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Innovation of Adaptive Technology based on the Internet of Things (IoT) in Teaching English for Specific Purposes

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Abstract:

This paper discusses learning English for Economics Students by adapting adaptive technology. The learning process is implemented by adjusting the curriculum and educational infrastructure. Economics students at PGRI Argopuro University Jember have 25 students in Semester I of 2021. Economics students have difficulty understanding English lessons, especially in mastering vocabulary, completing assignments, and communicating. The research method used the Inastec's adaptive technology innovation based on the internet of things (IoT) using application algorithms and hardware design schemes for the Raspberry Pi 3 B+. This research applies Inastec's adaptive technology based on the internet of things to help economics students improve their English language skills, namely, Mastery of English vocabulary, complete assignments, and communicating with Inastec platform tools with text output and voice feedback on voice speakers.

Keywords: adaptive technology, vocabulary, internet of things, Raspberry.

基于物联网的自适应技术在特定用途英语教学中的创新

摘要：

本文讨论了通过适应技术学习经济学学生的英语。学习过程是通过调整课程和教育基础设施来实施的。植物遗传资源研究所阿尔戈普罗大学的经济学学生在2021年第一学期有25名学生。经济学学生在理解英语课程方面有困难，特别是在掌握词汇、完成作业和交流方面。研究方法采用英纳斯达克基于物联网的自适应技术创新，采用树莓派3B+的应用算法和硬件设计方案。本研究应用英纳斯达克基于物联网的自适应技术帮助经济学专业的学生提高英语语言技能，即掌握英语词汇、完成作业、与英纳斯达克平台工具进行交流，并在语音扬声器上进行文本输出和语音反馈

关键词： 自适应技术，物联网，物联网.

1. Introduction

The education of economic students involves adjustments to the curriculum, infrastructure, and education system that can help the needs of students (Samad, 2018; Wewer, 2017) education such as elementary, junior high, high school, and colleges with learning difficulties in higher education (Kırkgöz & Dikilitaş, 2018). The economic students feel difficulty in understanding English lessons, especially in vocabulary knowledge, task completion, communication, and motivating economic Students' learning English for Specific Purposes Courses through the Corpus Building (Kweldju, 1998; Wu, 2014). The success factor of teaching and learning vocabulary knowledge, task completion, and communication is to provide tutoring programs on the English Reading Development of Bilingual Students (Muhsinin et al., 2017; Denton et al., 2013). To enable a better understanding of specific aspects of the multifaceted construct that is L2 lexical development, we need to spotlight some facets, inevitably leaving others in the dark.

According to Purba, (2018) apply psycholinguistic principles of how a person acquires his/her native language or first language (First Language Acquisition), learns his/her second or third language (Second Language Learning), perceives a language (Language Perception), and produces a language (Language Production). Language perception refers to listening and reading, while the language production refers to speaking and writing. Listening, reading, speaking and writing are called the four language skills. However, the process of economic student still has a problem with mastery of the vocabulary to be able to communicate between students because the Second language (L2) is the Indonesian language.

Additionally, Hanjani, 2018; Kabilan & Zahar, (2016) the effectiveness of using Facebook in enhancing vocabulary knowledge among Community College students. This large amount of vocabulary cannot be well developed when vocabulary learning is confined to 2–3 hours of classroom instruction per week. Additionally, as a command of vocabulary entails knowledge of spelling, syntax, meaning, and usage, learners should repeatedly encounter target words in various contexts to fully acquire new words.

The teaching and learning process of economic students can be supported by appropriate technology for solving problems. The effective and efficient learning system accompanies the technological advances. The learning activity needs for there to be an effective arrangement of assistive innovation administration conveyance that provides devices and administration without wasting much time (Bryant & Seay, 2020). Three factors affect this problem. First, the learning system is not right in higher education. Second, technological innovation cannot match the needs of students. Third, the implementation of teaching staff cannot adapt to adaptive technological innovations to facilitate economic student English learning.

