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THE IMPACT OF IMPLEMENTING X-RAY FEATURES ON WOODWORKING PRACTICES IN VOCATIONAL EDUCATION: CRITICAL THINKING SKILLS, COLLABORATION, AND CREATIVITY

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Abstract

Technology in learning is a necessity. Collaboration between teachers and technology is important to produce quality graduates. However, many teachers do not realize that the use of technology has a big impact, especially vocational teachers because of limited facilities and infrastructure, even though there are many simple applications that can be implemented, such as x-ray sketchUp. In response, this research applies x-ray sketchUp to reveal its impact on learning, especially on critical thinking skills, collaboration and creativity as 4c ability demands. This research is experimental research on woodworking practice subjects using experimental and control groups. Different treatments are carried out in the product design process using x-rays and without x-rays. Assessments are carried out at the design stage, product manufacturing process, and final product results. The main assessment is on the impact of the accompaniment. The research results prove that learning using x-ray can improve learning understanding and collaboration. They appear to be more critical in the learning process and more creative in product design. X-ray plays a role in improving the quality of product-based learning, even helping students teach it to their groups. Vocational teachers can use it to help the learning process.

Keywords: Critical Thinking, X-Ray, Blended Learning, Creativity, Product.

INTRODUCTION

The educational aspect is a world priority concern, especially after Covid-19 [1][2][3]. Education should not be stopped by anything, let alone just because of Covid 19 because every human being has the right to receive education. Modern education already uses advanced technology (developed countries) [4][5], but not all countries are like that. Currently everything is on the internet, but not all schools have internet due to limited facilities and infrastructure, especially in Indonesia [6]. Vocational education is education that has a heavy burden on this condition because the vocational education learning process requires technology. They must be able to present a learning process that is appropriate to the industry [7], they need labor and workshops that must not be old-fashioned. Therefore, this research tries to build teacher awareness to increase innovation in vocational education learning.

Surprisingly, limited facilities and infrastructure are the reason for not being creative in learning. even though there are many ways to make learning more interesting and even just by using simple computer applications. Teachers in developing and poor countries must realize this as a step in their teaching. Industry already uses advanced technology today [8][9].

This research began with concerns about the Covid-19 situation in Indonesia. However, after analysis, it seems like almost the whole world is like this. Therefore, ideas for vocational learning are being developed [10][6].

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This research is a solution for all vocational teachers in the world so they can innovate with simple applications without requiring expensive costs. The focus of the research was reduced to only looking at the impact of learning in practical woodworking courses using the x-ray feature of the SketchUp application. The learning process is carried out using blended learning and the impact is analyzed. The good news is that blended learning has had a positive impact on learning outcomes, therefore it can be implemented with confidence. [11][12][13].

Even though blended learning or virtual learning has been widely researched, there is not much research that focuses on x-ray features, especially for vocational education and is not even found in Scopus documents. The application is simple, but has a tremendous impact on learning outcomes. The key word is that there is no need for expensive applications, because vocational education is already expensive. However, teachers must be able to make a big impact on vocational learning even with simple applications. Based on the relevant studies obtained, vocational teachers should develop their learning ideas using blended learning because it has a positive impact on learning outcomes [14][15]. Apart from learning outcomes, this research also measures other impacts such as affective, psychomotor, critical thinking skills, collaboration, creativity, and product.

LITERATURE REVIEW

X-Ray in Learning

x-rays are not something new in the field of education because the field of health education has long used x-rays to collect data on the human body [16][17][18]. However, the x-ray feature used in this research is not an x-ray for the health sector (a scan of the human body or bones [19][20]. Conceptually, this x-ray has the same function, namely seeing the inside of an object. However, it is used to see the inside of the design of the product being made, in this case a product made from wood. The main aim of learning to use this x-ray feature is so that the furniture connections in the product design become visible because they are transparent, making it easier for students to understand the hidden parts.

Learning to use the x-ray feature in SketchUp should make it easier and improve students' understanding because they can be directly involved in 3D. Therefore, all product design connections will be clearly visible. Based on previous research studies (published on Scopus), there is not much, even almost no educational research that focuses on the implementation of this x-ray feature, even though this implementation can help learning for both teachers and students.

