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Strengthening 3D Model Design Learning by Utilizing Website-Based Onshape 3D to Improve the Competence of Students at SMKN Jateng in Semarang

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ABSTRACT

This community service is an implementation of science in the field of Design / Engineering, especially 3D object design. The Indonesian creative industry sees great opportunities with 3D design. This is closely related to the development of information technology that is increasing every year. Knowing how to create 3D objects will open up job opportunities for the current generation. In addition, it is also one way to attract scientific interests to the University level, especially in the Mechanical Engineering Department. In facing increasingly fierce global competition, it is very necessary The purpose of this community service program is to provide training in creating 3D objects to vocational school students because there is no comprehensive training on the process of creating 3D objects and their supporting tools. as an effort to improve design skills and also at the same time capture students' interests and talents to be able to learn early about one of the sciences in the Mechanical Engineering Department. 3D object design begins with how to create 3D objects with website-based Onshape3d. Onshape3d with a website was chosen because it is open source or free. Onshape3d's ability to create 3D objects and create 3D animations has long been recognized, because it is open source. To prevent creativity support from becoming a burden, it is hoped that this will become a source of innovation for participants. To assess the effectiveness of the training, student understanding was evaluated through Quizizz before the pre-test and after the post-test of the activity. The pre-test results showed that students' initial understanding of 3D design concepts and CAD software was still relatively low, with an average score of 45%. Their knowledge was still limited to the basic functions of modeling software. After the training, the post-test evaluation showed a significant improvement: the average score jumped to 76%, reflecting a better understanding of 3D design concepts and skills in using OnShape 3D.

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A. INTRODUCTION

With the development of information technology, more and more people understand how important computers are for their work. Currently, advances in computer technology have brought major changes in various fields, such as media, advertising, media, and culture (Maynard et al, 2005; Selwyn, 2007; Sun DW, 2016). The world of animation and design has developed along with the progress of information technology, not just computer desktop applications (Mahendra, 2016; Bentelu et al, 2016; Ulva, 2022; Cahyani, 2022; Fitrihana, 2022). As we know now, business needs are never limited, such as the need for visual communication. Television media, which can show moving images of the activities of living creatures, humans, or animals, has become popular since animation became very popular (Nengsi, 2015). Animation is preferred over still or motionless photos because it can arouse the enthusiasm and emotions of the audience (Rall, 2017; Staley, 2015). Animation techniques have existed in almost all media such as television, film, and computers. Because animation is a creative industry that requires a lot of labor, Indonesia has many opportunities for development (Limano, 2021; Dukut, 2019; Novani et al, 2023; Nurjati et al, 2020). In addition, the diversity and richness of Indonesian culture add additional value to animated stories (Rachmawati, 2023). 3D object creation training is provided to vocational school students to learn how to create 3D objects more easily. In designing 3D objects, various tools or software can be used, one of which is using the website-based Onshape3d (Ang et al, 2017). The Onshape3d 3D Design Program is widely used because it is open source or free. Website-based Onshape3d is widely used in the industrial world engaged in the design sector (Nasir et al, 2018; Villar, 2021; Plowman, 2016; Wong et al, 2015). In addition, Onshape3d is relatively easy to use because it displays attractive features for users (Hendriyani, Y; Amrizal, VA, 2019; Caudron et al, 2016). The screen display on Onshape3d can be seen in Figure 1. Onshape3d's capabilities in the design and rendering process are beyond doubt. The results of 3D object designs using Onshape3d can also be printed using 3D Print with accurate results (Ding et al, 2022; Van Mourik et al, 2014; Hosen et al 2019; Magdalena et al, 2021).

