed learning with ICT', in C.S. Chait & Q. Wang (eds.), *ICT for self-directed and collaborative learning*, Pearson, Singapore.

Lee, K., Tsai, T., Chait, C.S. & Koht, J.H.L., 2014, 'Students' perceptions of self-directed learning and collaborative learning with and without technology', *Journal of Computer Assisted Learning* 30, 425–437. http://dx.doi.org/10.1111/jcal.12055.

Lin, L., 2008, 'An online learning model to facilitate learners' rights to education', *Journal of Asynchronous Learning Networks* 12, 127–143.

Long, H.B., 1994, 'Resources related to overcoming resistance to self-direction in learning', *New Directions for Adult and Continuing Education* 64, 13–21. http://dx.doi.org/10.1002/ace.36719946404.

Lupshenyuk, D. & Adams, J., 2009, 'Workplace learners' perceptions towards a blended learning approach', *International Journal of Social and Human Sciences* 3, 428–432.

McLoughlin, C. & Lee, M.J.W., 2010, 'Personalised and self regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software', *Australasian Journal of Education Technology* 26(1), 28–43. http://dx.doi.org/10.14742/ajet.1100.

Merriam, S., Caffarella, R.S. & Baumgartner, L.M., 2007, *Learning in Adulthood: A comprehensive guide,* 3rd edn., John Wiley & Sons, San Francisco, CA.

Mok, M.M. & Lung, C.L., 2005, 'Developing self-directed learning in teachers', *International Journal of Self-directed Learning* 2(1), 18–39.

Nieuwenhuis, J., 2010, 'Qualitative research designs and data gathering techniques', in K. Maree (ed.), *First steps in research*, 6th edn., pp. 70–98, Van Schaik, Pretoria.

Picciano, A.G., 2009, 'Blended with purpose: The multimodal model', *Journal of the Research Center for Educational Technology* 5(1), 4–14.

Pilling-Cormick, J. & Garrison, D.R., 2007, 'Self-regulated learning: Conceptual links', *Canadian Journal of University Continuing Education* 33(2), 13–33.

Pinto, M.B. & Anderson, A., 2013, 'A little knowledge goes a long way', *Student Expectations and Satisfaction with Hybrid Learning* 10, 1–12, viewed 27 October 2015, from http://aarbri.com/maniscripts/121376.pdf.

Pool, J. & Du Toit, A., 2014, 'The design and development of an e-guide for a blended mode of delivery in a teacher preparation module', *Progressio* 26(2), 90–109.

Robertson, J., 2011, 'The educational affordances of blosgs for self-directed learning', *Computers and Education* 57, 1628–1644. http://dx.doi.org/10.1016/j.compedu.2011.03.003.

Shea, P. & Bidjerano, T., 2013, 'Learning presence as a moderator in the community of inquiry model', *Computers and Education* 59, 316–326.

Shea, P., Hayes, S., Smith, S.U., Vickers, J., Bidjerano, T., Gozza-Cohen, M. *et al.,* 2013, 'Online learner self-regulation: Learning presence viewed through quantitative content- and social network analysis', *The International Review of Research in Open and Distance Learning* 14(3), 428–461. http://dx.doi.org/10.1016/j.compedu.2012.01.011.

Silén, C. & Uhlin, L., 2008, 'Self-directed learning – A learning issue for students and faculty!', *Teaching and Higher Education* 13(4), 461–475. http://dx.doi.org/10.1080/13562510802169756.

So, H. & Brush, T.A., 2008, 'Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors', *Computers and Education* 51(1), 318–336. http://dx.doi.org/10.1016/j.compedu.2007.05.009.

Thomas, D. & Brown, J.S., 2011, *A new culture of learning: Cultivating the imagination for a world of constant change*, CreateSpace, Lexington, KY.

Thornton, K., 2010, 'Supporting self-directed learning: A framework for teachers', *Language Education in Asia* 1(1), 158–170. http://dx.doi.org/10.5746/LEiA/10/V1/A14/Thornton.

Turker, M.A. & Zingel, S., 2008, *Formative interfaces for scaffolding self-regulated learning PLEs,* viewed 08 May 2015, from http://www.elearningeuropa.info/files/media15975.pdf.

Vaughan, N.D., 2010, 'A blended community of inquiry approach: Linking student engagement and course redesign', *Internet and Higher Education* 13, 60–65. http://dx.doi.org/10.1016/j.iheduc.2009.10.007.

Voogt, J. & Roblin, N.P., 2012, 'A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies', *Journal of Curriculum Studies* 44(3), 299–321. http://dx.doi.org/10.1080/00220272.2012.668938.

Chapter 9

Alexander, N., 1989, *Language policy and national unity in South Africa/Azania*, John Benjamins, Amsterdam.