2. Literature Review

The Internet of Things, advanced innovation, becomes an indispensable piece of technique details. Along these lines, received models of overseeing IT as a normalized ware and adjusting IT to business techniques should be addressed and supplemented by new systems, which view IoT advancements as a help work and a center component of significant worth creation and as a wellspring of a competitive advantage (Wortmann & Flüchter, 2015). The internet of things arose as a problematic and extraordinary innovation that might actually fuel innovative designs of 'smart' administrations in the helped living and care space (Bhattacharya et al., 2017).

The application of adaptive technology as a learning medium can help the learning process by paying attention to students to evaluate the shortcomings of the teaching and learning system. Adaptive technology provides easy access for economic students at PGRI Argopuro University Jember with computer media. So that lecturers can provide a more effective and efficient learning process with methods that economic students easily understand.

Therefore, inastec adaptive technology innovation (assistive technology) based on the internet of things is proposed in the learning system for economic students. Inastec adaptive technology uses structured programming language algorithms. Each argument will result in an interaction without the help of human labor in doing its work. The working principle of inastec adaptive technology uses an internet network that is connected to a hardware system. Teaching staff can monitor students in the learning process, assigning assignments and completing assignments.

This study addressed the following research questions "How can Innovation of Adaptive Technology based on the Internet of Things (IoT) improve vocabulary knowledge, task completion, and communication?"

3. Methods

This study employed a qualitative method to explore the challenges faced by English teachers at PGRI Argopuro University in Jember. The following sections describe the research instrument, data collection and analysis.

The method used in Inastec's adaptive technology innovation based on the internet of things using Google's cloud platform and Respberry Pi3B+ (Google Cloud Platform, 2015). Technological design is divided into two, namely, the application of algorithms and hardware schemes. The application algorithm is similar

to the google cloud platform, which is used as a storage for communication services with the internet network as a Respberry Pi server (Molloy, 2016). Raspberry Pi provides google text to speech API, core, SQL, and own-cloud database services (Ibrahim et al., 2015). Voice input in the form of google text to speech API is stored in a database, and RPI Monitor is a monitoring server on a rest-full API. The stored database is sent via a fronted interface with the Respberry IP Address web browser, and then the text is converted into sound that is displayed on the Inastec platform. A hardware schematic is designed with a microphone and audio splitter as voice input on a Google assistant.

