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Development of Etno-STEM Integrated Bioentrepreneur Electronic LKPD PjBL on Technology Innovation Material to Improve Creative Thinking Abilities and Entrepreneurial Interests of High School Students

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Abstract: This development research aims to produce an ethno-STEM integrated PjBL bioentrepreneur electronic worksheet that is feasible, practical and effective for use in improving creative thinking abilities and entrepreneurial interest. This type of research is Research and Development R&D with the ADDIE model (Analysis, Design, Development, Implement, and Evaluate). The subjects in this research were expert lecturers, teachers and students. The instruments in this research are interview instruments, needs questionnaires, feasibility questionnaires, practicality questionnaires, learning implementation sheets, teaching module validation questionnaires, test instruments, and entrepreneurial interest questionnaires. The instrument will be validated by experts and then tested. Data analysis using Manova and N-gain score tests. The results of this research show that the ethno-STEM integrated bioentrepreneur PjBL electronic worksheet is very feasible with a feasibility score for material experts of 84% and media experts of 94%, very practical with a practicality score for teachers of 100% and students of 89%, and effective as seen from The N-gain test value for creative thinking ability for the experimental class was 0.57 and the control class was 0.47 in the medium category and the N-gain test for entrepreneurial interest in the experimental class was 0.40 and the control class was 0.30 in the medium category. The Manova test obtained sig. hotteling's trace 0.00 < 0.05. The results of the Manova and N-gain tests show that the ethno-STEM integrated bioentrepreneur PjBL electronic LKPD is effective in increasing creative thinking abilities and entrepreneurial interest.

Keywords: Creative thinking; Electronic bioentrepreneur LKPD; Entrepreneurial interest; Etno-STEM; PjBL

Introduction

Indonesia ranks 4th with the largest population in the world. It was recorded that in July 2023, Indonesia's population would reach 2778.7 million people (Badan Pusat Statistik, 2023). However, Indonesia's high population is often not in line with the quality of its human resources, this gives rise to various social problems; such as poverty and unemployment (Hasan, 2021; Hutabarat et al., 2023; Indrawati et al., 2021; Rifkhan, 2017).

Unemployment is a classic that has not been resolved properly until now. Referring to data from the Central Statistics Agency (BPS), in February 2024, unemployment in Indonesia was recorded at 7.2 million people with the number of unemployed being

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dominated by high school graduates and followed by college graduates. The high unemployment rate in Indonesia is very worrying, so the world of education currently has an obligation to prepare a generation that has independence, skills and a competitive spirit to face global competition (Dacholfany, 2021; Muliadi et al., 2021; Rusdiana et al., 2020). Education must be an agent of change capable of developmentting life skills-oriented learning, one of which is by teaching skills related to entrepreneurship (Reilly, 2018; Rukanda et al., 2020). Through integrated learning, entrepreneurs will be able to encourage what is called an entrepreneurial society in accordance with the Sustainable Development Goals (SDGs) (Durnali et al., 2023).

Entrepreneurial skills are important for every individual to have. Through entrepreneurship, you can create jobs, advance the economy, and at the same time reduce the number of unemployed (Fairlie et al., 2020; Hombert et al., 2020; Zainea et al., 2020). Through entrepreneurial learning, it will provide learning experiences, development skills, and increase independence (Nurwahyunani et al., 2021). Developmenting the entrepreneurial spirit and interest of the younger generation is an important thing to do to prepare a generation that is ready to face global competition (Apriana et al., 2019; Boldureanu et al., 2020; Jardim, 2021).

Based on Global Entrepreneurship Index (GEI) data, Indonesia is ranked 107th out of 189 countries. This data shows that the entrepreneurial interest of the Indonesian people is still relatively low. Ismail et al. (2021) revealed that the entrepreneurial interest of the current younger generation is still relatively low, where the current generation has a tendency to look for work rather than create jobs. In line with the findings of researchers who conducted observations at SMAN 1 Cangkringan. Observation results show that students' entrepreneurial interest at SMAN 1 Cangkringan is still low with an average score of 39%. The current generation's low interest in entrepreneurship is influenced by various factors, one of the factors that influences a person's entrepreneurial interest is the ability to think creatively.