Virtual Learning in Vocational Education

Modern learning in developed countries has implemented virtual learning or blended learning [14][21], Even though developing countries have started to implement it, it is not evenly distributed, especially poor countries [8]. Virtual learning requires facilities and infrastructure, as well as applications that support it, therefore this learning requires money. Virtual learning that is commonly used after Covid 1 is using the Google Classroom, Zoom, Google Meet and other applications. Many academics and practitioners combine these applications to achieve learning goals and they are successful in doing so [14][22].

In this research, the virtual learning applications used were Zoom, YouTube, Power Point and SketchUp. The focus of the design using the x-ray feature lies in the sketchUp application which is more dominantly used. Therefore, this research was conducted based on the positive results that have been carried out by previous research. In fact, they found many other positive impacts from implementing virtual learning or blended learning [9][15].

Indonesian Woodworking Practical Workshop

Even though it is not better than modern industry, Indonesian woodworking practical workshops still have equipment that is suitable for use (even though it is more than 30 years old). So far, online learning has never been carried out in practical woodworking courses or blended learning.

There are no facilities and infrastructure to support this. After Covid 19, everything is done to achieve learning and education continues to exist. Even though vocational learning in developed countries is more advanced (such as virtual reality), in Indonesia this is still rare [14], especially for woodworking practice.

Therefore, the idea emerged to apply learning using the x-ray feature of SketchUp. The focus this time is on the process and looking at its impact on learning outcomes and accompanying impacts.

Critical Thinking Skills

Critical thinking is a logical and systematic thinking process in making decisions regarding a condition or problem faced [23][24]. Critical thinking is a person's ability to think rationally in understanding facts [25]. Critical thinking is a rational process for determining thinking conclusions.

In the field of education, critical thinking is a topic that is always interesting because the field of education has an important role in producing graduates who think critically. Academics and practitioners have developed many methods for critical thinking, but not many have done so in the field of vocational education [26][27], especially in learning woodworking practices. The development of critical thinking research has been widely developed in the field of teacher education [26], nursing science students [27], pharm program [28], mathematics [29], and health [30].

In this research, critical thinking is assessed as the impact of implementing x-ray features on vocational learning. The uniqueness of this research is that the critical thinking assessment process is carried out through observation-based assessments. How to assess observation-based critical thinking? The assessment process uses a rubric through activities that are strictly monitored.

Students have good critical thinking skills if they get good grades on the rubric. The main note is that this rubric is only specifically for assessing critical thinking skills in the practical learning process of making products. So, this rubric is more specific and unique than test-based critical thinking assessments [31].

The next unique thing is that this research combines virtual learning and traditional learning (blended learning). Based on previous research, it is stated that blended learning has a good impact on students' critical thinking abilities [32]. Therefore, this research was carried out with full confidence. Apart from that, this research is also supported by research results which state that critical thinking is related to creativity [33]

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Creative Abilities

Creativity is the ability to create [34]. Creativity is related to efforts to find new ideas or new breakthroughs [33]. The demands of 21st century capabilities release creativity into one of four main abilities, namely critical thinking, collaboration and communication [35]. Many studies examine creativity, they develop it in the form of learning, methods and assessment [36][37][38]. In the field of education, creativity is also researched to see the impact of implementing learning on it [35][39]. In this research, the position of creativity is the same as critical thinking, namely as an impact aspect that is assessed from the application of learning using x-ray features. Assessment is carried out using an observation-based rubric. Students will be declared to have good creativity if they get a good score on the assessment rubric. What is unique is that this assessment can only be carried out on product-based practical learning activities or learning to make products. The good news is that creativity has a positive relationship with critical thinking skills [33][40], If someone's critical thinking skills are good then they will be creative.