The implementation of a system with voice recognition method using the Google Home Mini combined with an IoT platform so that it can control electronic equipment through voice commands (Thoriq et al., 2019). The Raspberry Pi B+ is equipped with a sound card to store sound, then a small computer is connected to keep the operating system safe while running (Pololu, 2022). Voice input is displayed on a monitor screen in text connected to a computer and LED Projector as learning medium for economic students (Milrad, 1998). The monitor speakers are controlled using a power amplifier for feedback as sound for economic students (Ibrahim et al., 2015). The Inastec's adaptive technology method based on the internet of things is described in Figure 1.
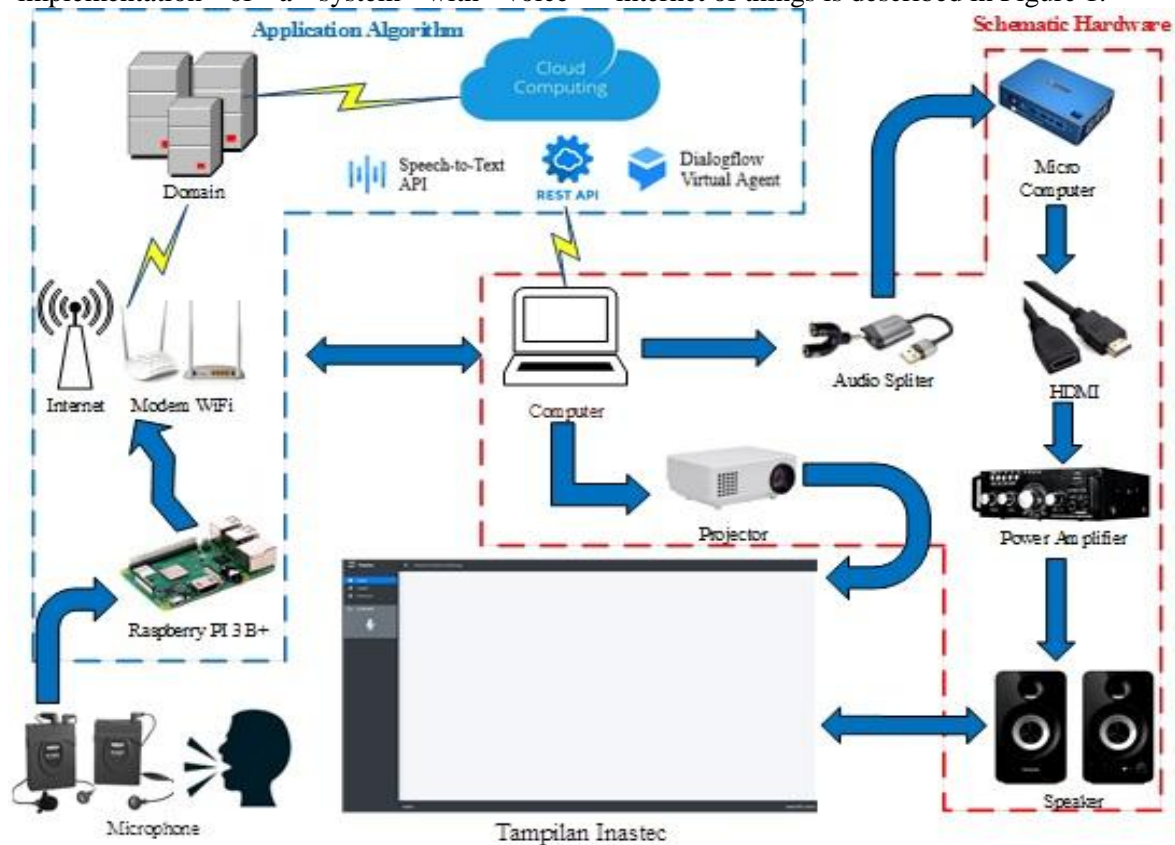

Figure 1. Inastec platform

The purpose of the Inastec assistive technology model is as a tool for economic students. First, the microphone voice input will be used as network communication that is connected to wireless using a static IP and client-server. The static IP and client-server use a dynamic domain name system (DDNS) to provide port forwarding on the Raspberry Pi with internet network access. Then, the Raspberry Pi is connected to the Inastec interface to display the sound output in text and feedback text as an output on the sound speaker.

Inastec products function as a platform for technology-based learning media. So that inclusive students can learn effectively by adapting to the internet of things-based technology. The benefits of inastec products are that economic students can easily understand the material, complete assignments, and communicate.

4. Result

4.1. Product Development Results

4.1.1. Name of Assistive Technology Learning Product

The product name of the tool for economics students is Interest of Assistive Technology (Inastec).

