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Eco-print Hijab through STEAM Project-Based Learning in Research Class

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Abstract: Environmental education is increasingly being given attention in school curricula in response to global environmental challenges. This article explores the implementation of science learning at the high school level with the STEAM-project-based learning method for the production of Eco-print Hijab. The research method used is a case study, and data are collected through interviews, observations, and analysis. This approach creates an innovative and creative learning environment. The data was analyzed qualitatively with a descriptive approach. The results of the study show that the process of making Eco-print Hijab is influenced by various factors, including the variety of fabric, the type of plant/leaf chosen, the source of the dye, the time of steaming, the strength of the squeeze, and other factors. Eco-print Hijab is a unique creative product with high artistic value. The STEAM-project-based learning method is considered effective in creating creative products. The practical implications of this study are innovative learning models in schools.

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INTRODUCTION

The rest of the synthetic dye liquid from the fabric dyeing process contains harmful chemicals. This is a special concern if the amount of waste is increasing. The environment can be polluted by such liquid waste. The textile industry is one of the contributors to a relatively high number of waste piles worldwide, including liquid waste (Hikmah & Retnasari, 2020). The liquid waste is produced from the textile dyeing process, which no longer uses natural dyes. The development of technology and the advancement of the times require humans to create and use synthetic dyes for textiles for several reasons of their advantages. Among them are various colors, guaranteed availability, easy to obtain, more practical in use, economical price, and more substantial coloring power. The colors produced are bright and stable and do not fade easily.

On the other hand, synthetic dyes also produce harmful waste that can cause environmental pollution, such as contaminating water, soil, and sediment and killing aquatic organisms (Yaseen & Scholz, 2018). Some dyes can be degraded into carcinogenic and toxic compounds (Kant, 2012). These negative effects make natural dyes begin to be in demand again because natural dyes include dyes that are non-toxic, renewable, and environmentally friendly. People choose to use natural dyes to protect environmental sustainability. This is in line with the increasing public awareness of the dangers of synthetic waste (Hikmah & Retnasari, 2020).

In addition, using natural dyes in Indonesia is considered a cultural heritage of ancestors that must be preserved. One of them is in the process of batik and fashion design. In fact, the world of trade provides incentives for textile products that use natural dyes to enter specific markets with high selling prices.

Schools have great potential to be agents of change in promoting environmental awareness and the creativity of the younger generation. A collaborative approach is needed to improve the quality of learning and understanding (Untari, et. al, 2018). In response, many schools integrate environment-based learning and utilize the natural resources around them. The implementation of the learning leads to the optimization of natural resources. One of them is producing Eco-print Hijab.

Eco-print Hijab is an interesting innovation. Not only because of its aesthetic value but also its positive environmental impact. Eco-print Hijab uses natural dyes derived from various types of plants, especially the leaves. This creativity arises because of the awareness of the importance of developing environmental education. This research aims to explore the natural resources available in the school environment, evaluate student awareness, and identify factors that affect the successful implementation of STEM learning. The contribution of this research is expected to provide insights into the development of scientific disciplines and the continuity of civilization.

Several researchers have reviewed similar studies with different research focuses and presentations. Faridatun (2022) also examines dyeing techniques with eco-printing. Meanwhile, Iskandar, et. Al (2018) Researching the Participatory Principles and Management of Environmentally Friendly School Programs (Ecology). The research of Brush et al. (2022) highlights the importance of integrating environmental education into the school curriculum and utilizing the school environment as a learning laboratory. Jones concluded that this approach can improve students' understanding of environmental issues. In addition, research by Smith and Brown (2019) revealed the positive impact of environment-based learning on learning motivation. Students tend to be more motivated to learn when the learning material is related to environmental issues relevant to daily life.

However, research that specifically explores learning at the high school level for creative production is still limited. Therefore, this research has presented a novelty in producing Eco-print Hijab by senior high school students through STEM-based instruction. The STEAM (Science, Technology, Engineering, Arts, and Mathematics) learning method reflects a combination of science education (environment and natural resources), technology, engineering, arts (creativity), and mathematical concepts. Integrated learning that produces products in the form of Eco-print Hijab offers a unique and innovative approach to utilizing natural resources and creating products with high artistic value. Interdisciplinary learning combines science, technology, engineering, art, and mathematics concepts. Thus, this research is expected to contribute to the development of holistic and oriented continuing education oriented to integrated STEAM learning practices. Eco-print Hijab offers a unique approach to combining science, engineering, engineering, art, and mathematics.

