PROCEEDING AISELT
(Annual International Seminar on English Language Teaching)
Available online at https://jurnal.untirta.ac.id/index.php/aiselt
e-ISSN: 2597-4955 and p-ISSN 2597-4947
ELT in Local and Global Lives: from Policy to Classroom Practices

Teacher Perspectives on the Use of Arduino UNO Technology in SENSE Book for Special Needs Students

Alya Afifah Izwandi, Wisma Yunita

alyaafifahizw@gmail.com
University of Bengkulu, Bengkulu, Indonesia

wismayunita@unib.ac.id
University of Bengkulu, Bengkulu, Indonesia

ABSTRACT

The advancement of technology has enabled us to utilize it to the fullest extent in learning English, especially in vocabulary acquisition. The impact of technology-based media on learning outcomes is widely recognized. One such platform is Arduino UNO, an open-source hardware prototype that allows for the development of various programming-based projects. It offers a combination of visual, textual, and auditory elements, making it a versatile tool in educational settings. This research aimed to explore teachers' opinions on innovating instructional media that apply Arduino UNO. SENSE Book is a vocabulary learning book equipped with a button board, allowing students to enhance their sensory and motor skills. This research adopted a descriptive qualitative approach, with a sample of a practical instructor at special schools (SLBN 2 and SLBN 3) in Bengkulu City, and observes two students. Observation, interviews, and documentation serve as instruments. The data analysis technique involves data reduction, data display, and conclusion/verification. The research results indicate that teachers have a positive perspective on creating innovative Arduino-based media for teaching vocabulary to special needs students. The research employs a qualitative approach, with data collected through observation and interviews. A systematic process was followed, including searching and organizing interview transcripts, field notes, and expert validations, along with other supporting materials. Data triangulation was applied to ensure the credibility of the findings. The results prove that students have difficulty remembering the pronunciation of unfamiliar words and mastering the meanings. Moreover, results demonstrate that this form is suitable for tech-based media in improving vocabulary and is generally claimed to be a valuable resource. This sound-enabled book can enhance students' vocabulary.

Keywords: Teacher Voice; Arduino UNO; Special Needs Student

INTRODUCTION

The world is currently facing a period of recovery after the past few years. The COVID-19 pandemic has had a domino effect on various sectors, particularly the education sector. Education plays a pivotal role in enhancing the quality of human resources. The new learning processes have given rise to a phenomenon known as "Learning Loss" among students (Kemdikbud, 2022). The COVID-19 pandemic has undeniably had adverse effects on the world of education, forcing a shift from conventional methods to online and digital platforms, compelling everyone to embrace technology and initiate the transformation (Fitria, 2021). This aligns with Indonesia's efforts to embrace the fourth industrial revolution, where all aspects of life are deeply intertwined with technology. The pandemic seems to be a gateway to the global industrial revolution, marking a crucial turning point for the

education sector. The development of intelligence engineering and the Internet of Things (IoT) marked the next phase of this revolution (Megawati, 2021).

Among the developments, the main indicator has been the advancement of science and technology. The dynamic field of technology in education, specifically the shift from traditional to modern methods of learning, is evident in the rapid social changes, both positive and negative. This transition encourages education stakeholders, including teachers, administrators, and policymakers, to become digitally literate. This enables them to acquire, understand, and use digital information from various sources. This, in turn, can produce a generation that is tech-savvy, highly competitive, and of high quality. Consequently, the goal of quality education becomes a focal point for the government's efforts to achieve sustainable development goals in the era of Sustainable Development Goals (SDGs) by 2030, based on the guidance established by the United Nations Forum on August 2, 2015.

The quality of education in a nation is a critical determinant of its progress. In other words, the progress of a nation can be seen in the quality of its education system. Poor education quality can lead to stagnation for a nation. The development of education in Indonesia continues to face increasingly complex challenges. The current issues in the field of education in Indonesia not only call for an enhancement of its quality but also demand a revision of the existing education standards (Gaol, 2018). One crucial aspect of education quality lies in having competent human resources, encompassing well-trained teachers, skilled administrators, and proficient students. This is intricately linked to Indonesia's future interactions. According to the World Economic Forum's 2017 Global Human Capital Report, Indonesia's education situation was concerning, as it ranked 65th out of 130 countries in education at that time. The lack of interest in learning and limited literacy enthusiasm were cited as reasons for Indonesia's education quality lagging significantly behind neighboring nations (Gaol, 2018). However, addressing these issues becomes even more critical in the context of inclusive education.

