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Training and Mentoring Interior Production Based on CNC Router at Miftahul Huda Al-Burhani Islamic Boarding School Plered Purwakarta

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ABSTRACT

Miftahul Huda Al-Burhani Islamic Boarding School is one of the Islamic boarding schools that teaches religious knowledge, especially yellow books, also teaches agricultural, livestock, and fisheries knowledge as well as specialization/skill education in the form of interior skills. The interior business unit under the head of the Islamic boarding school business management has produced interior products made of multiplex and HPL which are produced and marketed conventionally. Through community service activities (PKM) it seeks to help improve the production sector in terms of product diversity and the marketing sector in terms of the ability to design marketing strategies. The method used in solving partner problems in the production sector is providing appropriate CNC Router technology in the production process and training in design applications using Vetric Aspire and implementation using CNC Router. The completion of the marketing sector is carried out training in creating marketing tools using Canva and creating online marketing media such as on YouTube, TikTok, and creating online stores on Tokopedia, Shopee so that market reach becomes wider. The targeted output of this activity is product diversity and increased ability to design marketing strategies. The results obtained are the ability to innovate in making carved products, calligraphy, and others using CNC Router machines and the ability to create product catalogs using Canva.

A. INTRODUCTION

Purwakarta Regency is a regency in West Java with 17 sub-districts and 192 villages/sub-districts, geographically located between 107030' – 107040' east longitude and 6025'-6045' south latitude. Located 80km east of Jakarta City with an area of 971.72 km2 with the northern boundary being Karawang and Subang Regencies, the southern boundary being West Bandung and Cianjur Regencies, the western boundary being Karawang, Cianjur, and Bogor Regencies, and finally the eastern boundary being Subang and West Bandung Regencies. The population is around 1.05 million people in 2024. Viewed from the employment aspect, the population aged 15 years and over is 794,407 people, with 529,236 in the workforce and 265,171 not in the workforce. The labor force participation rate is 66.62% while the open unemployment rate is 7.34%, job seekers are 18,724 people (15,505 high school

and equivalent, 186 academy, 868 university) and as many as 1,422 people will be placed in work in 2024(Bps-statistics Purwakarta, 2025). The main economic sources of Purwakarta Regency are dominated by the processing industry, trade, agriculture, and fisheries sectors. Wood production, especially carpentry wood, is dominated by teak and jungle wood, amounting to 4,712.13 m3 and 2,981.11 m3 in 2013(Bps-statistics Purwakarta, 2025)(Purwakarta, 2015). The processing industry sector is the largest contributor to the Gross Regional Domestic Product of Purwakarta Regency with an average dominance of around 58.16% in the last 12 months(Pers Kemenperind, 2024).

Regional development planning requires information on the potential of a region's leading sectors. The availability of this information can facilitate development planners in developing more targeted development strategies and policies(Sudiyarti & Darmansyah, 2023). The activity was carried out at the Miftahul Huda Al-Burhani Islamic Boarding School in Tegal Jati Village, RT.19/RW.10, Cibogo Hilir Village, Plered District, Purwakarta Regency, West Java. In addition to religious education, the Islamic boarding school also provides skills in agriculture, animal husbandry, fisheries, and specialization/skill education, namely interior and furniture making, which is currently running conventionally through its business unit(Burhani, 2025). The problems currently faced by partners are the lack of knowledge and equipment used, business units carry out conventional production processes where the design and execution processes in the field are still manual, impacting production time(Seftianingsih, 2018), there is no optimal use of technology (Hardianningrum et al., 2025)(Aprizal et al., 2023).

Miftahul Huda Islamic Boarding School has a business unit with the chairman of the Islamic boarding school business management, M. Hilman Aziz Napis, in the interior production process involving many students and alumni who currently produce interior products made of multiplex and HPL (high pressure laminate) such as: kitchen sets, backdrops, tables, chairs, cupboards using production equipment such as multiplex cutting machines, saws, hammers, chisels(Previari Umi Pramesti et al., 2022). Through this community service activity, partners were introduced to the use of CNC Router machines for cutting and carving wood so as to improve the production process and diversify products. Based on existing conditions, there are two problems faced, namely the production and marketing sectors. The production sector is related to the slow and imprecise cutting process as a result of the production process which is still conventional and the types of products produced are still limited to multiplex and HPL materials. The marketing sector is related to known products which are limited to acquaintance relations and local customers and there is no online marketing using digital marketing and e-commerce(Harahap et al., 2021).