METHOD

This research uses a qualitative approach with a case study design (Brush et al., 2022). The case study was chosen because it provides an in-depth understanding of the implementation of the STEAM learning method in producing Eco-print Hijab. The participants of this study are 21 students who attend the KIR (Youth Scientific Work) research class and two teachers involved in the learning and production process of the Eco-print Hijab (Smith & Brown, 2019).

Data was collected through interviews, direct observations, and documentation to gain a comprehensive understanding of the learning and production process of the Eco-print Hijab. The interview is conducted to collect data about student's and teacher's perspectives on this learning comprehensively. Then, direct observations are performed to catch the actual process of learning systematically. The documentation was also conducted to collect the process and product of all students.

The research variables relevant to the production of hijab eco-print are related to the involvement of teachers in the implementation of learning, the process of mordanting and fixation, the characteristics of the motifs and colors of the fabrics produced, the fastness of color, the influence on environmental awareness, and student assessment. Problem or Challenge Description: Create an eco-print hijab within budget (no more than 300 USD).

Table 1. STEAM-based Learning Steps for Creating Eco-print Hijab

Engineering Design Steps	How Demonstrated	Student's Activities
1. Identifying a problem or challenge	• In the school environment, there are many types of plants. • The hijab is needed by Muslim women to cover the aurah.	Observation in the school environment
2. Exploring ideas related to solving the problem or challenge	• The use of leaves for learning media, for decoration, and natural dyes. • Eco-print technique to make the hijab • The steaming technique was chosen because it is possible to produce a better display of leaf prints than the other two techniques (solar dye and hapazome)	Reviewing various literature on eco-print, a type of natural dye
3. Developing a plan and a solution to solve the problem or challenge	• Choosing fabric variations using silk, rayon, and voal fabrics. • Choosing various plant leaf types: moringa leaves, roses, spikes, and jatropha. • Choosing the type of dye from the secang. • Create a design using Canva virtually and implement the leaf layout directly on a fabric with a length of 115 cm x 115 cm	Independent variables: fabric type, leaf type, and dye type
4. Testing and evaluating the solution	• The eco-printed hijab after the finish is washed using water to see how strong the dyeing sticks to the fabric, the clarity of the silhouette of the leaves, and the number of respondents who like the design of the eco-print product made	Trials to ensure the quality of hijab eco-prints: Clarity of leaf appearance (silhouette and leaf bones); Fade or not; and Number of people who like the design (%)
5. Presenting the solution	• Communicating the results of making hijab eco-prints in front of the class, along with their advantages and disadvantages.	Students in each group made presentations and shared ideas.

Then, a literature study was carried out by reviewing several articles related to the STEAM method. Finally, the process of making hijab eco-prints is carried out with independent variables: type of fabric used, type of plant/leaf, and type of dye. The researcher identified the main findings related to the implementation of STEAM learning in producing Eco-print Hijab. There are two research problems in this research:

1. How do students apply the Scientific Investigation Approach (STEAM-based learning)?
2. How is the simple business model on this eco-print hijab product?

This analysis allows researchers to explore in depth how environment-based learning and creativity can be integrated. The analysis results will be used to identify the factors that affect the successful implementation and evaluate the STEAM learning method.

RESULT AND DISCUSSION

This school is one of the green schools in Tasikmalaya because there are various types of plants in every corner of the school that make the school more comfortable, cool, and fresh. There are more than 100 species of plants in the school environment, both tree and ornamental plants. The potential for plant diversity allows students and teachers to use plants in addition to being a learning medium, for example in Biology subjects, and its use can also be aimed at becoming a natural dye in the eco-print process of fashion fabrics (both for hijab and clothing). The use of the veil/hijab is an important need for Muslim

women. Islam requires Muslim women to wear a veil to cover their awrah. Nowadays, the hijab is no longer only plain in color but is also very diverse in motifs and colors.