Inclusive education has the potential to help children, including those with special needs (CWSN), identify and learn from a curriculum that is not significantly different. Research indicates that children with special needs in inclusive early childhood education settings are better able to socialize compared to those in specialized educational institutions (Juherna et al., 2020; Purnama et al., 2017; Sectio et al., 2018). The prevalence of CWSN in Indonesia is increasing each year. The United Nations (UN) estimates that at least 10% of school-age children have special needs (Kemenkes, 2012). According to the Ministry of Education and Culture (2019), in 2017, Indonesia had 1.6 million children with special needs, with percentages of 2.5% (5-9 years old), 3.5% (10-14 years old), and 4.2% (15-17 years old) (Riskesdas, 2018). Children with special needs do not all miss out on opportunities to excel in education. Many of them possess unique talents that surpass those of typical children. They have more time to delve into specific knowledge and skills not commonly mastered by normal children.

Every student possesses a basic potential that can be developed through appropriate developmental programs. CWSN students do not have the same opportunities for optimal development in special schools, largely due to the exclusive nature of these institutions, making it difficult for CWSN students to adapt to the norm (Budimansyah, 2018).

As a means of fostering positive interaction between general education students and CWSN students, schools conduct interest and talent assessments of CWSN students to prove that they too have unique qualities worthy of recognition. In an interview with AHP, a practical instructor at special schools (SLBN 2 and SLBN 3) in Bengkulu City, it was mentioned that most children with special needs in Bengkulu do not receive extensive English language instruction, partly due to the small class sizes, with fewer than ten students per class. English language teachers predominantly use monotonous teaching methods and lack creativity in developing interactive learning materials, especially technology-based ones. The integration of technology in education serves to simplify the delivery of educational content from teachers to students, making it easier for students to understand (Afendi, 2019).

Bengkulu, rich in natural resources and minerals from mining activities like coal and gold, showcases a promising environment for educational development. The easy availability of necessary components for creating educational materials, along with a well-established internet access network reaching remote villages (Umbar, 2021), positions Bengkulu as a potential hub for fostering inclusive and technology-integrated education. (Satrisno & Friantary's 2019) revealed that SDIT Al Aufa, an educational institution providing inclusive education services for CWSN, employs a teaching method that involves both teachers and media. This research highlighted the importance of using engaging and interactive media for teachers and students in special schools. The children with special needs in Bengkulu, based on observations and trials of the SENSE BOOK, show potential and talent in grasping general English vocabulary at a basic level.

Learning English is crucial for developing the potential of these students and enhancing their English language competency. This will be beneficial when they enter the workforce, as individuals who can work effectively, or even as policymakers, utilizing the knowledge applied, particularly the lessons learned in English. Furthermore, according to Syamsul Yusuf in Rezkita and Wardani (2018), early childhood experiences have a significant impact on students' subsequent development. If they are provided with knowledge about the environment from an early age, it will offer a good opportunity for the future development of an environmentally conscious character. Children with special needs in Bengkulu can benefit from media resources that boost teacher motivation to be more creative in the teaching process if someone is willing to provide them.

Given the background, the research aims to address the following research question: What is the teacher's voice regarding the creative and innovative use of ARDUINO UNO technology for special needs students?

METHOD

This research is conducted at SLB Negeri 5 Bengkulu city. This research employed a descriptive qualitative research design to uncover the perspective of teachers in special needs schools. The focus is on exploring the opinions regarding media using Arduino Uno. Denzin and Lincoln (2000) assert that qualitative research is a well-established practice that situates the observer within the world. The approach adopted in this design is interpretive and naturalistic, emphasizing the transformation of the world into diverse representations through means such as observation, interviews, and written notes, as indicated by researchers. It is about contextual conditions in the social institutional and the environment of life of people and takes place. By using a qualitative approach, it can describe the social condition in the classroom during the demonstration of Arduino UNO in teaching special students in their class. Social situations, participants, and documents are sources of data.