Collaborative capabilities

In fact, the demand for collaborative activities has been around for a long time. However, recently collaboration has become the world's attention after becoming part of 21 century skills. In learning, collaboration becomes an innovative activity in learning methods and learning models. There are five forms of learning collaboration, such as Intra-group collaboration, Students—teachers collaboration, Inter-group collaboration, Students-entrepreneurs-teachers collaboration inside the University, and Intergenerational collaboration with specialists from outside the University [41]. In this research, the collaboration used is intra-group collaboration. Collaboration is an activity of working together to achieve a common goal [42]. Therefore, student collaboration in this research is to form groups to achieve learning objectives, such as woodworking practices - making products. Collaboration is also used as an approach [43], and is also considered a dynamic ability because of its position of always innovating if students can control it [41]. Collaboration abilities also have an impact on creative abilities [44]. In general, collaboration has a positive impact on learning, especially those related to problem solving [45].In this research, the collaboration that is assessed is the cooperation of students in their groups and their involvement in the presentation process, providing input/suggestions, and in the process of making real products in workshops. Their active contribution is assessed based on observations using a rubric that has been validated by seven experts. Students are declared to have collaborative abilities if they get the maximum score according to the rubric.

METHODS

Participants

The participants in this research were students from the civil engineering department who were taking practical woodworking courses. They were chosen because the course makes products, so it fits the research objectives, namely the field of vocational education. Participants consisted of two groups (experimental N=10 and control N=16). Both groups received the same learning topic and learning time, but had differences in the design stage (experiment = blended learning + x-ray feature, control = traditional learning). Participants were students who had never had practical woodworking experience before (see Table 1).

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Table 1: Conditions of experimental and control students

Group	Experimental (n=10)	Control (n=16)
Students' learning experience	Beginner - no experience	Beginner - no experience
Learning methods	Blended learning (+ x-ray)	Traditional teaching
Study program	Civil Engineering	Civil Engineering

The Experiment Procedure

This experimental research had two groups with 16 learning meetings, the difference in treatment was only 5 meetings. At the first meeting, both groups received a pre-test to determine their basic cognitive abilities. The experimental group received special attention from the second meeting to the sixth meeting (5 meetings received treatment through blended learning + x-ray features), while the control group took part in traditional learning. Meanwhile from meeting 7 to meeting 16 they made real products in the workshop. The difference in treatment is at the product design stage.

Assessment is carried out strictly, even though it requires extra effort, this process produces something different for learning. At the last meeting they conducted a post-test to see post-treatment cognitive abilities. The assessments of the two groups were analyzed and summarized to see the differences.

Meanwhile, assessment of direct impacts and accompanying impacts is carried out during the learning process. Cognitive assessment is carried out through pre-test and post-test. Affective and psychomotor assessments were carried out at the practical stage in the workshop at meetings 1-16 and summarized at meeting 16. Product assessments were carried out at meeting 16. Critical thinking, collaborative and creativity assessments were carried out at group work activities (product design = meetings 2-5, and product creation=meetings 6-16).

Measurement Materials

This research instrument has passed the assessment of seven experts consisting of academics and practitioners. These instruments are designed according to the aspects assessed such as critical thinking ability, collaboration, creativity, affective, psychomotor and product. Each instrument is developed based on indicators obtained from accurate references.

This instrument is useful for measuring the impact of implementing x-ray features in learning. Cognitive aspects are measured using tests. Affective, psychomotor, critical thinking skills, collaboration and creativity aspects using continuous observation-based instruments.

Meanwhile, product assessment uses a one-time observation-based instrument at the end of the meeting. All instruments were used to obtain data for both groups, the results were analyzed and compared. The impact of learning using x-ray will be seen if the experimental group scores are better than the control group.

Setting

The experimental group received focused learning in 5 meetings/week. During these 5 meetings they received extra learning (synchronous and asynchronous). During synchronous meetings, they are divided into groups with one group of 3, 3, 2, 2 students (4 groups). Differences in the number of group members are also a matter of research (but for further analysis, not for this article).

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During asynchronous learning, they were asked to design a product using the sketchUp application and focus on the x-ray feature. Each group was asked to make a different design, but with a limited amount of materials (the amount was the same for all groups, namely only 1 wooden plank).

