

LB/TH/43/2025
TH6019

**AN INTERACTIVE LEARNING ENVIRONMENT FOR
PROGRAMMING LANGUAGES WITH GENERATIVE
AI**

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MSc in Computer Science

Department of Computer Science and Engineering
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Thesis/Dissertation submitted in partial fulfillment of the requirements for the
degree

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature:

Date: 27/06/2025

The above candidate has carried out research for the Master's thesis under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: Prof. Indika Perera

Signature of the Supervisor:

Date: 27/06/2025

DEDICATION

In loving memory of my father whose unwavering support, wisdom and encouragement set the foundation for my academic career. His memory will always inspire me to achieve greater heights.

To my mother who grants me freedom and offers unwavering support, even during the most difficult moments. Thank you for your sacrifices, understanding and endless love. This achievement is as much yours as it is mine.

This research is dedicated to all individuals who are passionate about education and curious about the impact of AI technology.

May this work contribute, in some small way, to the ongoing dialogue about the transformative potential of AI technology in education.

ACKNOWLEDGEMENT

I would like to express my heartfelt gratitude to all those who have contributed to the successful completion of this project.

First and foremost, I would like to extend my heartfelt gratitude to my research supervisor, Prof. Indika Perera for his immense support and invaluable guidance given to me from the beginning of the project. His expertise and encouragement have been instrumental in shaping the direction and quality of this project.

I would be grateful to the faculty and staff of Department of Computer Science for initial understanding and guidance we were given and for the immense support given throughout the project.

Last but not least, I want to express my appreciation to my family and friends for their unwavering support, understanding and encouragement. Their confidence in my abilities has been a constant source of inspiration.

This research journey has been a collaborative effort and I am sincerely thankful to all who have played a part, no matter how big or small.

ABSTRACT

Generative Artificial Intelligence (GAI) has emerged as a transformative force in education, offering the potential to revolutionize learning experiences. This study focuses on the design and implementation of an interactive learning environment for Python programming language, leveraging GAI, specifically the Gemini API, to deliver personalized and adaptive education. This system aims to address the limitations of traditional programming education such as lack of individualization, delayed feedback and limited interactivity by offering dynamic content generation, real-time AI-driven feedback and interactive learning experience. The evaluation of the developed system revealed high user experiences with 100% of user satisfaction, with most finding it easier to understand compared to traditional learning materials. Further they marked explanations/ contents as accurate and code suggestions as useful, while engagement features like daily challenges and AI-generated teaching tips were frequently highlighted as motivational. By integrating GAI, this study explores the opportunities and challenges of utilizing advanced AI technologies to enhance programming education, contributing to the development of future-oriented educational tools. Ultimately, this study contributes meaningfully to the ongoing dialogue on leveraging AI technologies to enhance teaching and learning experiences in education system. As we move to the new era of Generative Artificial Intelligence, this study attempts to design a future where technological advancements enhance educational achievements with seamless integration of AI.

Keywords: Generative Artificial Intelligence, Gemini API, Interactive Learning Environment, Programming Education, Adaptive Learning, Personalized Education.

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LIST OF ABBREVIATIONS

Abbreviation	Description
AI	Artificial Intelligence
GAI	Generative Artificial Intelligence
TAM	Technology Acceptance Model

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