There are three components in social situations; place, actors, and activities. The researcher observed activity, place, and actor in the implementation of Arduino in teaching English. The participant is one of the practical instructors who teaches in SLB 2 and SLB 3. For the demonstration of the book only introduced two students but because of some factors, the student is absent and cannot come to the class so the class consists of 6-8 students. Instruments that are used are observation interviews and documentation. They are used to collect the data. Interviews provide some information that cannot be obtained through observation. Interview is one of the basic methods for obtaining qualitative data. By doing interviews, the researcher can get data about opinions, beliefs, and situations from the teacher about the book to help students enjoy acquiring new vocabulary. Even this book can inspire other teachers to innovate a lot to create innovative media. Documents include video recordings, photographs, or other items that provide insight related to the context or participants.

The data collection tool employed in this study was a "semi-structured interview form." This form consisted of open-ended questions crafted by the researchers, with the aim of eliciting teachers' perspectives on the utilizing media that applying Arduino uno for the system of the book for learning English in the classroom. The participant confirmation method involved sharing findings with participants for feedback on the accurate representation of their views. The detailed description method was applied to enhance the transferability of results, incorporating direct quotations from teachers' statements. For dependability, consistency analysis and confirmation analysis were conducted. An external qualitative research expert examined the researchers' consistency throughout the study's stages,

ensuring reliability in data collection tool construction, data collection, analysis, and coding. The necessary adjustments were made based on these analyses.

RESULT

This study delved into the viewpoints of teachers working with special needs children who took part in the research, focusing on their opinions regarding the implementation of the SENSE book. The research question specifically explored teachers' perspectives on using Arduino Uno as a tool for teaching English to facilitate successful education. Based on the insights gathered from participants, a table was created to elucidate teachers' responses, outlining their opinions concerning the efficacy and knowledge associated with generating ideas for creating educational media tailored for special needs students. The technology employed in this context was Arduino Uno.

In this study, the results indicate that incorporating teacher voice through interactive and engaging media is beneficial for learning English. An intriguing aspect is the exposure of students to technology, given that these media are technology-based. Additionally, this approach enhances their motoric and sensoric abilities, facilitating a more effective English language learning experience. Special needs students, in particular, exhibit enjoyment when exposed to these interactive media, allowing teachers to capture their attention effectively. However, it is crucial for teachers themselves to employ a more repetitive and slower explanation method. Engaging with students by initially making the learning experience enjoyable is essential for a better understanding of the material, especially in the context of English language learning. Furthermore, the creative use of technology not only benefits the students but also serves as an inspiration for other educators.

Interview Results

The following section presented the results of an interview with a teacher, exploring their perspectives on using the SENSE Book with Arduino UNO technology for special needs students. Each question is followed by a summary of the teacher's responses, including direct quotations where applicable.

1. Effectiveness of the SENSE Book for Special Needs and Young Learners

When asked about the effectiveness of the SENSE Book for special needs students and young learners, the teacher expressed that it was highly effective due to its ability to cater to different learning styles—auditory, visual, and kinesthetic. The integration of audio and visuals with a physical book made learning more engaging. However, the teacher noted that students with special needs might require more time to absorb and retain vocabulary. She remarked, "*It is very effective because it covers all children's*

learning styles... Unfortunately, children with special needs take quite a long time to understand and remember some of the vocabulary in it."

2. Students' Previous Experience with English

The teacher was asked whether the students had any previous exposure to the English language. She observed that while the students may not have had extensive lessons, they were intrigued by the material presented to them and showed interest in learning more. According to her, "*You can see it from the children who become interested to find out more*."

3. Frequency of Using Tools or Media for Teaching

When discussing the frequency of using teaching tools or media, the teacher admitted to using various aids, but with mixed results. She explained that the students were sometimes disengaged and unresponsive to the props used. She noted, "*Yes, but the results are not as expected. Sometimes students are less interested in the props used*."

4. Previous Use of Devices like SENSE Book

The teacher shared that they had used similar technology before, and the students found it interesting. She stated, "*Yes, they are interested in technology and interesting books." This suggests that technology-enhanced learning tools can draw students' attention and engagement*.