After the design process is complete, each group is asked to present in turn, and the best design is selected. The focus of this research is on the design process, design results, and making real products from the designs carried out.

Data Collection and Analysis

Although the main focus of the data is on critical thinking, creativity, and collaboration, cognitive, affective, psychomotor, and product assessments are still included (Figure 1). All research data was obtained through 2 main methods such as tests for cognitive abilities and observation-rubric for affective, psychomotor, product, critical thinking abilities, creativity and collaboration (Figure 2).

In Figure 1, it can be seen that there are three main stages of research, namely basic skills, intervention, and measurement. In each phase, there are similarities and differences in the treatment carried out during the research.

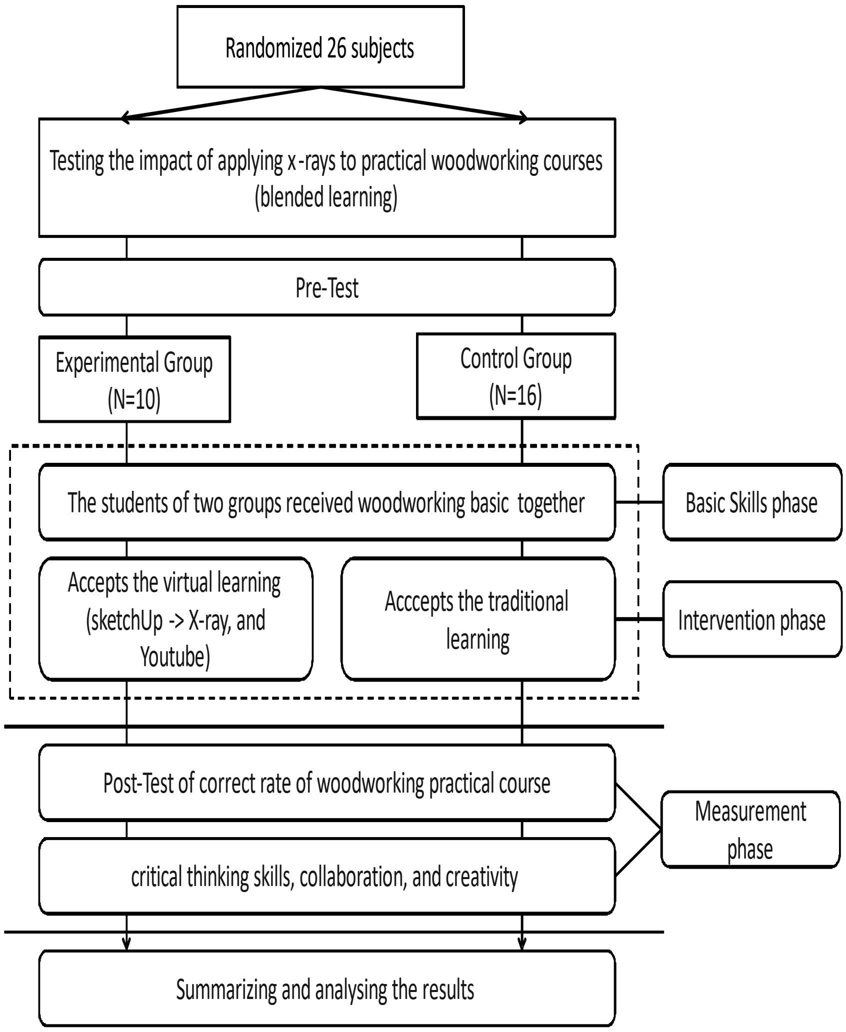

