Green Technopreneur for People With Disability Using Technology Assistive

Bayu Rahmat Setiadi [1], Angga Damayanto [2], Anggi Tias Pratama [3]

[1] *Faculty of Engineering, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia*
[2] *Faculty of Education and Psychology, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia*
[3] *Faculty of Mathematics and Sciences, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia*

Abstract **– This study aims to develop green technopreneurs in 20 members of Mitra Handayani's Disabled Persons' Organization (DPO) based on assistive technology. Development is directed at the ability of people with disabilities to see the potential of nature, namely Tectona grandis leaf waste, the use of assistive technology, and application through green technopreneur training. This study used a mixed methods approach. The first method is quantitative to test the utilization of Tectona grandis leaf waste, the second is research and development, and the third is an experiment with one shoot case study. The results showed that using assistive technology in people with disabilities can make it easier for them to apply green technopreneur when making dyes from Tectona grandis leaf waste, applying assistive technology, and training of green technopreneur. This research helps provide alternative solutions for empowering people with disabilities through green technology to improve their economy and quality of life.**

Keywords **– Green technopreneur, people with disabilities, green technology, assistive technology.**

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Corresponding author: Bayu Rahmat Setiadi,
Faculty of Engineering, Universitas Negeri Yogyakarta, Yogyakarta, Indonesia
Email: bayursetiadi@uny.ac.id

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1. Introduction

Based on data from the Central Statistics Agency (BPS), it is known that there is around 7.6 million people with disabilities in Indonesia of productive age who work out of a total of 17 million [1]. In Gunungkidul Regency in 2020, there were more than 7.5 thousand people with disabilities, most of whom were below the poverty line [2], [3]. Access to work and employment ability of people with disabilities are still considered low by various job service providers [5], [6]. Given the hope of becoming an independent disabled individual capable of improving quality of life, much must be done to ensure that no person with a disability is left behind in accessing services or support [7], [8], [9] to improve technopreneur skills. However, the job opportunities that must be given to people with disabilities have not been maximally realized. One of the reasons is the lack of maximum use of assistive technology. Thus, people with disabilities still struggle to become independent in becoming entrepreneurs and even technopreneurs.

Assistive technology is a tool designed to fit and make it easier for someone with specific situations. Assistive technology is created using instruments and related systems and services adapted to various disability conditions to produce technological adaptations that can improve the functioning of a person or child with a disability [10], [11], [12]. Assistive technology refers to the range of devices and services used to help people make it easier to perform their daily activities and achieve a higher quality of life [13]. Assistive technology should be created with practical support [14] to generate important behavioral and social benefits for users to reduce the negative impact of their disability and support them to become successful and sustainable technopreneurs.

A sustainable technopreneur, along with having expertise in technology, must also be able to use their abilities to utilize and maintain what is around them. The concept of green technopreneur is one step to run both capabilities. Green technopreneurs commit to environmental conservation by optimizing the environment [15], [16], [17].

Gunungkidul Regency has abundant natural potential, namely teak trees (Tectona grandis). Tectona grandis is the largest commodity in Gunungkidul Regency. The teak forest area in Gunungkidul Regency is 12,914 ha [17].

Rejosari Village is a partner village that is overgrown with teak trees. This village is surrounded by a forestry area of 540 ha consisting of teak wood 50 ha, acacia 300 ha, and mahogany 90 ha forests [18]. Residential land with a percentage of 20% agricultural land, 40%, and 40% forestry area makes Rejosari Village have enough greening potential to be developed by the surrounding community, including people with disabilities.

The development of entrepreneurial skills in the field of creative industries for people with disabilities in Rejosari Village has been carried out since 2015 by the Disabled Persons' Organization (DPO), known as the Association of People with Disabilities Mitra Handayani. Mitra Handayani has 20 members: people with disabilities and parents with children with disabilities. Until now, Mitra Handayani members have not been able to optimize the potential of Tectona grandis waste into various products that can be of economic value. In fact, with the abundant potential of Tectona grandis, owned by Rejosari Village, it can be optimized as one of the coloring materials because one of the natural sources that has benefits is natural coloring by providing a variety of colors ranging from purplish red to yellow-brown [19]. Young teak leaves have anthocyanin compounds that can give red, purple, and dark red colors to give purple color to fabrics or threads [20]. In recent years, batik craftsmen have developed ecoprint techniques for plant coloring because the process is environmentally friendly [21].

This research will focus on developing green technopreneurs for people with disabilities who are members of Mitra Handayani based on assistive technology. The goal is to make Mitra Handayani a Project Pilot to strengthen entrepreneurial skills through green technopreneur as one of the solutions to improve the quality of life of people with disabilities.

2. Methodology

The study uses a mixture of three combined methods. In using Tectona grandis leaf waste, quantitative research is used as an experimentation process for testing the extraction of Tectona grandis leaf waste. The method of developing dye machines uses a qualitative approach. The method of applying green technology uses a quantitative approach through a shoot case study through pretest and post-test. The number of samples used by research respondents was 20 people.

