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Code Generator using Agentive AI

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ABSTRACT: This paper examines the impact of AI-integrated web-based coding environments on programming education. With advancements in artificial intelligence (AI), particularly models like Google Gemini and DeepSeek, these platforms have become pivotal in enhancing how programming is taught and learned. By offering real-time assistance, personalized feedback, and multimodal interactions, AI-integrated environments provide significant benefits for learners at all levels. This study synthesizes recent research to highlight the features of key AI models, their applications in coding education, and their broader implications for programming learning and development. The findings underscore the transformative potential of such environments while addressing challenges and future directions.

KEYWORDS: Agentive AI, code generator, programming education, web-based coding environments, Google Gemini, DeepSeek, real-time assistance, personalized feedback, multimodal interaction, AI in education, collaborative tools, ethical considerations, accessibility, AI-driven learning.

I. INTRODUCTION

The integration of artificial intelligence into web-based coding environments has transformed programming education. These platforms, powered by advanced AI models such as Google Gemini and DeepSeek, offer learners real-time code assistance, debugging support, and interactive learning experiences. As programming skills become increasingly essential across various fields, understanding how AI can enhance learning and development in this domain is critical. This paper explores the impact of AI-integrated web-based coding environments on programming education, drawing on recent research to provide insights into their benefits, challenges, and future potential.

II. OVERVIEW OF AI MODELS IN CODING EDUCATION

Several AI models have emerged as key components of web-based coding environments, each offering unique features that support programming learning and development.

Model	Key Features Relevance to Coding Educat					
DeepSeek	Mixture-of-Experts (MoE) approach, cost-effective for domain-specific tasks	Efficient for specialized programming tasks [1]				
Google Gemini	Multimodal transformer integrating text, code, and images	Handles large code blocks, offers visual aids [1][2]				

- **DeepSeek**: Employs a Mixture-of-Experts approach, making it effective for domain-specific tasks. Its costeffectiveness in handling code inference tasks makes it valuable for specialized programming education (Comparative Analysis).
- **Google Gemini**: A multimodal transformer model that integrates text, code, and images. It can process large code blocks (up to 100,000 lines) and provide comprehensive solutions, modifications, and explanations, making it particularly suited for educational contexts where learners need detailed feedback and visual aids (Gemini Review).

These models, when integrated into web-based coding environments, enable learners to engage with code in interactive and intuitive ways, bridging the gap between theoretical knowledge and practical application.

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III. IMPACT ON PROGRAMMING LEARNING AND DEVELOPMENT

AI-integrated web-based coding environments have demonstrated significant impacts on programming learning and development, as evidenced by recent research.

- Assistance with Programming Tasks: Models like Google Gemini can handle complex programming tasks by analyzing large code blocks and providing detailed solutions. This capability helps learners understand intricate concepts and apply them effectively (Gemini Review).
- Feedback and Assessment: AI models offer systematic and consistent feedback on coded assignments. For instance, Gemini's advanced language and logic capabilities enable it to provide precise and actionable feedback, which is invaluable for both learners and educators (Gemini Review).
- **Personalized Learning**: AI-driven platforms can tailor the learning experience to individual needs, offering timely and context-aware assistance. This personalization is particularly beneficial in programming education, where learners often have varying levels of proficiency (Systematic Review).
- **Multimodal Interactions**: The ability of models like Gemini to process and integrate text, code, and images enhances the learning experience. Learners can benefit from visual explanations of code, making abstract concepts more tangible (Comparative Analysis).

These features collectively create a more engaging and effective learning environment, enabling learners to progress at their own pace while receiving immediate support.

