JVCE 8 (1) (2023) : 68-75

Journal of Vocational Career Education

https://journal.unnes.ac.id/nju/index.php/jvce

Using AREK as Adaptive Physical Education Learning Model for Disability Vocational Students Sports

Acep Ovel Novari Beny[1]✉, Ima Kurrotun Aini[1], Dodik Arwin Dermawan[2], Fifuka Dwi Khory[3], Novia Restu Windayani[4]

[1]Faculty of Education, Surabaya State University, Indonesia
[2]Faculty of Vocational Studies, Surabaya State University, Indonesia
[3]Faculty of Sports and Health Sciences, Surabaya State University, Indonesia
[4]Faculty of Engineering, Surabaya State University, Indonesia

Article Info

Article History :
Received
October 2022
Accepted
January 2023
Published
July 2023

Keywords:
Education Learning; Sport Disability; AREK; Safety Swimming

Abstract

AREK, or Asistif Rompi Elektronik Kambang, is a safety tool for blind people to help them swim and exercise. Blind people have so many problems with swimming exercises. They can sink or be guided in the middle of training. AREK can give the entry-level blind swimmer a GPS-like system that is safe from sinking incidents and accidents. Trainers can only make close contact with swimmers during the COVID-19 pandemic with a safety system and GPS guide. Level-blind swimmers can train safely in the middle of the swimming pool. Especially for students who experience special needs. The approach used is Research and Development (R&D). Products using the ADDIE process remain one of the most effective tools today. Because the ADDIE model is a process that serves as a guiding framework for complex situations, it is appropriate to develop AREK to be more accessible to learners' diverse characteristics and special needs. The results in this study using AREK are very feasible, with a feasibility test by two validators with a result of 3.25 and tested by 15 blind vocational students with a result of 3.58. The conclusion is that the development of learning models is stated to be usable in blind and decent vocational students.

✉ Correspondence:
Jl. Lidah Wetan, Lidah Wetan, Kec. Lakarsantri, Surabaya, Jawa Timur, Indonesia 60213
E-mail: fakhrifauzi12@students.unnes.ac.id

p-ISSN 2339-0344
e-ISSN 2503-2305

INTRODUCTION

Students with special needs are citizens with the same right to access education at all types and levels, including higher education (Bahri S., 2022). Law Number 20 of 2003 concerning the National Education System, among other things, has mandated that every citizen with physical, mental, emotional, and social disabilities has the right to receive special education (Article 5). Special education is provided for citizens with learning obstacles due to physical, mental, emotional, and social disorders and citizens with extraordinary intelligence and talent potential, organized inclusively or in special education units (Saputra A., 2016). Thus, the right to obtain quality education for every citizen, including students with special needs, has been stated and protected by law. Education is a fundamental right for every person—from the elementary to the tertiary level.

Higher education aims to develop students' potential to become faithful and devoted to God Almighty, with a noble character, healthy, knowledgeable, capable, creative, independent, skilled, competent, and cultured for the nation's benefit (Simatupang et al., 2021). For this reason, education must be opened as widely as possible to all sons of the nation so that they can utilize and enjoy education well, moderately, and evenly throughout the country. However, access to education—significantly higher education—is only sometimes available evenly throughout the country. In certain circumstances, access to higher education is minimal. Limited access can be caused by infrastructure, geographical location, economic growth, natural disasters, socio-cultural conditions, and particular historical backgrounds experienced by a group.

Persons with disabilities have the right to receive quality education in educational units of all types, pathways, and levels in an inclusive and particular manner (Al Faiq, M. F., & Suryaningsi, S. 2021). The Center for Disability Studies and Services (PSLD) at Surabaya State University is a forum for empowering student volunteers with the main task of assisting students with special needs and disabilities to minimize obstacles in completing their studies at Unesa. Furthermore, through this PSLD, Unesa carries out many activities related to inclusive and special education services through collaboration with several domestic and foreign institutions. This effort is in line with Unesa's strategic plan in the field of research and community service while taking into account the readiness and availability of existing human resources and supporting equipment, as well as in order to improve services and answer community demands related to expanding access and improving the quality of education for students with needs, especially in Indonesia.

Sport is a form of physical activity that is very popular today. Sports involve individuals or sports carried out by groups to carry out physical activities. Sport for people with disabilities is used as a medium to develop their potential and talents, remembering that every human being, apart from having weaknesses, also has strengths, abilities, and uniqueness (Wijayanti, 2016). Sports activities do not require many requirements, and everyone has the right to participate, including people with disabilities. Sports media will help people with disabilities explore their hidden sporting talents and abilities so that they can actualize themselves.

