

Designing Talk to GPT Prototype to Support Learning in Vocational Schools

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Abstract

Developing an Artificial Intelligence (AI)-based robot utilizing OpenAI technology for Vocational High School (SMK) students aims to improve the learning experience, especially in self-directed learning. The robot is designed to provide a differentiated learning experience, utilizing OpenAI's ChatGPT model to provide dynamic and relevant responses to students' questions and needs. This research involves implementing and evaluating the robot in a vocational learning environment, where students are invited to interact with the robot while learning independently. The pilot test results show that the robot can provide a unique learning experience, stimulate student engagement, and increase understanding of learning concepts. Nevertheless, further development is needed, especially in the formulation of keywords used by the robot in responding to student questions. Analysis shows that improvements to the keyword formulation will provide answer feedback more in line with the material students need. Therefore, improvements to the language model and integration of AI technology need to be made to improve the accuracy and relevance of the robot's response to student questions. This research contributes significantly to developing robotics and AI-based learning technology in vocational schools. The evaluation results illustrate the robot's potential to facilitate self-directed learning. However, special attention must be paid to technical aspects, especially keyword formulation, to improve the quality of interaction and learning.

Keywords : ChatGPT, OpenAI, Learning, Raspberry Pi, Audio Input.

Background

Integrating artificial intelligence (AI) in education is necessary to improve the quality of learning. Vocational High Schools (SMK) as secondary education institutions in Indonesia can also use AI to innovate in providing students' knowledge, especially in learning English. The Generative Pre-Trained Transformer (GPT) model is relevant, especially for speaking and listening skills, which require innovative approaches to optimize student learning outcomes. The "Talk to GPT" prototype is designed to create an interactive learning experience and increase student engagement.

Testing this prototype using the System Usability Scale (SUS) is important in evaluating its effectiveness. SUS provides a robust framework for measuring user satisfaction with the experience of using the prototype from both student and teacher perspectives. Therefore, this study aims to gain an in-depth understanding of how the "Talk to GPT" prototype can improve English learning in vocational schools, especially in the context of speaking and listening.

According to Serdianus Saputra, using openAI effectively saves time, for example, in lesson planning, especially when making lesson plans and preparing assessment instruments. However, its use must be adjusted to the rules and ethics of preparing lesson plans. In addition, research was conducted by Setiawan et al. on the use of openAI to improve writing skills. In the test, students were asked to use openAI to develop their writing. The result of the research is to see the overall activity process and character building for students related to honesty and moral values. (Faiz & Kurniawaty, 2023)

The research that has been conducted illustrates that education basically cannot stem students' use of AI (Alam, 2021). However, teachers need to utilize AI so that it can facilitate and provide a different experience in supporting the teaching and learning process (Tjahyanti et al., 2022).

Integrating ChatGPT with robots in learning activities can also be used as a learning assistant to interact with students. The robot can respond to questions, provide explanations, and assist students in the learning process (Rizki et al., 2020). Robots can help facilitate dialogue-based learning with students. ChatGPT acts as a source of information and answers, while the robot acts as a physical interface facilitating interaction. Using robots to help create a more interactive learning experience. For example, in language learning, robots can assist students in conversational exercises or speaking practice.

The Blackboard app, which allows students to submit questions and assignments for evaluation and publishes notes, homework, quizzes, and tests, is an example of artificial intelligence (AI) in higher education in Europe and America. This tool provides pre-released and pre-programmed solutions in addition to identifying the causes of students' misunderstandings.

Students can use voice assistant applications to speak or mention keywords while searching for resources, articles, books, and reference questions. Present-day digital library applications in public libraries, universities, and schools (Kusumaningtyas et al., 2020). This app can swiftly and methodically locate and classify books, as well as suggest books and other content that is pertinent to the user's search query. AI Speech Recognition translator application that allows users to hear in their native language (Leini & Xiaolei, 2021). Users can read and understand journals, articles, and books in any language more easily and quickly. In addition, there are Global Courses, Automatic Assessments, and Personalized Learning (Tjahyanti et al., 2022). ChatGPT and robotics technology integration aims to create a more interactive, adaptive and customized learning experience. Further research can provide deeper insights into the effectiveness and implications of this model in an educational context.

Implementing AI in robots involves Raspberry Pi as hardware and facilitates interaction between AI and physical devices. Raspberry Pi is a small-sized computer that can be modified according to user needs. In this research, a prototype is designed to support English learning and train students' ability to interact in English. By involving vocational students and teachers in testing, this research is expected to provide a holistic view of the effectiveness and usability of the prototype in improving English competence. The SUS evaluation results obtained from this testing will provide a practical and theoretical understanding of the implementation of artificial intelligence-based technology in the context of education in SMK.