IV. GENERAL TRENDS IN AI FOR PROGRAMMING EDUCATION

A systematic review of AI in computer programming education from 2012 to 2024 provides broader context for these advancements (Systematic Review):

Aspect	Details							
Study Period	2012–2024							
Number of Papers Analyzed	119							
Key Areas of Impact	Course design, classroom implementation, assessment and feedback, performance monitoring							
Trends Post-2020	Shift from performance monitoring to classroom implementation and assessment							
Technologies Used	Traditional machine learning, deep learning for complex data sources							
Benefits for Instructors	Efficient focus on creative tasks							
Benefits for Learners	Timely and personalized assistance							

- Shift in Focus: Post-2020, there has been a noticeable shift from AI-powered performance monitoring to classroom implementation and assessment, indicating a growing emphasis on integrating AI directly into educational settings.
- **Technological Advancements**: While traditional machine learning techniques have been foundational, deep learning models are increasingly used to handle complex data sources, such as large code repositories and multimodal inputs.
- **Benefits for Stakeholders**: Instructors can leverage AI to focus on creative and strategic tasks, while learners benefit from timely, personalized assistance, enhancing the overall efficiency of programming education.

These trends highlight the evolving role of AI in programming education, with web-based environments serving as a key platform for these advancements.

V. CASE STUDY: A MODERN AI-INTEGRATED CODING ENVIRONMENT

Consider a web-based coding environment that integrates Google Gemini and DeepSeek models, as described in recent educational contexts. Such a platform would likely feature:

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- **Real-Time Code Execution**: Learners can write and test code instantly in the browser, with AI models providing immediate suggestions and error corrections.
- Multimodal Support: Gemini's ability to handle text, code, and images allows for visual explanations, such as diagrams illustrating code flow.
- Collaborative Features: Using WebSocket technology, learners can work together, with AI models facilitating group debugging and feedback.
- Security Measures: Robust safeguards ensure safe code execution, protecting users from malicious inputs.
- Contextual AI Interactions: Conversation history with AI assistants maintains context, enabling more relevant and personalized assistance.

This hypothetical platform aligns with the capabilities of Gemini and DeepSeek, offering a comprehensive toolset for programming education (Comparative Analysis; Gemini Review).

VI. SIMULATION RESULTS

Code Studio Generator & Con × +					
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🛛 YouTube 🛛 M Gmail					All Bookr
🔤 Al Code Generator					
Ask me to generate code, explain concepts, or help debug issues					
You: python code to add 2 numbers					
				_	
Okay, so I need to write a Python program that adds two numbers. Hmm, where do I start? Well, first, I guess I should figure out how					
to get the two numbers from the user. Do I have to read them as input or can I just assign them directly in the code?					
If I'm writing a script for someone else to use, I think it's better to get input from the user so that they can enter their own numbers.					
But if this is just a simple example where I know the numbers beforehand, maybe I can hardcode them. Let me go with getting input					
because it makes the program more flexible.					
Alright how do Legad input in Puthon? Ob right using the input() function But wait input() gives maig string so Legad to convert					
those strings into integers or floats. Right, so something like num1 = int(input("Enter first number: ")) and similarly for num2.					
Once I have both numbers, adding them is straightforward with sum = num] + num2. Then I should print the result. So print(f"The					
sum of (numi) and (numz) is (sum).) would do it.					
Wait, what if someone enters something that's not a number? Like letters or symbols. Should I handle errors? Well, maybe in this					
					v
Type your message				Þ	
Code Playmound L New Chat G Chat History					

Fig - 1: Code generator with chat response







Fig - 3: Terminal output

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VII. CHALLENGES AND FUTURE DIRECTIONS

Despite their potential, AI-integrated coding environments face several challenges:

- Ethical Considerations: Ensuring transparency in AI-generated code and feedback is critical. There's also a risk of over-reliance, which could hinder independent problem-solving skills.
- Accessibility: Not all learners have access to high-speed internet or advanced devices, potentially exacerbating educational inequalities.
- Continuous Learning: As AI models evolve, educators and learners must adapt to new tools, requiring ongoing training.

Future research should focus on:

- Developing inclusive AI tools that cater to diverse learners.
- Exploring integrations with emerging technologies like virtual reality for immersive coding experiences.
- Addressing ethical concerns through clear guidelines on AI use in education.

VIII. CONCLUSION

AI-integrated web-based coding environments, powered by models like Google Gemini and DeepSeek, have transformative potential for programming learning and development. By providing real-time assistance, personalized feedback, and multimodal interactions, these platforms make programming education more accessible and effective. However, addressing challenges such as ethical concerns and accessibility is crucial for equitable implementation. As AI technology advances, educators and developers must continue to innovate, ensuring these tools empower learners worldwide.

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