5. Can SENSE Book Be a Solution for Educational Reform?

The teacher affirmed that the SENSE Book could indeed be part of a solution for improving learning experiences, emphasizing that its concise and creative presentation of content helps in making learning more accessible. She mentioned, "*Yes, it can. Moreover, it is presented concisely and creatively.*"

6. Teaching New Concepts to Students

When asked about teaching new concepts to students, especially those with special needs, the teacher stressed the importance of repetition and patience. She explained, "*It must be done slowly and repeatedly, especially for children with special needs*." This highlights the necessity of pacing instruction according to students' individual needs.

7. Tips for Teaching Special Needs Students

The teacher shared her personal approach to teaching special needs students, stating that establishing an emotional connection first is crucial. She emphasized the need to create a supportive environment before introducing theoretical concepts. "*For me, there must be an emotional approach first, then we can play... because most of them will not like being given theory straight away*," she explained.

8. The Main Utility of Arduino UNO in SENSE Book for Special Needs Students

The teacher highlighted that Arduino UNO technology significantly enhances the learning experience for special needs students. She praised its interactivity and the engagement it fosters, stating, "*As a teacher, I view the main utility of Arduino UNO in the context of the SENSE Book as a remarkable tool that enhances the learning experience... providing an interactive and engaging platform*." This reflects the potential of technology to bridge gaps in traditional learning approaches for special needs students.

9. School Subjects Where Arduino UNO is Used with SENSE Book

Regarding the subjects in which Arduino UNO was employed, the teacher shared that she had predominantly used it in English language learning. The impact was substantial, as the technology made the material more tangible and engaging for special needs students. She explained, "*The device not only makes the material interesting and less abstract but also actively engages students, contributing to a more effective learning experience*."

10. Professional Skills and Factors for Integrating Arduino UNO in the Classroom

The teacher reflected on the professional skills necessary for utilizing Arduino UNO effectively. She underscored the importance of teachers being proficient with the device and creative in adapting lessons. She also pointed out that enthusiasm and openness to innovation are critical for successfully integrating technology into inclusive education. She concluded, "*Proficiency in understanding and operating the device is crucial... Factors enabling its successful integration include teachers' enthusiasm, creativity, and willingness to explore innovative methods*."

Student Activity Observation Sheet

Investigation Stages	No	Observed activities	Score		
			Less	Eoough	Good
Observing Stage	1	Students listen to the accompanying explanation and instructions for use SENSE Books			✓
	2	Students observe the material supporting objects in the SENSE Book			✓
Trying Stage	1	Students are able to speak when asked about ongoing learning		✓	
	2	Students are able to introduce themselves with the new vocabulary they acquire		✓	
	3	Students are able to explain what new vocabulary they like most	✓		

Investigation Stages	No	Observed activities	Score		
			Less	Eoough	Good
	4	Students are able to tell which vocabulary material is difficult and needs further explanation	✓		
	5	Students are able to provide good output after the learning process has progressed to completion. So it can help their learning achievement.			✓

Questionnaire of SENSE Book

No	Statement	Scale			
		1	2	3	4
1.	Effectiveness of using SENSE BOOK for children with needs Bengkulu.				✓
2.	SENSE BOOK can grow children's willingness to learn English.				✓
3.	SENSE BOOK can be a supporting medium in understanding English vocabulary mastery.			✓	
4.	Students are enthusiastic when studying with SENSE Book.				✓
5.	SENSE BOOK can be a solution in learning English for children with special needs.			✓	

DISCUSSION

The integration of technology into the curriculum is introduced and demonstrated with the aim of conveying how the world is becoming more globalized. It is essential to recognize that various facets of the world should be comprehended by special needs students, despite focusing on social life aspects, as they are human beings. A crucial role in achieving this understanding is played by teachers, who explain concepts step by step and utilize appropriate and enjoyable media. This research produces prototypes which are then used by ABK in the learning process. The interaction model in question can be seen in the Appendices. By understanding the limitations that ABK has, as well as the learning media support that can be carried out along with the use of input equipment. The learning media application that is prepared has a role as a tool for teachers to deliver material. learning is more enjoyable, can involve ABK in learning, and makes it easier for ABK to understand the material. The teacher has the role of an administrator who can teach materials, and monitor student interaction with the learning media SENSE Book that have been prepared. Students, in this case, ABK, act as users who can directly utilize existing learning media applications.

