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Students' Science Process Skills in using Worksheets Integrated with Entrepreneurship

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ABSTRACT

The waste processes skill is an essential skill to overcome environmental pollution problems. Unfortunately, teachers cannot yet train student skills due to the lack of a specific worksheet for specific activities. Waste processing activity would be more meaningful if it were integrated with entrepreneurship. This research aims to develop a natural science worksheet integrated to entrepreneurship that can train students' science processes skills through waste management activity. This research uses the developmental research method of ADDIE type. This research sample was junior high school students in Mataram. The data analysis of validity results uses the Aiken V index. The result of the Aiken V index from the material experts was V =0.84, categorized as very good, and the result from the worksheet design experts was V=0.83, categorized as very good. The observation reliability of science processes skills was analyzed using a Percentage of Agreement (PA). It was derived with a PA = 0.85, meaning that it meets the standard result of good observation. Students' science processes skill was observed in three activities, they are: making compost fertilizer, making handicraft products, and SWOT identification activity. Natural science worksheet integrated to entrepreneurship can train students to be skillful in making compost fertilizer and handicraft products. Meanwhile, the students consider that SWOT identification activity is still strange for them. Hence, as much as 10% of students have not been skilled yet in performing SWOT identification. The teachers need to be more active in arranging waste management, be it in school or assigning tasks to manage waste at home.

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1. INTRODUCTION

The waste handling issues in various places have not been appropriately addressed. It is proven that many wastes are piled up in ditches, beaches area, and even in the nearby residential environment. In Mataram West Nusa Tenggara, government policy related to waste handling has been imposed, i.e., zero-waste policy. The policy has established rules that household waste must be managed by 70%, and the government manages by as much as 30%. However, the people in Mataram generally do not understand the advantage of self-managing household waste, mainly plastic waste (Kurniati et al., 2017). Moreover, facilities and infrastructure for managing waste have not been adequate and evenly distributed in every region.

The previous research result indicates that people with the highest knowledge of managing waste are 15-30 years old. Meanwhile, for people between the age of 50-60 years old, their knowledge is still low (Nizaar et al., 2020). So that a person's productive age in managing waste is 15-30 years old. At this age the school students who enter it are senior high school students.

Almost everyone understands the organic and nonorganic waste types. Meanwhile, few people have not understood how to manage waste such as paper, plastic, glass, metal, clothes, and hazardous and toxic substances. High school students, at the age of 15-30 years old, have the best knowledge regarding the way of managing waste compared to junior high school students or people above 30 years old (Desa et al., 2012). Therefore, the school's role in training students in managing waste is highly needed, especially for junior high school students (Kusumawardani, 2014).

Although based on previous research, the productive age of managing waste is at the age of 15-30 years, there is nothing wrong if the awareness of managing the waste has started from an early age, for example since junior high school age. The role of the school is very important in this regard because 50% of students' time each day is spent at school. In learning in schools, it is important to present a lesson that can increase the awareness of junior high school students in terms of waste management. Waste management in question is recycling management, for example, so that it has a selling value and can add to the economic sector.

One of the primary lessons in natural science that junior high school students study is environmental pollution. The students will perceive the meaningfulness of such a material learning process if the teachers can train their students to be skillful in solving environmental pollution problems in daily life (Aydogdu & Idin, 2015; Huda & Dewi, 2012). The organic and nonorganic waste can be processed into sellable products, such as compost fertilizer made of leaves and animal dung, wall decoration from used paper, children's toys from used bottles and pieces of wood (Pratiwi & Yasin, 2022; Lamasai et al., 2017). Several kinds of research have proven that waste processing activities can improve students' creativity, comprehension, learning interest, and learning activeness (Kaleka & Ika, 2018; Suryanti et al., 2018; Licy et al., 2013).