The conclusions and recommendations from this study can serve as a basis for further development and integration of similar technologies in educational institutions that are at the level.

Research Method

The research method involves a mixed methods approach, combining quantitative and qualitative elements. Participants in the study were vocational students and teachers, especially in English lessons, focusing on speaking and listening. Teachers were interviewed as part of the data-gathering process to determine the needs and intended impact of the tool. After the prototype is built, observation is carried out by monitoring the interaction of students and teachers on the prototype and continued with a survey to measure students' perceptions of the use and ease of the prototype using SUS (System Usability Scale) indicator questions.

This research has several Research Questions:

RQ1. How do students perceive the usefulness of the "Talk to GPT" prototype in learning at SMK?

RQ2. What is educators' perception and support towards using prototypes in the context of learning in vocational schools, especially in English?

This research is still within the prototype's scope, so it still requires the support of a monitor and elevenLabs for the voice input interface, which still needs to be a standalone device.

A prototype was built using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) product development method to answer these questions, which is a systematic approach to the development of learning or technology (Widyastuti & Susiana, 2019). Picture 1 is the flow of robot prototype development following the ADDIE steps.

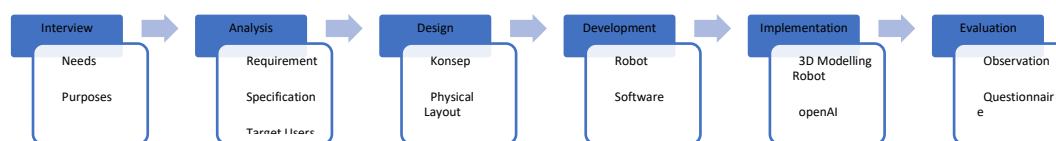


Image 1. Research Flow based on ADDIE

Source: Team Research, 2023

In the analysis stage, researchers explore the needs and objectives of developing this prototype. This stage includes understanding the problem to be solved and how the robot will support learning objectives. The Design stage begins by establishing the concept of AI-based robots, physical layout, and physical interface based on the needs and learning objectives.

An Artificial Intelligence (AI) system uses a computer system to mimic human behavior. The goal of the developing branch of computer science known as artificial intelligence is to create machines that can do human tasks and processes automatically (Guntoro et al., 2020)s. Expert systems, machine learning, and natural language processing are examples of specialized AI applications. AI gives robots the ability to learn from their mistakes, adjust to changing inputs, and carry out human-like activities(Avisyah et al., 2023).

A non-profit organization called OpenAI works to advance AI technology to benefit people. OpenAI focuses on security, privacy, and fairness in AI research and development and offers resources to assist others in creating more advanced AI. ChatGPT is among the most well-liked products(Avisyah et al., 2023).

A large language model (LLM) called Generative Pretrained Transformer 3.5 (GPT-3.5) was trained using a data set of more than 400 billion words from books, articles, and other online media. ChatGPT is an online chatbot that responds to user inquiries directly using GPT-3.5 (Rosol et al., 2023). ChatGPT allows free-text input and spontaneous output instead of deliberately prepared finite-state inputs and outputs, as opposed to the majority of chatbots previously tested in clinical settings (Ruksakulpiwat et al., 2023). ChatGPT has already started to be tested in medical settings and has drawn attention for achieving the necessary accuracy in medical licensing exams to graduate as a doctor (Garg, 2023). The introduction of autonomous decision aids and advisers may supplement current measures to increase the provision of general practitioners (GPs) in light of primary care's challenges with low recruitment, rising workloads, and early retirement (Rosol et al., 2023). Innovation in this field would allow practicing general practitioners to maximize the value they deliver, which would probably assist the most underprivileged and rural areas, where there are fewer doctors per capita (Thirunavukarasu et al., 2023).

In implementing a chatbot so that the system can respond to user queries dynamically, Natural Language Processing plays a vital role, namely understanding user queries in natural language (Singh et al., 2021). Chatbot, often called an Artificial Conversational Entity bot or Chatterbox, is a computer program that can imitate human conversation using NLP methods (Mulyono & Sumijan, 2021).

With the help of elevenLabs, the user can alter a recorded voice to sound like a different person spoke it. It gives users more control over pronunciation, tone, and emotions. The user must express the content of the source speech with the characteristics of the target speech in order to transform it into the target speech. An excellent comparison would be the face-swapping applications that combine two people's faces to create a single image of them (STANISZEWSKI, 2023).