From these problems, an idea was obtained to utilize plants (especially leaves) from the school environment to be processed into natural dyes in the manufacture of hijab, namely Eco-print Hijab. This creative product has artistic value and benefits that are highly marketable. Eco-print hijab with all its processes will make the resulting hijab very unique, limited edition, and artistic. The reason is that the manufacturing process is influenced by many factors, for example, the variety of fabric used, the variety of plant/leaf type chosen, the source of dye used, the time of steaming, the strength of the squeeze, and other factors. Therefore, students in the research class are challenged to design and make eco-prints of hijab with a variety of types of fabrics, types of leaves, and types of dyes. Eco-print hijab that is categorized as successful is the one that produces a clear color leaf print on the fabric, does not fade when washed, and does not cost more than 300 USD.

This study provides an in-depth overview of the implementation of STEAM learning in school for the production of Eco-print Hijab. The analysis shows that STEAM methods create a skilled and creative learning environment. The findings of the work show that the learning process involving STEAM methods in producing Eco-print Hijab has provided practical and theoretical experience. Students not only learn about the technique of making Eco-print Hijab but also understand the importance of sustainable use of natural resources.

In this study, the applied eco-print technique is divided into three ways: the hapazome/pounding technique, dye bundle/steaming, and solar dye. The results of the study by Tresnarupi & Hendrawan (2019) concluded that each technique has its own advantages and disadvantages. The hapazome technique produces good silhouette colors but has less fading resistance. While the solar dye technique takes a long time, it makes good color transfer. Meanwhile, the dye bundle technique produces good color transfer, silhouette, and leaf bones and has good fastness. Therefore, in this hijab eco-print project, the dye bundle technique was chosen because it gives the best results.

Several ways can be used to dye textile materials in a natural way, one of which is by using the eco-print dyeing technique. The eco-print technique is a process of transferring colors and shapes to the fabric through direct contact (Flint, 2008). The eco-print technique utilizes materials from plant parts that contain color pigments, such as leaves, flowers, stem bark, and others. In the research (Hikmah & Retnasari) it was explained about eco-print techniques which are divided into three ways, namely:

1. Hapazome/Pounding technique: the process of transferring color and shape directly by hitting it with a small hammer. This technique is suitable for fabrics such as linen, hemp, cotton, and silk.
2. Dye Bundle / Steaming technique: at the end of the dyeing process, the fabric is left to dry and then can go through the process of fixation and washing of the fabric. This technique is especially good for use on silk and wool fabrics.
3. Solar Dye Technique: with this technique, natural materials (leaves, bark, stems, fruits) are placed on the surface of the fabric and put into a jar filled with airtight water. This method requires sunlight and is left for approximately 1 month.

The results of a study by Tresnarupi & Hendrawan (2019) that compared the results of eco-print using the three techniques above, it was known that the hapazome technique produced silhouette colors that were well transferred in the fabric but had poor fastness to fade. By using the solar dye technique, the color and silhouette of the leaves are transferred well, but in the process, it takes a long time. Meanwhile, using the dye-bundle technique produces colors, silhouettes, and leaf bones that are transferred and have good fastness. Therefore, in this hijab eco-print project, we chose to use the dye bundle technique.

The motifs and colors of the fabrics produced using the eco-print technique have distinctive characteristics because the motifs produced will vary and cannot be predicted. Even though it uses the same manufacturing techniques and types of plants. The kind of fabric, the mordanting process, and fixation also affect the final result. This makes the eco-print technique have high artistic value (Ulin & Hamsah, 2021). In Indonesia, batik craftsmen have redeveloped the eco-print technique in recent years. Currently, the use of batik fabric is more freely created in any form and can be used daily or when traveling (Dwita & Sarasati, 2020).

Mordanting Process

The mordanting process can help brighten, provide dark colors, and prevent color fading. The mordanting process aims to increase the absorption of natural dyes into fabrics and produce good color sharpness (Abu, 2016). Mordans can be applied before (pre-mordanting), during staining (simultant), and after staining (post-mordanting). Mordanes and natural dyes will also produce different impacts depending on the fibers used such as proteins, cellulose or synthetics.

Fixation Process

In dyeing textiles with natural dyes, a fixation process (fixer) is needed, which is a color-locking process so that the natural colors absorbed in natural fiber materials have good flexibility. The fixation process is carried out by adding materials that contain metal complexes. According to Abu (2016), there are three types of fixer solutions that are commonly used, namely tunjung ($FeSO_4$), alum ($AlSO_4$), and lime ($CaCO_3$).