The purpose of this community service activity is to optimize the interior production process at the Miftahul Huda al-Burhani Islamic boarding school by improving skills and knowledge in creativity and innovation through the use of appropriate technology and information systems to increase product diversity while enhancing online marketing promotions. This activity is highly needed by partners in equipping their male and female students not only with religious knowledge but also skills that can be used as provisions for being able to work or become entrepreneurs.

B. METHOD

The methodology used in implementing this activity refers to the five stages of community service implementation: outreach, problem identification, problem solution analysis, application of science and technology, training and mentoring, and activity reporting and publication, including program sustainability, as depicted in the waterfall diagram in

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Figure 1. The target achievements that are the outputs of this activity are firstly the application of appropriate technology in the form of the implementation of a 3 Axis CNC Router machine used in the learning and production process, secondly the implementation of training for students and alumni so that they are able to design, simulate and realize interior carving and cutting products by utilizing the 3 Axis CNC Router machine obtained as shown in Table 2.

1. Outreach

This activity is the initial step in explaining the Community Service Program (PKM) activities issued by the government through the Directorate of Research and Community Service (DPPM), Directorate General of Research and Development, Ministry of Higher Education, Science, and Technology, specifically the Community-Based Empowerment Scheme, specifically the scope of community partnership empowerment. It is hoped that partners will gain an understanding and be motivated.

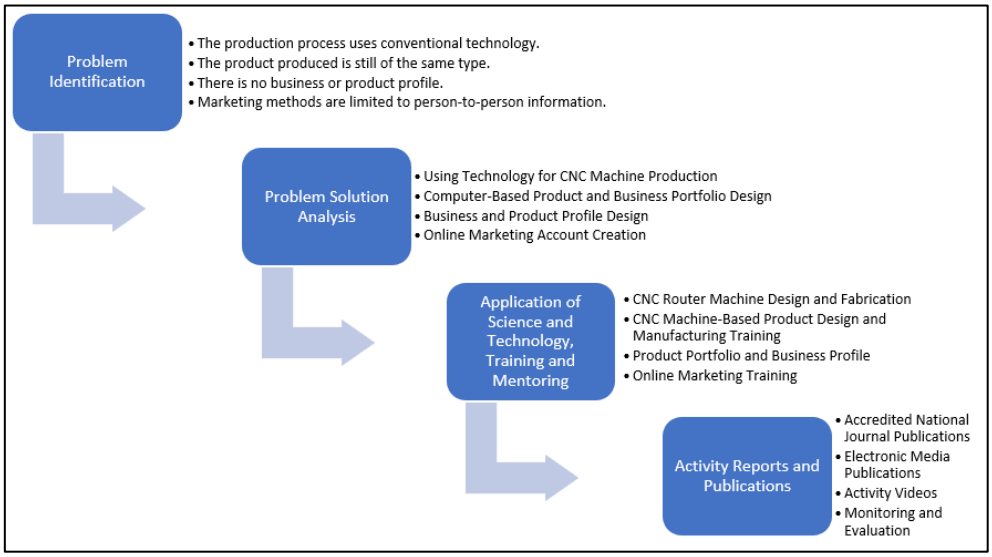

Figure 1. Flowchart of Community Service Activities

2. Identify and analyze problem solutions

Once partners understand this activity, they conduct a survey and observation of their production activities, discuss the problems they face, and analyze solutions to those problems. There are two aspects that partners face: production and marketing.