Various things stated earlier indicate that in the problem of household waste management, there are symptoms of a culture of inconsistency between knowledge, attitudes, and behavior. Inconsistencies between knowledge, attitudes, and behavioral manifestations, may also be caused by the following things. Our primary and secondary education, both elementary and junior high and high school places more emphasis on cognitive abilities and not at the affective or psychomotor level. Even if there has been an attempt to include affective and psychomotor aspects, for example with the Active Student Learning Method (CBSA), Community Science and Technology (STM), and others, the subject of the test returns to the cognitive aspect. This will encourage inconsistencies between students' knowledge, attitudes, and behavior. If this happens, there will be a culture of inconsistency which is not only related to household waste management problems, but also to other problems (Muhdhar, 2012).

Based on the above, it is necessary to increase learning related to waste management. Things that can be done include developing learning tools or teaching materials that are adapted to ways of managing waste, recycling waste into items that can be used. The teaching materials in question are

able to develop student worksheets that are integrated with waste management and procedures for recycling the waste.

The students' waste processing products outcomes need to be integrated with entrepreneurial values to improve students' entrepreneurship literacy from an early age (Deveci & Cepni, 2017; Nwakaego & Kabiru, 2015). Entrepreneurship needs to be taught from an early age and become a part of students' identity. Entrepreneurship integration with non-business studies presents education that trains students to make certain products skillfully (Hamond et al., 2019; Yuanita, 2018). Integrated waste management entrepreneurship is one of the ways to develop human capital for 21st-century society.

Teachers need the worksheet to be a specific and directed learning activities guidance. The worksheet is part of the learning materials. The worksheet provided by the government is not sufficient yet and is too general (Elvianasti et al., 2021). Teachers should be freed to develop the worksheet and other learning resources corresponding to their requirements and situation in every region. Therefore, natural science worksheet containing entrepreneurship integrated waste management activities in the school needs to be developed and tested scientifically.

The function of Worksheet is crucial in learning activities, but teachers' ability to develop worksheet is still low. They prefer to use worksheet offered by the government or publisher. The distributed worksheets have not yet accommodated students' needs and character, so they must be specifically designed (Widodo et al., 2022). The worksheet quality is assessed based on three requirements, e.g., didactic, construction, and technical aspects (Wilujeng, 2010). Worksheet components comprised the title, manual, the targeted competency, work steps, tasks, and assessment.

Natural science worksheet containing waste processing activities will encourage molding science processes skills. This science process skill emphasizes active, creative, and innovative learning. These principles are shaped by every learning component. According to Bandura (2001), the learning process consists of three components, e.g., individual, behavioral, and environmental. All three are reciprocal causality. Students receive information stored within the brain, and behavior in the form of interaction occurs during the learning process and under a supportive social environment condition.

Science processes skills are developed through the learning process; the fundamental indicators of science processes skills that can be observed consist of observation, classification, measurement, communication, deducing, and predicting skills (Elvianasti et al., 2021). Students' science processes skills are developed if they are stimulated to be active, creative, and innovative (Nizaar et al., 2020). Through this research, students' science processes skills can be developed through natural science worksheet containing entrepreneurship integrated waste management activities.

With the science's worksheet integrated with entrepreneurship, it will increase students' awareness of the benefits of waste management and how to recycle it. The knowledge possessed by these students can be applied to the community so that students will become people who are aware of environmental cleanliness. The long-term impact will add to the beauty, cleanliness, and beauty of the environment.

In addition, a clean environment will minimize air pollution and will improve health for all people in the environment. On the other hand, if the process of recycling waste into finished goods that can be used can have a selling value, then the waste can become a source of income for the community and can indirectly improve the community's economic sector.

