

APPENDIX 3: PERMISSION LETTER: TO CHINHOYI UNIVERSITY OF TECHNOLOGY

Central University of Technology

Faculty of Humanities

Bloemfontein, Free State

South Africa

The Vice Chancellor

Chinhoyi University of Technology

Dear Sir,

REF: APPLICATION TO CARRY OUT RESEARCH ON, “Framework for implementing STEM learning technologies to alleviate students’ challenges of the 21st-century skills in a Zimbabwean university”

I, Doris Chasokela, is applying to be allowed to carry out research on the above reference. I am a PhD student at the Central University of Technology, Bloemfontein, Free State Province in South Africa and a lecturer at the National University of Science and Technology, Bulawayo Zimbabwe. The data collected will be used for the purpose of framework for the implementation of technologies to alleviate students’ challenges at 21st-century. I assure you that the data collected will be mainly used for this research and will be confidential. I also promise that the participants will remain anonymous.

Thank you

..........

Doris Chasokela

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Email: dchasokela@gmail.com/doris.chasokela@nust.ac.zw

APPENDIX 4: PERMISSION FROM THE Ministry of Higher and Tertiary Education, Science and Technology Development (MoHTESTD) TO COLLECT DATA

All official communications should be addressed to
"The Secretary"

Telephone: 795891-5, 796441-9, 730055-9
Fax: 792109
E-mail: eduniversity2011@gmail.com
Telegraphic Address "EDUCATION"



MINISTRY OF HIGHER AND
TERTIARY EDUCATION,
INNOVATION SCIENCE AND
TECHNOLOGY DEVELOPMENT
P.BAG CY 7732
Causeway
HARARE

REF: P/CHASOKELA D. (MRS)

STAFF CONFIDENTIAL

09 September 2021

Mrs. D. Chasokela
C/o Chinhoyi University of Technology

Dear Mrs. Chasokela,

REQUEST FOR AUTHORITY TO CARRY OUT RESEARCH AT THE CHINHOYI UNIVERSITY OF TECHNOLOGY: MRS. DORIS CHASOKELA: PHD STUDENT: CENTRAL UNIVERSITY OF TECHNOLOGY, BLOEMFONTEIN, FREE STATE, SOUTH AFRICA: MINISTRY OF HIGHER AND TERTIARY EDUCATION, INNOVATION, SCIENCE, AND TECHNOLOGY DEVELOPMENT

Reference is made to your application in which you requested for authority to carry out research at the Chinhoyi University of Technology.

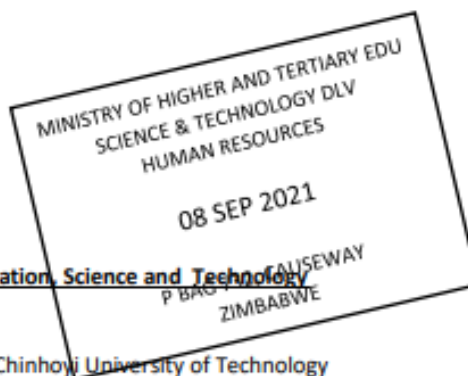
Please note that the Head of Ministry, has granted you authority to carry out your research entitled, 'A Framework for Implementing STEM learning Technologies to alleviate student's challenges of the 21st Century Skills at a University of Technology in Zimbabwe'.

Please be advised accordingly.

E. Yesaya (Mrs)

FOR: Secretary

Higher and Tertiary Education, Innovation, Science and Technology Development



C.c The Vice Chancellor - Chinhoyi University of Technology
File

APPENDIX 5: PERMISSION FROM CHINHOYI UNIVERSITY OF TECHNOLOGY TO COLLECT DATA



CHINHOYI UNIVERSITY OF TECHNOLOGY

☎: P. Bag 7724, Chinhoyi ☎: 263-67-22203-5 📠: 263-67- 27214 E-mail : vicechancellor@cut.ac.zw

Vice-Chancellor's Office: Prof. D. J. Simbi - PhD, BSc, MIM, CEng, FZ'welE, FICorr, FZAS, Hons FZ'wel

HUMAN RESOURCES DEPARTMENT

31 August 2022

Ms. Doris Chasokela
C/o National University of Technology
Cnr Gwanda Road and Cecil Avenue
P.O Box AC 939 Ascot
BULAWAYO

Dear Ms. Chasokela

RE: REQUEST TO CARRY OUT A RESEARCH PROJECT AT CHINHOYI UNIVERSITY OF TECHNOLOGY

We acknowledge receipt of your application letter seeking permission to undertake research study at Chinhoyi University of Technology for Research entitled: *"A framework for implementing STEM learning technologies to alleviate students' challenges of the 21st Century skills in*

Zimbabwe

You are kindly advised that permission to undertake your study is hereby granted. However, you are reminded to observe the University Official Secrecy Oath.