METHODOLOGY

The approach used is Research and Development (R&D). Research and development is a process used to develop educational products that can be accounted for. The model chosen is the ADDIE (Analysis-Design-Develop-Implementation Evaluate) model. The ADDIE model is a systematic model used for development. According to Branch (2009:2), making products using the ADDIE process remains one of the most effective tools today. Because the ADDIE model is a process that functions as a guiding framework for complex situations, it is appropriate to develop AREK to be more accessible to students with diverse characteristics and special needs. The ADDIE model can be described as follows:

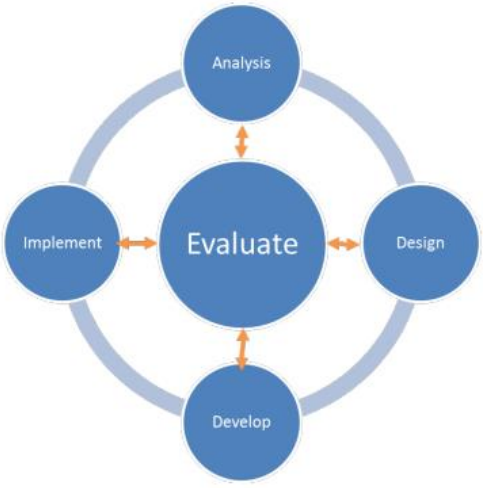

Figure 1. Model ADDIE (Branch, 2009)

Procedures

This research begins with a needs analysis related to the product to be developed, namely a needs analysis for students with disabilities, especially those who are blind, regarding swimming sports activities. After that, planning was carried out to make vests to help blind students swim. In this stage, a focus group discussion was held with experts who included experts in the fields of blindness, sports, and design. After careful planning, the development of the test, which was called AREK, was carried out. After the completion of development, AREK was tested. Applications at this stage can be run if the results of the expert test (feasibility test) and practicality test carried out by lecturers and student users meet the feasible and practical criteria. The next stage is evaluation; at this stage, an evaluation covers four levels: perception, learning behaviour, and results.

Setting

This research was carried out from September 2021 to February 2022. The location of this research was Surabaya State University, and it was carried out at the Unesa swimming pool. The subjects in this research were blind students at Surabaya State University, consisting of 15 people and two adaptive sports experts. These blind students are research subjects so they can exercise, especially swimming, using AREK vests, which will help blind students. Hopefully, this research will benefit blind students in improving their health and quality of life through swimming.

Research Instruments

The research instruments used in this research, especially in the evaluation stage, include the following points:

a. Student reactions: what they think and feel about the adapted AREK.
b. Learning: Students can take steps to solve the problems they face.
c. Behavior: level of behavior, Behavior and improvement, abilities, and implementation of AREK in learning.
d. Results: the impact produced after utilizing AREK in learning.

Data source

The data source in this research was 15 vocational students with disabilities as an experimental class.

Data validation

The validity used in this research is content and empirical validity. Content validity helps check the suitability of the research instrument developed and the instrument development indicators determined based on the research-dependent variables. Content validity is used to check learning tools and AREK questionnaires.

Data analysis technique

The data analysis technique for testing or feasibility of AREK products uses a sample t-test to determine whether AREK significantly affects the desire of blind students to take up swimming.

RESULTS AND DISCUSSION

AREK is a device in the form of a motorized vest that is used as a swimming training companion for blind beginners. Not only can the visually impaired benefit from AREK, but all categories of beginner swimmers and people new to swimming training will be helped by using AREK.

During the COVID-19 pandemic, coaches could not approach novice swimmers. Beginners who have just learned to swim have the potential

to experience problems during the training process, such as drowning and cramps. In this case, AREK has proven to overcome this with a safety vest system equipped with GPS and a motor that allows the user to stay afloat and be directed towards the pool's edge when something undesirable happens. Swimming vests that meet standards protect swimmers from unwanted problems (Ningrum, Anita Puspa., 2016). The buoy material must go through a durability, buoyancy, and density test to support better accessibility. Material selection is crucial for accessibility so users can float well just above the water surface (Putera, R. Rizqi Fasaldy & Rochmania; Azizati, 2021).