2. METHODS

This research is a developmental research type of ADDIE (Analyze, Design, Develop, Implement, and Evaluation) model. The worksheet development process was conducted through five stages. First, it conducted the problem analysis and requirements for problem-solving. The analysis was conducted on learning material and its conformity with students' learning requirements. Second, the study designed the worksheet that trains students to process waste integrated with entrepreneurship values. The worksheet was developed to improve waste handling skills assessed from students' science

processes skills. The third, stage is worksheet development. The developed worksheet prototype was then tested its validation by the learning materials experts. The validation result is a suggestion and correction from the expert intended to rectify the worksheet. The fourth stage is worksheet implementation. This implementation was intended to assess the worksheet usage within the class, including observing students' science processes skills. Fifth is the evaluation stage. This stage is the worksheet improvement stage to be more effective and efficient to be implemented within the class. The research sample for the product trial was 38 students in grade VII of SMPN 17 at Mataram.

The worksheet prototype was validated by the expert and analyzed using the Aiken V index (Aiken, 1985) to measure the three experts' logical validity of the research result. The assessment of practicality was carried out by observing the skill of the waste handling process conducted by the students. Subsequently, the study conducted a reliability test to observe the result data of the waste management process from the three experts using the Percentage of Agreement (PA) by standard value of ≥ 0,75 (Grinnell & Richars, 1988). The students' skills in such a process were categorized into science processes skills: highly-skilled, skilled, somewhat skilled, and less skilled. If the result percentage is between 85%-100%, it is categorized as highly skilled. The result percentage was 74%-85%, categorized as skilled. If the result percentage is 65-74%, it was categorized as somewhat skilled. If the result percentage is 55%-64%, it is categorized as less skilled (Koyan, 2012).

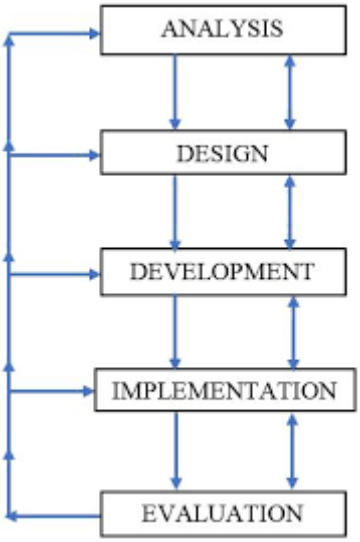


Diagram 1. The process of research using ADDIE method

FINDINGS AND DISCUSSION

Waste management is carried out through the 3R principle. The 3R principle is three forms of waste management activities to decrease everything that can cause the waste amount to pile up, reuse leftover items for the same function or a different function, and decipher waste (recycle) to be created into a new product.

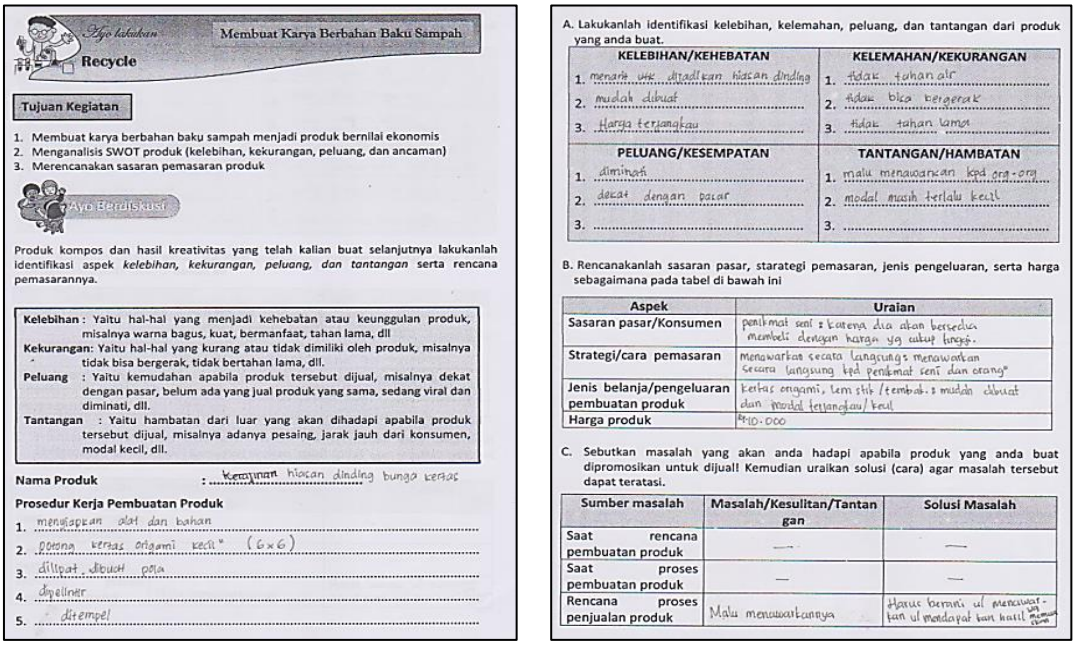
The theme and material analysis was first carried out to determine the problems and requirements for problem-solving. The environmental pollution theme has consisted of water pollution, soil pollution, and air pollution subthemes. The activities in the Worksheet focus on managing organic and nonorganic waste. The scope of waste management activities is presented in the following table.