Python is a programming language that places a strong emphasis on code readability to facilitate syntax comprehension. Python boasts a good, user-friendly design concept that is straightforward (Singh et al., 2021). Additionally, Python can be integrated with programs written in other programming languages, such as C, C++, Java, and others, and has a large number of libraries for a wide range of application needs. Python is a highly sought-after programming language among programmers due to its open-source nature (Rifandi, n.d.).

Based on the concept design, the prototype was developed into functional hardware (robot) and software (openAI implementation with API to process the language and provide relevant responses). Coding with Python language with OpenAI and GPT-3 API services. Chat GPT has also been applied to the improvement of writing skills (Setiawan & Luthfiyani, 2023).

ElevenLabs was chosen because it can present several native speaker audio feedback voice options, making it more natural in conversation (Minghai et al., 2023). At the implementation stage, coding with Python is done to access the OpenAI library and API (Application Programming Interface) and connect Raspberry with a network via Wi-Fi to store the system programming developed (Santoso et al., 2023).

The implementation stage is followed by the evaluation stage with SUS (System Usability Scale) testing. The prototype is applied to the learning environment in this study, taking the subject, namely students and junior high school teachers. This stage ensures that the robot prototype design can function according to the needs of its users. This stage also facilitates usage training to maximize the robot's potential.

This stage evaluates the prototype's usability, measures the satisfaction level, and identifies challenges and problems from the users' perspective, whose data will support future design development. The use of SUS in this study will provide a comprehensive picture of how the "Talk to GPT" prototype is received and used by vocational students and teachers in the context of English language learning. This paper will focus on testing and evaluation results on the prototype on a sample of users, namely vocational students and teachers.

Result and Discussion

Based on the results of interviews with SMK teachers, the list of needs, tool specifications, end-user identification, and the study's objectives are presented in Table 1.

Table 1
Preliminary Data Analysis

Requirement	:	Can capture voice input, process it with Artificial Intelligence and then provide feedback according to the language entered
Specification	:	Raspberry Pi as computer elevenLabs as voice generator speaker as output module microphone as input module OpenAi as AI Technology Phython as Programming Language Power supply Network Connection via Wifi
Target Users	:	Vocational school Students
Goals	:	Facilities to support students' speaking and listening interactions in English learning

From the analysis results table, it is developed into a concept in the form of a robot concept, robot flowchart, physical layout and interface. The robot's construction layout and interface will be discussed in detail in a different paper. The concept of an AI robot integrating several technologies is depicted in Picture 2.

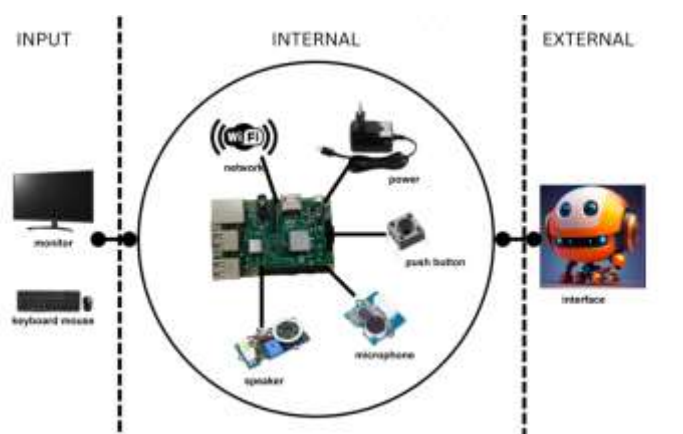


Image 2. Technology Concept

Source: Team Research, 2023

Based on this concept, the system flowchart is depicted in Picture 3. In Picture 3, the application starts by using the interface from elevenLabs, because the development of the robot interface is still ongoing.

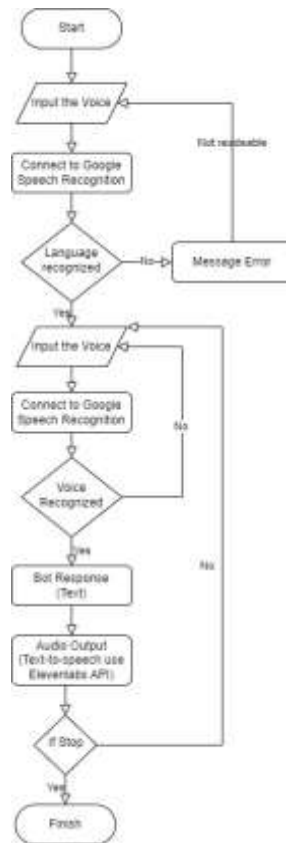


Image 3. Learning from anywhere picture

Source: Team Research, 2023

After integrating OpenAi and the prototype device, testing is carried out through the media command prompt as the interface, as shown in Image 4.