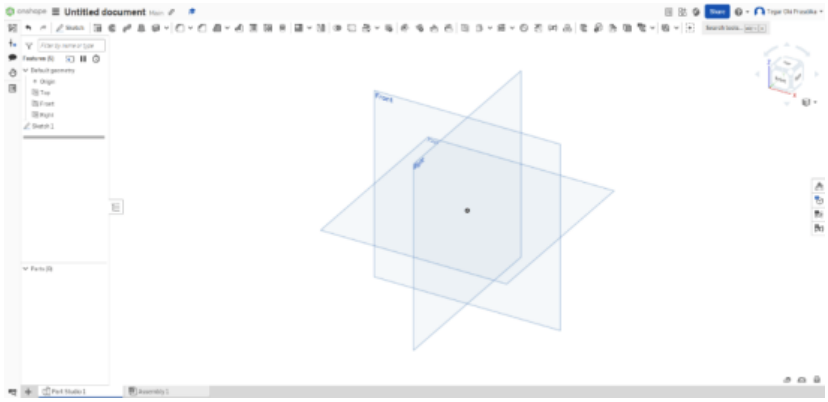

Figure 1. User interface at Onshape 3D

One of the vocational schools ready to support character education is SMK Negeri JATENG in Semarang which has a vision of Quality, Credible, Competent, and Character-Based Education (See Figure 2). This vocational school is located at Jl. Brotojoyo No. 1, Plombokan, North Semarang District, Semarang City, Central Java. SMKN Jateng in Semarang was established to increase the Gross Partition Rate (APK) and primarily to reduce poverty in Central Java through education. SMKN Jateng in Semarang uses a boarding system and students must come from underprivileged families from all over Central Java. Therefore, in the learning process, in order to produce competent and character-based graduates, SMKN

Jateng in Semarang, needs to improve student competencies, especially in designing a product or work that can be modeled.

Figure 2. SMKN Jateng Semarang

Based on discussions with the principal and teacher representatives at a Central Java State Vocational High School in Semarang via WhatsApp, many students still lack a clear understanding of their interests and talents. Vocational high school education should prepare students for their interests and prepare them for higher education. Furthermore, given the increasingly competitive workforce, students must develop not only hard skills but also soft skills. Therefore, specialized training is needed to enhance skills and prepare them for higher education (university). Furthermore, it can also serve as capital to open business opportunities (entrepreneurship) in relation to the competencies of students at a Central Java State Vocational High School in Semarang. According to one of the curriculum teachers at a Central Java State Vocational High School in Semarang, the potential that can still be explored in students is fostering their creativity. The vocational high school curriculum also needs to include training specifically to foster student creativity. For example, training in design that encompasses not only 2D but also 3D visuals. This is to enable students to hone their creative thinking, enabling them to compete after graduation at Central Java State Vocational Schools in Semarang. However, the challenge facing Central Java State Vocational Schools in Semarang is the lack of competent human resources to develop or provide design training to students. Therefore, this training activity presents an excellent opportunity.

PROBLEM

Based on discussions with partners, several factors hinder the development of student competencies, including:

1) Students at Central Java State Vocational Schools in Semarang do not yet understand their interests and talents, requiring stimulating activities in the form of training and workshops.
2) The lack of facilities at Central Java State Vocational Schools in Semarang, including adequate device specifications, can hinder the learning process in 3D model design.
3) Central Java State Vocational Schools in Semarang have limited educators proficient in the use of the latest technology software. Multimedia teachers must be proficient in using the latest technology software to create and design 3D object animations that align with technological advances.

4) Students are not yet aware of the vast career opportunities and opportunities for early learning to prepare for university, particularly in the Mechanical Engineering Department.

5) Central Java State Vocational Schools in Semarang lack adequate guidance and direction for learning 3D modeling, so students do not receive adequate support to help them understand 3D modeling design and animation. This situation can lead to students facing problems and difficulties while learning 3D modeling.

PROBLEM SOLUTION

Based on the partners' problems, concrete actions are needed to find solutions, as outlined in Table 1.

Table 1. Problem Solutions and Target Outcomes

No	Aspect	Problem	Solution	Assets to be Granted
1.	Curriculum	3D design materials have not been integrated with the use of web-based software	3D design materials have not been integrated with the use of web-based software	Onshape3D learning modules, syllabi, and lesson plans (RPP) should be tailored to the needs of vocational schools.
2.	Accessibility	Limited computer hardware and adequate specifications in schools	Ensure laboratory facilities are equipped with adequate equipment.	Computers/laptops with supporting specifications, and additional equipment such as projectors for presentations.
3.	Teacher Competence	Teachers lack mastery of web-based 3D design technologies like Onshape3D	Conduct workshops and training to improve teacher competency in using Onshape3D	Onshape3D training certification for teachers, training guides, and practice modules should be provided.
4.	Student Motivation	Lack of student motivation in learning 3D design due to perceived difficulty	Implement project-based learning methods that are engaging and relevant to industry needs	Project-based case studies, inspiring 3D design examples, and awards for students with the best results (certificates or prizes).

