

ANALYSIS OF GENDER DIFFERENCES IN THE MAKING OF MATHEMATICAL CROSS-STITCH ART SYMBOLS AND LEARNING OUTCOMES OF HIGH SCHOOL STUDENTS

Analisis Perbedaan Gender Dalam Pembuatan Simbol Seni Jahitan Silang Matematika Dan Hasil Belajar Siswa SMA

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ABSTRACT:

This study aims to determine the influence of gender differences on the making of mathematical cross-stitch art symbols and students' learning outcomes. This study is descriptive qualitative research. The study used observation, interviews, documentation, and students' learning outcomes tests as research instrument. This research has been conducted in the crafts subject at SMA Negeri 1 Pengasih, Kulon Progo, Yogyakarta class XI. Meanwhile, the results of midterm and final exam were used for all students of class XI. This study revealed a significant difference between male and female students when completing the cross art of mathematical symbols. Female students are found to be able to complete the art within 1 month, while male students have not been able to complete the cross stitch. Furthermore, the average scores obtained during midterm and final exam between male and female students also have quite significant differences, in which female students show higher learning outcomes than male students. It is in line with the completion of the cross-stitch assignment given in the craft subject where female students have better abilities in completing the cross-stitch art.

Keywords:

gender; mathematics cross-stitch art symbols; learning outcome

Kata kunci:

jenis kelamin; seni kristik symbol matemati; hasil belajar

ABSTRAK:

Penelitian ini bertujuan untuk mengetahui ada tidaknya pengaruh perbedaan gender terhadap pembuatan seni kristik symbol matematika dan hasil belajar siswa. Jenis penelitian yang digunakan dalam penelitian ini adalah penelitian deskriptif kualitatif. Adapun teknik pengumpulan data menggunakan observasi, wawancara, dokumentasi, dan tes hasil belajar siswa. Penelitian ini akan dilakukan pada mata pelajaran Prakarya di SMA Negeri 1 Pengasih, Kulon Progo, Yogyakarta kelas XI. Sedangkan secara kuantitatif digunakan hasil PTS dan PAS semua siswa kelas XI. Penelitian ini menghasilkan perbedaan yang cukup signifikan antara siswa laki-laki dan perempuan saat menyelesaikan seni kristik symbol matematik. Yang mana siswa perempuan mampu menyelesaikan seni tersebut dalam waktu 1 bulan, sedangkan siswa laki-laki belum mampu menyelesaikan seni kristik tersebut. Lebih lanjut, rata-rata skor yang diperoleh saat PTS dan PAS antara siswa laki-laki dan perempuan juga memiliki perbedaan yang cukup signifikan, yang mana siswa perempuan memiliki hasil belajar yang lebih tinggi daripada siswa laki-laki. Hal tersebut selaras dengan penyelesaian tugas seni kristik yang diberikan pada mata pelajaran prakarya yang mana siswa perempuan memiliki kemampuan yang lebih baik dalam menyelesaikan seni kristik tersebut.

PENDAHULUAN

Education is an interaction process in which there are information exchange activities that aim to develop a person's mindset towards a better direction (Faatin & Rusnilawati, 2022). To achieve this, a quality learning process is needed. Learning is a teacher's process of facilitating students to make them active, creative, and independent in order to achieve predetermined learning goals (Dewi & Hamdu, 2020). Currently, learning has

to face the 21st century where the learning situation and process demands that it must be conditioned into an ideal form (Fajri, 2017). One of the government's efforts to respond to the demands of the ideal needs of the 21st century is by implementing the 2013 curriculum (Solikha & Fitrayati, 2021). This curriculum is still used by the school where this research was conducted. This is because, the curriculum that emphasizes the educational process holistically so that

the scope is wider in the cognitive, affective, and psychomotor domains (Setiadi, 2016). In addition to the 2013 curriculum, 21st century learning also requires 4C (*collaboration, critical thinking and problem solving, creativity and communication*) skills which are expected to improve the quality of education in Indonesia.

