African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper   Open Access

The 7C Theoretical Framework for Implementing Generative AI in Teaching at Higher Education Institutes

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Abstract: The integration of Generative AI (GenAI) in education offers the potential to revolutionize teaching and learning experiences by providing personalized instruction, enhancing engagement, and streamlining administrative tasks. This paper introduces the "7C Theoretical Framework," a structured approach to implementing GenAI in teaching at higher education institutes. The framework encompasses seven critical steps: Conceptualize, Create, Customize, Connect, Check, Cultivate, and Consider, designed to effectively leverage AI technologies in educational settings.

Keywords: Generative AI, Personalization, Teaching, Higher Education.

1. Introduction

Artificial intelligence (AI) is playing a transformative role in various sectors and reshaping the way organizations work and deliver, and education is no exception to this. The rise of AI in education, signifies a major change towards adapting innovative and effective teaching methods. Generative AI (GenAI) shows a significant advancement in the field of AI with capabilities of creating diverse educational content, simulations, and personalized learning experiences. This technology has the potential of revolutionizing the teaching experience and how educators use it for generating study material, adaptive assessments and tailored tutorials for individual needs and preferences. These experiences not only allow students to engage with the study material but also unfolds new possibilities for innovation and creativity across various fields. However, the integration of AI into teaching practices requires well-structured frameworks. These frameworks aid educators navigate the complexity of AI tools and ensures its effective and ethical application across different educational settings.

Although AI has its potential, the incorporation of AI in education presents significant challenges. Integrating AI in education presents several challenges like data privacy, bias, huge costs and the need for comprehensive teacher training programs to equip educators with the prerequisite skills to utilize AI efficaciously. Moreover, preparing both educators and students to adopt and adapt to AI tools to enhance teaching and learning is crucial for its successful implementation. This paper will explore the specific advantages of generative AI in teaching, such as enhancing engagement, supporting differentiated instruction, and generating varied educational content. However, the integration of AI into teaching practices requires well-structured frameworks to ensure its effective and ethical application.

2. Literature review

Generative AI (GenAI) technologies like ChatGPT and Midjourney have recently captured the attention of the higher education sector, promising to revolutionize traditional teaching and learning paradigms. However, the academic exploration of these technologies remains in its infancy, with limited literature available. Existing studies primarily focus on the immediate opportunities and challenges posed by GenAI, such as enhancing learning experiences and addressing ethical concerns like academic integrity. Given the novelty of GenAI, much of the research is preliminary, aiming to lay the groundwork for future inquiry. This literature review aims to collate and synthesize the current research, offering a detailed overview of how GenAI is being integrated into higher education and identifying areas that require further investigation.

Generative AI holds significant potential for enhancing educational practices in higher education, as explored in several recent studies. [2] Kleopatra Nikolopoulou delves into the applications of AI, particularly ChatGPT, in supporting personalized learning, automating assessments, providing virtual assistance, and generating content. The study highlights AI's role in improving collaboration, accessibility, and inclusivity in education, while addressing ethical considerations such as data privacy, bias, and the necessity for human oversight. Nikolopoulou emphasizes the importance of integrating AI responsibly to complement rather than replace human educators, ensuring that educational benefits are maximized and potential risks mitigated. [3] In a critical review, Jiahui Luo examines university policies on generative AI (GenAI) in higher education assessments using Bacchi's 'What's the problem represented to be' (WPR) framework. The study analyzes policies from 20 leading universities, focusing on issues like the originality of student work, reliability of AI-generated outputs, and equitable access to GenAI. Luo argues that current policies fail to address the evolving notion of originality in the digital age and calls for more inclusive approaches that consider the collaborative and technologically mediated nature of knowledge production. [4] Xianghan O'Dea explores the impact of generative AI on higher education, discussing both its opportunities and challenges. O'Dea provides an overview of the current state of generative AI in education, emphasizing its potential to transform learning and teaching through personalized learning, automated assessments, and content generation. The paper also highlights ethical considerations, such as data privacy and academic integrity, and advocates for the responsible integration of AI to complement human educators and enhance learning experiences. [5] Yihan Cao et al. provides a comprehensive overview of the history and the advancements in Artificial Intelligence Generated Content (AIGC) through AI models like ChatGPT, DALL-E-2 and Codex. The study also addresses concerns about trustworthiness and responsibility while exploring open problems and future directions for AIGC. [6] Gila Kurtz et al. examines implications of GenAI in learning and teaching practices and proposes strategies like awareness raising, training faculty, adapting teaching and assessment methods, partnering with students, fostering AI literacy, briding digital divides and conducting applied research for successful adoption of GenAI in higher education. [7] Cecilia Ka Yuk Chan and Wenjie Hu's study examines students' perspective of the use of Generative AI like ChatGPT in higher education. The survey of 399 students from different disciplines in Hong Kong indicates a generally positive attitude among students towards GenAI as they recognize the potential for personalized learning, writing assistance, and research capabilities offered by it. The study applies John Biggs' 3P model, emphasizing that student perceptions significantly influence learning approaches and outcomes. They also raise concerns about accuracy, privacy, ethical implications and its impact on personal development, career prospects and societal values.[8] Xiaoming Zhai discusses the impact that natural language processing tools like ChatGPT has