Image 4. Running Program

Source: Team Research, 2023

At the evaluation stage, the user accesses the program with the .py format. Users can choose the language used in the conversation. Testing using a questionnaire with SUS questions as in Table 2.

Table 2

List of System Usability Scale (SUS) Questions

No	Questions	Scale				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Saya berpikir akan menggunakan alat ini lagi					
2	Saya merasa alat ini rumit digunakan					
3	Saya merasa alat ini mudah untuk digunakan					
4	Saya perlu bantuan dari orang lain atau teknisi untuk menggunakan alat ini					
5	Saya merasa fitur yang terdapat dalam alat sudah berjalan dengan semestinya					
6	Saya merasa ada banyak hal yang tidak konsisten/serasi pada alat ini					
7	Saya merasa orang lain akan memahami cara menggunakan alat ini dengan cepat					
8	Saya merasa alat ini membingungkan					
9	Saya merasa tidak ada hambatan dalam menggunakan alat ini					

10	Saya perlu mempelajari banyak hal terlebih dahulu sebelum saya bisa menggunakan alat ini					
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In addition, there are additional questions to get input from respondents, such as (1) AI applications that have been used, (2) usage needs, (3) experience in similar applications, (4) difficulties when using prototypes, (5) experience when using applications, and (6) input on product development.

Testing was conducted using questionnaires to 30 vocational students and structured interviews with three teachers who were test respondents. Respondents came from grade 11, and testing was carried out in English lessons. The results of testing with questionnaires are as follows:

Table 2
SUS Result

	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q10
R1	4	3	3	4	3	3	4	3	2	4
R2	5	1	5	1	4	2	2	1	5	3
R3	4	2	4	2	4	4	4	2	4	4
R4	4	3	3	3	3	2	4	3	2	2
R5	2	2	4	2	4	3	4	2	4	2
R6	3	2	4	3	3	2	4	2	4	2
R7	4	2	4	3	3	4	4	2	4	2
R8	4	2	4	2	4	3	4	2	4	2
R9	5	2	4	4	3	3	4	3	3	3
R10	3	3	4	4	4	3	4	3	2	3
R11	4	2	4	2	3	4	5	3	2	2
R12	4	3	4	3	4	3	4	2	3	4
R13	5	2	4	3	4	3	2	2	4	5
R14	4	2	4	4	4	3	4	2	4	4

5= Strongly Agree

4= Agree

3= Neutral

2= Disagree

1= Strongly Disagree

R1 5	4	3	3	3	4	3	3	3	3	4
R1 6	4	3	4	4	4	2	3	2	4	4
R1 7	4	4	3	4	4	3	4	3	4	4
R1 8	5	2	3	4	4	3	3	3	4	5
R1 9	4	2	4	2	3	4	4	3	3	5
R2 0	4	2	5	2	4	2	3	2	3	3
R2 1	4	2	4	2	4	4	4	2	4	2
R2 2	5	1	5	2	4	4	4	2	4	2
R2 3	4	2	4	2	3	3	4	2	3	2
R2 4	4	2	4	2	3	3	4	2	3	3
R2 5	4	2	5	2	3	3	4	2	3	3
R2 6	4	2	4	2	4	3	4	2	3	4
R2 7	4	2	4	4	4	2	4	2	4	5
R2 8	4	2	4	5	5	4	3	4	4	5
R2 9	5	2	5	2	4	3	4	2	4	4
R3 0	4	2	4	2	4	2	4	2	3	4

Source: Research Data, 2023

From these questions, a SUS (System Usability Scale) score can be calculated to evaluate the use of AI robots in learning activities at SMK. The SUS scale ranges from 0 to 100, where the higher the score, the better the usability level of a system. Results are calculated with the caveat that the answer to question number five determines the score for odd questions (1, 3, 5, 7, and 9). The score for even questions (2, 4, 6, 8, 10) is the result of 5 - the answer.

Formula 1 is a SUS calculation,

$$X = \text{Sum}(\text{points of odd questions}) - 5$$

$$Y = 25 - \text{Sum}(\text{points of even questions})$$

$$\text{SUS Score} = (X + Y) \times 2.5$$

Table 3

Interpretation SUS Score

SUS Score	Grade	Adjective Rating
> 80.3	A	Excellent
68 – 80.3	B	Good
68	C	Okay
51 – 68	D	Poor
< 51	F	Awful

Source: Research Data, 2023

The calculation results are 63,083. Based on the interpretation of the SUS Score criteria in Table 3, the SUS Score of the Talk to Robot prototype is in the Poor rating category. The results mean users feel quite comfortable using AI robots, but there is still room for improvement.

