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Design and Implementation of Chatbot Pancasila for Teaching Pancasila and Character Building for University's Students

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Abstract—**In the modern era, where global influences are rapidly shaping young minds, the need to maintain strong national identity and moral values is more crucial than ever. For Indonesian students, Pancasila education and character building play a central role in developing not only academic competence but also personal integrity and social responsibility. The design approach involved analyzing student needs, integrating Pancasila-based content, as well as applying automated learning algorithms so that the chatbot can provide answers that match the context of the conversation especially Character-Building Pancasila topics. This Pancasila Character Building Chatbot is designed with Natural Language Processing (NLP) technology to provide creative, interactive, and interesting learning experiences that are easily understood by students. Implementation is done through a digital platform that allows students to interact in real-time in understanding the values of Pancasila, such as divinity, humanity, unity, democracy, and social justice. Furthermore, this innovation aims to bridge the gap between traditional moral education and modern digital learning methods. By utilizing artificial intelligence, the chatbot can adapt to different learning styles and provide personalized feedback to each student. It is hoped that the presence of Chatbot Character Building Pancasila can increase the enthusiasm for learning and curiosity of students so that learning character building Pancasila is more creative and interesting for students in university classrooms.**

Keywords— Pancasila; Character Building; chatbot; AI; NLP

I. INTRODUCTION

In today's digital era, Generation Z—born between 1997 and 2012—has unique characteristics: they are very familiar with technology, critical, and more open to change [1]. They are highly skilled in using technology such as the internet, social media, and smart devices, which enables them to adapt quickly to technological advancements [2]. However, behind these advantages, Indonesia is facing serious challenges related to the ethical crisis among this young generation. The propagation of fake news (hoaxes), hate speech, cyberbullying, and privacy infringement are common issues [3]. An ethical crisis is a condition in which moral values such as honesty, responsibility, politeness, and empathy begin to be ignored or are not prioritized in everyday life. In the context of Generation Z, this can be seen from behavior on social media, how to interact, and attitudes towards social regulations and norms [4]. Factors Causing the Ethical Crisis in Generation Z are the Influence of Social Media and Popular Culture.

Pancasila is the philosophical foundation of the Indonesian state, formulated by the founding fathers during the country's struggle for independence [4] [5]. It consists of five principles that reflect the core values of the nation:

1. Belief in the One and Only God (Ketuhanan Yang Maha Esa)
2. Just and civilized humanity (Kemanusiaan yang adil dan beradab)
3. The unity of Indonesia (Persatuan Indonesia)
4. Democracy guided by the inner wisdom in the unanimity arising out of deliberations among representatives (Kerakyatan yang dipimpin oleh hikmat kebijaksanaan dalam permusyawaratan/perwakilan)
5. Social justice for all the people of Indonesia (Keadilan sosial bagi seluruh rakyat Indonesia)

Pancasila serves as the guiding philosophy in politics, education, and daily life in Indonesia [5].

Research related to Pancasila and character building for teaching and education has been conducted by many Indonesian researchers. Some of the previous researchers who have examined Pancasila [6][7] and the praxis of sustainability development in the ideology of Pancasila: Ecological insights from Indonesia [8], screening Mobile

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Application Based on Social Ecological Model with Pancasila in Learning as an effort to prevent radicalism in the digital era [9]. From previous research, research related to the topic of Character-Building Pancasila learning using chatbot has never been done. Therefore, this research is new research that can provide new epistemological knowledge on learning Pancasila and Character Building for students in universities, especially in the Indonesian context. Exploration of Pancasila character education in higher education, especially using technology, especially chatbots, needs to be strengthened in the current digital era [10].

Chatbot Pancasila is an AI-powered assistant designed to support students in learning Pancasila and character-building concepts. It delivers context-based responses from the DeepSeek API through a web interface developed using Streamlit for the UI.

Chatbot is a program designed to simulate human conversation and interact with users through text or voice, often embedded in websites, apps, or messaging platforms. Chatbots can serve a wide range of tasks and domains [11], from answering customer service queries to providing personalized recommendations or even offering mental health support. In the education field, chatbots are increasingly used as interactive learning tools that help improve student learning outcomes and engagement [12].

The core technology that enables chatbots to understand and respond to human language is Natural Language Processing (NLP). NLP is a subfield of artificial intelligence (AI) that focuses on the interaction between computers and human language. It involves tasks such as language understanding, generation, translation, sentiment analysis, and more [13, 14]. By using NLP, chatbots can analyze user input, extract meaning, and generate contextually appropriate responses.