The ability to think creatively has been interpreted as one of the variables related to entrepreneurship. The ability to think creatively is one of the basic assets to be independent, survive and be successful in entrepreneurship (Weng et al., 2022). Creative thinking involves cognitive processes for solving problems, analyzing various points of view, adapting ideas, creating new solutions, and evaluating ideas in problem solving (Sumarni et al., 2020). The ability to think creatively is an important factor that every individual must have to compete in the 21st century. Creativity plays an important role in developmenting innovation, making discoveries and solving problems in everyday life (Astuti et al., 2020).

According to International Student Assessment (PISA), Indonesian students' creative thinking abilities were ranked 70th out of 78 countries in 2018 and in 2022 their thinking abilities will experience a decline due to the 2019 Covid pandemic. Research conducted by Rohimah et al. (2019) revealed that students' thinking abilities in learning biology are still relatively low, this can be seen from the average score obtained at 44%. The results of observations carried out at SMAN 1 Cangkringan also showed that students had difficulty answering hot questions, especially questions with cognitive levels C4, C5 and C6. The low level of students' creative thinking abilities is influenced by several factors including; still making the teacher the center of learning so that learning tends to be memorized, the use of models and methods that do not provide freedom in developmenting thinking skills (Heriyanto, 2020), and the application of technology in learning (Jaenudin, 2023).

Creative thinking skills and entrepreneurial interest will development well if teachers deliberately encourage these two skills through planned and structured learning. One lesson that is suitable for developmenting thinking and entrepreneurial skills is studying biology. Entrepreneurship-based biology learning can provide real experience and skills to train various thinking skills in solving problems and building businesses by utilizing biological sciences (Muliadi et al., 2022). Creative thinking and entrepreneurial abilities can be developmented through making biotechnology products. The incorporation of entrepreneurship into the concept of biotechnology is known as bioentrepreneur. Through learning, bioentrepreneurs can provide learning experiences and development values such as independence, creativity, courage to take risks, action-oriented, leadership, hard work, honesty, discipline, innovation, responsibility, cooperation, never giving up, commitment, realistic, sense curious, communicative, and strong motivation to succeed (Muliadi et al., 2022).

Learning with the bioentrepreneur concept requires learning that is able to construct the relationship between science, technology and society. This is confirmed by Vygotsky's theory that human development is greatly influenced by the interaction between interpersonal (social), cultural-historical and individual factors (Puspasari et al., 2019). Therefore, developmenting a bioentrepreneur learning concept with ethno-science and STEM concepts is a challenge for learning in schools. Through bioentrepreneurship with ethno- and STEM concepts, we will create meaningful learning by providing science concepts through the development of products based on local wisdom. One

product that can be developmented in biotechnology learning is the typical food growol, Kulon Progo, Yogyakarta (Puspaningtyas et al., 2019). Growol specialty food is a specialty food made using fermentation and methods passed down from generation to generation.

In developmenting entrepreneurial interest, students' creative thinking abilities need to development learning tools, one of which is the Student Worksheet (LKPD). LKPD will answer problems where learning has not linked entrepreneurial values, still makes students passive and tends to memorize, has not implemented local potential, has not implemented innovation and learning models. The development of an ethno-STEM integrated bioentrepreneur electronic worksheet (PjBL) is important to development. Learning with the PjBL concept integrated with the ethno-STEM approach is one of the multicultural-based science learning, namely learning that combines culture with science, technology, engineering and mathematics to grow students to become innovators, independent, think logically, solve problems, and are able to connect cultures with education (Sudarmin et al., 2023). Through bioentrepreneur learning combined with PjBL projects integrated with ethno-STEM, we can create STEM-literate citizens, thus increasing the competitiveness of science and technology, entrepreneurship, and equipping graduates with competencies to be ready to face the real world of work according to the challenges of the 21st century (Tresnawati et al., 2021).

Method

This type of research is research and development (R&D). The product resulting from this research and development is a bioentrepreneur Electronic Student Worksheet (E-LKPD) with an ethno-STEM integrated Project Based Learning (PjBL) model that meets the criteria for feasibility, practicality and is effectively used to improve creative thinking abilities and entrepreneurial interest high school student. The development model used refers to the ADDIE (Analysis, Design, Development, Implement and Evaluate) development model. The stages of the ADDIE model can be seen in Figure 1.