1. **Scientific Investigation Approach Used**: observations, making and testing hypotheses, measurements, data collection and analysis, identification/description, and theoretical explanations based on evidence.
   a. Observations
      Students identified the school environment and found many types of plants that have the potential for eco-print images.
   b. Making and Testing Hypotheses
      Eco-print hijabs made of silk fabric will show a better silhouette image than other types of fabrics.

Figure 1. Demonstration of Making and Testing Hypotheses

   c. Measurements
      Students measure various materials needed for the hijab eco-print manufacturing process. Students determine the number of leaves and design a leaf pattern on the fabric using Canva media.
   d. Data Collection and Analysis
      The process of making eco-prints is carried out using various variations of fabric types (silk, rayon, voal), variations of leaf types (kersen, fern, rose, moringa, and kepyar, kimanila), as well as variations in leaf designs and patterns. Demonstration in data collection and analysis shown in figure 2.
   e. Identification/description
      Alum mordanus produces a brownish-green color for the leaves; Lime mordanus produces brownish-green to dark brown to foliage; Mordan tunjung produces a dark green color and does not fade after washing. Therefore, a combination of the three ingredients (alum, lime, and pure vinegar) is used for the mordanting process and shown in figure 3.

Figure 2. Demonstration in Data Collection and Analysis

Figure 3. Demonstration in Identification/description

f. Theoretical Explanation Based on Evidence

Silk cotton fabric has the potential to produce more visible pigments due to its more natural fibers. Plants that can be used as eco-prints have a sharp aroma and scars when rubbed and produce color in water when boiled for 10 minutes.

Figure 4. Demonstration in Theoretical Explanation based on Evidence

STEAM is a term used to group the academic disciplines of Science, Technology, Engineering, Arts, and Mathematics and their related content, practices, and applications. STEAM methods can foster students' creative character. This is evidenced by Ristiani, et. al (2021) who conducted research at SDIT

Khairu Ummah Leuwisadeng, Bogor, West Java on science subjects by developing Lectora Inspire version 12 defense media. Anggraini and Huzaifah (2017) quoted from Moore et. al that STEM is a combination of four subjects in the lesson with the foundation of the subject and concrete problems. Even in the 21st century, there have been significant changes in the existence of STEM methods (Khairiyah, 2019). Thus, Yunita et. Al (2019) emphasized the importance of character education in accordance with religious manners and norms reflected in their activities. The STEM components are defined as follows:

1. Science involves research and understanding of nature.
2. Technology is the modification of the natural environment through products, systems, and processes that humans design to meet needs and desires.
3. Engineering is the use of scientific principles and mathematical reasoning to optimize technology to meet the needs that have been defined by the criteria in the Constraints (Engineers create technology).
4. Mathematics enables critical communication and analysis as well as the way we understand the human and natural world using numbers and computational reasoning.

Table 3. STEAM Component on Eco-print Hijab Production

Component of STEAM	Content, practices, and/or applications related to the solution of the problem or Challenge	Notes
Science	• Biology: students learn the different types of plant diversity, their benefits, and their characteristics (morphology). • Chemistry: students apply the concepts of acids and bases. • Physics: students learn the concepts of heat and temperature.	Comprising of three branches of science: biology, chemistry, and physics.
Technology	Students conducted an eco-print experiment using the dye-bundle method and the mordanting technique.	The sun dye technique was not chosen because it took a long time, then the hapazome technique was also not chosen because it lacked good silhouettes for different types of leaves.
Engineering	Students make a leaf pattern design on fabric with a hijab size of 115 cm x 115 cm, with various fabric types, leaf types, and dyes used.	Various types of leaf patterns are produced by students.
Arts	Students choose leaf compositions with variations in type, layout, and size.	Students are creative to create artistic and marketable eco-print hijab designs.
Mathematics	Students apply concepts about scale and measurement.	Students perform a leaf measurement process to estimate the number of leaves required in their design.

2. Bussiness Model/Prototype of Eco-print Hijab Produced

The process of making eco-prints is not carried out in one learning process but is carried out in four meetings. Here are the details of the learning process of Project Eco-print Hijab.