Smart life jackets that use long-range wireless data telemetry technology consist of two primary devices: a transmitter and a receiver. The transmitter device uses GPS neo-Ublox to obtain coordinate data from satellites. The data is then processed on the Arduino nano microcontroller and sent wirelessly to the receiver using the LoRa module in the form of longitude and latitude coordinates. The buoy on the jacket uses a pull switch mechanism, which causes the buoy to turn on automatically. This design can be connected within a distance of 1.05 km, provided there are no obstacles between the transmitter and receiver (Anas, Ikram., et al., 2023)

Research Result

1. Analysis At this stage, the researcher identifies the objectives of AREK development, determines product targets, and examines various theories related to online learning using AREK.
2. Design (Design) The design stage includes the following activities:
   a. Prepare an initial draft of AREK accessibility that will be developed. Prepare an initial draft of AREK, namely by creating an accessibility plan that will be developed. The initial draft was obtained through various references and the characteristics of children with special needs (disabilities).
   b. The evaluation tool created is a questionnaire with statement items with a choice of scores using a Likert scale. The evaluation tool created is also complete with a comment's column.
   c. System topology

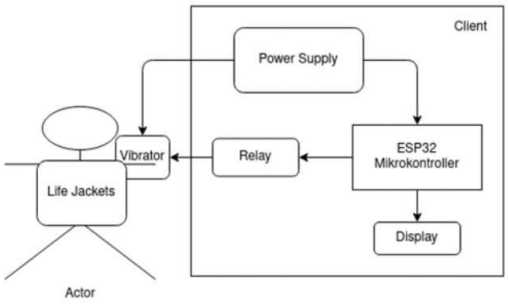

Figure 2. Topology System

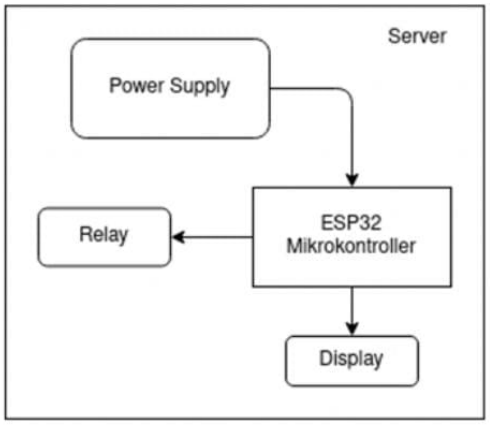

Figure 3. Topology System

3. Development At this stage, a more accessible and adaptive AREK that follows universal rules is developed. When the design is complete, a material expert evaluates it. At the development stage, formative evaluation was also carried out, including individual, small group, and field trials.

Figure 4. AREK Design

4. The fourth stage of R&D (research and development) using the ADDIE model is the implementation stage or application stage. Applications at this stage can be run if the results of the expert test (feasibility test) and practicality test carried out by lecturers and student users meet the feasible and practical criteria. Implementation is the stage of applying AREK to students with disabilities at the Faculty of Vocational Sports, with 15 vocational students with disabilities as the experimental class as respondents.
5. Evaluation At this stage, an evaluation covers four levels: perception, learning, behaviour, and results. Evaluation of the four levels: a. Student reactions: what they think and feel about the adapted AREK. b. Learning: Students can take steps to solve the problems they face. c. Behaviour: level of behaviour and improvement, abilities, implementation of AREK in learning. d. Results: The impact produced after utilising AREK in learning.

According to Kolmogorov Smirnov, the data normality test was carried out using IBM SPSS software. The results of the pre-test and post-test data normality tests for the experimental class and control class can be seen in the table below:

Table 1. Normality Test of AREK Effectiveness Questionnaire

Class		Sig. Kolmogorof-Smirnov[a]	Sig. Shapiro-Wilk
Pre-Test	Experiment	0.200	0.106
	Control	0.200	0.109
Post-Test	Experiment	0.200	0.556
	Control	0.200	0.216

Source: Calculation Results (2022)

Based on Table 1, it is known that the normality test for student career decision-making has the lowest significance (Sig.) value of the Kolmogorov-Smirnov normality test for the pre-test group of 0.106 > 0.05 and the post-test group of 0.216 > 0.05. The AREK feasibility test stage was carried out to determine whether the AREK being developed was feasible or needed improvement. Media experts carried out the AREK feasibility test to obtain input and criticism from validators regarding the product in the form of the AREK being developed. This stage is proven by filling out the response questionnaire, which shows that AREK is suitable for use in research. AREK feasibility test instrument developed in research.

The result of this development research is AREK. In this case, the process is done in stages to produce a viable AREK. Then, a series of validations are carried out by media experts, users, and the effectiveness of the users. Media Experts and users are validated directly in the field to obtain data for product revision in the form of AREK.