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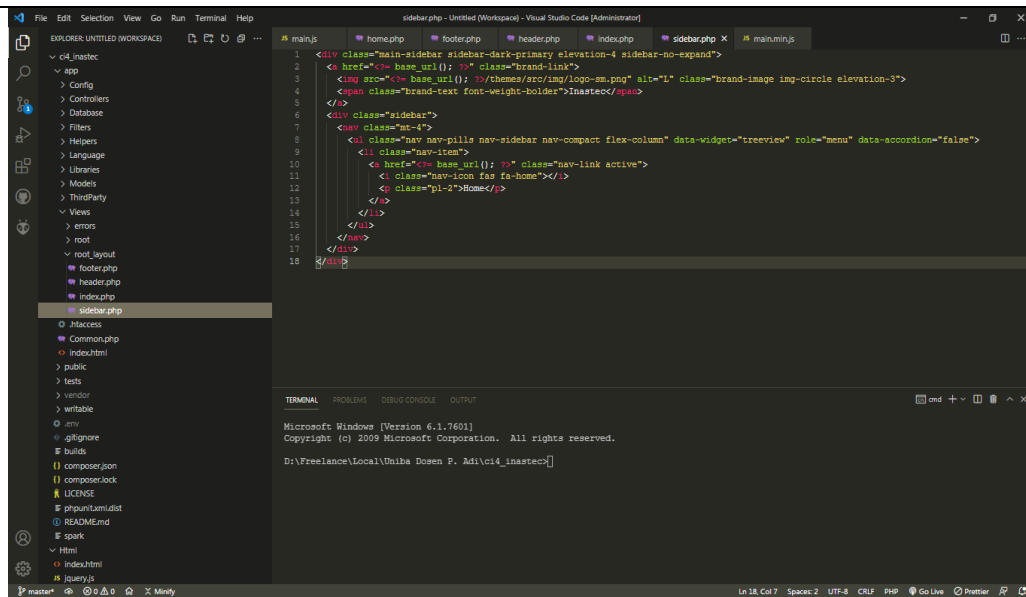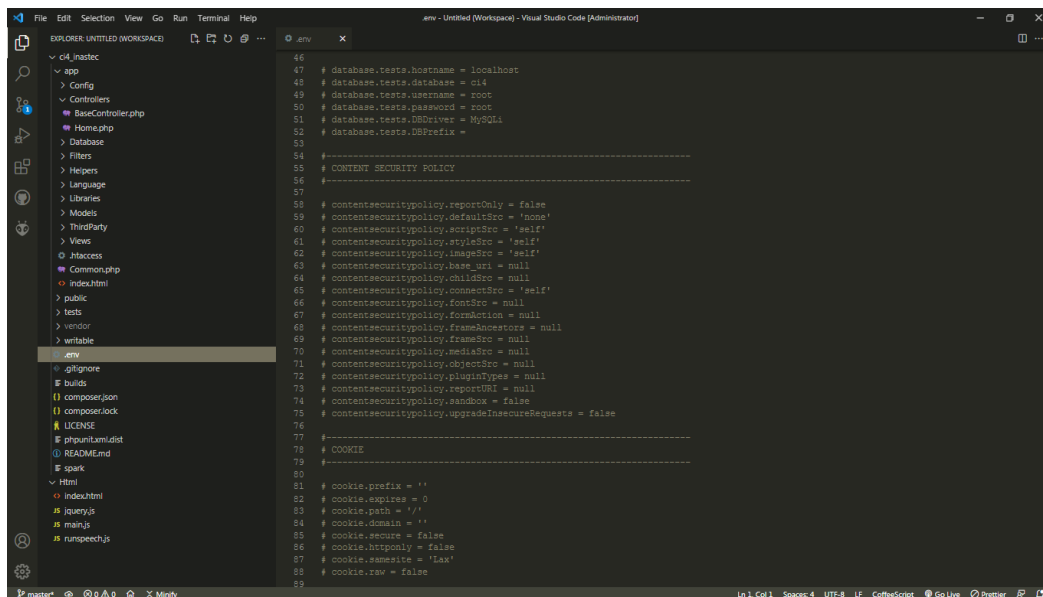Spring/Summer 2022