The 4C skills are the skills recommended by the National Council Social Studies framework (Nganga, 2019). These skills are a provision to enter world competition, which is getting tougher since it requires the provision of meaningful education (meaningful learning) (Kurniawan, 2020). One of the 4C skills that is important to teach is the ability to think critically and solve problems (critical thinking and problem solving). The ability to think critically is the ability in the process of making reasonable decisions, so that a truth can be carried out correctly (Abdullah, 2013). Students are categorized in having critical thinking when they are able to analyze and evaluate any information they receive critically (Khoirunnisa & Malasari, 2021). However, schools actually encourage students to give correct answers rather than direct students to come up with new ideas or review existing conclusions (Syahbana, 2012). Meanwhile, problem-solving ability is the ability of students to solve problems that are oriented to real life (Ayubi et al., 2018).

Increasing problem-solving skills needs to be developed through the

skills of understanding problems, making mathematical models, solving problems and interpreting solutions (Hidayat & Sariningsih, 2018). Critical thinking skills and problem solving are seen very important to be taught in learning mathematics. This is in line with several studies that state that problem-solving skills are a very important part of learning mathematics because it requires students to be ready to solve each problem without fear of not finding a solution (Ariawan & Nufus, 2017; Nufriyanti, 2016). Whereas in critical thinking skills, students are also required to have an attitude of confidence and believe in their abilities so that they avoid feelings of anxiety and doubt when solving math problems (Tresnawati et al., 2017).

This critical thinking ability is the key competency for solving problems that students need in order to live successfully and responsibly and be able to face present and future challenges (Nugraha et al., 2017). There are various ways of students' thinking, namely vertical, lateral, critical, analytical, creative and strategic thinking (Karim, 2014). Critical thinking skills have indicators, namely students are able to identify and provide reasons for a concept, generalize and complete supporting information, and analyze algorithms in the form of evaluating or examining algorithms (Zetriuslita et al., 2016).

Problem solving is a process for overcoming difficulties encountered and solving problem-based questions

(Sumartini, 2016). According to NCTM (National Council of Teacher of Mathematics), problem-solving abilities have multiple roles in the school curriculum, namely as a fundamental means or tool for learning mathematics and as the main objective in learning mathematics (Amam, 2017). In learning mathematics at school, teachers usually make problem solving as an important part of knowing the level of understanding of learning material and training for students to be able to apply their knowledge in different situations (Umrana et al., 2019). According to Ibrahim, the characteristics of a good problem should be adapted to the conditions of the students, related to the material to be studied, have answers/completions that require exciting and challenging explanations, adjustable difficulties, and not boring (Ibrahim, 2012). Meanwhile, an indicator of problem-solving ability is a process when students carry out activities including identifying elements to solve problems, selecting and implementing problem-solving strategies, performing calculations, and interpreting their findings on the original problem and re-examining the solutions that have been gained (Akbar et al., 2018). Because of the importance of these abilities, it is necessary to carry out further analysis regarding the characteristics of students who show themselves to have the ability to think critically and solve problems. One of the ways that

researchers have initiated to analyze these two abilities is to use cross-stitch art.

Cross-stitch art is a type of embroidery art by hand. It is the art of embroidery by crossing threads to form an "x" shape and form a certain pattern (Fauziah & Agustin, 2019). It is also an art that has been passed down among generations and does not just provide decoration on the material, but is a mean of expressing the art of the maker. In this study, the cross art made will be patterned with mathematical symbols combined with other patterns such as flowers, birds, trees, and so on. The way to make this pattern is like in making mosaic art with the following steps (Cholis & Yustana, 2015):

1. Making design patterns with manual techniques
2. Making a design pattern with digital techniques assisted by Corel Draw 4 software (determining the size of the cross stitch and making a cross cut design) If these steps have been carried out, then the cross cut design can be used for art learning.

In this study, is intended that students are able to have the ability to think critically and solve problems through the created cross-stitch art. This is because in the process of constructing, students will be faced with the following problems:

1. Specify the embroidery start box.
2. Pattern consistency (right and left) or alternating.

3. The cross-stitch fabric is torn in the pattern so some troubleshooting is required.
4. Student creativity in completing cross-assembly.