Figure 1: Phases, sessions, and experimental conditions

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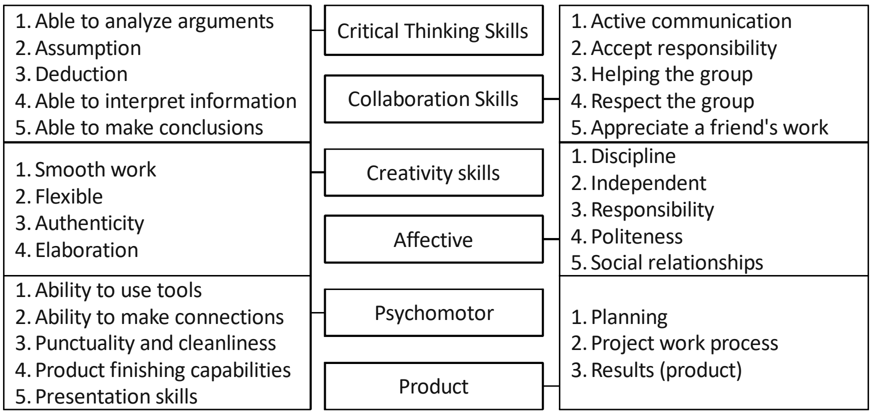

Figure 2: Indicators of critical thinking, creativity, collaboration, affective, psychomotor and product abilities

RESULT

Design display using x-ray

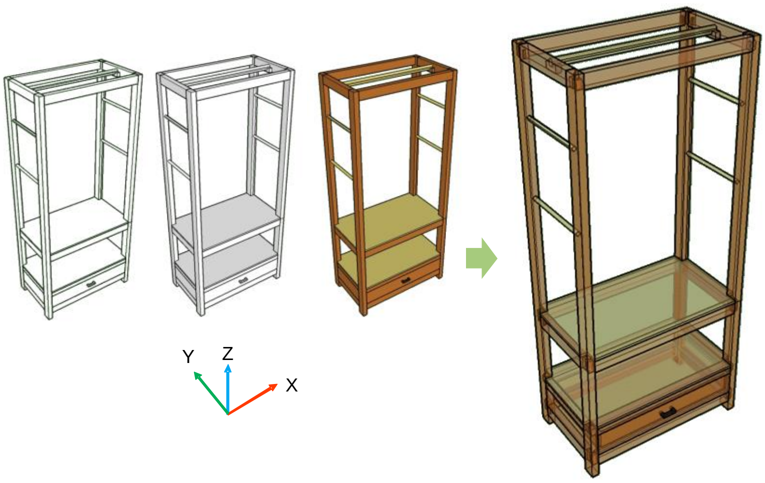

Figure 3: Display the design until it becomes x-ray transparent

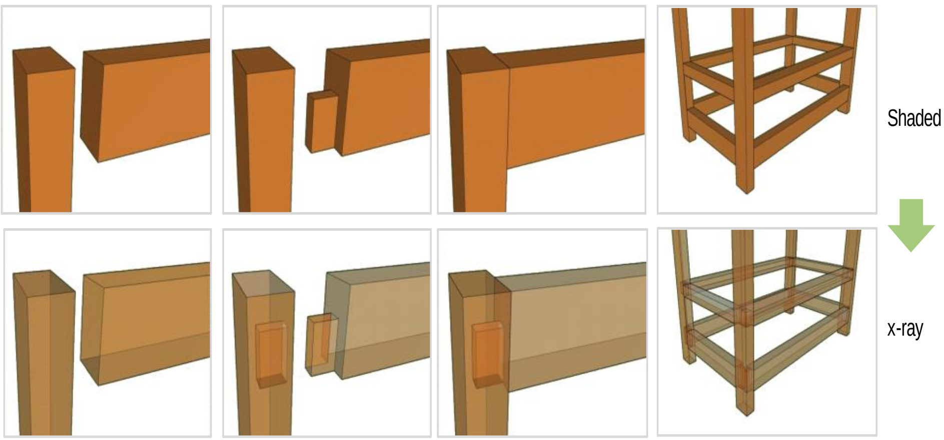

Figure 4: The main focus of learning to use x-ray – wood joints

In Figure 2, the product design process carried out by students is explained. This design is a design that has been selected from the four designs they designed per

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group. They studied the design, provided comments, and provided feedback. Meanwhile in Figure 3, this is the focus of learning, namely that each student must understand wood connections - assisted by the x-ray display.