II. PROPOSED METHOD

A. System Overview

Chatbot Pancasila is an AI-powered assistant designed to support university students in learning Pancasila and character-building concepts. It uses a language model (DeepSeek via OpenRouter) to generate context-aware responses by retrieving the most relevant text context from the study materials. These study materials are segmented into searchable chunks using sentence embeddings and cosine similarity. The chatbot is deployed using Streamlit for a user-friendly interface.

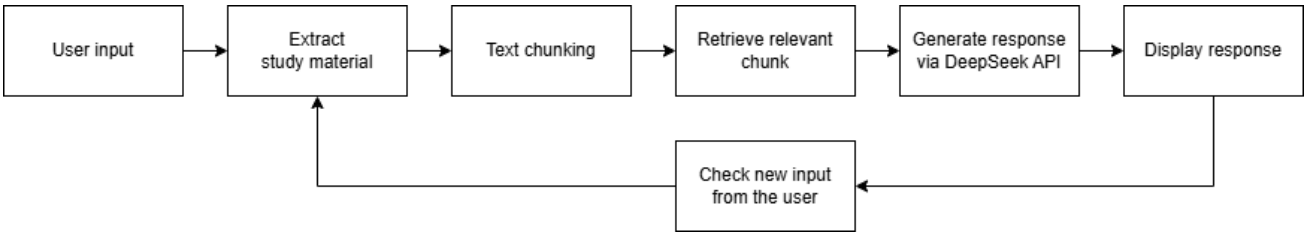

Figure 1. Chatbot Pancasila System Overview

B. System Workflow

This section provides a detailed explanation of the architecture and the workflow of the Pancasila chatbot.

- User input: In this stage, the system is activated when the user submits a question to the AI. The question must be in Indonesian and relate to topics such as Pancasila or Character Building. The input can be provided either as text or voice.
- Extract study material: The system processes the official BINUS study materials, focusing on topics such as Pancasila and Character Building, in PowerPoint format. The text from each slide is extracted using the python-pptx library and then combined into a single long string to serve as the study material corpus.
- Text chunking: The extracted material will be split into a collection of sentences using regex. Then, these sentences are combined into chunks with a maximum length of 1000 characters. This is done to optimize token efficiency and improve the accuracy of context selection from the corpus [15].
- Retrieve relevant chunk: The system converts each chunk and the user's question into numerical vectors (embeddings) using the 'all-MiniLM-L6-v2' model based on SentenceTransformer. After that, cosine similarity is used to find the most relevant chunk by comparing the embeddings of the user's question and each chunk.
- Generate response via DeepSeek API: Once the most relevant chunk is found, it will be inserted into the AI prompt. This prompt contains the AI behavior instructions, the selected chunk, and the user's question. Then, the complete prompt is sent as a request to the DeepSeek R1 API endpoint via OpenRouter. The authors used the DeepSeek R1 model due to its recent innovation in large language models capable of multi-modal and instructional alignment [16].
- Display Response: After the AI response is successfully generated, the answer is first converted into audio format using Google Text-to-Speech (gTTS). Then, both the text and the audio of the response are displayed simultaneously in the chat UI via Streamlit. This audio feature functions as a Text-to-Speech option available to users.
- Check any new input from the user: Once the AI response is displayed, the system will wait for new input. If new input is sent, the system restarts the process from the study material extraction function.

The main logic of the chatbot system is summarized below. This pseudocode highlights the flow and modular structure of the system.

C. *UI Design*

The chatbot interface is developed using Streamlit to ensure accessibility and simplicity for students. It displays a clean layout with a sidebar for topic selection and voice input activation, and a main chat area that displays the conversation history. By using the topic selection feature, users have the option to choose a specific topic, such as Pancasila or Character Building, to receive more accurate and specific responses. However, using this feature is not mandatory. Users can submit questions via text or voice and receive AI-generated responses both in text and audio formats. The UI is designed to support continuous interactions and provide a seamless educational experience. Below are screenshots of the Pancasila Chatbot application's user interface.