These problems can be used as a way to improve critical thinking skills and problem solving. The characters are conscientious, responsible, consistent, creative and so forth. First, conscientiousness means when students are able to finish cross-stitch with the same embroidery. Second, responsibility is meant to find out whether students can complete cross-stitch or not, this is because cross-stitch art requires a variety of characters and requires a short amount of time to complete. Third, consistency, it means that students are able to complete cross-stitch art in a stable right to left pattern, so that there are no different patterns, such as right to left, then left to right. Fourth, this creativity is intended to find out how students' strategies are in completing cross-stitch project. Even though students are inconsistent, students show different strategies so that students can be seen to be creative in solving the problem. In addition, when students can choose certain patterns to complete, it is also an indicator of students' creativity. Therefore, the aim of the study was to analyze gender differences in students' critical thinking skills and problem solving towards the construction of mathematical symbols of cross-art and learning outcomes. The mathematical symbols used in this study are $f(x)$ and

$[x]$. This symbol was chosen because it is a symbol that is often used in mathematics lessons and has the same precision.

RESEARCH METHOD

The type of research used in this research is descriptive qualitative research since this study only focuses on analyzing students' critical thinking skills and problem solving through the art of mathematical cross-stitch symbols. In order to collect the data, this study used observation, interviews, documentation, and students learning outcomes tests. This study has been conducted in the Craft subject at SMA Negeri 1 Pengasih, Kulon Progo, Yogyakarta. Purposive sampling technique was adopted to determine the sample.

Data analysis used in this study was carried out before, during and after completion in the field (Sugiyono, 2017). Prior analysis in the field was carried out on the results of preliminary studies and secondary data used to determine the research focus. Field analysis was carried out during data collection and after data collection was completed. The data analysis activities carried out using Miles and Huberman are data reduction, data display, and conclusions, withdrawal or verification (conclusion drawing/verification) (Miles et al., 2014). After the cross-stitch results were completed, the researcher

analyzed qualitatively whether there were differences in the completion of the cross-stitch between the male and female sexes. Afterwards, it was followed by a quantitative analysis, namely to find out whether there were gender differences in student learning outcomes. Analysis was used with the hypothesis that there is no difference in the results of learning crafts between male and female students. The test was carried out using Mann Whitney nonparametric statistics because the data obtained was not normally distributed.

RESEARCH AND DISCUSSION

This research was carried out for 2 months, from November to December 2022. The steps of this research are; (1) determining the subject of the study, (2) making a design of mathematical cross-stitch art symbol, (3) giving assignments to a sample of students to complete the cross-stitch for 1 month,

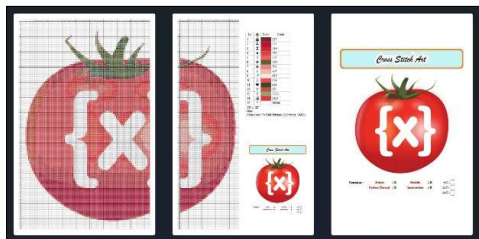


Figure 1: Cross-stitch design 1

and (4) analyzing the results of the cross-art that have been completed by students. The design of this cross-stitch art is presented in Figure 1 and Figure 2.

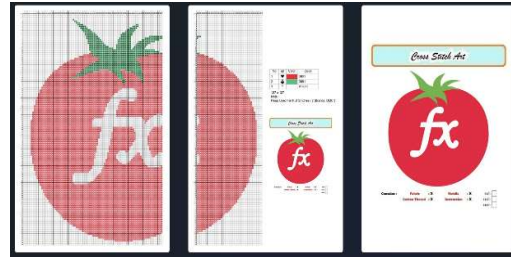


Figure 2. Cross-stitch design 2

After the cross-stitch designs were finished, the researcher then distributed 1 package of the cross-stitch designs to class XI students of SMA Negeri 1 Pengasih. The selected students were students who liked cross-stitch art and students who were directly selected by the craft teacher at the school. The results of student work in completing this cross art are presented in Figure 3