Assessment of cognitive abilities and practical products

Table 2: Assessment of cognitive aspects (pretest-posttest) and product

Test-based assessment			
Group	Experimental (n=10)	Control (n=16)	Description
Pre-test	6,65 (SD= 0,46)	7,03 (SD= 1,67)	max value 10
Post-test	9,20 (SD= 0,63)	8,13 (SD= 1,68)	max value 10

Based on Table 2, it can be seen that the cognitive abilities of participants from the experimental group have improved better compared to the control group. The products produced by students also scored better by the experimental group than the control group.

Assessment of affective, psychomotor and product aspects

In this section, an overview of the results of observation-based assessment for three aspects is explained, such as the affective aspect, the motoric aspect, and the student product assessment aspect. In Table 3, the EX code is used for the experimental group and the CT code for the control group. The number symbol at the back of the code is a description of the number of participants.

Table 3: Assessment of affective, psychomotor and product aspects

Observation-Based Assessment													
Affective					**Psychomotor**					**Product**			
code	**∑**	**x̄**	**σ²**	**SD**	**code**	**∑**	**x̄**	**σ²**	**SD**	**∑**	**x̄**	**σ²**	**SD**
EX1	80	3.2	0.025	0.158	EX1	95	3.8	0	0.019	83.33	3.33	0.007	0.08
EX2	95	3.8	0.001	0.032	EX2	95	3.8	0	0.019	100	4	0.016	0.13
EX3	95	3.8	0.001	0.032	EX3	95	3.8	0	0.019	100	4	0.016	0.13
EX4	95	3.8	0.001	0.032	EX4	90	3.6	0.002	0.044	83.33	3.33	0.007	0.08
EX5	90	3.6	0.001	0.032	EX5	95	3.8	0	0.019	83.33	3.33	0.007	0.08
EX6	95	3.8	0.001	0.032	EX6	95	3.8	0	0.019	100	4	0.016	0.13
EX7	90	3.6	0.001	0.032	EX7	95	3.8	0	0.019	100	4	0.016	0.13
EX8	95	3.8	0.001	0.032	EX8	95	3.8	0	0.019	83.33	3.33	0.007	0.08
EX9	95	3.8	0.001	0.032	EX9	90	3.6	0.002	0.044	83.33	3.33	0.007	0.08
EX10	95	3.8	0.001	0.032	EX10	90	3.6	0.002	0.044	83.33	3.33	0.007	0.08
CT1	90	3.6	0.016	0.128	CT1	90	3.6	0.003	0.05	83.33	3.33	0.007	0.08
CT2	75	3	0	0.022	CT2	80	3.2	0.002	0.05	75	3	0	0
CT3	70	2.8	0.005	0.072	CT3	80	3.2	0.002	0.05	66.67	2.67	0.007	0.08
CT4	75	3	0	0.022	CT4	90	3.6	0.003	0.05	75	3	0	0
CT5	75	3	0	0.022	CT5	90	3.6	0.003	0.05	75	3	0	0
CT6	80	3.2	0.001	0.028	CT6	80	3.2	0.002	0.05	66.67	2.67	0.007	0.08
CT7	70	2.8	0.005	0.072	CT7	75	3	0.01	0.1	66.67	2.67	0.007	0.08
CT8	75	3	0	0.022	CT8	90	3.6	0.003	0.05	75	3	0	0
CT9	80	3.2	0.001	0.028	CT9	90	3.6	0.003	0.05	83.33	3.33	0.007	0.08
CT10	75	3	0	0.022	CT10	90	3.6	0.003	0.05	75	3	0	0
CT11	80	3.2	0.001	0.028	CT11	90	3.6	0.003	0.05	83.33	3.33	0.007	0.08
CT12	75	3	0	0.022	CT12	75	3	0.01	0.1	66.67	2.67	0.007	0.08
CT13	80	3.2	0.001	0.028	CT13	90	3.6	0.003	0.05	83.33	3.33	0.007	0.08
CT14	90	3.6	0.016	0.128	CT14	90	3.6	0.003	0.05	83.33	3.33	0.007	0.08
CT15	75	3	0	0.022	CT15	85	3.4	0	0	75	3	0	0
CT16	70	2.8	0.005	0.072	CT16	75	3	0.01	0.1	66.67	2.67	0.007	0.08