B. METHODS

This community service program is implemented using various methods to achieve the desired output targets effectively and efficiently. Some of the methods used include lectures, demonstrations, hands-on practice, and mentoring.

The choice of method is tailored to the material and objectives to be achieved. Informational or theoretical material is delivered through lectures or socialization. However, practical material, such as how to operate machinery or how to market products online, is delivered through demonstrations, hands-on practice, and mentoring with partner vocational schools in Central Java (Central Java) in Semarang.

1. Lectures

Theoretical material can be delivered through lectures. Theoretical material includes the reasons for learning web-based 3D modeling using Onshape3d, how to design a good model, what Onshape3d is, why use Onshape3d, how to use Onshape3d, and the advantages of web-based 3D modeling.

2. Demonstration

In this activity, the implementation team demonstrates how to use Onshape3d, including the tools used, how to use the features within Onshape3d, how to compose initial drawings, edit models, render models, and save models from Onshape3d.

3. Hands-On Practice

In this activity, students practice directly by preparing tools and materials, opening the Onshape3d webpage, creating an initial design, converting 2D to 3D, editing the model using Onshape3d, rendering the model, and saving the 3D model from Onshape3d. If any steps are not yet completed, ongoing mentoring is required.

4. Mentoring

The mentoring method is implemented with the target as a partner or subject. The implementation team acts as a mentor, with the intention of being the primary actor, so there is no dependence on the implementation team. Initially, they are given examples, instructed to practice, and finally, they are released, but still given supervision and guidance because they are still learning. Once they have achieved sufficient skills, they can be released so they can become independent. In other words, this activity is community empowerment with a bottom-up approach. Mentoring is provided through a WhatsApp group. This assistance aims to address teachers' challenges in creating 3D model designs using the web-based Onshape3d.

To determine the success of the community service program, an evaluation is conducted. The evaluation is conducted in three stages: before, during, and after the activity. The pre-activity evaluation serves as a comparison, reflecting the initial conditions of the activity partners, such as their knowledge, skills, and responses. The evaluation during the activity aims to determine the motivation and intensity of the target audience's involvement in the activity. The evaluation at the end of the activity is conducted to determine the extent to which the established activity objectives have been achieved. The benchmark for success is if the program's output targets related to the partners are achieved by at least 75 percent.

C. RESULTS AND DISCUSSION

The community service activities that have been carried out include providing reinforcement of 3D model design learning by utilizing website-based Onshape 3D to students of SMKN Jateng in Semarang. The team of lecturers provided training to improve student competency in the field of 3D design and at the same time to strengthen students' understanding of modern CAD technology that can be accessed online. This activity also serves as a means to capture student interest in the Mechanical Engineering department. Documentation of the activities can be seen in Figures 3, 4 and 5. As well as the visual appearance of the Website-based Onshape3D can be seen in Figure 6.

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Figure 3. Presentation of basic material on 3D object models to students of SMKN Jateng Semarang

Figure 4. Documentation of students and teachers at SMKN Jateng Semarang

(a) (b)

Figure 5. Documentation of the symbolic handover of souvenirs and training modules at SMKN Jateng Semarang: (a) Teacher Representatives, (b) Student Representatives