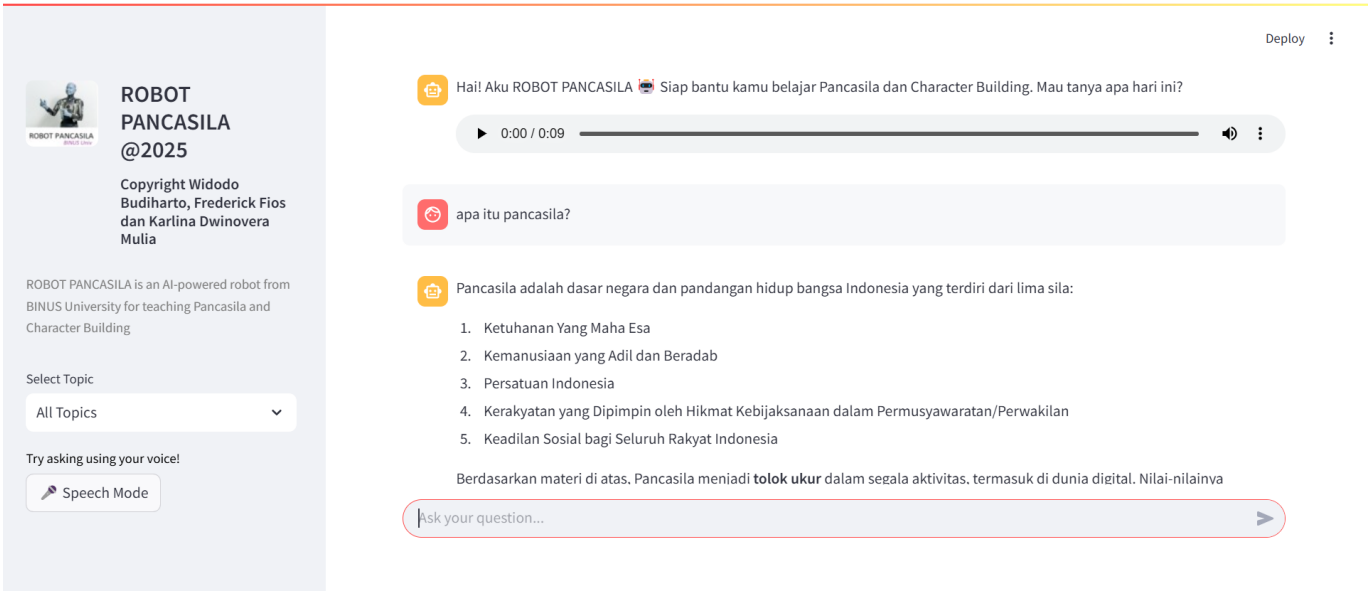

Figure 2. Chatbot Pancasila UI Design

III. EXPERIMENTAL RESULT

To evaluate the effectiveness of Chatbot Pancasila in assisting students with character-building and Pancasila-related learning, we conducted an experimental test using 20 representative questions derived from course materials in PDF format. Each question was asked through the chatbot interface, and the generated answer was recorded and compared to a predefined ground truth. The correctness of the chatbot's response was assessed manually. This paper only includes 5 sample responses selected from a total of 20 test questions to illustrate the chatbot's behavior.

Table 1. Chatbot Response Samples

No.	Question	Ground Truth	Chatbot Answer	Correct
1.	What is Pancasila??	Pancasila is a concept that summarises and crystallises many diverse universal values, ranging from the values of divinity, humanity, unity, democracy and social justice.	Pancasila is the foundation of the state and the Indonesian people's philosophy of life, consisting of five principles: Belief in God, Humanity, Unity, Democracy, and Justice. In the context of digital literacy and science and technology, Pancasila serves as a moral guideline to ensure that virtual and technological activities remain grounded in the noble values of the nation, such as respecting differences, maintaining ethics, and prioritising the common good.	TRUE