Data collection techniques refer to the research objectives to be achieved in experiments using observation to determine the potential of the environment around DPO and the condition of people with disabilities; and testing ethanol concentration in Tectona grandis waste extract to find out what percentage of ethanol content is needed to bring out the best color in Tectona grandis leaf waste.For dye machine products, testing is carried out through analysis and simulation of techniques and functional tests of tools based on technological accessibility and acceptability. Justification of the achievement of understanding of green technopreneur trainees was collected with a self-perception questionnaire on implementing the training program.

The data analysis technique used in this study was descriptive analysis. This analysis refers to the results of observations, programming simulations, functional tests, and assessment of the average and percentage of pretest and post-test.

3. Results and Discussion

After making observations related to the environmental potential and condition of people with disabilities who are members of Mitra Handayani; trial of ethanol concentration in Tectona grandis leaf waste; And designing dye machines that are accessible and adjusted to the results of the need assessment to users, we get 3 important points that are our concern. The three points are: Utilizing Tectona Grandis Leaf Waste as a Green Skill; Accessible, Green-Based Assistive Technology for People with Disabilities; and Green Technopreneur Training as a Strengthening of the Capacity of People with Disabilities. We really hope that these three points can provide new insights to readers in future research. The following is a breakdown of each of our findings:

3.1. Utilizing Tectona Grandis Leaf Waste as a Green Skill

The understanding of people with disabilities about green knowledge of a technopreneur can be realized through natural coloring training. One example applied is using Tectona grandis leaf waste as a lesson for people with disabilities in using high-value waste.

Tectona grandis is a unique tree widely found in Gunungkidul Regency, especially in the research area. Based on observations and laboratory tests, the leaves of Tectona grandis have large leaf characteristics, which shed in the dry season with generally large, ovate inverted, opposite, with very short peduncles. The leaves on saplings are large, about 60-70 cm × 80-100 cm, while in old trees shrink to about 15 × 20 cm. Fresh Tectona grandis leaves have a moisture content of 8%, ethanol-soluble juice content of 8.1%, and water-soluble juice content of 6.2%. The total ash content was 5.1%, the water-soluble ash content was 1.3%, and the acid-insoluble ash content was 3.2%. Phytochemical screening of teak leaves shows that these leaves contain flavonoids, saponins, gallic tannins, cathectic tannins, quinones, and steroids/triterpenoids.

Support for the potential characteristics of Tectona grandis leaves can be optimized by equipping people with disabilities to take advantage of it. They started with the collection of leaf waste and the implementation of the extraction process. People with disabilities are directly involved in the process so that they understand the extraction work process. The steps of the extraction process to explore natural dyes carried out on a laboratory scale are as follows:

a. Cut the leaves of Tectona grandis into small sizes, then the material can be dried and extracted. Take the piece weighing 1000 gr.
b. Put the pieces in a saucepan, than add water in a ratio of 1:10.

c. Boil the ingredients until the volume of water is halved (5 liters). As the color pigment in the plant has come out, it is indicated by water after boiling to become colored. If the solution remains clear, the plant almost does not contain color pigments.
d. Filter with using gauze the solution from the extraction process to separate it from the remaining extracted material (residue). This filtered extract solution is called a natural dye solution. After cooling, the solution is ready for use.

(a)

(b)

(c)

Figure 1. Extraction process of Tectona grandis waste (a) Tectona grandis leaf waste; (b) the result of the description; and (c) extraction fluid

3.2. Accessible, Green-based Assistive Technology for People with Disabilities

Assistive technology in accessible coloring techniques begins with conducting a user need assessment. This method determines the standardized size according to the needs of disabled workers. This reference refers to the Regulation of the Minister of Public Works of the Republic of Indonesia Number: 30 / PRT / M / 2006 concerning Technical Guidelines for Facilities and Accessibility in Buildings and the Environment that the recommended height for wheelchair users is 90 cm plus clearance of 20 cm, and a hand reach distance of 150 cm.

Based on the analysis results, user interviews, and literature reviews related to the standardization of wheelchair workers' work, these initial data are used as initial design materials. The design process begins with initial planning through sketching, model embodiment, design optimization, and prototyping.

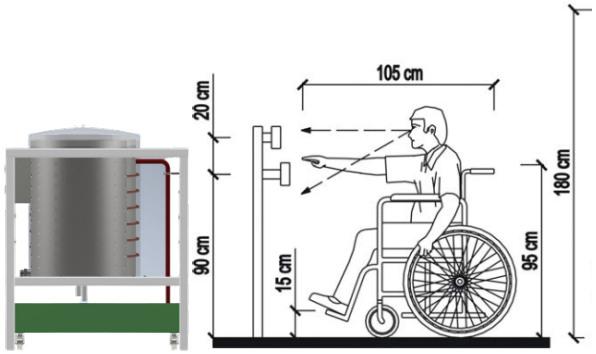

Figure 2. The height of accessible dye machine technology for people with disabilities

The design presented in Figure 2 is further embodied in the machine prototype. The prototype of the dye machine adapts to the accessibility of people with disabilities. Acceptability is proven by their conducting product feasibility tests through coloring testing where test results were obtained based on operation and compliance with worker ergonomics. Product feasibility assessment is taken based on the perception of users with disabilities when conducting machine operation training. A total of 20 people were involved as users in the functional trials of the machine. The overall assessment results are summarized in Table 1 below.