on educational learning goals, assessment and evaluation practices. The study piloted ChatGPT to write an academic paper, and it presented a coherent, partially accurate, informative content with limited professional expertise from the author. The author suggests the need to adapt learning goals that uses AI tools and engages students to enhance their creative and critical thinking skills. However, it does raise concerns that AI might enable students to outsource assessment tasks but highlights that need to design new assessment tasks that AI cannot substitute. [9] Anna Mills et al. emphasizes the use of open education practices, a form of amalgamation between Open Educational Resources (OER) and digital content that can help us collaborate across institutions and countries ensuring a more equitable and fair usage of generative AI. Such collaboration would include engaging online communities' creation of crowdsourced articles and learning materials allowing for reuse and adaption. They further propose to have ongoing reflection and revision to the core values and educational philosophies, enabling a swift adaption to technology advancements.[10] Ravit Dotal et al. investigates the role of interdisciplinary approach to the adoption of generative AI in higher education. The insights were drawn from a semester-long survey, focus groups and semi-structed discussions which included in-depth iterations with university personnels to help them understand that to successfully integrate AI requires to avoid a top-down approach of centralized decisions. They suggest an approach that allows individual decision-makers as well as shared traditional faculty governance helps in achieving the goals of higher education.

2. The 7C Theoretical Framework

The integration of AI in education enables numerous opportunities to enhance training and learning. The use of AI helps in creating comprehensive lecture materials, interactive content, and multimedia aids, makes complex topics more accessible and engaging for students. It also permits teachers to explore personalized learning avenues based on individual performance, providing real-time feedback and adaptive learning experiences. AI-driven tools can facilitate interactive discussions and collaborative projects, fostering a more dynamic and participatory classroom environment. Additionally, AI can automate grading and assessments, offering detailed feedback and saving valuable time for educators. Thereby AI's analysis of performance data can help identify trends and areas for improvement, contributing to continuous educational development. Ensuring data privacy and fairness in AI applications is crucial to maintaining an inclusive and ethical educational framework.

The 7C's framework for integrating AI in education begins with Conceptualize, where educators clearly define learning objectives and identify areas where AI can enhance the educational experience. This involves selecting appropriate AI tools like ChatGPT for interactive Q&A and DALL-E for generating visual content. Next, in the Create phase, AI is used to generate comprehensive lecture materials, including notes, presentations, and visual aids. This phase also involves developing diverse examples, case studies, and interactive content such as simulations and models, as well as multimedia content like images, animations, and videos to explain complex topics.

After creation, the Customize phase uses AI to develop personalized learning paths based on student performance and preferences, and then to provide real-time feedback through AI-driven systems. In the Connect phase, AI chatbots facilitate interactive discussions and support collaborative projects by assisting with brainstorming and project management. The Check

phase involves using AI for automated grading and regular formative assessments to gauge student understanding and adjust teaching strategies accordingly. In the Cultivate phase, AI is employed to analyse performance data, identify trends, and highlight areas for improvement. Educators also focus on their professional development by staying updated with the latest AI advancements. Finally, the Consider phase ensures compliance with data privacy regulations and reviews AI-generated content for biases, ensuring fairness and inclusivity throughout the educational process. This model promotes a continuous improvement loop, leveraging AI to enhance both teaching and learning experiences.
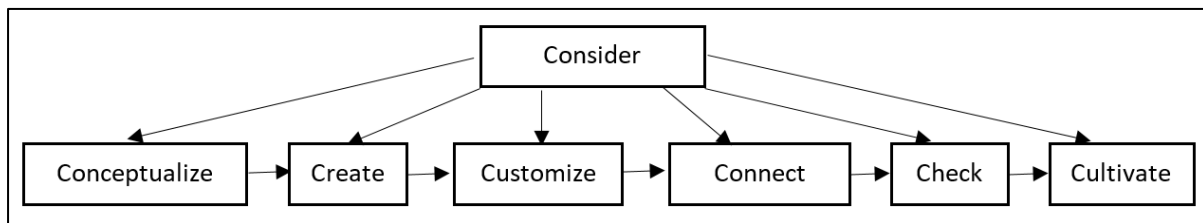