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Based on Table 3. It can be seen that the affective average of the experimental group is higher than the average of the control group. This applies to psychomotor aspects and product assessment aspects. Apart from that, the preferred research focus is the assessment of three aspects such as critical thinking, collaboration and creativity which is carried out using an observation-based approach (Table 4). This instrument was developed using expert assessments (academics and practitioners) such as components involving expert assessments of content, language, writing grammar, depth of content. In Table 4, it can be seen that the value of critical thinking is more varied, but is more dominant than the experimental group. In the collaborative assessment section, it was also found that the experimental group scored better than the control group. Then in the creativity assessment, the experimental group's score was also better.

Assessment of critical thinking, collaboration and creativity aspects

Table 4: Assessment of aspects of critical thinking skills, collaboration and creativity

Observation-based assessment														
Think critically					Collaborative					Creative				
code	∑	x̄	σ²	SD	code	∑	x̄	σ²	SD	code	∑	x̄	σ²	SD
EX1	95	3.8	0	0.019	EX1	95	3.8	0	0.057	EX1	87.5	3.5	0.002	0.04
EX2	100	4	0.002	0.044	EX2	100	4	0	0.006	EX2	93.75	3.75	0.002	0.04
EX3	100	4	0.002	0.044	EX3	100	4	0	0.006	EX3	93.75	3.75	0.002	0.04
EX4	95	3.8	0	0.019	EX4	100	4	0	0.006	EX4	87.5	3.5	0.002	0.04
EX5	95	3.8	0	0.019	EX5	100	4	0	0.006	EX5	93.75	3.75	0.002	0.04
EX6	100	4	0.002	0.044	EX6	100	4	0	0.006	EX6	93.75	3.75	0.002	0.04
EX7	95	3.8	0	0.019	EX7	100	4	0	0.006	EX7	93.75	3.75	0.002	0.04
EX8	95	3.8	0	0.019	EX8	100	4	0	0.006	EX8	87.5	3.5	0.002	0.04
EX9	95	3.8	0	0.019	EX9	100	4	0	0.006	EX9	87.5	3.5	0.002	0.04
EX10	95	3.8	0	0.019	EX10	100	4	0	0.006	EX10	87.5	3.5	0.002	0.04
CT1	85	3.4	0.001	0.028	CT1	90	3.6	0	0.031	CT1	87.5	3.5	0.001	0.03
CT2	75	3	0.005	0.072	CT2	85	3.4	0	0.019	CT2	81.25	3.25	0.001	0.03
CT3	75	3	0.005	0.072	CT3	80	3.2	0.01	0.069	CT3	75	3	0.009	0.09
CT4	85	3.4	0.001	0.028	CT4	90	3.6	0	0.031	CT4	87.5	3.5	0.001	0.03
CT5	85	3.4	0.001	0.028	CT5	85	3.4	0	0.019	CT5	87.5	3.5	0.001	0.03
CT6	75	3	0.005	0.072	CT6	85	3.4	0	0.019	CT6	81.25	3.25	0.001	0.03
CT7	75	3	0.005	0.072	CT7	80	3.2	0.01	0.069	CT7	81.25	3.25	0.001	0.03
CT8	85	3.4	0.001	0.028	CT8	90	3.6	0	0.031	CT8	87.5	3.5	0.001	0.03
CT9	90	3.6	0.006	0.078	CT9	90	3.6	0	0.031	CT9	87.5	3.5	0.001	0.03
CT10	85	3.4	0.001	0.028	CT10	90	3.6	0	0.031	CT10	87.5	3.5	0.001	0.03
CT11	85	3.4	0.001	0.028	CT11	85	3.4	0	0.019	CT11	87.5	3.5	0.001	0.03
CT12	75	3	0.005	0.072	CT12	90	3.6	0	0.031	CT12	81.25	3.25	0.001	0.03
CT13	85	3.4	0.001	0.028	CT13	90	3.6	0	0.031	CT13	87.5	3.5	0.001	0.03
CT14	95	3.8	0.016	0.128	CT14	90	3.6	0	0.031	CT14	87.5	3.5	0.001	0.03
CT15	85	3.4	0.001	0.028	CT15	90	3.6	0	0.031	CT15	87.5	3.5	0.001	0.03
CT16	75	3	0.005	0.072	CT16	80	3.2	0.01	0.069	CT16	75	3	0.009	0.09

A unique thing happened in the collaborative aspect assessment, where the majority of scores from the experimental group got the best score with $\bar{x}=4$. This shows that the application of x-ray causes good cooperation/collaboration between students.