Table 1. Scope of Waste Management Activities Using the 3R Principle

No	Waste Management Activities	Science Processes Skill
1	Making compost made of organic waste (leaf, rice leftovers, grass, cow dung)	a. Selecting waste that can be made as compost fertilizer b. Preparing the primary materials: organic waste, cow dung, and rice rinsing water c. Mixing and storing compost fertilizer process
2	Making handicraft products made of used goods	a. Selecting used goods b. Making work procedure c. Designing product
3	Product SWOT identification	a. Identifying product strengths and weakness b. Identifying the opportunity and obstacles that will be faced if the product is sold c. Planning on how to market the product

The activities in the worksheet consisted of three parts: making compost fertilizer, making handicraft products, and SWOT identification. Students conduct a simple SWOT identification by identifying the product's strengths and weaknesses and predicting the opportunity and threats they face if the products are sold in the market.

The developed Worksheet component is consisted of: the activity title, general knowledge, the activity objective, the activity instruction, working steps, tasks, and assessment. One of the students' activities results is presented in the following figure.



Ayo lakukan — Membuat Karya Berbahan Baku Sampah

Recycle

Tujuan Kegiatan

1. Membuat karya berbahan baku sampah menjadi produk bernilai ekonomis
2. Menganalisis SWOT produk (kelebihan, kekurangan, peluang, dan ancaman)
3. Merencanakan sasaran pemasaran produk

Ayo Berdiskusi

Produk kompos dan hasil kreativitas yang telah kalian buat selanjutnya lakukanlah identifikasi aspek *kelebihan, kekurangan, peluang, dan tantangan* serta rencana pemasarannya.

Kelebihan : Yaitu hal-hal yang menjadi kehebatan atau keunggulan produk, misalnya warna bagus, kuat, bermanfaat, tahan lama, dll
Kekurangan: Yaitu hal-hal yang kurang atau tidak dimiliki oleh produk, misalnya tidak bisa bergerak, tidak bertahan lama, dll.
Peluang : Yaitu kemudahan apabila produk tersebut dijual, misalnya dekat dengan pasar, belum ada yang jual produk yang sama, sedang viral dan diminati, dll.
Tantangan : Yaitu hambatan dari luar yang akan dihadapi apabila produk tersebut dijual, misalnya adanya pesaing, jarak jauh dari konsumen, modal kecil, dll.