Figure 1: 7C Theoretical Framework

2.1. Conceptualize

The Conceptualize phase involves defining clear learning objectives and identifying specific areas where AI can enhance the educational experience. Educators should align course goals with AI capabilities to maximize the impact. For instance, using AI tools like ChatGPT can facilitate interactive Q&A sessions, helping students understand complex concepts through personalized explanations [11]. Similarly, tools like IBM Watson can analyze course content and suggest enhancements to improve learning outcomes.

In this phase,
- Clearly define the learning objectives for each course.
- Identify specific areas where AI can enhance the educational experience.
- Choose appropriate AI tools that align with course objectives (e.g., ChatGPT for interactive Q&A[11], DALL-E[12] for generating visual content).

2.2. Create

In the Create phase, AI is used to generate comprehensive lecture materials, presentations, and visual aids. Tools like DALL-E can create images and animations to visually explain complex topics[12], while tools like GPT-3 can assist in generating detailed lecture notes and case studies[11]. AI-driven simulations and models can provide interactive content, making learning more engaging and effective. Platforms like Adobe Sensei can also be used to create multimedia content, including videos and interactive presentations [13].

To summarize, in this phase,
- Use AI to generate comprehensive lecture notes, presentations, and visual aids.
- Develop diverse examples and case studies using AI tools.
- Create simulations and models to demonstrate key concepts interactively.
- Generate images, animations, and videos to explain complex topics.

2.3. Customize

Customize involves using AI to create personalized learning paths based on student performance and preferences. Tools like Knewton can adapt learning materials to individual student needs, ensuring each learner progresses at their own pace[15]. AI-driven feedback systems, such as Gradescope, can provide instant assessment and guidance, helping students improve continuously [14]. These adaptive learning technologies tailor the educational experience to meet diverse student needs effectively.

Thus in this phase,

- Utilize AI to create personalized learning paths based on student performance and preferences.
- Implement AI-driven feedback systems to provide instant assessment and guidance.

2.4. Connect

In the Connect phase, AI chatbots and virtual assistants facilitate interactive discussions and answer common questions, enhancing classroom engagement. Tools like Microsoft Teams' AI features can manage discussions and collaborative projects[16], while platforms like Slack integrate AI bots to support brainstorming and project management. AI-driven platforms encourage active participation and foster a collaborative learning environment, making education more interactive and inclusive.

This phase can be dedicated to:
- Integrate AI chatbots to facilitate classroom discussions and answer common questions.
- Encourage group projects with AI-assisted brainstorming and project management tools.

2.5. Check

The Check phase uses AI for automated grading and formative assessments, providing detailed feedback to students. Tools like Gradescope can automate the grading of assignments, quizzes, and exams, saving educators time and ensuring consistency in evaluation[14]. AI can also conduct regular assessments to gauge student understanding, helping educators adjust teaching strategies. Platforms like Turnitin [17] can also check for originality and provide insights into student writing.

In this phase,
- Use AI to grade assessments and provide detailed feedback.
- Conduct regular assessments using AI to gauge student understanding and adjust teaching strategies.

2.6. Cultivate

Cultivate involves using AI to analyze performance data, identify trends, and highlight areas for improvement. Tools like Tableau, enhanced with AI analytics, can visualize data and provide actionable insights. Educators can use these insights to refine their teaching methods and address student needs more effectively. Additionally, staying updated with the latest AI developments through platforms like Coursera or edX supports ongoing professional development and ensures educators are equipped with current knowledge and skills[18][19].
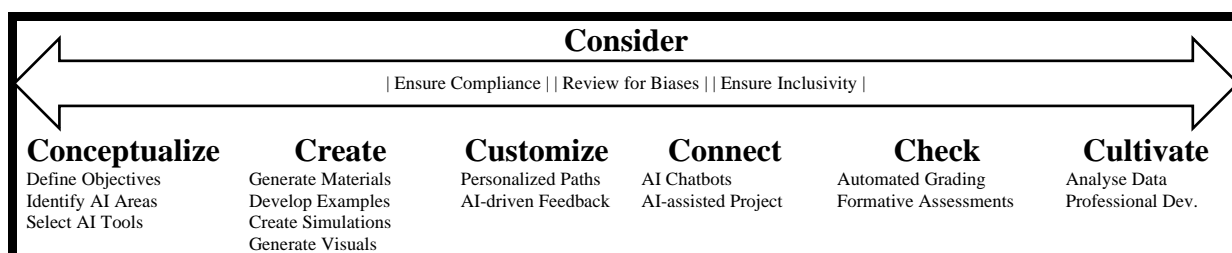
This phase can be dedicated to,

- Analyze performance data using AI to identify trends and areas for improvement.
- Stay updated with the latest AI developments in education and attend relevant workshops.