The prototype of the learning media was developed to enhance the learning experience, increase motivation, and foster independence for individuals with disabilities (ABK). Given the limitations and abilities of mentally challenged individuals, such as below-average IQ, difficulties in verbal communication, and motor perception issues, the learning media aims to address these challenges.

The learning media application is designed to utilize input equipment and present materials in a visually engaging manner. This visual representation helps make the material more interesting and less abstract, catering to the unique needs of mentally disabled individuals. According to Danış (2007), incorporating visual materials into a course not only makes it interesting but also rescues it from monotony, enhances focus, and renders the lessons more meaningful and enduring. Students but also from This digital learning tool enhances students' attentiveness to practical aspects and serves as a source of motivation for instructors. It allows instructors to involve students in various design activities, accelerating meaningful learning through diverse experiments. Additionally, it is cost-effective, user-friendly, and easy to handle. Consequently, educational institutions encourage students to utilize different digital platforms, promoting both their career development and enhancing their technical knowledge (Mohapatra, 2020). Furthermore, the learning media emphasizes the importance of repetition in the learning process for ABK. Continuous repetition is crucial for them to practice adaptive skills and effectively grasp the presented material. The development of the learning media application for mildly mentally disabled individuals followed a systematic research method with various stages. The objective is to create a tailored and effective tool for their learning needs.

Interviews with AHP, a Practical Instructor at SLBN 2 and SLBN 3 in Bengkulu City, revealed that special needs children in Bengkulu often lack comprehensive English language instruction due to small class sizes, typically fewer than 10 students. English language teachers in the region commonly employ monotonous teaching methods, lacking creativity in interactive learning media, especially those based on technology. Recognizing the significance of technology in education, media serves a dual purpose in the teaching and learning process. It aids teachers in effectively delivering material to students, ensuring better understanding and engagement in the learning process (Afendi, 2019). In an era marked by rapid technological advancements and the constant introduction of new technological products into daily lives, educators must align themselves with these changes. Teachers must actively engage in self-development in the realm of technology, creating diverse educational materials and embracing the role of future-oriented educators. Ultimately, the primary responsibility for implementing educational tools in school rests with the teachers (Atilgan, 2020). This underscores the importance of innovative and technology-based learning media in addressing the unique needs of special education students, promoting inclusivity and effective learning outcomes.

CONCLUSION

In conclusion, this research explored teachers' perspectives on implementing the SENSE Book, particularly using Arduino Uno, for teaching English to special needs students. The findings highlighted the positive impact of interactive media on the English language learning experience, emphasizing engagement and enjoyment among special needs students. The study also demonstrated the integration of technology into the curriculum, showcasing prototypes and learning media applications designed to enhance the learning experience for individuals with disabilities. It emphasized the importance of addressing the unique needs of mentally challenged individuals and the significance of technology in promoting inclusivity and effective learning outcomes in special education. As educators navigate a technologically advancing era, the responsibility falls on teachers to actively engage in self-development, creating diverse educational materials and embracing a future-oriented role. The study underscores the crucial role of innovative and technology-based learning media in meeting the distinctive needs of special education students, ultimately fostering inclusivity and enhancing learning outcomes.

References

Agustang, A., Mutiara, I. A., & Asrifan, A. (2021). Masalah Pendidikan di Indonesia.

Atilgan, D. S., & Gürman, Ü. (2020). Material design in music education using Arduino Platform. Eğitimde Nitel Araştırmalar Dergisi, 8(4), 1377-1402.

Bawanti, P. K. D., & Arifani, Y. (2021). The Students' Perceptions of Using Zoom Application on Mobile Phone in Improving Speaking Skills During Online Learning at Ban Loeiwangsai School, Loei Province, Thailand. *Journal of English Teaching, Literature, and Applied Linguistics*, *5*(1), 54-61.

Beta, S. & Sri, A. 2019. Modul Timbangan Benda Digital Dilengkapi Led Rgb Dan Dfplayer Mini. Orbith Vol.15 No.3 pp: 160 – 166. Gaol, L. (2018, April 25). Membenahi Kualitas Pendidikan Indonesia. Diambil kembali dari analisadaily.com: https://analisadaily.com/berita/arsip/2018/4/26/545175/membenahi-kualitaspendidikan-indonesia/

Hafidhin, M. I., Adam S. & Selamet S. 2020. Alat Penjemuran Ikan Asin Berbasis Mikrokontroler Arduino Uno. JTIKOM Vol. 1 No. 2 pp: 59-66.