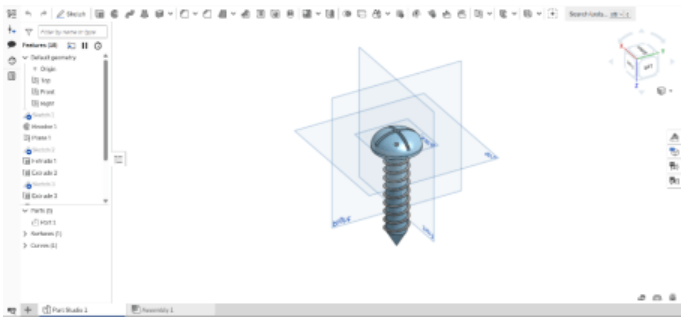


Figure 6. Onshape3D Website-based view for designing 3D model objects

Vocational high school students successfully mastered the use of the web-based OnShape3D platform and were able to independently design simple models. Their skills developed rapidly from understanding the Onshape3D interface, creating 2D sketches such as lines, circles, and other shapes, to transforming them into 3D objects using the extrude, revolve, and sweep features. They were even able to create a detailed screw model using the helix and sweep features, which require precision and a good understanding of 3D geometry. Their enthusiasm was clearly visible when experimenting with various tools and features, making the learning process feel more creative and interactive.

Implementing Onshape3D in 3D design learning offers several advantages over traditional software. First, this platform doesn't require high computer specifications because the entire design process is conducted online. Second, an automatic save system ensures every progress is secure without the risk of data loss. Third, flexible access from various devices, from computers to smartphones, allows students to design and review at any time. These advantages are clearly visible in Figure 7.

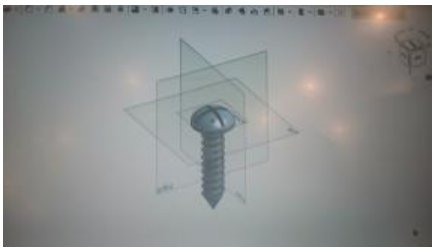
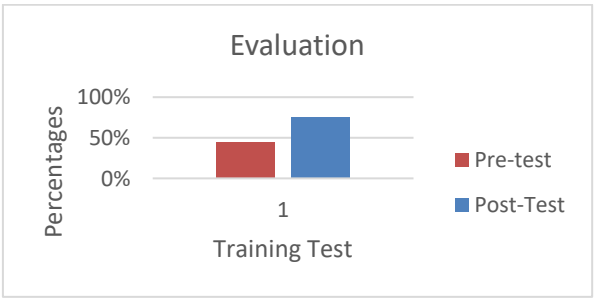


Figure 7. Documentation of the results of creating a 3D model object from one of the students

To assess the effectiveness of the training, students' understanding was evaluated through Quizizz before the pre-test and after the post-test of the activity. The pre-test results showed that students' initial understanding of 3D design concepts and CAD software was still relatively low, with an average score of 45%. Their knowledge was still limited to the basic functions of modeling software. After the training, the post-test evaluation showed a significant improvement: the average score jumped to 76%, reflecting a better understanding of 3D design concepts and skills in using OnShape 3D. A summary of these results can be seen in Table 2. In this case, vocational high school students were already able to operate Onshape 3D and create a simple model but needed further in-depth study to hone their skills in using web-based design at several more complex design levels.

Table 2. Table of Student Understanding



We then submitted an IPR for this community service activity in the form of a video documentary of the community service activity. The application process has been completed, and a Creation Registration Letter has been issued by the Minister of Law and Human Rights,

Director General of Intellectual Property, Director of Copyright and Industrial Design with registration number "EC002025146273". Evidence of the IPR output can be seen in Figure 8.

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Alamat	:	Universitas Negeri Semarang, Gunungpati, Kota Semarang, Jawa Tengah
Kewarganegaraan	:	Indonesia
Pemegang Hak Cipta		
Nama	:	**Universitas Negeri Semarang**
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Kewarganegaraan	:	Indonesia
Jenis Ciptaan	:	**Karya Rekaman Video**
Judul Ciptaan	:	**Video Dokumenter Pengabdian Dosen Penguatan Pembelajaran Perancangan Design 3D Model dengan Memanfaatkan Onshape3d berbasis Website dalam Meningkatkan Kompetensi Siswa SMKN Jateng di Semarang**
Tanggal dan tempat diumumkan untuk pertama kali di wilayah Indonesia atau di luar wilayah Indonesia	:	19 Agustus 2025, di Kota Semarang
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Figure 8. IPR Output (Community Service Activity Documentary Video)

Another output that has been achieved is documentation of the implementation of community service presented in video format. Evidence of the results of the video implementation can be seen in Figure 9.