2.7. Consider

Consider ensures compliance with data privacy regulations and fairness in AI applications. Tools like Microsoft's Fairlearn can help review AI-generated content for biases, ensuring inclusivity and ethical use of AI [20]. Educators must inform students about data usage and privacy policies, maintaining transparency and trust. Regularly evaluating AI tools for fairness and privacy helps create a secure and equitable educational environment. This is a phase which spans over all other phases. In every phase , educators should emphasize on usage and privacy policies to ensure fairness throughout.

This phase can be summarized as follows:
- Ensure compliance with data privacy regulations and inform students about data usage.
- Regularly review AI-generated content for biases and ensure inclusivity.

Consider					
	Ensure Compliance | | Review for Biases | | Ensure Inclusivity |				
Conceptualize	**Create**	**Customize**	**Connect**	**Check**	**Cultivate**
Define Objectives	Generate Materials	Personalized Paths	AI Chatbots	Automated Grading	Analyse Data
Identify AI Areas	Develop Examples	AI-driven Feedback	AI-assisted Project	Formative Assessments	Professional Dev.
Select AI Tools	Create Simulations				
	Generate Visuals				

3. Sample Demonstration of the 7C's Model to plan the Course Probability & Statistics

3.1 Conceptualize

Objectives:

- Define clear learning objectives such as understanding random variables, probability distributions, and hypothesis testing.
- Identify areas where AI can enhance the educational experience, like interactive learning and real-time feedback.

Tools:

- ChatGPT: For interactive Q&A sessions, helping students clarify doubts in real-time.
- IBM Watson: To analyze course content and suggest enhancements.

3.2 Create

Lecture Materials:

- Use GPT-4 to generate detailed lecture notes and presentations on topics such as Bayes' Theorem, Normal Distribution, and Hypothesis Testing.
- Develop case studies and examples using AI-generated content.

Interactive Content:

- Create simulations to demonstrate the Law of Large Numbers using tools like MATLAB integrated with AI.
- Use DALL-E to generate visual aids and animations explaining concepts like probability distributions.

3.3 Customize

Adaptive Learning Paths:

- Utilize Knewton to create personalized learning paths based on individual student performance, ensuring that each student progresses at their own pace.

Real-time Feedback:

- Implement AI-driven feedback systems such as Gradescope for instant assessment and guidance on assignments and lab exercises.

3.4 Connect

Interactive Discussions:

- Integrate AI chatbots in platforms like Microsoft Teams to facilitate classroom discussions and answer common questions.

Collaborative Projects:

- Encourage group projects with AI-assisted brainstorming tools such as Miro and project management tools like Trello with AI integrations.

3.5 Check

Automated Grading:

- Use Gradescope for automated grading of assignments, quizzes, and exams, providing detailed feedback and saving time for educators.

Formative Assessments:

- Conduct regular assessments using AI tools like Edmentum to gauge student understanding and adjust teaching strategies accordingly.

3.6 Cultivate

Data Analysis:

Analyse performance data using AI tools like **Tableau** enhanced with AI analytics to identify trends and areas for improvement.

Professional Development:

Stay updated with the latest AI developments in education by attending workshops on platforms like **Coursera** or **edX**.

3.7 Consider

Data Privacy:

 Ensure compliance with data privacy regulations and inform students about data usage. Use tools like Microsoft's Fairlearn to review AI-generated content for biases.

Bias and Fairness:

Regularly review AI-generated content to ensure inclusivity and fairness in educational materials and assessments.

4. Benefits and Challenges

The use of generative AI in higher educational settings presents multiple challenges that needs careful consideration. One of the major concerns is data privacy as AI systems require extensive student data to function effectively but increases the risk of exposing sensitive student information. Educational institutions must ensure robust data protection measures to safeguard their personal information. Additionally, bias in AI algorithms poses a significant challenge. If the data used to train these AI systems is biased, the outputs will reflect and potentially exacerbate these biases, leading to unfair treatment of students. Thus, it necessitates continuous monitoring and upgrading the AI models to ensure fairness and inclusivity. Moreover, the successful implementation of AI in education requires comprehensive teacher training. Without proper training, the potential benefits of AI could be underutilized, and its integration could face resistance. Educators must be equipped with the knowledge and skills to effectively integrate and utilize AI tools in their teaching practices. These training programs should also discuss the ethical challenges associated with the use of AI in education. Additionally, seamless integration of AI tools in the curriculum can be complex, due to the costs involved in accessing these resources and lack of appropriate alignment with the learning goals.