The University would also expect results of your research upon completion. *

Thank you


M.C. Makaza (Mr)
Deputy Registrar- Human Resources



APPENDIX 6: LETTER OF CONCENT FOR ALL PARTICIPANTS

I am Doris Chasokela, a PhD student at the Central University of Technology, Bloemfontein, Free State Province in South Africa. I am carrying out research on: **Framework for implementing STEM learning technologies to alleviate students' challenges of the 21st-century skills in Zimbabwe**

I am kindly requesting you to participate in the interviews and focus-group discussions of the study. I guarantee you that all the information you provide will be confidential and will be used for this study only. I also promise that you will remain anonymous.

Thank you



Doris Chasokela

Date:....13/02/2023...

Ihereby give my consent to participate in the above study.

.....

Date:.....

Respondent signature

APPENDIX 7: INTERVIEW SCHEDULE FOR LECTURERS

TOPIC: Framework for implementing STEM learning technologies to alleviate students' challenges of the 21st-century skills in Zimbabwe

1. What are your academic and professional qualifications?
2. What are your highest professional qualifications?
3. What is your teaching and laboratory experience?
4. Does the university have institutional ICT/Technology policy?
5. Does the university offer staff development on ICT/technology integration with rapidly evolving technology?
6. What are the STEM learning technologies (course/module software and LMSs) used in the 21st-century at the University?
7.
 - (a) What do you understand by 21st-century skills?
 - (b) Which 21st-century skills are you familiar with?
 - (c) Which 21st-century skills are important in STEM?
 - (d) Which skills are needed by STEM students for future workplace?
 - (e) Which 21st-century skills do students benefit when integrating course/module software and LMSs in the teaching and learning?
 - (f) What does a lecturer need to be excellent in 21st-century skills?
 - (g) Which skill challenges are faced by students in the 21st-century?
8. How do you rank and value the importance of 21st-century skills by students?
9. State any gender differences in the teaching of STEM.
10. Which framework is useful in determining skills and competences for excelling in teaching STEM programmes?
11. What are the challenges faced by the lecturers, technicians and students in the implementation of course/module software and LMSs?
12. What are the students' perceptions regarding the use of LMS integration in STEM learning technologies?
13. What are the beliefs, knowledge and attitude in the implementation of course/module software and LMSs in the teaching and learning of STEM?
14. Perceived usefulness of technologies to improve students' 21st-century skills
15. What are the perceptions, practices and comfort with teaching and learning STEM programmes?

16. Which gadgets/tools/software availability and extent of use in the teaching and learning of STEM programmes at the institution?
17. How are STEM learning technologies implemented for the 21st-century skills and their effects in the university of technology?
18. Does the university offer technical and financial support to lecturers and students?
19. How is STEM promoted to students?
20. a) Who is responsible office/personnel for the technical support?
b) Is the technical support adequate?
21.
 - a) What are the sources of funding for STEM programmes?
 - b) Are the ICTS/technologies with adequate funding?
 - c) How does the university sustain funding of ICTs/technologies?
 - d) What are the challenges in technical and financial support of ICTs/technologies faced in teaching and learning?
22. What are the possible solutions to the challenges faced in teaching STEM programmes?
23. Any other information shared in regard to the implementation of technologies in STEM learning to improve students' 21st-century skills in the institution?

APPENDIX 8: INTERVIEW SCHEDULE FOR TECHNICIANS

TOPIC: Framework for implementing STEM learning technologies to alleviate students' challenges of the 21st-century skills in Zimbabwe.

1. What is your academic and professional qualifications?
2. What is your highest professional qualifications?
3. What is your teaching and laboratory experience?
4. Does the university have ICT/Technology policy?
5. Which staff development have you been offered by the university on ICT/technology integration with rapidly evolving technology?
6. Which STEM learning technologies (course/module software and LMSs) are used in the 21st-century at the University?
7.
 - a) What do you understand by 21st-century skills?
 - b) Which 21st-century skills are you familiar with?
 - c) Which are the important 21st-century skills in STEM?
 - d) Which skills are needed by STEM students for future workplace?
 - e) Which 21st-century skills that students benefit when integrating course/module software and LMSs in the teaching and learning?
 - f) What does a lecturer need to possess to be excellent in terms of 21st-century skills?
 - g) What are the skill challenges faced by students in the 21st-century?
8. What challenges do lecturers, technicians and students in the implementation of course/module software and LMSs?
9. What are the perceived usefulness of technologies to improve students' 21st-century skills?
10. Which gadgets/tools/software are available and extent of use in the teaching and learning of STEM programmes at the university?
11. Which STEM learning technologies are implemented for the 21st-century skills and their effects in the university of technology?

12.