1) The first meeting was the preparation of groups consisting of 4-5 students.
2) Students in the group observe the school environment and determine problems.
3) Students conduct a literature review related to the specified problem.
4) Students make designs manually on paper and continue to create designs using the Canva application media. The process of making hijab eco-prints is shown in Figure 5.

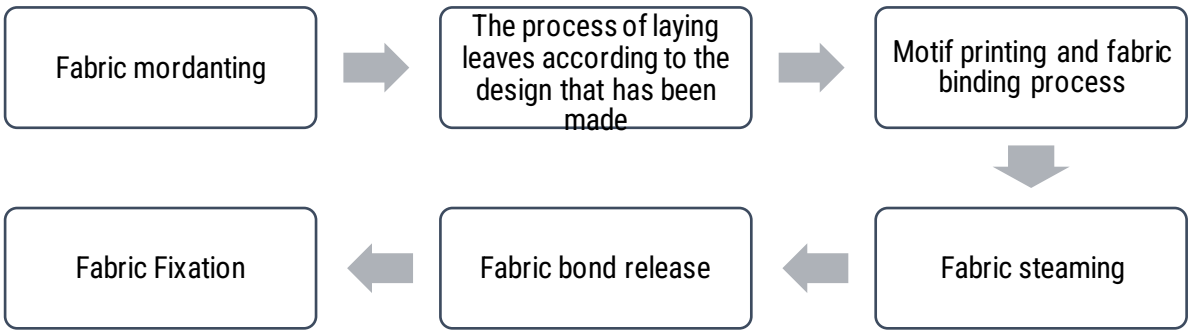

Figure 5. The Process of Making Hijab Eco-prints

a. Materials & Budget

Table 4. Materials and Budget on Eco-print Hijab Production

No	Supplies	Amount	Price (IDR)
1	Bucket	1 pcs	40.000
2	Plastic (115 cm x 115 cm)	1 pcs	10.000
3	Pipe (3/4 inch)	1 pcs	20.000
4	Raffia String	1 roll	12.500
5	Stove	1 pcs	Free
6	LPG fuel	5 kg	27.000
7	Steaming Pot	1 pcs	Free
8	Cover Cloth	1 m^2	Free
9	Water	10 L	Free
10	Alum	500 gram	4.000
11	Tunjung	250 gram	5.000
12	Baking Soda	500 gram	3.500
13	Concentrated Vinegar	100 mL	11.000
14	TRO Detergent	100 gram	2.000
15	Leaves: *Pteridophyta, Riccinus communis L., Jatropha gossypiifolia, Tectona grandis, Cassia alata L., Cosmos caudatus, Muntingia calabura, Moringa oleifera, Rosa hybrida, Acalypha wilksiana, Psidium guajava, Peristophe bivalvis L., Biden pilosa L.*	(according to design per group)	Free
16	Type of Fabrics:		
	a. Rayon	115 cm x 115 cm	46.000
	b. Miracle Voal	115 cm x 115 cm	46.000
	c. Silk Cotton	115 cm x 115 cm	46.000
	d. Paris Cotton	115 cm x 115 cm	18.400
17	Type of color:		
	a. Tingi Wood (Sundanese Pine)	500 gram	12.250
	b. Tegeran Wood	500 gram	17.500
	c. Jolawe Wood	500 gram	17.500
	Total Cost		338.650

b. The Need

Hijab is a must for a Muslim woman to cover her hair, because in Islam, hair is one of the parts of the body that must be covered. Currently, the hijab varies significantly in terms of materials, colors, and motifs. Likewise, the price of hijab varies greatly, ranging from tens of thousands to hundreds of thousands

of rupiah, there are even certain brands that reach five hundred thousand rupiah.

Having a hijab with attractive motifs is the dream of almost all Muslim women, but there are also many hijabs with unique and branded motifs that are expensive. Based on these problems, we offer a solution by making hijab motifs with the eco-print method to get hijab with unique motifs at an affordable price. This method uses the leaves of plants around the school to produce branded quality hijab motifs. Based on the survey conducted, the design used is most in demand by Muslim women because it has a design that is not too crowded and large but still looks elegant. In this project, students are challenged to design and make eco-print hijabs at a cost not exceeding 300 USD.

c. Development Plan

Eco-print is not only applied to sheets of fabric, but in principle, the eco-print technique is also very good if applied to various clothing products and household complementary products, such as scarves, napkins, curtains, clothes, pants, pashminas, bed sheets, bags, shoes, mugs/glasses, fans, umbrellas, and others according to their wishes and needs.