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The design results become real products

Figure 5: Three main wood joints

Figure 6: The process of making real products after design

Based on Figure 5, it can be seen that the focus of learning practical woodworking using x-ray is on wood joints. There are three parts to focus on, namely the top, middle, and bottom. The wood joints in these parts are very easy to understand from the x-ray view. Meanwhile, the right side of the image is the shape of the real product after the production process (see Figure 6). The stage of the process of making a real product is carried out by students guided by the design of the product image. They are given time to create a product for 5 meetings (weeks). Aspects of collaboration, creativity

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and critical thinking skills can be seen easily during practical work in the laboratory. Even though the assessment process is based on a rubric.

Shaded view Shaded + x-ray view Real Product

Figure 7: Shaded view – x-ray – real product

Figure 7 is a shaded – x-ray – view and the real product is almost perfect. The learning process of using x-rays in woodworking practices is very helpful in achieving learning objectives.

DISCUSSION

This research proves that modern vocational education does not have to be expensive, because there are simple application technologies that have a big impact on learning. Teachers must realize that the main purpose of technology is to make human work easier. This x-ray feature really helps learning in practical woodworking courses. The direct impact is very good, namely helping students improve their understanding of the learning topic. Apart from that, the direct impact on students' affective and psychomotor skills is also good. However, what is even better is the accompanying impact which is very good, namely increasing critical thinking skills, collaboration and creativity. Even though this research was conducted on a limited sample, the results of this research can describe a good new phenomenon.

This is the structure, this research has two main impacts from the implementation of x-ray in practical woodworking courses in vocational education, namely the direct impact and the accompanying impact. The direct impacts assessed are cognitive (learning outcomes), affective and psychomotor impacts. Meanwhile, the indirect impacts assessed are critical thinking skills, collaboration and creativity. Valid assessment instruments have been used to measure this impact. In fact, blended learning research for woodworking practicum courses has never been carried out

[6][46], especially in the Indonesian Civil Engineering Department due to limited facilities and infrastructure. The tools used have not been replaced for more than 30 years. However, this research was carried out as a new breakthrough, applying x-ray through blended learning as a big leap. X-ray features as part of the product design process in learning woodworking practices. These results prove that blended learning has a positive impact on learning outcomes, and is proven to help teachers in teaching [22][9]. Apart from that, this research proves that blended learning is very supportive for product-based learning [12][14][21]**.**

Apart from that, a very good finding from this research is the accompanying impact of the application of x-ray on critical thinking, collaborative and creative abilities. Based on the assessment carried out, it was found that students who took part in learning using x-ray were more active in providing suggestions/input in the design process and product presentation. They engage in discussions and solve problems to find better design ideas. They seemed to collaborate more in the design process and at the stage of working on real products in the workshop. Apart from that, their ideas from the design process to product completion were more creative than the control group. Above all, observation-based assessments are carried out on each of them during the learning process. However, it has been proven that learning activities using x-ray features in blended learning are better than traditional learning. world vocational teachers should try it.

CONCLUSION

The use of X-ray SketchUp has a positive impact on practical learning. The learning process using x-ray encourages students to understand more about the learning topic. students are more critical and creative in making product designs. Students also have better collaboration skills than those who do not use x-rays in learning. This research proves that x-ray really helps teachers in learning, simplifies the design process, and makes learning more meaningful. Vocational teachers should utilize it as a simple solution for product-based learning.

Conflict Of Interest

There is no conflict of interest in this article

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