2.	Pancasila recognises the principle of monotheism. What does this mean?	The monotheism of Pancasila refers to the recognition of only one God, believed in by the Indonesian people from the past, present and into the future.	Pancasila recognises the principle of **monotheism**, which means **believing in one Almighty God (Single)** as a fundamental principle. This affirms that Indonesia adheres to the belief in **one supreme God**, not many gods (polytheism) or the recognition of many gods with one supreme god (henotheism). This principle forms the basis for harmony in Indonesia's religious diversity, while also reflecting the nation's commitment to inclusive and just values of divinity.	TRUE
3.	What are the strategies for eradicating corruption?	Indonesia's strategies to eradicate corruption include: First, budget accountability and transparency. Second, strengthening the Corruption Eradication Commission (KPK). Third, strengthening the role of the mass media and civil society participation.	Corruption eradication strategies based on the learning context include: 1. **Strengthening the role of anti-corruption agencies (such as the KPK) ** with a strong commitment to taking firm action against corruptors. 2. **Implementing a reverse burden of proof system** to facilitate investigations into the suspected illegal wealth of public officials. 3. **Developing a corruption prevention system** through transparency, oversight, and good governance policies. In addition, civil society participation in monitoring and supporting anti-corruption efforts is also crucial. What do you think, will these measures be effective?	TRUE
4.	What exactly is meant by the term tolerance?	Tolerance is conceptualised as an attitude of respecting, allowing, permitting other beliefs, opinions, beliefs, behaviours that are different from one's own or that contradict one's own beliefs.	Tolerance in the context of Pancasila, particularly the principle of Belief in One God, is an active attitude of mutual respect, acceptance, and cooperation among followers of different religions. It is not merely "allowing" differences but upholding the right of every individual to their beliefs, while maintaining harmony through dialogue and empathy. This value forms the ethical basis for building intersubjective relationships—where we see differences as a source of richness, not barriers—for the sake of unity amid Indonesia's diversity.	TRUE
5.	What is the meaning of the third principle of Pancasila, which is Indonesian Unity?	The third principle of Pancasila is Indonesian Unity. The meaning of Unity, which comes from the word satu, meaning single and whole, has a very deep meaning for the Indonesian people. The principle of unity is realised by prioritising the interests of the nation and state over the interests of groups or factions, including political parties (Pancasila Education Textbook: 2016, p. 133).	The third principle of Pancasila, "Indonesian Unity", has a profound meaning about the importance of maintaining national unity. This means that we must prioritise national interests above the interests of groups, classes, or political parties. This unity is based on a spirit of togetherness as a *single and unified* nation, despite being composed of diverse ethnicities, religions, and cultures. Thus, this principle calls on us to always strengthen our national bonds and maintain the integrity of the Unitary State of the Republic of Indonesia through mutual respect and cooperation. *(Source: Pancasila Education Textbook, 2016, p. 133)*."	TRUE

$$Accuracy = \frac{18}{20} = 0.9 = 90\%$$

$$Precision = \frac{TP}{TP + FP} = \frac{18}{18 + 2} = 0.9$$

$$Recall = \frac{TP}{TP + FN} = \frac{18}{18 + 2} = 0.9$$

$$F1\ Score = 2 \times \frac{\text{Precision} \times \text{Recall}}{\text{Precision} + \text{Recall}} = 2 \times \frac{0.9 \times 0.9}{0.9 + 0.9} = 0.9$$

Out of 20 questions, 18 were answered correctly in terms of relevance and conceptual accuracy, resulting in a 90% accuracy rate. Besides accuracy, we also evaluated the chatbot's performance using precision, recall, and F1-score. Among the 20 questions, 18 were answered correctly (true positives), and 2 were incorrect (false positives). No questions were left unanswered (false negatives = 0), resulting in a precision of 90%, recall of 90%, and an F1-score of 90%.

These metrics further indicate that the chatbot is highly reliable in providing contextually relevant responses, with minimal irrelevant or incorrect outputs.

Some limitations were observed in the AI's response time, which varies depending on the length of the generated text, with the longest generation time reaching approximately 20 seconds. Furthermore, if the questions asked are too general, the AI tends to generate generic answers and lacks reference to the specific context of the source materials.

Overall, the experimental result shows that the generative response approach using DeepSeek and semantically matched material can be effectively applied to educational domains like Pancasila and character building.

IV. CONCLUSION

This paper explains how the implementation of the Pancasila Chatbot can assist students in learning about Pancasila and Character Building. The chatbot utilizes NLP and the DeepSeek API to generate relevant, study material-based responses. Experimental results show that the chatbot achieved an accuracy of 90% from a set of 20 questions. This indicates that the Pancasila Chatbot is effective in providing accurate and relevant answers to user queries, supported by a simple and interactive user interface. However, some limitations need to be addressed, particularly regarding the AI's response time. For future development, enhancements such as improving semantic similarity with deeper embeddings and expanding coverage to more educational topics are recommended to further enrich the learning experience.

AUTHOR'S CONTRIBUTION

The study was conceived and designed by Frederikus Fios and Widodo Budiharto. The experiments and programming are performed by Karina Dwinovera Mulya. The writing is guided by Widodo Budiharto. The Writing - Review & Editing by Heri Ngarianto. All authors read and approved the manuscript.

AVAILABILITY DATA AND MATERIALS

This study utilized data obtained from the experiment and accessible at *www.widodo.com/pancasila.zip*.

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