The piloting project as a follow-up to this project is to hold training for the community around the school. The training method that will be applied to this community is basic technical training on eco-printing (steam). The type of expertise needed to solve an economic problem or the needs of partners is to conduct counseling and training in a training forum to provide knowledge and understanding of making eco-printing that is environmentally friendly, economically and creatively valuable for PKK community members who need eco-printing skills, to open up independent entrepreneurial jobs. Providing a good brand image for the eco-print hijab in the school market. Eco-print hijabs and other eco-print products are packaged as attractively as possible so that photos look more beautiful.

d. Marketing Plan

Introducing and promoting eco-print hijab products online and offline. Effective marketing through online media, students and trainees are equipped to promote and market through social media such as Facebook, Instagram, Twitter, or in any marketplace (Shopee, Tokopedia, Lazada, TikTok, and so on). In addition, we plan to train students and trainees on the art of processing words and persuasive sentences that are short and clear.

e. Budget

Based on the table in section IV.b, it is known that the estimated cost of making an Eco-print Hijab other than fabric is 182.250 rupiah for materials and tools other than fabric. Based on calculations, the cost of materials and tools can be used to produce 40 pieces of hijab fabric. So, if calculated, producing 1 pcs of Eco-print Hijab takes a material production cost of Rp 4,556, not including the fabric material, because the fabric material has a variable price. For example, silk fabric is more expensive because the price of the fabric is expensive, while rayon fabric can be cheaper.

This study also highlights the distinctive characteristics of the motifs and colors of the fabrics produced by the eco-print technique. Even though it uses the same manufacturing techniques and types of plants, the resulting motifs will vary and be unpredictable. Factors such as the type of fabric, the mordanting process, and fixation also affect the final result. This characteristic gives high artistic value to eco-print techniques (Ulin & Hamsah, 2021). The mordanting and fixation processes are also an essential part of eco-print techniques. The mordanting process helps in increasing the absorption of natural dyes in the fabric and provides good color sharpness. Meanwhile, the fixation process is needed to lock the natural color to have good resistance to the fabric fibers. The selection of the type of mordan and the fixation process will affect the final result of the hijab eco-print (Abu, 2016). In research (Firda et al., 2021), it is stated that learning strategies that integrate Science, Technology, Engineering, and Mathematics (STEM) provide extensive opportunities for students to learn about sustainable issues and also can develop student's attitudes and concerns about sustainable lifestyle. In the second step of this STEAM-based learning, students carried out a literature study to find out the advantages and disadvantages of the methods students chose to produce eco-print hijab. This is in line with other researchers who stated that online learning which makes it possible to develop self-regulation skills (Kaniawati & Sriyati, 2021).

CONCLUSION

The Eco-print Hijab project shows that the integration of environmental education and the arts can create a creative and sustainable learning environment. This article underlines the importance of projects like this in improving students' environmental awareness and practical skills. This study makes a significant theoretical contribution to the understanding of learning implementation practices in high schools, focusing on optimizing natural resources for producing hijab eco-prints. By analyzing learning strategies centered on using natural resources, this study complements the literature that previously focused more on the technical aspects of hijab production. The implications of the findings of this study highlight the importance of integrating ecological approaches in learning, which not only enriches the student experience but also provides insights into environmental awareness. Further study is needed on how student products can be accepted in society through the development of the business world, both online and offline markets.

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REFERENCES

Abu, A. (2016). *Pewarnaan alami kain sutra dengan menggunakan fiksator tawas, tunjung, dan kapur tohor*. Makassar.

Anggraini, F. I., & Huzaifah, S. (2017). Implementasi STEM dalam pembelajaran IPA di Sekolah Menengah Pertama. Prosiding Seminar Nasional Pendidikan IPA 2017. STEM Untuk Pembelajaran Sains Abad 21. 23 September 2017, 1998, 722–731.