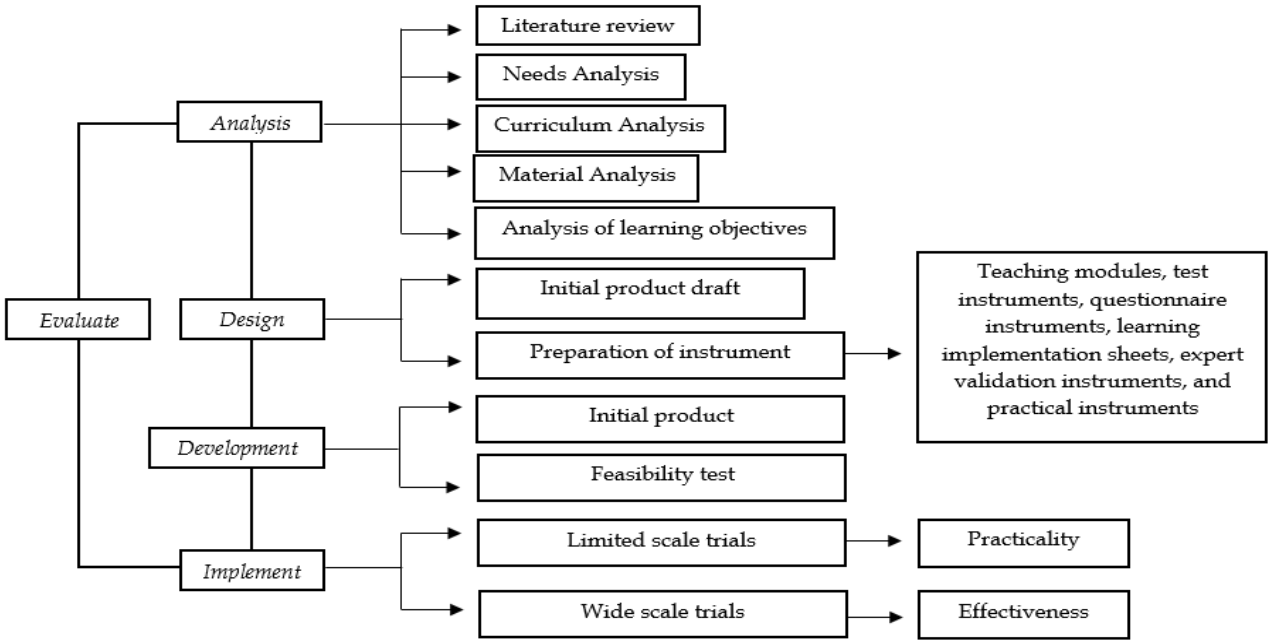

Figure 1. ADDIE research scheme

At the analysis stage, literature study, needs analysis, curriculum analysis, material analysis and learning objectives are carried out, so that the research carried out is right on target. In the second stage, design is carried out, at this stage ideas will be put forward and an initial product draft will be created and research instruments will be prepared. In stage three, initial product development is carried out, feasibility testing is carried out by media experts and material experts, and testing the validity and reliability of the instrument. In the fourth stage, trials are carried out which include limited and wide scale trials and evaluation at each stage of research and development.

The test subjects in this research were media experts and material experts, teachers and students. Media experts come from UNY expert lecturers, Biology teachers from SMAN 1 Cangkringan and students from SMAN 1 Cangkringan. The number of students in the

limited scale trial was 16 students in class XII and in the wide scale trial was 64 students in class X. Data collection instruments used questionnaires and test instruments. The questionnaire instruments used were teacher and student needs instruments, media and material suitability instruments, practicality instruments, question validation instruments, teaching module validation instruments, and entrepreneurial interest instruments. The test instrument used is a creative thinking ability test instrument. The questionnaire was described with several questions on a Likert scale.