Figure 3: Students are able to finish the design (female)

Figure 3 shows that two of female students have good levels of critical thinking skills and problem solving skills. Critical thinking ability is one of the higher order thinking skills so that students are able to understand various problems that occur in daily life (Novtiar & Aripin, 2017). Figure 3 also shows that although there are several parts of the thread that are not in accordance with the design they should be. Furthermore, the female student (right) produced a cross-stitch design that was much different from the initial design at the top, after being confirmed, this was because the student finished by first drawing the existing pattern and then filling it in with the threads. Even though the Cross Stitch designs that have been distributed have been adjusted to the size of each dot on the cloth, so that students can more easily complete these Cross Stitch by imitating existing patterns.

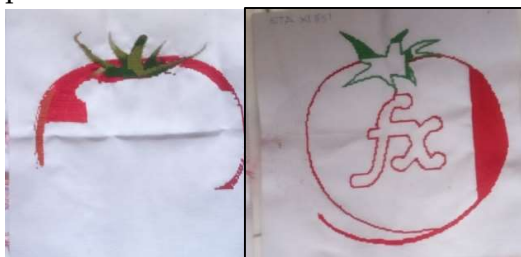


Figure 4. students have not finished the design yet (male)

Figure 4 seems very different from Figure 3. It shows students who have not succeeded in completing cross stitch within 1 month. Once confirmed, the student completed the crisscross during free time only. Furthermore, these two students are

male students, while in Figure 3, there are female students. Due to differences in the completion of this cross-stitch, the researcher then analyzed the results of the End of Semester Assessment and Mid Semester Assessment of class XI students who were distinguished between male and female students. The number of students in class XI is 215 with 85 being male and 130 being female. In SMA Negeri 1 Pengasih class XI there are 6 classes consisting of 4 MIPA classes and 2 IPS classes. The hypothesis testing carried out is used to determine whether there are differences between male and female students in craft learning associated with the results of students' mathematical cross-stitch art symbols. The description of research data on midterm and final test values are presented in Table 1.

Table 1: Data Description

Nilai	Min	Max	Mean	SD
PAS	70	95	84,92	5,891
PTS	66	100	91,23	6,004

Table 1 reveals that during midterm and final test, the highest average student scores were during midterm. This also shows that during midterm, there were students who managed to get a maximum score of 100. However, during midterm and final test the average student had achieved the minimum grade score.

After describing the data, it is followed by testing the hypothesis to find out whether there is an average difference between male and female students in the craft subject. The

results of the analysis prerequisite tests were not fulfilled so that the non-parametric Mann Whitney test was carried out. The results of this test are presented in Table 2.

Table 2: *Mann-Whitney test*

Variabel	Asym. Sig. (2-tailed)	Mann-Whitney U
PTS	0,000	3785,5
PAS	0,000	2875

Table 2 indicates that the midterm and final exam values have Asym. Sig. (2-tailed) $0.000 < \text{Sig. } \alpha$ (0.05). It means that the hypothesis is accepted. Moreover, there is an average difference between male and female students in the value of their work. The male students had an average of 89.53 during midterm and 81.92 during final exam, while female students had an average of 92.34 and 86.88 during final exam. Therefore, there is a significant difference in PTS and PAS values between the two sexes, where the average difference between PTS and PAS is 2.81 and 4.96. Thus it can be concluded that female students have better learning achievement than male students. This is also in line with the cross-art work between male and female students where the female students are able to complete the cross-art while the male students have not completed the cross-art.

CONCLUSION

This study found a significant difference between male and female students when completing the mathematical cross-stitch art symbols.

Female students are able to complete the art within 1 month, while male students have not been able to complete the cross-stitch. Furthermore, the average scores obtained during midterm and final exam between male and female students also have quite significant differences, in which female students reveal higher learning outcomes than male students. It is in line with the completion of the cross-stitch assignment given in the craft subject where female students have better abilities in completing the cross-stitch art.

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