Figure 8. Output Video in Youtube

Link: https://youtu.be/RKDVi4LUwag?si=-H2UEDMXXDpX7skm

D. CONCLUSION

Community service activities for lecturers were conducted in partnership with students from Central Java State Vocational High Schools. This activity involved website-based 3D modeling training and a competency test for the students.

To assess the effectiveness of the training, student understanding was evaluated using Quizizz before and after the activity's post-test. The pre-test results indicated that students' initial understanding of 3D design concepts and CAD software was relatively low, with an average score of 45%. Their knowledge was still limited to the basic functions of modeling software. After the training, the post-test evaluation showed a significant improvement: the average score jumped to 76%, reflecting a better understanding of 3D design concepts and skills in using OnShape 3D.

Suggestions for this program include strengthening student competency through technology-based, computer-aided design skills, implemented in more realistic case studies that can be directly utilized by students at Central Java State Vocational High Schools. This allows students to directly experience the impact and further enhance their competencies.

E. ACKNOWLEDGEMENTS

We would like to express our gratitude to the Institute for Research and Community Service (LPPM) of Semarang State University (UNNES) for providing the opportunity and support that made this community service activity possible and run smoothly. We would also like to thank our partner, SMKN Jateng Semarang, for their willingness to collaborate, and to all members of the UNNES community service team for their support and cooperation, ensuring its smooth running.

F. AUTHOR CONTRIBUTIONS

All team members actively contributed to every stage of the Community Service Activity through the training in SMKN Jateng Semarang. As team leader, Aldias Bahatmaka coordinated with partners, planned activities, addressed science and technology needs, and conducted practical demonstrations. Febri Budi Darsono and Irawaty conducted materials preparation for the training. Meanwhile, Tegar Oki Prasdika, and Aryo Eko Laksono conducted training and consultation for the students. Muhammad Habibullah provided training on the use of tools to partners. And Choriul Anton Muclisin assisted Aldias Bahatmaka in compiling reports and writing journals. This collaborative effort ensured the program's success, from identifying needs to evaluating its impact, as detailed in this article.

G. REFERENCES

Maynard Ae, Subrahmanyam K, Greenfield Pm. (2005). Technology And The Development Of Intelligence: *From The Loom To The Computer. In: Intelligence And Technology*. Routledge; P. 53–78.

Selwyn N. (2007). The Use Of Computer Technology In University Teaching And Learning: A Critical Perspective. *Journal Of Computer Assisted Learning*.;23(2):83–94.

Sun Dw. (2016). Computer Vision Technology For Food Quality Evaluation. Academic Press.

Mahendra Ibm. (2016). Implementasi Augmented Reality (Ar) Menggunakan Unity 3d Dan Vuporia Sdk. Dari Https://Ojs Unud Ac Id/Index Php/Jik/Article/View/26341.

Bentelu As, Sentinuwo S, Lantang O. (2016). Animasi 3 Dimensi Pencegahan Cyber Crime (Studi Kasus: Kota Manado). *Jurnal Teknik Informatika*; 8(1).

Ulva Af. (2022). Visualisasi 3d Pameran Dengan Konsep Virtual Reality Berbasis Web Dan Mobile.

Cahyani N. (2022). Film Pendek Animasi 3d "Try"(Design Character, 3d Modeller Asset). Politeknik Negeri Media Kreatif Jakarta.

Fitrihana N. (2022). Penerapan Teknologi Virtual 3d Untuk Pengembangan Produk Fesyen Di Era Digital. Prosiding Pendidikan Teknik Boga Busana; 17(1).

Nengsi S. (2015). Pengembangan Media Pembelajaran Animasi Pada Materi Fotosintesis Untuk Siswa Kelas Viii Mtsn Koto Nan Gadang; Available From: Http://Ejournal.Stkip-Pgri-Sumbar.Ac.Id/Index.Php/Bioconcetta

Rall H. (2017). Animation: From Concepts And Production. *Crc Press*.

Staley Dj. (2015). Computers, Visualization, And History: How New Technology Will Transform Our Understanding Of The Past. Routledge.