Result and Discussion

Analysis Phase

Very little research has been development to development learning tools such as LKPD in schools, especially in biology learning, so learning tools such as LKPD are important. Based on the curriculum analysis, on average, every school for class X has implemented the Independent Curriculum, as is the case at SMAN 1 Cangkringan where the school has implemented the independent curriculum for class the subject taught in the independent curriculum is technological innovation. Technological innovation is a biotechnology lesson that is taught in class XII in the independent curriculum in class 10. Technological innovation is one of the subjects that students consider difficult. This can be seen from the document that the average score obtained by students at SMAN 1 Cangkringan is still below the KKM. This is due to a lack of learning that stimulates students' thinking abilities. Apart from the low student learning outcomes in technological innovation material, students' entrepreneurial interest at SMAN 1 Cangkringan is also still relatively low at 44%. This is because contextual learning is rare, such as linking learning with everyday life. According to Weng et al. (2022) contextual learning will provide students with a more meaningful understanding of a concept.

Figure 2. Draft student worksheet. a) Cover page, b) Student identity and instructions for use, c) Learning outcomes and learning objectives, d) Concept maps, e) Learning materials, f) Work practices

Design Phase

At this stage, an initial product draft of the electronic LKPD is development. The initial product draft of the electronic Student Worksheet (LKPD) that was development consisted of a LKPD structure consisting of a cover page, student identity, instructions for use, table of contents, learning outcomes, learning objectives, concept map, learning materials, learning activities, work steps, and tasks. The draft Ethno-STEM integrated bioentrepreneur PjBL electronic LKPD can be seen in Figure 2.

Apart from creating a draft of the initial electronic LKPD product, at this stage various instruments are also prepared that will be used by researchers in the research. These instruments include product feasibility sheet instruments, product practicality sheets, teaching module validation sheets, creative thinking ability test instruments, entrepreneurial interest questionnaires, and learning implementation observation sheets.

Development Phase

The development phase in which in this phase or stage the initial product is produced, namely, Ethno STEM integrated bioentrepreneur PjBL electronic LKPD. Before testing the ethno-STEM integrated bioentrepreneur PjBL electronic LKPD product, a feasibility test was first carried out. The feasibility tests carried out include material feasibility tests and media feasibility tests. Based on the feasibility test carried out by material experts and media experts, suitable student worksheets were obtained, starting from the appearance of an attractive cover, learning objectives that are in accordance with learning outcomes, content and learning steps presented that are very clear, systematic and tiered. . Use of communicative language so that students become more interested in learning. The average validator assessment results obtained can be seen in tables 1 and 2.

Table 1. Material Experts Feasibility Test Results

Aspect	Range of scores obtained	Category
Appropriateness of content	31 < 36 ≤ 37	Worthy
Construction	12 > 10. 2	Very worthy
Language	19.6 < 23 ≤ 23.8	Worthy
Average	84%	Very worthy

Table 2. Media Expert Feasibility Test Results

Aspect	Range of scores obtained	Category
Quality	19 > 17	Very worthy
Effectiveness	15 > 14	Very worthy
Graphics	19 > 17	Very worthy
Presentation	19 > 17	Very worthy
Average	94%	Very worthy

Based on tables 1 and 2, it can be seen that the LKPD developmented by the researcher is very feasible in terms of material and media with an average score for material of 84% and media of 94% with a note of several revisions and suggestions from the validator.

Not only electronic LKPD, creative thinking ability test instruments, entrepreneurial interest questionnaire instruments, and teaching modules are also tested for feasibility. The test results obtained for the creative thinking ability test instrument with an average score of 100% were categorized as suitable for use which had previously been revised based on suggestions and input from material experts. The entrepreneurial interest questionnaire obtained an average score of 100% in the appropriate category without revision, and for the teaching module validation results were obtained from material experts, namely that it was suitable for use with a note of slight revision. The results of the feasibility test for the instruments used in this research can be seen in Figure 3.

