Chapter 1
Harnessing Learner Content and User Interface Design for Basic Education:
Research Methodology and Design

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ABSTRACT

The purpose of this chapter is to describe the research methodology and design to be implemented in a study towards harnessing learner content and user interface design for basic education. Against the background of harnessing generative Artificial Intelligence (AI) for science education, the main focus of the chapter will include an emphasis on the challenges and opportunities related to ethical Generative Artificial Intelligence (GenAI) use in Science, Technology, Engineering and Mathematics (STEM) education.

INTRODUCTION

This section will describe the general perspective of the chapter and end by specifically stating the *objective.*

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Harnessing Generative Artificial Intelligence for Science Education

Generative Artificial Intelligence (GenAI) had quickly become one of the most revolutionary *emerging trends* across most sectors, including education, healthcare, and creative fields. As part of this book, the purpose of the chapter is to investigate the theoretical foundations, empirical studies, and *practical* uses of generative artificial intelligence (GAI) in science education, with the chapter covering a variety of *issues*, such as instructional design, adaptive learning interfaces, and ethics in school and tertiary education.

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As part of a book with a theme similar to the current volume, on *Integration Strategies of Generative AI in Higher Education*, the most recent chapter by Yeboah and Goosen (2025) presented integration strategies of learner content and user interface design in higher education for teaching and learning online in times of crises, while a previous chapter by Yeboah and Goosen (2024) explained the impact of learner content and user interface design on e-learning quality as part of a book presenting *Cases on Economics Education and Tools for Educators.*

The research approach for the study discussed in this chapter is detailed. This chapter will explain the research strategy and paradigm. It will also describe the population of the study, as well as the sampling strategies and data collection procedures used for the study. It further proposes the instruments that will be used for data collection and covers the steps to be taken to guarantee the development, validity and reliability of the study. The chapter will also touch on the pilot study to be undertaken and the data gathering techniques, the implementation of the actual intervention, as well as what make up the ethical **issues**, which need to be addressed throughout the research study.

Recommended Topics

From the *recommended topics* suggested for the book, this chapter will discuss e.g.,

- Ethical GenAI Use in Science, Technology, Engineering and Mathematics (STEM) Education: *Challenges* and Opportunities
- Gambling on the *future* of creativity in science education with the integration of GenAI
- GenAI-Integrated Curriculum Models for *Future*-Ready Scientists