Nama Produk : Kemunan hiasan dinding bunga kertas

Prosedur Kerja Pembuatan Produk

1. menyiapkan alat dan bahan
2. potong kertas origami kecil" (6x6)
3. dilipat, dibuat pola
4. dipelinter
5. ditempel

A. Lakukanlah identifikasi kelebihan, kelemahan, peluang, dan tantangan dari produk yang anda buat.

KELEBIHAN/KEHEBATAN	KELEMAHAN/KEKURANGAN
1. menarik utk dijadikan hiasan dinding	1. tidak tahan air
2. mudah dibuat	2. tidak bisa bergerak
3. Harga terjangkau	3. tidak tahan lama
PELUANG/KESEMPATAN	**TANTANGAN/HAMBATAN**
1. diminati	1. malu menawarkan kpd org-org
2. dekat dengan pasar	2. modal masih terlalu kecil
3.	3.

B. Rencanakanlah sasaran pasar, stategi pemasaran, jenis pengeluaran, serta harga sebagaimana pada tabel di bawah ini

Aspek	Uraian
Sasaran pasar/Konsumen	penikmat seni : karena dia akan bersedia membeli dengan harga yg cukup tinggi.
Strategi/cara pemasaran	menawarkan secara langsung: menawarkan secara langsung kpd penikmat seni dan orang°
Jenis belanja/pengeluaran pembuatan produk	kertas origami, lem stik / lembab.: mudah dibuat dan modal terjangkau/kecil
Harga produk	Rp10.000

C. Sebutkan masalah yang akan anda hadapi apabila produk yang anda buat dipromosikan untuk dijual! Kemudian uraikan solusi (cara) agar masalah tersebut dapat teratasi.

Sumber masalah	Masalah/Kesulitan/Tantangan	Solusi Masalah
Saat rencana pembuatan produk	—	—
Saat proses pembuatan produk	—	—
Rencana proses penjualan produk	Malu menawarkannya	Harus berani ul menawarkan ul mendapat dan hasil memuaskan

Figure 1. Example Design of a Natural Science Student Worksheet Integrated to Entrepreneurship

The Worksheet prototype made by the researcher is then validated by three experts in worksheet material and three experts in worksheet design. The worksheet validation result by material and design experts of natural science worksheet is displayed in the following table.

Table 2. Assessment Result of the Natural Science Material Expert on the Worksheet

Rater	Average of Indeks V	Category
Natural science material experts	0.84	Very good
Natural science worksheet design experts	0.83	Very good

Based on the average of the Aiken V index from the natural science material experts, it is derived V value = 0.84, a very good category, meaning that its validity is excellent. Meanwhile, the average of the Aiken V index from the worksheet design experts is derived V value = 0.83, a very good category, meaning that its validity value is also excellent. The three observers' results on reliability observation in students' science processes skills are derived percentage of agreement score of as much as 0.85, meaning that it meets the standard of a good observation result. The result of skill observation of Natural Science students' process based on the category and percentage is displayed in the following table.

Table 3. Students' Waste Management Skill Category

No	Waste Management Activity	Category (%)				
		Highly Skilled	Skilled	Somewhat Skilled	Less Skilled	Very Less Skilled
1	Making compost made of organic waste (leaf, rice leftovers, grass, cow dung)	54,8	35,20	10,00	-	-
2	Making handicraft products made off used goods	42,5	34,00	23,5	-	-
3	Product SWOT identification	15,80	43,70	30,50	10,00	-

The observation of making compost fertilizer activity is assessed from the precision in selecting the waste to be taken into compost, preparing the primary raw material, and the process of mixing compost raw material. As much as 58.8% of students categorize as highly skilled, 35.20% categorize as skilled, and 10.00% of students are somewhat skilled in making compost fertilizer. This activity is helpful in training students in managing organic and nonorganic waste. Organic waste is the raw material for compost fertilizer mixed with cow dung and leftover rice.

Making handicraft products made of used goods is assessed based on students' ability to choose used goods, making work procedures for making the product, and the ability to design the product. As much as 42.5% of skilled students make handicraft products. 34.00% of students are categorized as skilled, and 23.5% are somewhat skilled. The handicraft product made by the students is designed by themselves. Students make work procedures based on their knowledge or browsing results on Youtube channels.