Apart from questionnaires with students, three teachers were also tested through interviews with a list of questions in Table 4.

Table 4

List of Interview Questions

No	Questions
Q1	Motivasi yang menjadi alasan penggunaan aplikasi AI

Q2	Puas/Kurang puas menggunakan aplikasi AI sejenis disertai dengan alasannya.
Q3	Kesulitan yang dirasakan pada saat menggunakan produk yang dibangun?
Q4	Pengalaman berkesan saat menggunakan produk
Q5	Apakah akan sering menggunakan alat ini jika nanti diproduksi?
Q6	Komentar dan Saran untuk perbaikan produk ke depannya

The compilation of answers given by the teacher for each question is as follows:

- Q1 : Motivasi yang menjadi alasan penggunaan aplikasi AI
- A : membuat outline, mencari POV lain, mencari literatur, Untuk latihan ngobrol dalam bahasa inggris, untuk menerjemahkan, Cari materi, mencari ilmu
- Q2 : Puas/Kurang puas menggunakan aplikasi AI sejenis disertai dengan alasannya.
- A : Puas dengan catatan mengambil paket berbayar, karena hasilnya sesuai dengan keinginan, Jawaban yang didapatkan realistis, dan dirasa seperti jawaban orang yang memiliki pengalaman di hal yang ditanyakan, Memberikan hasil yang sesuai dengan pencarian.
- Q3 : Kesulitan yang dirasakan pada saat menggunakan produk yang dibangun?
- A : masalah pada penyedia API, Alat kadang gagal merespon karena kita bertanya di saat alat belum siap merespon
- Q4 : Pengalaman berkesan saat menggunakan produk
- A : memberikan pandangan lain pada pengembangan AI dan pemrograman python, Jawaban sangat baik dan natural, Kemudahan mendapatkan sesuatu yang dicari.
- Q5 : Apakah akan sering menggunakan alat ini jika nanti diproduksi?
- A : 1-2 x sehari.
- Q6 : Komentar dan Saran untuk perbaikan produk ke depannya
- A : penambahan saklar input suara, agar ketika melakukan input suara langsung dapat direspon oleh mesin, Ada tambahan indikator jika alat sudah siap merespon, Dibatasi dalam bentuk aplikasi android

Analysis of the answers given by teachers regarding prototype usability is that teachers access AI-based applications such as chatGPT with the motivation to get outlines and information that can be developed in the lessons taught. Apart from that, in language lessons, AI applications can help with the translation process so that learners get more natural answers than Google. One obstacle when using it is that the API cannot be accessed simultaneously by several devices. Image 4 depicts usage density at one time.

GPT-3.5-turbo-0613

API requests 301



Tokens 41,248



Image 5. API Usage Graph

Source: Team Research, 2023

The absence of tool start control is also annoying because the sentence input received is incomplete. For development, researchers can add a voice input button and also an indicator that the tool is ready for use.

Conclusion and Suggestion

From the test results, analysis of the data focuses on several prominent questionnaire results, namely: The prototype is relatively easy to use, although there are users who still need clarification about using the tool. Based on observations during testing and essay answers given by respondents, this could be due to a network that is not supported enough, so during use, respondents need to provide voice input repeatedly so that the system can respond.

Users have a positive perception of the available features, but there are recommendations for further development. Namely, there needs to be consistency and uniformity in the tool interface in the form of clear guidelines, for example, guidelines for composing keywords when entering input, so that the feedback sentences given by the product are not too long because, in sentences delivered in audio form, long answers are less than ideal. Apart from that, users also find it difficult to recognize the sentences entered by respondents, so it may be necessary to enrich the dataset to improve the AI's understanding of various language inputs.

Apart from that, what can be most highlighted is the difficulty of using the tool because it is very dependent on the internet network, so it is necessary to consider technology that can respond well even if network conditions are less supportive. The elevenLabs API also becomes an obstacle in responding if accessed by more than five devices at one time. It was running a prototype that still uses a monitor, so the practicality of use still needs to be met. Additionally, the tool's interface design may make it easier to see when it's ready to use. Every development can benefit from further testing to make the final product better. Features that scan products or images can also be incorporated. To ensure optimal tool operation during feedback loading, the maximum word count in questions must be evaluated.

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