- a) How are the lecturers and students technical and financial supported?
- b) Who is/are responsible office/personnel for the technical support?
- c) How do you rate the adequacy of technical support?

13.

- a) What are the sources of funding for STEM programmes?
- b) Is funding adequate for ICTS/technologies?

14. What are the challenges in technical and financial support of ICTs/technologies faced in teaching and learning?

15. What are the possible solutions to the challenges faced in teaching STEM programmes?

16. Do you have any other information shared in regard to the implementation of technologies in STEM learning to improve students' 21st-century skills in the university

APPENDIX 9: FOCUS-GROUP DISCUSSION SCHEDULE FOR STUDENTS

TOPIC: Framework for implementing STEM learning technologies to alleviate students' challenges of the 21st-century skills in South Africa and Zimbabwe.

1. What are the STEM learning technologies (course/module software and LMSs) used in the 21st-century at the University?
2.
 - a) What do you understand by 21st-century skills?
 - b) Which 21st-century skills are you familiar with?
 - c) Which 21st-century skills are important in STEM?
 - d) Skills needed by STEM students for future workplace
 - e) 21st-century skills that students benefit when integrating course/module software and LMSs in the teaching and learning
 - f) What are the skill challenges faced by students in the 21st-century
 - g) How do you rate ranking and valuing the importance of 21st-century skills?
3. What are the gender differences in the teaching of STEM?
4. What challenges are faced by the lecturers, technicians and students in the implementation of course/module software and LMSs?
5. What are the students' perceptions regarding the use of LMS integration in STEM learning technologies?
6. What are the beliefs, knowledge and attitude in the implementation of course/module software and LMSs in the teaching and learning of STEM?
7. What are the perceived usefulness of technologies to improve students' 21st-century skills?
8. What are the perceptions, practices and comfort with teaching and learning STEM programmes?
9. Which gadgets/tools/software are available and extent of use in the teaching and learning of STEM programmes at the university?
10. How is STEM learning technologies implementation for the 21st-century skills and their effects in the university of technology?

11. How is STEM promoted to STEM to students?

12.

- a) Who is/are responsible office/personnel for the technical support?
- b) Is the technical support adequate?

13. Any other information shared in regard to the implementation of technologies in STEM learning to improve students' 21st-century skills in the institution

**APPENDIX 10: LESSON OBSERVATION SCHEDULE FOR (AVAILABILITY OF
STEM LEARNING COURSE/MODULE SOFTWARE AND LEARNING
MANAGEMENT SYSTEMS)**

**TOPIC: Framework for implementing STEM learning technologies to alleviate
students' challenges of the 21st-century skills at a Zimbabwean university**

OBSERVATIONS	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6	Lesson 7	Lesson 8
Availability of laboratory or classroom								
Availability and adequacy of Course/module software or LMSs								
Equipped Laboratory or classroom, arrangement of furniture and technological gadgets								
Internet connectivity broadband								
Availability of electricity								
Software or LMSs used								
Ratio of technological gadget/tools to student								
Lecturer competencies								

during lesson delivery								
Lecturing strategies used								
Lecturer to student interaction during lessons								
Lecture duration								
Number of students in the class								
Relevancy of technological gadget or tools used								
Possession of basic digital skills by students								
Possession of basic digital skills by lecturers								
Course/module software or LMSs implemented in the lesson								
Extent of Course/module software or LMSs implementation								
21 st -century skills observed from students								
Availability of technician								

Technical support from the technician								
Lecturers' knowledge and skills in the integration of software and LMSs								
Students' knowledge and skills in the integration of software and LMSs								
Lecturers' attitudes in the integration of Course/module software or LMSs								
Students' attitudes Course/module software or LMSs								
Challenges encountered by the students during the lesson								
Challenges encountered by the technician during the lesson								
Challenges encountered by the lecturer during the lesson								

APPENDIX 11: EDITOR'S LETTER

CORNELIA GELDENHUYS

☎083 2877088

corrieg@mweb.co.za

24 September 2023

TO WHOM IT MAY CONCERN

Herewith I, **Cornelia Geldenhuys (ID 521114 0083 088)** declare that I am a qualified, accredited language practitioner and that I have edited the following doctoral thesis:

**FRAMEWORK FOR IMPLEMENTING STEM LEARNING TECHNOLOGIES
TO ALLEVIATE STUDENTS' CHALLENGES OF THE 21ST-CENTURY
SKILLS AT A ZIMBABWEAN UNIVERSITY**

BY

Doris Chasokela

STUDENT NO: 218011498

All changes were indicated by track changes and comments **for the author to verify, clarify aspects that are unclear, make the necessary adjustments and finalise.** The editor takes no responsibility in the instance of this not being done. The document remains the final responsibility of the author.



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C GELDENHUYS

MA (Lin) cum laude, MA (Mus), BA Hons (French), HED, HDL, UELM

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