Table 1. Identification and Analysis of Problem Solutions

Problems	Identify Needs
Regarding the equipment used in the production process, the precision cutting process is limited to straight cutting and is carried out manually.	Additional devices that can perform cutting and even engraving based on pre-designed vector image designs.
The knowledge given to male and female students is currently still limited to the graphic design process and has not touched on the continuation of the production process by utilizing technology.	Training and workshop activities related to interior production knowledge and competencies using CNC technology.

The products that have been made have not been well documented, including the business profile.	Training and workshop activities related to creating a business portfolio and its products
Product marketing is limited to information from one person to another.	Training and workshop activities related to marketing through digital media and E-Commerce or online stores.

3. Application of science and technology, training, and mentoring

The application of science and technology, training, and mentoring emphasizes two aspects: production and marketing, with solutions and desired target outcomes as shown in Table 2.

Table 2. Problems, Solutions and Target Achievements

Problems	Solutions	Target Achievements
Current knowledge of interior and furniture production technology is limited to the production of interior and furniture based on multiplex boards coated with HPL, which is carried out using conventional equipment, so it is only able to produce standard interior and furniture products. This causes product variations and motifs to be limited to straight-shaped products and is not yet able to create carved motifs on its products due to limited equipment. Another deficiency in the production process is the precision of curved products which is also an obstacle faced, even though the production process already utilizes computer-based product design.	Dapat menghasilkan mesin CNC Router 3 Axis dengan biaya rendah menggunakan listrik 1 fasa yang mampu melakukan proses router terhadap material multipleks, MDF, Akrilik, ACP, PVC Board dan bahan lunak lainya. Serta kesiapan Santri dan Alumni yang terlibat dalam produksi untuk mengoperasikan dan membuat produk produk berbasis CNC Router melalui workshop dan pelatihan sehingga diperoleh diversitas produk.	Can produce a 3 Axis CNC Router machine at low cost using 1 phase electricity that is capable of performing the router process on multiplex, MDF, Acrylic, ACP, PVC Board and other soft materials. As well as the readiness of Students and Alumni involved in production to operate and make CNC Router-based products through workshops and training so that product diversity is obtained.
Marketing was conventional, relying on person-to-person information. Furthermore, the lack of marketing tools like product displays, company portfolios, and product portfolios made convincing consumers	Improving marketing tool development capabilities, such as business portfolios and product portfolios. Improving marketing capabilities using e-commerce platforms (Tokopedia, Shopee, and others) and online	Workshops and training on creating business and product portfolios using computers were conducted, along with an e-commerce account and online marketing platform for the Miftahul Huda Islamic

difficult. Marketing media was also underdeveloped due to limited knowledge.	marketing media (Tiktok, YouTube, and others).	Boarding School Business Unit. Business and product portfolios were created that can be used as marketing tools, and online sales platforms were created on Tokopedia, Shopee, TikTok, and YouTube.

4. Evaluation and reporting

During the PKM process, mentoring and evaluation of production and marketing activities are carried out, enabling partners to increase product diversification and improve their ability to design product marketing strategies.

5. Sustainability of Activities

The sustainability of this program, partnered with the Miftahul Huda Al-Burhani Plered Islamic Boarding School, is based on the diversification of its products and the ability to design marketing strategies. Continuous monitoring will be conducted periodically to monitor the ongoing process. If the partner requires assistance or new problems are identified, a new Community Service Program (PKM) activity will be created.

C. RESULTS AND DISCUSSION

The Community Service activity, themed "Training and Mentoring for CNC Router-Based Interior Production at the Miftahul Huda Al-Burhani Islamic Boarding School, Plered, Purwakarta," consisted of two activities: the creation of appropriate technology in the form of a 3-Axis CNC Router machine, including the creation of mechanical and electronic systems. The next activity was interior design training and simulation using Aspire V.9 software and implementation using a 3-Axis CNC machine with a MACH3 controller. The workshop involved lecturers, assisted by six students, at the home of Ustadz Hilman Azis Napis. The entire activity took place from September to December 2025.

1. Creating Appropriate Technology

The solution provided to the problems faced by partners is to provide appropriate technological equipment in the form of a CNC router machine equipped with several types of Router bits so that they can create and innovate to make products with the machine as well as training for students and alumni in the use of vetric aspire design software and CNC controller software Mach3. The design and results of the implementation of the CNC Router machine can be seen in Figure 2.