Table 1. Functional test measurement results

Variable	Measurement Indicators	Success Percentage
Technology accessibility	Machine height with wheelchair sitting position	88%
	Arm distance to the bottom of the dye tube	76%
	Access to use machine operation buttons	100%
	The trajectory of technology use	80%
Acceptance of the use of technology	Ease of turning the machine on and off	96%
	Ease of machine maintenance	65%
	Compatibility between needs and assistive technology	90%

Based on the functional test results in Table 1, the overall percentage is 85%. In addition, there is still a low score, namely the implementation of machine maintenance.

The condition of the components is quite a lot in order to make them (especially disabled) difficult in disassembling [22]. The physical limitation of seeing the deepest parts of a machine requires the help of others.

3.3. Green Technopreneur Training as a Strengthening of the Capacity of People with Disabilities

Strengthening the capacity of persons with disabilities can be expanded by encouraging them to attend training [4]. Training can make them more confident, independent, creative, and innovative in implementing their green experience in their entrepreneurial activities. Green technopreneur training emphasizes three aspects: green technopreneur knowledge and application, green technology-based business marketing knowledge, and business diversification based on green technopreneur trends.

The research respondents used in this sub-study were the same people in various activities ranging from coloring, machine use, and strengthening self-capacity. The research phase is carried out by conducting a pretest before the training (Figure 3), providing self-capacity strengthening training, and conducting a post-test at the end (Figure 4).

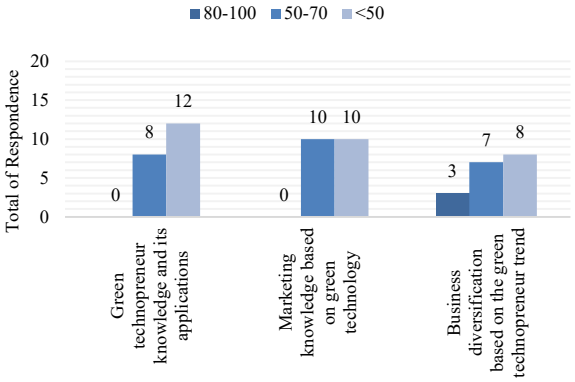

Figure 2. Pretest results of respondents' self-capacity before green technopreneur training

Figure 2 explains that the initial condition of many trainees (people with disabilities) still does not understand how to optimize their capacity to explore more about green technopreneurs. Their educational backgrounds are six elementary school graduates, eight junior high school graduates, and six high school graduates.

To increase the capacity of people with disabilities as green technopreneur actors, people with disabilities who are members of Mitra Handayani are involved in training participants. The implementation of green technopreneur training and mentoring was carried out for three consecutive days. Based on the observations of researchers, the activeness of trainees increasingly shows positive behavior. Overall, understanding related to green technopreneurs began to be accepted and applied in their respective fields of work. After attending the training, participants filled out a self-evaluation questionnaire that measured progress related to three main things measured by researchers. Figure 3 below is the post-test progress value of self-capacity trainees.

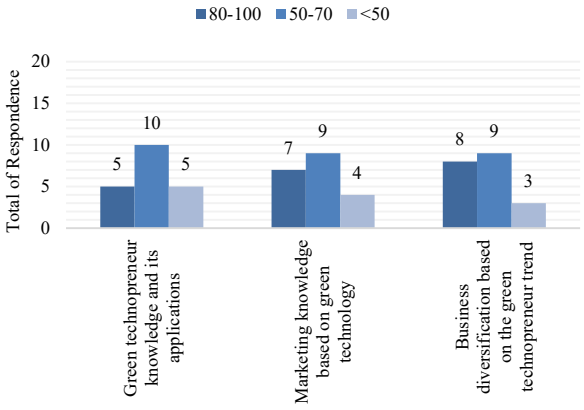

Figure 3. Post-test results of respondents' self-capacity after green technopreneur training

Based on the results of the post-test analysis, there was a significant increase before the training. People with disabilities have demonstrated the transformation of good green technology skills as part of assistive technology. The difference analysis results before and after showed a significant value of 0.008 with a substantial correlation of 0.593. This shows a strong relationship when green technopreneur training is given so that the self-capacity of people with disabilities increases significantly.

4. Conclusion

Based on the variance of data and analysis obtained, it can be concluded that using green technopreneurs for people with disabilities is important to study. Initial understanding of managing Tectona grandis leaf waste into natural dyes that environment-based entrepreneurs can utilize. The application of Tectona grandis leaf waste dyeing technology is carried out using accessible machine design and construction for people with disabilities. It increased the understanding and capacity of people with disabilities in learning and applying green technopreneurs. These three small targets greatly benefit from building a green technopreneur spirit that prioritizes inclusivity in everything. The results of research and findings in the field can have implications for all people with disabilities to be sensitive to the potential and landscapes that have the attraction for productive and independent entrepreneurship.

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