Discussions

Swimming for blind people can feel scary. This is because water will cover the listeners' senses, which they rely on. Of course, swimming training for blind people will be different. Several factors should be considered when offering swimming sessions to people with visual impairments. These sessions will help plan and ensure they will have a good experience. Below are some reviews of 10 tips for teaching or training the basics of swimming.

1. Introduce Yourself
   The first swimming exercise for disabled people, especially blind people, is to introduce yourself. Introduce yourself as a coach and tell them your name. Do it more than once, which helps get them used to your voice.
2. Introduce Features
   After introducing yourself, introduce several physical and AREK features that can be used as a swimmer reference. For example, introduce a route or road on how they can find the meeting point to the pool entry point. Apart from that, introduce a pool ladder, where the ladder functions to help them when they want to get into or out of the pool. Introducing some of the features in the pool will be very helpful for them. This is a

form of basic swimming training for people with disabilities.

3. Verbalisation of Body Language
   The next training trick is to verbalise body language. Some blind swimmers cannot read facial expressions or make eye contact. You should call their name or touch the side of their arm lightly. This is useful to indicate that you are talking to them specifically. This is something to remember, especially if people speak in groups. Ensure someone with vision problems is included in the conversation or knows you are referring to them. This is essential, as basic swimming training is for people with disabilities.
4. Treat Like a Normal Person
   Treating them like ordinary people will make them feel confident and not feel left out or inferior. This will also foster feelings of joy and respect. When giving initial instructions before a session, remember to make the most of your language. You must explain something in more words than you would when teaching a sighted person.
5. Introducing Water
   The following swimming exercise for visually impaired people introduces them to water. Introduce them to water in many ways, depending on each individual. If you are afraid of too much water, you can help by dipping your feet in the water first. When they are used to it, slowly bring them into the water. Remember, use shallow water pools to introduce them to water.
6. Train your legs
   This leg exercise can be done in a shallow pool. Check whether the leg exercises with the head or upper body remain on the water's surface. This is useful for reducing their panic when entering the water.
7. Exercise with assistive devices
   The most crucial training technique for beginners is to keep your head above the water. If the leg training has been done, the next step is leg training using assistive equipment. The tool commonly used is fin. This open-heel fin or frog leg is more straightforward to help swimmers keep their heads above the water. This open-heel fin is used so that when swimming, your feet move more quickly.
8. Upper Body Workout
   Swimming for disabled people, especially blind people, involves training the upper body. To train the upper body of some beginners, the trainer provides hand floats made of plastic. This type of buoy only sinks slowly because the base material is light plastic. This tool helps swimmers maintain upper-body balance. If the training participants are fluent in this flotation device, moving and carrying their bodies in the water will be easier.
9. Breathing Exercises
   After upper body training, the participants then do breathe exercises. The breathing exercises here are done in a shallow pool, of course. This is to anticipate panic when putting your head into the water. A blind person will indeed have a higher sensitivity to analysing the environment. Because it is susceptible, it is necessary to be slow in teaching each training step. Voice is essential when teaching a technique, so give precise and clear directions when giving directions. The swimming breathing training steps here are like learning to swim for regular swimming beginners.
10. Learn to Swim
    For blind swimmers, the most important thing is sound, so initially, the coach must be near the swimmer who will glide and move. Always direct the swimmer with a loud voice when the swimmer is going in the wrong direction. The use of pool barriers will be beneficial in directing blind swimmers.

One of the most essential things in teaching the basics of swimming to people with disabilities is proper explanation. This will apply to all swimming participants with disabilities, not just the visually impaired. Apart from that, as accompaniment for beginners, each training participant is accompanied by a companion or trainer.

Test results on a 1.5-meter swimming pool show excellent effectiveness. The desired accessibility and objectives at this depth are

maximally achieved. This is because the pool height is close to the average height of Indonesians, so when problems occur, AREK users are very responsive and can provide directions as desired.

Test results at a 2–2.7 m depth show that AREK has not demonstrated optimal performance. The system often provides inappropriate feedback, so trainers must continue supervising users. Safety guards also show less effectiveness in mitigating users who experience undesirable things in the middle of the swimming pool. Errors indicate that the system is imperfect and that the floats must be fixed.

The test results at a system depth of 2.8–3.4 metres showed several random errors beyond the researchers' expectations. So, AREK needs more feedback, and further development must be done. This results in a responsive system and a more flexible AREK topology for each pond depth.