Brown, J. L., & Smith, C. M. (2019). An Examination of Student Performance in Pre-Requisite Coursework and Upper Division Nursing Coursework. *Journal of Nursing & Interprofessional Leadership in Quality & Safety, 2* (2). Retrieved from https://digitalcommons.library.tmc.edu/uthoustonjqualsafe/vol2/iss2/4

Brush, K.E., Jones, S.M., Balley, R., & Nelson, B. (2022). Social and emotional learning: from conceptualization to practical application in a global context. Life Skills Education for Youth, pp. 43-71. Cambdige: Murphy-Graham.

Dwita, A. A. & Sarasati, M. (2020). Penerapan Teknik ecoprint pada dedaunan menjadi produk bernilai jual. *Jurnal Pengabdian Seni*. DOI: https://doi.org/10.24821/jas.v1i2.4706

Faridatun, (2022). Cetak Ramah Lingkungan; Cetak Motif Alam Ramah Lingkungan. *Jurnal Prakarsa Paedagogia 5 (1)*.

Firda, R., Kaniawati, I. & Sriyati, S. (2021). STEM Learning in Sustainability Issues to Improve Sustainability Consciousness of Junior High School Students. *Jurnal Penelitian Pendidika,. 24* (1).

Flint, I. (2008). *Eco colour*. Millers point. Murdoch Books. Available Online at: https://books.google.co.id/book?printsec=frontcover&vid=ISBN9781741960792&redir_esc=y#v=onepage&q&f=false

Himah, A.R. & Retnasari, D. (2020). Ecoprint sebagai alternative peluang usaha fashion yang ramah lingkungan. *Journal UNY*. Available online at: https://44478-122482-1-SM.pdf

Iskandar Iskandar, Hamlan Andi Baso Malla (2018) Manajemen Kepemimpinan Kepala Sekolah dalam Mengembangkan Kesadaran Ekologi Di Sma Model Negeri 3 Palu Sulawesi Tengah. *Paedagogia: Jurnal Pendidikan, 7* (1), 141-154, 2018.

Kaniawati, I. & Sriyati, S. (2021). STEM Learning in Sustainability Issues to Improve Sustainability Consciousness of Junior High School Students. *PAEDAGOGIA Jurnal Penelitian Pendidikan*. 24 (1), 53-60.

Kant, R. (2012). Textile dyeing industry an environmental hazard. Open Access Journal Natural Science, 4 (1), article ID: 17027, 5 pages, DOI: 10.436/ns.2012.41004.

Khairiyah, N. (2019). *Pendekatan Science,Technology,Engineering dan Mathematics (STEM)*. (Guepedia (ed.)). Indonesia.

Siti Mayyuthi'i Ristiani, Retno Triwoelandari, Yono (2021) Pengembangan Media Lectora Inspire Versi 12 pada Pembelajaran IPA Berbasis STEM untuk Menumbuhkan karakter Kreatif Siswa. DOI: https://doi.org/10.31004/basicedu.v5i1.613

Untari, Titin., Rahmaniah, Rima., Islami, A.B., & Ihsani, B.Y. (2018). Peningkatan Pembelajaran Microteaching Melalui Pendekatan Kolaboratif. *Jurnal Prakarsa Paedagogia*. 1 (1), 2018.

Tresnarupi, R. N. & Hendrawan, A. (2019). Penerapan Teknik ecoprint pada busana dengan mengadaptasi tema bohemian. *e-Proceeding of Art and Desig*n, *6* (2), pp. 1954-1960.

Ulin & Hasmah. (2021). *Penciptaan tekstil Teknik ecoprint dengan memanfaatkan tumbuhan local Gorontalo*. Available online at: https://journal.isi-padangpanjang.ac.id/index.php/Ekspresi

Yaseen, J.K. & Schloz, M. (2018). Textile dye wastewater characteristics and constituents of sythetics effuents: a critical review. *International Journal of Environmental Science and Technology* vol 16, page 1193-1226. Available online at: https://doi.org/10.1007/s13762-018-2130-z.

Yunita, I., Triwoelandari, R., & Fahri, M. (2019). Pengembangan Media Focusky Terintegrasi Nilai Agama Untuk Mengembangkan Karakter Disiplin Siswa Sekolah Dasar [Development of Integrated Focusky Media on Religious Values to Develop the Discipline Character of Elementary School Students]. *PEDAGOGIA: Jurnal Pendidikan, 8*(2), 335.