Students conducted the SWOT identification on the compost fertilizer and handicraft products. The students identified the products' Strengths and weaknesses they made and identified the opportunity and threats if the products were marketed. This activity is new for students. Usually, students only make the products, and then the teacher grades their products. As much as 15.80% of students are highly skilled in conducting SWOT identification, 43.70% of students were categorized as skilled, 30.50% categorized as somewhat skilled, and the reset 10.00% were less skilled in SWOT identification. Students feel that SWOT identification was challenging because they were not accustomed to doing so.

The activity of SWOT identification is a follow-up activity after finishing making the product. Through this activity, it is expected that students can think reflective and futuristic. The activity of strengths and weaknesses product identification is identical to the way of reflective thinking, that is, the ability to view the process of an event to derive perspective or assessment (Demir & Mayis, 2015). Opportunities and threats identification is the way to think futuristic, that is, the ability to estimate

changes and correlate an event that occurred today with the possibility that might be happened in the future (Sommer, 2012). The exercise in thinking about opportunities and threats will help students think forward through analysis and prediction of possible events that might occur in the future.

The natural science worksheet used by the students can enhance students' science processes skills. It is indicated from the observation result that all students can process waste by conforming to the directions within the Worksheet. This result aligns with Dewi & Firman's (2019) study that utilizing worksheet is highly helpful in developing students' natural science processes skills. Moreover, the other benefit of this worksheet is that students can easily understand the activity objective swiftly. The lesson material on environmental pollution in grade VII of junior high school needs to be done through practical activities so that students are accustomed to reducing, reusing, and recycling in handling pollution issues.

4. CONCLUSION

Based on this research, the result indicates that the experts rated natural science worksheet integrated to entrepreneurship as valid and feasible. Hence, it can be used to guide students in waste management activities. Students' science processes skills also develop through three main activities in the worksheet, e.g., making compost fertilizer, handicraft products, and SWOT identification. This activity also trains students to think reflective and futuristic as an entrepreneur. As the learning process controller, the teacher needs to arrange this activity more often so that students are trained to solve environmental waste problems in their respective neighborhoods.

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REFERENCES

Aiken, L. R. (1985). Three coefficients for analyzing the reliability and validity of ratings. *Educational and Psychological Measurement, 45*(1), 131–142.

Aydogdu, C. & Idin, S. (2015). An analysis of the learning activities covered in the 5th-grade science textbooks based on 2005 and 2013 Turkish science curricula. *Journal of Education in Science, Environment, and Health*. 1*(1)*, 49-55.

Bandura, A. (2001). Social cognitive theory: an agentic perspective: *Annual review of Psychology: 52*(2), 1-26.

Demir, S., & Mayis, O. (2015). *Evaluation of critical thinking and reflective thinking skills Among science teacher candidates. Journal of Education and Practice, 6(18),* 17-22.

Desa, A, Abdul Kadir, N. B., & Yusooff, F. (2012). Environmental awareness and education: A key approach to solid waste management (SWM) – A case study of a University in Malaysia. https://ideas.repec.org/h/ito/pchaps/75016.html.

Deveci, I., & Cepni, S. (2017). The effect of entrepreneurship education modules integrated with science education on the entrepreneurial characteristics of pre-service science teachers. *Social Work Research Journal. 15*(2), 56-85.

Dewi, M.P., & Firman (2019). Pengaruh lembar kerja praktikum terhadap keterampilan proses sains siswa kelas IV SD. *Edukatif.* 1*(3).* 170-176.

Elvianasti, M., Meitiyani, Maesaroh, Irdalisa, Yarza, H.N. (2021). Building students' critical thinking skills through authentic learning by designing eco-brick social campaigns. *Al-Ishlah.* 13(3), 1841 – 1847.

Grinnell, Jr., Richars M. (1988). *Social work research and education (3rd ed.)*. Canada: EE Peacock Publisher, Inc.

