

# Comparative effectiveness of Context-based and Traditional teaching approaches in enhancing learner performance in life sciences

by

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## CERTIFICATION

**This thesis has been examined and approved as meeting the required standard of scholarship for the fulfilment of the Degree of Doctor of Philosophy in Science Education.**

**Prof. G.O.M. Onwu**

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**SUPERVISOR**

**Date.....**

## DECLARATION

I, **Kazeni Mungandi Monde Monica**, hereby declare that this thesis for the Doctor of Philosophy in Science Education degree, at the University of Pretoria hereby submitted by me, is my own work, in design and execution, and it has not been previously submitted for any degree at any other university. To the best of my knowledge this thesis contains no material previously published by me or any other person, and that all references contained herein have been duly acknowledged.

.....

**Date:** .....

**Kazeni, M.M.M**

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## ABSTRACT

Young people's interest in the study of science-related courses is declining worldwide. In most developing countries, this waning aspiration has been coupled with reports of poor performance in science subjects. Fading interest and poor performance have led to low enrolment rates in science courses in higher institutions of learning, which pose the potential threat of reduced research activity and economic productivity. The methods usually used to teach science subjects in schools – which often involve the transmission of abstract facts and ideas, that are not explicitly relatable to learners – fail to provide learners with the opportunity to see the relevance of studying science. The failure to see the significance of science education could partly account for the lack of appeal and poor performance in the study of science. This study was an attempt to use contexts as a theoretical framework, and applications of life sciences (biology) to develop and implement 'relevant' curriculum materials as a means of motivating learners and improving performance in genetics, a topic which learners consider difficult to learn. The context-based approach was premised on the use of contexts which learners themselves identified as being relevant, meaningful and interesting in the study of genetics, and a five-phase learning cycle. The relative efficacy of the context-based and traditional approaches to the teaching of genetics in enhancing learner performance was assessed. The study was essentially a quantitative research, involving a quasi-experimental non-equivalent pre-test–post-test control group design. Qualitative data were collected using focus group learner interviews and one-to-one educator interviews to complement and triangulate the quantitative data. The study sample comprised 190 Grade 11 learners and six life sciences educators from six high schools randomly selected from the Tshwane South educational district in Gauteng, South Africa. Five instruments were used to assess learner performance in genetics content knowledge, science inquiry skills, problem-solving and decision-making abilities, and their attitudes towards the study of life sciences. The findings of the study, based on learner performance and perceptions, and their educators' views, revealed that in comparison with traditional teaching approaches, the context-based approach was significantly better in enhancing learner performance in genetics content knowledge ( $F = 63.00$ ;  $p = <0.0001$ ), ability to formulate hypotheses ( $F = 33.21$ ;  $p = <0.0001$ ), ability to draw conclusions from results ( $F = 7.70$ ;  $p = 0.0062$ ), decision-making ability ( $F = 17.22$ ;  $p = <0.0001$ ), problem-solving ability

( $F = 16.57$ ;  $p = <0.0001$ ), and in improving learners' attitude towards the study of life sciences ( $F = 25.04$ ;  $p = <0.0001$ ). The educational implications of the study are discussed.

**Key words:** context-based teaching, traditional teaching, context, relevance, performance, life sciences, genetics.



## **DEDICATION**

**This work is dedicated to my lovely children, Dr. Kazeni Mulai and Given**

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## LIST OF ACRONYMS

AAAS	American Association for the Advancement of Science
ACS	American Chemistry Society
CDE	Centre for Development and Enterprise
CEI	Centre for Education and Industry
DHA	Department of Home Affairs
DoBE	Department of Basic Education
DoE	Department of Education
DoL	Department of Labour
EC	European Commission
EIRMA	European Industrial Research Management Association
ESRC	Economic and Social Research Council
HSRC	Human Sciences Research Council
IET	Institute of Engineering and Technology
NRF	National Research Foundation
OECD	Organisation for Economic Co-operation and Development
SBP	Small Business Project
SET	Science, Engineering and Technology
TIMSS	Trends in International Mathematics and Science Study