Babbie, E. & Mouton, J., 2002, *The practice of social research*, Oxford University Press, Cape Town.

Batibo, H.M., 2009, 'The use of African languages for effective education at tertiary level', paper presented at the Rhodes University SANTED Workshop, *PRAESA Occasional Papers* 38, 30–33.

Bertram, C. & Christiansen, I., 2014, *Understanding research: An introduction to reading Research*, Van Schaik Publishers, Pretoria.

Bettinger, E.P. & Long, B.T., 2009, 'Addressing the needs of underprepared students in higher education. Does college remediation work?' *The Journal of Human Resources* 44(3), 736–771. http://dx.doi.org/10.3368/jhr.44.3.736.

Boughey, C., 2000, 'Multiple metaphors in an understanding of academic literacy', *Teachers and Teaching: Theory and Practice* 6(3), 279–290.

Burch, V.C., Sikakana, C.N.T., Yeld, N., Seggie, J.L. & Schmidt, H.G., 2007, 'Performance of academically at-risk medical students in a problem-based learning programme: A preliminary report', *Advances in Health Sciences Education* 12, 345–358. http://dx.doi.org/10.1007/s10459-006-9006-6.

Bursaries South Africa, 2015, *Bursaries for teaching & education*, viewed 28 September 2015, from bursaries-southafrica.co.za/bursaries-for-teaching-education.

Buthelezi, T.M., 2008, 'Exploring the role of conceptual blending in developing the extension of terminology in IsiZulu Language', *Alternation* 15(2), 181–200.

Buthelezi, T., Mhlongo, B. & Hlongwa, T., 2014, 'IsiZulu metaphor as a vehicle for terminology extensions in IsiZulu Academic Language: Lessons learnt in Postgraduate Language and Media Education Modules at a South African University', *Alternation Special Edition* 13, 191–208.

Canipe, J.B. & Fogerson, D.L., 2006, 'The Literature of self-directed learning: Dissertations', *International Journal of Self-directed Learning* 3(2), 34–44.

Chokwe, M.J., 2011, 'Academic writing in English second language contexts: Perceptions and experiences of First year Students and Tutors', MA thesis, University of South Africa.

Coffin, C., Curry, M.J., Goodman, S., Hewings, A., Lillis, T.M. & Swann, J., 2003, *Teaching academic writing. A toolkit for higher education*, Routledge, London.

Creswell, J.W., 2014, *Research design*, 4th edn., SAGE, Washington DC.

Dempster, E. & Zuma, S., 2010, 'Reasoning used by isiZulu-speaking children when answering science questions in English', *Journal of Education* 50, 35–59.

Garrison, D.R., 1997, 'Self-directed learning toward a comprehensive model', *Adult Education Quarterly* 48(1), 18–33. http://dx.doi.org/10.1177/074171369704800103.

Granville, S. & Dison, L., 2009, 'Making connections through reflection: Writing and feedback in an Academic Literacy Programme', *Southern African Linguistics and Applied Language Studies* 27(1), 53–63. http://dx.doi.org/10.2989/SALALS.2009.27.1.5.753.

Greene, J.P. & Foster, G., 2003, *Public High School Graduation and College Readiness Rates in the US, Education Working Paper 3,* Manhattan Centre for Civil Information, New York.

Grow, G.O., 1991, 'Teaching learners to be self-directed', *Adult Education Quarterly* 41(3), 125–149. http://dx.doi.org/10.1177/0001848191041003001.

Guglielmino, L.M., 1978, 'Development of the self-directed learning readiness scale', PhD thesis, University of Georgia, Dissertations Abstracts International 38, 6467.

Guglielmino, L.M., 2013, 'The case for promoting self-directed learning in Formal Educational Institutions', *SA-eDUC Journal* 10(2), 10–13.

Henning, E., 2004, *Finding your way in qualitative research*, Van Schaik Publishers, Pretoria.

Jalongo, M.R. & Sarocho, O.N., 2016, *Writing for publication: Transitions and tools that support scholars' success,* Springer International Publishing AG, Switzerland.

Jones, L.E., 2011, 'Inside and Outside1101: First-Year students perceptions of Academic Writing', MA thesis, Georgia State University.

Knowles, M.S., 1975, *Self-directed learning*, Association Press, New York.

Khubchandani, L.M. 2003. Defining mother-tongue education in plurilingual contexts. *Language Policy* 2(3). pp.239-254. doi: 10.1023/A:1027372700861.

Lea, M.R. & Street, B.V., 1998, 'Student writing in higher education: An academic literacies approach', *Studies in Higher Education* 23(2), 157–172. http://dx.doi.org/10.1080/03075079812331380364.