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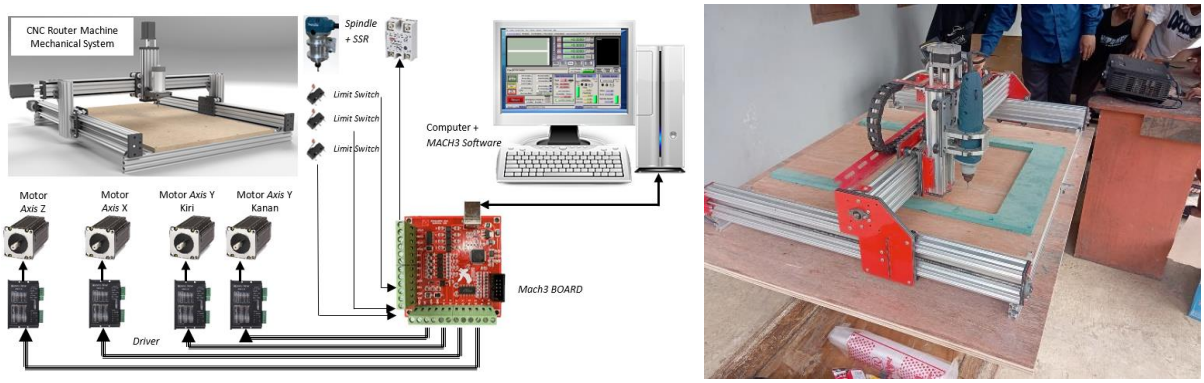

Figure 2. 3-Axis CNC Router

2. Design, Simulation and Implementation Training

Training and mentoring activities for students and alumni include training and operation of CNC Router machines starting from the design and simulation process using Vetric Aspire software. The output of this software is G-Code which will later be run on Mach3 software on the computer and the code is sent to the Mach3 Board to drive the stepper motor actuator on the X, Y, and Z axes so that the machine can implement the design and simulation results on MDF material. Training activities to improve the ability to design marketing strategies are training in creating business and product portfolio tools using Canva and creating online stores (Tokopedia and Shopee) as shown in Figure 3.

Figure 3. Introduction training on Product Design and CNC machine operation

The results of this PKM activity are that students and alumni are able to design and simulate carving and cutting products using vetric aspire v9.5 software which is then configured according to the needs of the toolpath type whether for graphics, carving, cutting which is adjusted to the available router bit. Before being implemented on a CNC router machine, participants are also taught the simulation process first and if it is appropriate, then convert the design into G-Code code. The G-Code code is then used as input when running the MACH3 software which will drive the CNC Router machine to do carving, cutting and others based on the commands in the G-Code code.

The impact obtained by partners from this activity is the production sector from the aspect of product diversity can be increased with more students and alumni who have the ability to design products and operate CNC Router machines so that the same standard of work results are obtained with the same accuracy which has an impact on the design time to implementation being faster. In the marketing sector, students and alumni can create marketing tools and market online by using an online store from the results of the participants' creativity so that the marketing reach becomes wider. This activity also received appreciation

and support from the parents of students with the hope that the independence of Islamic boarding schools and students can be realized.

D. CONCLUSION

Based on the results of the implementation of training and mentoring activities for interior production in the business unit of the Miftahul Huda Al-Burhani Islamic Boarding School located in Kp. Tegal Jati RT.19 / RW.10 Cibogo Hilir Village, Plered District, Purwakarta Regency, West Java, it has a positive impact on the Islamic boarding school and appreciation from the parents of students in solving problems in the production sector in terms of product diversity by having a 3 Axis CNC Router machine with a work area of 120x60cm with electricity consumption below 900W to implement products designed using Vetric Aspire and MACH3, in the marketing sector, the aspect of the ability to plan marketing strategies by using the ability to create business and product portfolios using Canva and conducting online marketing via YouTube, TikTok and online sales through online stores such as Tokopedia, Shopee and others.

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