Hamond, L. D., Flook, H., Harvey, C. C., Barron, B., & Osher, D. (2019). Implication for educational practice of the science of learning and development. *Journal Applied Developmental Science,* 24*(2)*. 97-140.

Huda, N., & Dewi, N. R., (2012). Use cigarette wrapping paper to increase student activity in making 3 in-1 electric circuits. *Unnes Science Education Journal,* 1*(1)*, 44-49.

Kaleka, M., Ika, Y.E. (2018). Developing the character-based students worksheet of science with inquiry model for students of grade IX. *Journal of Science Education Research,* 2(2), 87-97.

Koyan, I.W. (2012). *Statistik pendidikan dan teknik analisis data kuantitatif.* Singaraja: Undiksa Press.

Kurniati, S., Zaida U., & Munawarah, P.A. (2017). IbM Kota Mataram yang mengalami sampah rumah tangga. *Jurnal Pengabdian Masyarakat IKIP Mataram.* 2*(1).* 37-41.

Kusumawardani, R. (2014). Penerapan pembelajaran IPA terpadu dengan pendekatan chemoentrepreneurship untuk mengetahui minat berwirausaha siswa. *Proceding Seminar Nasional Kimia 2014, 978-602-19421-0-9*..

Lamasai, M. M., Mestawaty, A. A., & Puadi, R. I. (2017). Pemanfaatan lingkungan alam sekitar sebagai sumber belajar dalam meningkatkan hasil belajar IPA siswa Kelas III SDN 10 Gadung. *Jurnal Kreatif Online, 5*(3), 32-41.

Licy, C.D., Civek, R., Sarita, K., Anies, T.K., & Josphina, C.T. (2013). Awareness, Attitude, and Practice of School Students towards Household Waste Management. *Journal of Environment.* 6*(2)*, 147-157.

Muhdhar, M. H. I. Al. (2012). Pemahaman Dan Keterampilan Siswa Dalam Pengelolaan Sampah Rumah Tangga Dan Penerapan E-Media. *Jurnal Ilmu Pendidikan*, *18*(1), 8–16.

Nizaar, M., Sukirno, Djukri & Haifaturrahmah (2020). Wastepreneurship: A model in improving students' confidence and creativity. *European Journal of Educational Research*, *9*(4), 1473-1482.

Nwakaego , O. N., & Kabiru, A. M. (2015). The need to incorporate entrepreneurship education into chemistry curriculum for colleges of education in Nigeria. *Journal of Education Policy and Entreprenurial Research, 2*(5), 84-90.

Pratiwi, D.I., & Yasin, A. (2022). Optimization of waste banks in schools: Education-based solutions to overcome environmental pollution. *Al-Ishlah,* 14(1), 787-794.

Sommers, C. (2012). *Think like a futurist: Know what changes, what doesn't, and what's next.* Jossey-Bass.

Suryanti, Ibrahim, M., & Lede, N. S. (2018). Process skills approach to develop primary students' scientific literacy: A case study with low achieving students on water cycle. IOP Conference Series: Materials Science and Engineering, 296(1).

Widodo, E., Setyawarno, D., Rosana, D. (2022). Developing assessment as learning on basic physics virtual practicum as an asessment instrument of process and cognitive skills on online-learning. *Journal of Science Education Research,* 6(1), 97-108.

Wilujeng, I., Setiawan, A., & Liliasari. (2010). Kompetensi IPA terintegrasi dengan pendekatan keterampilan proses. *Cakrawala Pendidikan, 29*(3). 353-364.

Yuanita, Y., & Yuniarita, F. (2018). Pengembangan Petunjuk Praktikum IPA Berbasis Keterampilan Proses Untuk Meningkatkan Keterampilan Berpikir Kritis Siswa Sekolah Dasar. *Profesi Pendidikan Dasar*, 1(2), 130-139.