Hanifah, M. P. (2022). Implementasi Kepemimpinan Transformasional Kepala Sekolah Dalam Meningkatkan Mutu Pembelajaran. CV Literasi Nusantara Abadi.

Hartono, Y. (2017). Pendidikan nasional dan kualitas manusia Indonesia dalam perspektif sejarah. Agastya: Jurnal Sejarah dan Pembelajarannya, 7(2), 84- 102.

Hidayah, N. (2022). Pandangan Terhadap Problematika Rendahnya Mutu Pendidikan di Indonesia. Jurnal Pendidikan dan Konseling (JPDK), 4(4), 6593-6601.

Mahmud, M., & Koniyo, R. (2023, January). Digitizing Education in Indonesia After the Pandemic. In Unima International Conference on Social Sciences and Humanities (UNICSSH 2022) (pp. 265-269). Atlantis Press.

Marpaung, S. 2017. Penggunaan Media dalam Pembelajaran Bahasa Inggris di Sekolah Menengah Atas. Seminar Nasional Multidiplin Ilmu 2017

Miles, M.B. (1994). Qualitative Data Analysis. London: Sage Publications.

Mohapatra, B. N., Mohapatra, R. K., Jagdhane, V., Ajay, C. A., Sherkar, S. S., & Phadtare, V. S. (2020). Smart performance of virtual simulation experiments through Arduino Tinkercad Circuits. Perspectives in Communication, Embedded-systems and Signal-processing-PiCES, 4(7), 157-160.

Nurhuda, H. (2022). MASALAH-MASALAH PENDIDIKAN NASIONAL; FAKTOR-FAKTOR DAN SOLUSI YANG DITAWARKAN. Dirasah: Jurnal Pemikiran Dan Pendidikan Dasar Islam, 5(2), 127 - 137. https://doi.org/10.51476/dirasah.v5i2.406

Ritchie, Jane and Ritchie, Lewis. (2003). Qualitative Research Practice. London: Sage Publication.

Rosaria, D. Novika, H. 2017. Bimbingan Belajar Bahasa Inggris Bagi Anak Usia Sekolah Dasar (6-12 Tahun) Di Desa Semangat Dalam Rt.31handil Bhakti. 2/1993. Volume 2 Nomor 2. 2461-0992. Jurnal Al-Ikhlas.

Saputra, Y. E. 2014. Rancangan Bangun Wireless Sensor Network Untuk Monitoring Pencemaran Air Sungai Menggunakan Topologi Mesh Network. Skripsi. Sekolah Tinggi Manajemen Informatika & Teknik Komputer, Surabaya.

Sariyati, I. 2013. The effectiveness of TPR (Total Physical Respond) Method in English Vocabulary Mastery of Elementary School Children. Parole Vol.3 No. 1, April 2013

Wahyudi, L. E., Mulyana, A., Dhiaz, A., Ghandari, D., Dinata, Z. P., Fitoriq, M., & Hasyim, M. N. (2022). Mengukur kualitas pendidikan di Indonesia. Ma'arif Journal of Education, Madrasah Innovation and Aswaja Studies, 1(1), 18-22.

Widyatama, A. 2013. Automatic Turmeric Extraction Machine Based Arduino Uno. Skripsi. Program Studi Teknik Elektro Jurusan Teknik Elektro Sains dan Teknologi Universitas Sanata Dharma, Yogyakarta.

Winandi, G. T. (2020). Perencanaan Pendidikan Pada Masa Pasca Pandemi Covid19. In Prosiding Seminar Nasional Pascasarjana (PROSNAMPAS) (Vol. 3, No. 1, pp. 315-317).

Wulandari, P. L., Kurniawan, D., Ihsan, R., Safaruddin, S. & Damri, D. 2022. Printer Penerjemahan Teks ke Audio-Braille Menggunakan Sistem Arduino Uno Untuk Tunanetra. JAIPTEKIN Vol.5 (3): pp. 99-106

Appendices

Implementation of Introduction Form for Students with Special Needs (ABK) at SLB 5 in Bengkulu City