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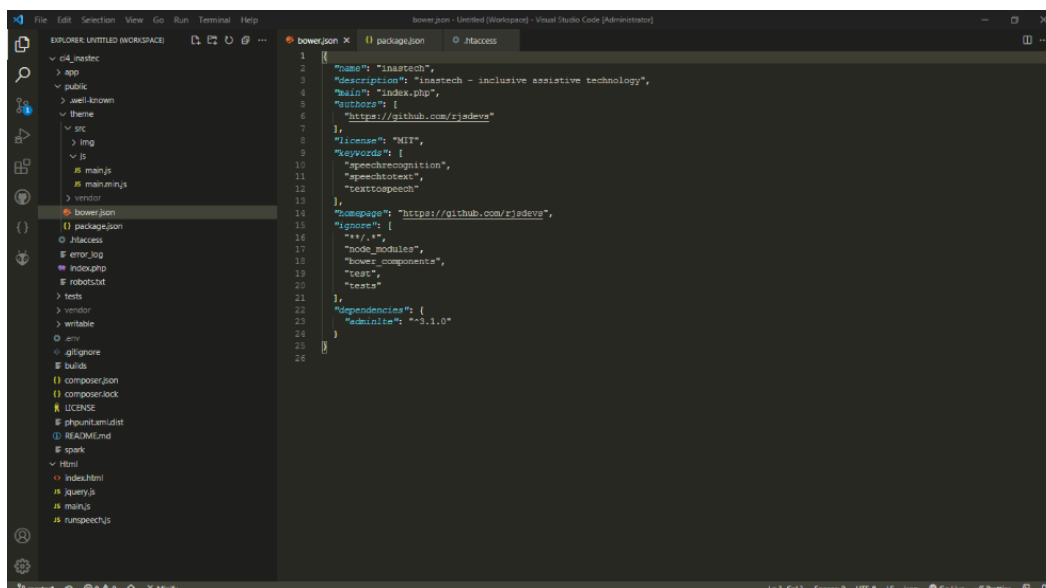Figure 2. Inastec product