Marsick, V.J. & Watkins, K.E., 2001, 'Informal and incidental learning', in S.B. Merriam (ed.), *New directions for adult and continuing education no.89 spring*, pp. 25–34, Jossey-Bass, San Fransisco, CA.

Maseko, P., Sam, M., Dalvit, L., Nosilela, B. & Terzoli, A., 2010, 'The role of the web in the promotion of African Languages', *Alternation* 17(1), 312–327.

Mashiya, N., 2011, 'IsiZulu and English in KwaZulu-Natal schools: How teachers fear failure and opt for English', *South African Journal of Childhood Education* 1(1), 19–31.

Mashiyi, N., 2014, 'Towards promoting an inclusive tertiary education system in South Africa through multilingualism', *International Journal Education Social Sciences* 6(1), 1–9.

Mbirimi, V., 2012, 'Academic writing challenges faced by First Year BEd Students at a South African University', MA thesis, University of Witwatersrand.

Mouton, J., 2002, *Understanding social research*, Van Schaik Publishers, Pretoria.

O'Shea, E., 2003, 'Self-directed learning in nurse education: A review of the literature', *Journal of Advanced Nursing* 43(1), 62–70. http://dx.doi.org/10.1046/j.1365-2648.2003.02673.x.

Salamonson, Y., Koch, J., Weaver, R., Everett, B. & Jackson, D., 2009, 'Embedded academic writing support for nursing students with English as a second language', *Journal of Advanced Nursing* 66(2), 413–421. http://dx.doi.org/10.1111/j.1365-2648.2009.05158.x.

Schugurensky, D., 2000, *The forms of informal learning: Toward a conceptualization of the field,* WALL Working Paper no.19, Centre for the study of Education and Work, University of Toronto, Toronto.

Spaull, N., 2013, *South Africa's Education Crisis: The quality of education in South Africa 1994–2011*, Report commissioned by the Centre for Development and Enterprise, Johannesburg.

Storch, N., 2009, 'The impact of studying in a second language (L2) medium university on the development of L2 writing', *Journal of Second Language Writing* 18, 103–118. http://dx.doi.org/10.1016/j.jslw.2009.02.003.

Towle, A. & Cottrell, D., 1996, 'Self-directed learning' *Archives of Disease in Childhood* 74, 357–359. http://dx.doi.org/10.1136/adc.74.4.357.

Tshabangu, I., 2015, 'Interpretive research: Construction of meanings', in C. Okeke & M. Van Wyk, *Educational research, An African perspective*, pp. 39–56, Oxford University Press, Cape Town.

Wheeler, S. & Wheeler, D., 2009, Using wikis to promote quality learning in teacher training, *Learning, Media and Technology* 34(1), 1–10. http://dx.doi.org/10.1080/17439880902759851.

Wingate, U., 2006, 'Doing Away with 'Study Skills' *Teaching in Higher Education* 11(4), 457–469. http://dx.doi.org/10.1080/13562510600874268.

Wingate, U., 2007, 'A Framework for Transition: "Learning to Learn in Higher Education"', *Higher Education Quarterly* 61(3), 391–405. http://dx.doi.org/10.1111/j.1468-2273.2007.00361.x.

Zuma, S.C. & Dempster, E.R. 2008. IsiZulu as a language of assessment in science. *African Journal of Research in Science, Mathematics and Technology Education* 12(2), 31-46.

Index

Self-directed learning has become increasingly important, not only for education in South Africa but also for education sciences in the international arena. This is a result of the changing education landscape caused by the demands of the 21st century as well as the rapid change in knowledge production. Learners should be equipped with skills to take responsibility for their own learning. New innovative strategies should be incorporated into teaching and learning in order to meet the changing demands in education. Traditional teacher-centred practices are still the norm in most South African schools and higher education institutions and do not adequately prepare students for lifelong learning in the 21st century.

The contributions in this book investigate the theory behind SDL and the strategies that enhance SDL. The book emphasises educators' awareness of how their own expert knowledge can be applied to curricula content. The focus is on potential techniques for incorporating SDL into educational settings, specific subjects where it has been applied, as well as the use of blended learning in an SDL environment.

Professor Andries G. van Aarde, Chief Editor, AOSIS Scholarly Books

Innovation and progress in communications technologies have widened access to learning. They have also revolutionised the way in which learning occurs. The role of the teacher as both communicator of knowledge and primary knowledge authority has changed. This fascinating collection of chapters addresses the theme of learner agency in self-directed learning. In this brave new world there should be possibilities for the learners to discern their own learning needs, formulate objectives or outcomes, describe the types of resources needed to realise their aspirations, and finally to self-evaluate the learning.

Robert Balfour, Professor and Dean of the Faculty of Education Sciences, North-West University, Potchefstroom Campus, South Africa

AOSIS
www.aosis.co.za

ISBN: 978-1-928396-01-7