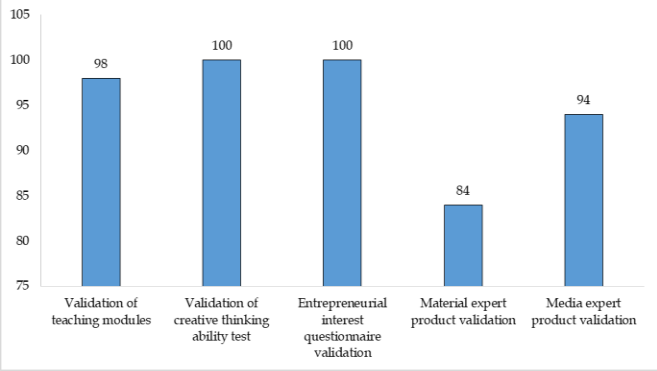

Figure 3. Feasibility validation chart

Implement Phase

In the implementation phase, the ethno-STEM integrated bioentrepreneur PjBL electronic LKPD product was carried out on a limited scale field trial, namely a practicality test and a wide scale trial, namely an effectiveness test. The practicality test is given to Biology teachers and students who have or are currently studying biotechnology. Teachers and students are given a series of statements in the form of a questionnaire to fill out. The results of the practicality test show that the developmented ethno-STEM integrated PjBL bioentrepreneur electronic worksheet is practical starting from the worksheet being easy to use, efficient in terms of usage time, and the material presented is clear and coherent in accordance with the material concept. The results of the average practicality test score can be seen in tables 3 and 4.

Based on the results of the practicality test in tables 3 and 4, it can be seen that the development ethno-STEM integrated PjBL bioentrepreneur electronic worksheet is practical and ready to be used in learning on the topic of

biotechnology or technological innovation, although with some suggestions and input

Table 3. Practical Test Results by Teacher

Aspect	Range of scores obtained	Category
Material	20 > 17	Very worthy
Construction	20 > 17	Very worthy
Languange	15 > 10,2	Very worthy
Quality	20 > 17	Very worthy
Effectiveness	15 > 10,2	Very worthy
Graphics	15 > 10,2	Very worthy
Presentation	15 > 10,2	Very worthy

Table 4. Practical Test Results by Students

Aspect	Range of scores obtained	Category
Material	19 > 17	Very worthy
Construction	11 > 10	Very worthy
Languange	11 > 10	Very worthy
Quality	19 > 17	Very worthy
Effectiveness	7 > 6	Very worthy
Graphics	11 > 10	Very worthy
Penyajian	7 > 6	Very worthy

After carrying out limited scale trials, the next step is to carry out large scale field trials. Wide-scale field trials aim to see the effectiveness of the product being developmented. The effectiveness test was carried out in a real class, namely class X at SMAN 1 Cangringan and used 2 classes. One class is the experimental class and the other class is the control class. Each class has 32 students. Learning in the experimental class took place using the Etno-STEM integrated bioentrepreneur electronic LKPD product, while the control class learning was carried out without the Etno-STEM integrated bioentrepreneur electronic LKPD product. Furthermore, the product effectiveness test results can be seen and concluded based on the N-Gain score obtained from the control and experimental classes and the manova test results from the pre-test and post-test scores. The results of the N-gain score test for the control and experimental classes can be seen in table 5.

Table 5. The Results of Obtaining the N-gain Score Value

Aspect	Creative Thinking		Entrepreneurial interest	
	Experiment Class	Control Class	Experiment Class	Control Class
Average Pre test	43.7	39.5	68.7	67.6
Average Post test	75.7	66.9	80.9	77.3
N gain score	0.57	0.45	0.40	0.30

Based on table 5, it is known that the scores obtained before and after learning using the Etno-STEM integrated bioentrepreneur electronic LKPD product in the experimental class increased by 32% and in the control class there was an increase before and after learning also by 27%. The increase in the experimental class was higher than the control class. This proves that the use of ethno-STEM integrated bioentrepreneur electronic worksheet is effective in increasing students' creative thinking abilities and entrepreneurial interest. This is also proven by the N-gain score obtained from each class, where the N-gain score for the experimental class for creative thinking ability was 0.57 and the control class was 0.45 and for the N-gain score for entrepreneurial interest the experimental class was 0.40 and the control class was 0.30. Although the difference in the N-gain score of the experimental class and the control class is significant, it is still in the moderate category. The results of this research are in line with research conducted by Sumarni et al. (2020) which states that learning using the ethno-STEM integrated PjBL model has a significant influence on improving students' critical and creative thinking abilities. This is also reinforced by research conducted by Tresnawati et al. (2021) who explains that ethno-STEM learning can provide stimulus and stimulation for students to think creatively to create new products. This research also supports research put forward by Tresnawati et al. (2021) which states that ethno-STEM project-based learning can development the entrepreneurial character of students in the medium category.