Figure 3. Program env
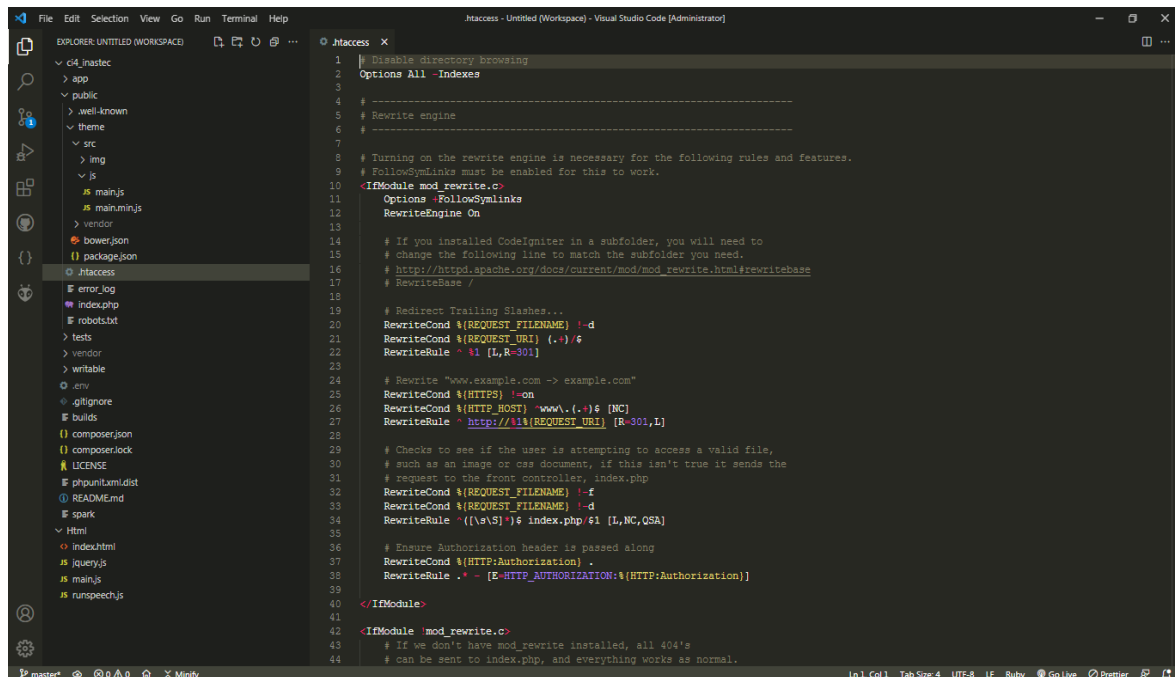

Figure 4. Program bower

Figure 5. Program HTTS

Figure 6. English language Inastec platform

Figure 7. Indonesia language Inastec platform

4.1.2. Inastec Product Specification

Inastec product specifications consist of an application algorithm and a hardware schematic. Application Algorithm in the form of a google cloud platform that is used to store communication services and is integrated on the internet network as a Raspberry Pi server. Raspberry Pi provides database services such as Google text to speech API, Core, SQL, and Own Cloud. Voice input in the form of google text to speech API is stored in a database, and Rpi Monitor is a monitoring server on a rest-full API. The Raspberry Pi is connected to the Inastec application frontend interface with the Raspberry IP web browser. Meanwhile, to connect to the server using the internet network with a DDNS system and a router IP address.

Schematic Hardware consists of a microphone used for voice input on the Google Assistant, which is connected to an audio splitter. A sound card is installed on the micro-computer to keep the operating system safe while running. Voice input is displayed on the monitor screen by connecting the computer and the LED projector. The monitor speakers are controlled using a power amplifier. The characteristics of the Inastec model specifications produced to facilitate the economics of students in the learning system through text and sound. Inastec product specifications are described in Figure 1.

4.1.3 Purpose of Inastec Product

The purpose of Inastec's assistive technology model is as a tool for economics students. The microphone voice input will be used as network communication that is connected to wireless using a static IP and client-server. The static IP and client-server use a dynamic domain name system (DDNS) to provide port forwarding on the Raspberry Pi with internet network access. Then, the Raspberry Pi is connected to the Inastec interface to display the sound output in text and feedback text as an output on the sound speaker.

4.1.4. Functions and Advantages of Inastec Assistive Technology Products

Inastec products function as a platform for technology-based learning media. So that economics students can learn effectively by adapting the internet of things-based technology. The inastec product's benefit is that economics students can easily understand the material, complete assignments, and communicate.

The advantage of Inastec's assistive technology

product is that it is based on the internet of things with the integration of Raspberry Pi and Bluetooth. So that Inastec assistive technology can be controlled remotely using a smartphone or laptop. Users of this technology not only use it as a learning media, but can monitor student learning systems effectively with one device. The Raspberry Pi can be connected to various sensors, then the data obtained from the sensor is then forwarded back to the Raspberry Pi via the internet. Raspberry Pi will continue messaging to give orders to control and monitor economics students who are learning English in a private university based in Jember Indonesia.

4.1.5. The Process of Implementing the Produced Inastec Products

The process of applying Inastec assistive technology with voice input on the microphone, the voice is processed into text with a Raspberry Pi to send data to cloud computing. Cloud computing processes data in the form of text and is fed back to the domain via the internet. Internet connected to a laptop as monitoring economics student. The processed text is sent over the internet network based on the IP Address of each laptop or smartphone. The laptop is connected to the projector to display text, and the power amplifier is used to adjust the sound output on the sound speaker.

Economics students can listen to the sound with a sound speaker and can simultaneously see the text displayed on the monitor screen.
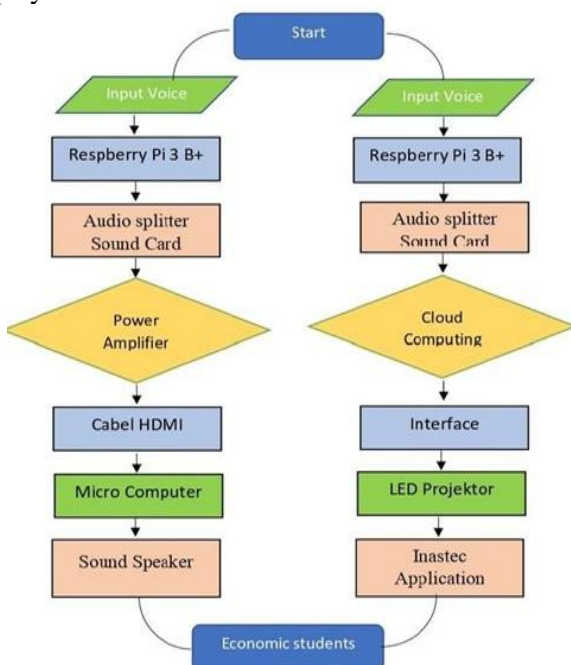