Limano F. (2021). Sustainability Indonesia Animation Intellectual Property (Study Case Youtube Channel). In: *Iop Conference Series: Earth And Environmental Science*. P. 12088.

Dukut Em. (2019). Popularizing Indonesian Scenes Through Picturebooks And Digital Animation Software: A World Englishes Teaching Idea. *Asian Englishes*; 21(2):142–57.

Novani S, Cyntiawati C, Kijima K, Trianto As, Mayangsari L, Alamanda Dt, Et Al. (2023). Empowering Digital Creative Ecosystem Using Problem Structuring Method And A Service Science Perspective: A Case Study In Cimahi And Bandung, Indonesia. Asia Pacific *Management Review*; 28(2):215–28.

Nurjati E, Rianto Y, Wulandari R, Fatmakartika O. (2020). Indonesian Animation Industry: Its Mapping And Strategy Development. *International Journal Of Business Innovation And Research*; 4(Viii):2454–6186.

Rachmawati A. (2023). Management Of Education Daya Tarik Pesan Nilai Budaya Pada Film Animasi Raya And The Last Dragon. *Manajemen Pendidikan Islam*; 9(2):2442–4048.

Ang Bwk, Yeow Ch. (2017). Print-It-Yourself (Piy) Glove: A Fully 3d Printed Soft Robotic Hand Rehabilitative And Assistive Exoskeleton For Stroke Patients. In: *Ieee International Conference On Intelligent Robots And Systems. Institute Of Electrical And Electronics Engineers Inc.*; P. 1219–23.

Nasir M, Prastowo Rb, Riwayani R. (2018). Design And Development Of Physics Learning Media Of Three Dimensional Animation Using Blender Applications On Atomic Core Material. *Journal Of Educational Sciences*; 2(2):23–32.

Villar O. (2021). Learning Blender. *Addison-Wesley Professional*.

Plowman J. (2016). 3d Game Design With Unreal Engine 4 And Blender. Packt Publishing Ltd.

Wong F, Tan C, Ponnusamy B, Gima S, Adnan Ma. (2015). Design And Development Of V-Blender Machine, Part. *Researchgate Net*.

Hendriyani Y, Amrizal Va. (2019). The Comparison Between 3d Studio Max And Blender Based On Software Qualities. In: *Journal Of Physics: Conference Series*; P. 12030.

Caudron R, Nicq Pa. (2015). Blender 3d By Example. Packt Publishing Ltd.

Baechler O, Greer X. (2020). Blender 3d By Example: A Project-Based Guide To Learning The Latest Blender 3d, Eevee Rendering Engine, And Grease Pencil. *Packt Publishing Ltd*.

Kelaiah I. (2016). An Introduction To Blender 2.69 For Scientific Illustrations. *Nanomaterials: Science And Applications*; 335.

Caudron R, Nicq Pa, Valenza E. (2016). Blender 3d: Designing Objects. Packt Publishing Ltd.

Ding Y, Li T, Liang J, Wang D. (2022). Blender: Toward Practical Simulation Framework For Ble Neighbor Discovery. In: *Proceedings Of The 25th International Acm Conference On Modeling Analysis And Simulation Of Wireless And Mobile Systems*. P. 103–10.

Van Mourik J, Oxnard S, Foteinou A, Murphy Dt. (2014). Hybrid Acoustic Modelling Of Historic Spaces Using Blender. In: *Forum Acusticum*.

Hosen Ms, Ahmmed S, Dekkati S. (2019). Mastering 3d Modeling In Blender: From Novice To Pro. Abc Research Alert; 7(3):169–80.

Magdalena I, Nurul Annisa M, Ragin G, Ishaq Ar. (2021). Analisis Penggunaan Teknik Pre-Test Dan Post-Test Pada Mata Pelajaran Matematika Dalam Keberhasilan Evaluasi Pembelajaran Di Sdn Bojong 04 [Internet]. Vol. 3, *Jurnal Pendidikan Dan Ilmu Sosial*. Available From: Https://Ejournal.Stitpn.Ac.Id/Index.Php/Nusantara