Despite these challenges, the benefits of incorporating generative AI in higher education are multifaceted. AI can significantly enhance personalized learning experiences by tailoring instruction to meet individual student needs. It allows for multilingual support by translating content from diverse backgrounds ensuring for more effective and efficient learning, as students can progress at their own pace, and receive immediate feedback on their performance. AI tools can also automate administrative tasks such as grading and assessment, freeing up valuable time for educators to focus on more critical aspects of teaching. Moreover, AI-driven content generation can create diverse and engaging educational materials, making learning more interactive and stimulating for students. By providing real-time insights into student

performance, AI can help educators gain insights on students' performance in groups as well as in individual tasks where students struggle, allowing them to adjust their teaching strategies accordingly. This continuous feedback promotes a more dynamic and responsive educational environment, ultimately enhancing the overall quality of education.
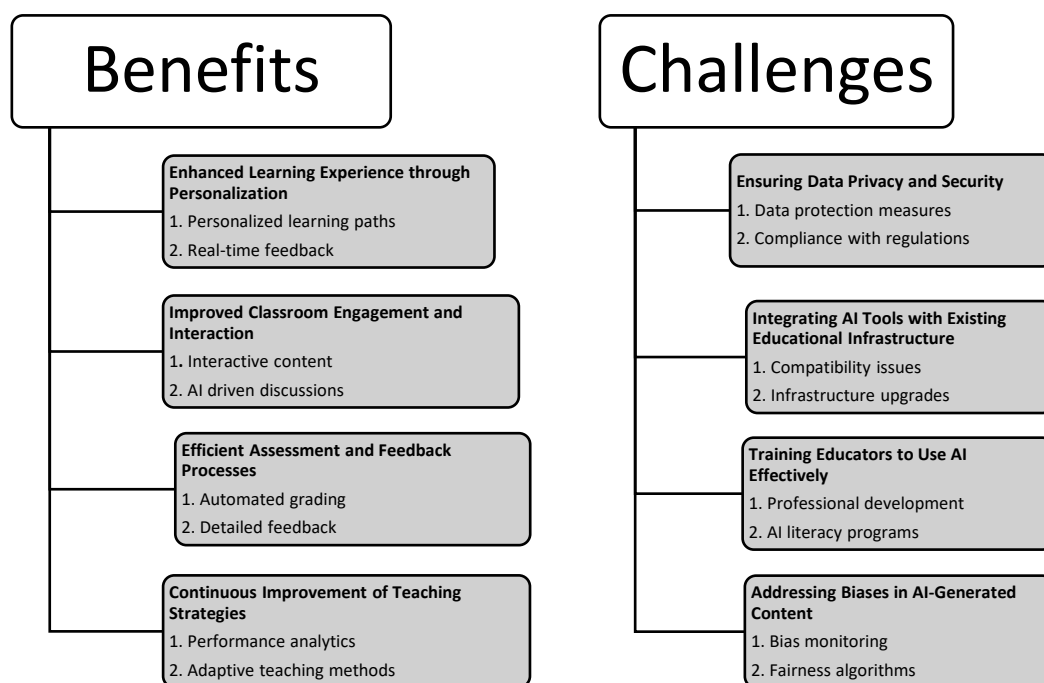

Figure 2: Benefits & Challenges

5. Conclusion

The 7C Framework encompassing the stages of Conceptualize, Create, Customize, Connect, Check, Cultivate, and Consider equips educators with a structured and comprehensive approach to integrating generative AI in higher educational settings. This framework highlights the potential of AI to transform educational practices by enhancing personalized learning experiences, improving classroom engagement and streamlining assessment processes. The continuous evaluation of teaching strategies is the key to ensure the utilization of AI to its optimal potential. Therefore, a careful execution is crucial for the implementation of the 7C Framework that ensures learning is dynamic, engaging and responsive to students' need.

Although AI can be advantageous, ensuring data privacy, addressing biases in AI-generated content, integrating AI tools with existing educational infrastructure, and training educators to use AI effectively are essential steps that must be meticulously planned and executed. The 7C Framework encourages educators and institutions to approach AI integration methodically, ensuring that ethical considerations and best practices are always at the forefront. This proactive approach will ensure that AI enhances the quality of education and prepares students for the challenges of the future.

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