Figure 8. Inastec product deployment process

4.2. The Learning of Monitoring Using Inastec

An inastec assistive technology is the Internet of things based on Raspberry Pi and Bluetooth integration. So that Inastec assistive technology can be controlled remotely using a smartphone or laptop. Users of this technology not only use it as a learning media, but can

monitor student learning systems effectively with one device. The Raspberry Pi can be connected to various sensors, then the data obtained from the sensor is then forwarded back to the Raspberry Pi via the internet. The Raspberry Pi will continue to message to give orders to control and monitor economic students at PGRI Agropuro University of Jember.

4.3. Inastec Programs

The Inastec program consists of inv, bower, htts, index, and package programs. Each program provides arguments on the Respberry Pi B+. RESTful API uses the PHP programming language and the phpMQTT library found on the Server. This RESTful API is a service that serves to bridge the gap between IFTTT and MQTT Broker. phpMQTT is a simple php class used to connect, subscribe and publish to the MQTT Broker. The HTTP RESTful API source code uses PHP programming and the php MQTT library.

The results of the application of the Inastec assistive technology model based on the internet of things are applied effectively as a learning medium for inclusive students. Inclusive students can understand the material presented by the lecturer easily, make assignments and communicate efficiently. Figure 9 describes the effect of applying Inastec assistive technology on inclusive students with the following before and after conditions.
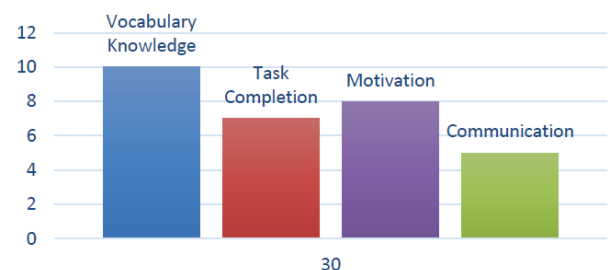

Figure 9. The results: application of inastec products

Based on Figure 4, vocabulary knowledge is 10%, and task completion is 7%, while communication increases by 5% and motivation is 8%. The 4 components increased because the use of IoT programs was effective and easy to use by lecturers and economics students at PGRI Argopuro University Jember.

5. Conclusion

The students' economic learning process can be achieved with adaptive technology. Technological innovation plays an important role in solving problems and satisfying students' needs. Teaching staff can adapt to technology-based learning media to provide the quality of education needed.

The application of Inastec's adaptive technology

based on the internet of things (IoT) has a significant impact on learning English language materials, such as; vocabulary knowledge, task completion, communication and motivation to learn English for Economics students is easier at the Economics Study Program at PGRI Argopuro University Jember. Additionally, the learning process can be monitored remotely by the lecturer.

6. Limitations

No study covers all aspects of a research problem. The author(s) should therefore discuss the limitations or gaps in the study. The future scope or plan of the study should also be identified.

The limitation of this research is that there is internet access at the university and other facilities that students need.

6.1. Recommendations and Further Studies

Recommendations and further study are expected to provide proper internet access and IoT programs that are easily accessed by students.

Acknowledgments

Authors' Contributions

The first author is the one who suggested the idea and writing of this article. The second and third authors contributed to making materials and content to be taught to students. The fourth author contributed to the development of methods and product analysis.

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