The system topology uses an open-loop system, so it does not require any feedback from outside. With this, a more straightforward and effective system design can be achieved. Open-loop systems also minimise production and design costs. The simple topology makes the component assembly process more accessible. However, the open loop system topology prevents the system from integrating appropriate output when undesirable things happen (Habiba, Nur., 2020).

Very complex learning media, one of which is AREK, can be used in the learning process. Learning using AREK will be more effective, efficient, and relevant. In the learning process using AREK, students are required to learn independently and be able to solve problems (Sari et al., 2016, p. 136)—validation of material experts, who are experts in the vocational field of food presentation processing. The results of material expert validation based on the content feasibility aspect got a score of 4.68 with very decent criteria, the presentation feasibility aspect got a score of 4.67 with very decent criteria, the linguistic feasibility aspect got a score of 4.76 with very decent criteria, the contextual scoring aspect got an average score of 4.70 with very decent criteria, and the average of all aspects of the material validity test obtained a score of 4.70 with very decent criteria.

Based on the AREK effectiveness test stage. The independent sample test table shows that it can be concluded that the experimental class and control class are the same or homogeneous before being treated using AREK media. In this study, the data was distributed after being tested, and the conclusion is quite effective and significant.

CONCLUSION

The design stage includes preparing the module framework, collecting and selecting references, designing the module, and preparing the module assessment instrument. The development stage includes AREK development, validation by media and material experts, user validation, revisions prepared according to validator input, and developing instruments to test AREK's effectiveness. The implementation stage includes a test in the experimental and control classes and a post-test in the experimental and control classes. This research has two evaluation stages, including an interactive evaluation related to the module feasibility test carried out by two media experts and the module practicality test in the context of AREK revision. The following evaluation, namely a summative evaluation, was carried out for AREK.

The open loop system applied to AREK provides a load that is too high when faced with a swimming pool with a depth of more than 2.5 m, so errors and missed responses are found in the system. The floats applied are also less effective in supporting the user's body weight at pool depths of more than 2.5 m. So, it still needs a reset and further development in the future.

ACKNOWLEDGEMENT

The entire team is from Surabaya State University, collaborating with two faculties, namely the Faculty of Education and the Faculty of Vocational Studies.

REFERENCES

Al Faiq, M. F., & Suryaningsi, S. (2021). Hak Anak Penyandang Disabilitas untuk Sekolah. Nomos: Jurnal Penelitian Ilmu Hukum, 1(2), 44-50.

Bahri, S. (2022). Manajemen Pendidikan Inklusi di Sekolah Dasar. Edukatif: Jurnal Ilmu Pendidikan, 4(1), 94-100. Depdiknas. (2000). Pendidikan Jasmani. Jakarta: Balai Pustaka.

Putera, R. R. F., & Rochmania, A. (2022). Peningkatan Rasa Percaya Diri Penyandang Disabilitas Netra Melalui Pembelajaran Olahraga Renang di SLB Yasmin Sumenep. Jurnal Prestasi Olahraga, 5(7), 28-32.

Novita Ludvy (2009). Pengaruh latihan lari aerobic dan renang terhadap peningkatan kebugaran. Skripsi. UNS: Surakarta.

Nur Habiba (2020). *Control Aplication*. Jurnal UNSRI Kendali dan Robotika.

Saputra, A. (2016). Kebijakan pemerintah terhadap pendidikan inklusif. Golden Age: Jurnal Ilmiah Tumbuh Kembang Anak Usia Dini, 1(3), 1-15. Simatupang, E., & Yuhertiana, I. (2021). Merdeka belajar kampus merdeka terhadap perubahan paradigma pembelajaran pada pendidikan tinggi: Sebuah tinjauan literatur. Jurnal Bisnis, Manajemen, Dan Ekonomi, 2(2), 30-38.

Siregar, A. H., & Prayitno, S. (2021). Pengembangan Material Neoprene untuk Rompi Pelampung yang Ergonomis. Jurnal Teknologi dan Inovasi Industri (JTII), 2(1).

Wijayanti, D. G. S., Soegiyanto, S., & Nasuka, N. (2016). Pembinaan Olahraga Untuk Penyandang Disabilitas Di National Paralympic Committee Salatiga. Journal of Physical Education and Sports, 5(1), 17-23.

Yunita, E. I., Suneki, S., & Wakhyudin, H. (2019). Manajemen pendidikan inklusi dalam proses pembelajaran dan penanganan guru terhadap anak berkebutuhan khusus. International Journal of Elementary Education, 3(3), 267-274.