The manova test results obtained a sig value for Hotelling's Trace of 0,000. This value is smaller than 0.05 ($p < 0.05$), so it can be concluded that there is an influence between learning using the ethno-STEM integrated PjBL bioentrepreneur electronic LKPD and learning without using the ethno-STEM integrated PjBL bioentrepreneur electronic LKPD. The manova test was carried out after the data met the normality and homogeneity tests. Manova test results can be seen in table 6.

Tabel 6. The Value Hotteling's Trace Manova Test

Effect	Sig	Partial Eta Squared
Hotelling's Trace	0.000	0.273

Conclusion

Based on the LKPD developmented, it was obtained that the ethno-STEM integrated PjBL bioentrepreneur LKPD product was suitable for use in the biology learning process with the topic of technological innovation with an average feasibility score for material experts of 84% and media experts of 94% with a very feasible category. The practicality of the LKPD is in the very practical category with an average score of 100% for teachers and 85% for students. The developmented LKPD is effectively used to improve

creative thinking abilities and entrepreneurial interest as seen from the results of the N-gain test for creative thinking abilities for the experimental class at 0.57 and for the control class at 0.47 in the medium category. The results of the N-gain test for entrepreneurial interest in the experimental class were 0.40 and the control class was 0.30 in the medium category. The Manova test obtained sig. hotteling's trace 0.00 < 0.05.

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References

Apriana, D., Kristiawan, M., & Wardiah, D. (2019). Headmaster's competency in preparing vocational school students for entrepreneurship. *International Journal of Scientific and Technology Research*, *8*(8), 1316–1330. Retrieved from https://www.ijstr.org/final-print/aug2019/Headmasters-Competency-In-Preparing-Vocational-School-Students-For-Entrepreneurship.pdf

Astuti, A., Waluya, S. B., & Asikin, M. (2020). the Important of Creative Thinking Ability in Elementary School Students for 4.0 Era. *International Journal of Educational Management and Innovation*, *1*(1), 91. https://doi.org/10.12928/ijemi.v1i1.1512

Badan Pusat Statistik. (2023). *Laju pertumbuhan penduduk*. Jakarta: Berita Resmi Statistik.

Boldureanu, G., Ionescu, A. M., Bercu, A.-M., Bedrule-Grigoruță, M. V., & Boldureanu, D. (2020). Entrepreneurship Education through Successful Entrepreneurial Models in Higher Education Institutions. *Sustainability*, *12*(3), 1267. https://doi.org/10.3390/su12031267

Dacholfany, M. H. M. I. (2021). Reconstruction of Educational Institutions in Business Development of Indonesian Human Resources through Cooperation among ASEAN Countries. *Journal of Hunan University Natural Sciences*, *48*(12). Retrieved from http://jonuns.com/index.php/journal/article/view/901

Durnali, M., Orakci, Ş., & Khalili, T. (2023). Fostering creative thinking skills to burst the effect of emotional intelligence on entrepreneurial skills. *Thinking Skills and Creativity*, *47*, 101200. https://doi.org/10.1016/j.tsc.2022.101200

Fairlie, R. W., & Fossen, F. M. (2020). Defining Opportunity versus Necessity Entrepreneurship: Two Components of Business Creation. In *Change at home, in the labor market, and on the job* (pp. 253–289). Emerald Publishing Limited. https://doi.org/10.1108/S0147-912120200000048008

Hasan, Z. (2021). The effect of economic growth and human development index on poverty in Indonesia. *Journal of Economics and Sustainability*, *3*(1), 12–12. https://doi.org/10.32890/jes2021.3.1.5

Heriyanto, D. (2020). Analisis kemampuan berpikir kreatif siswa sekolah menegah pertama. *PRISMA, Prosiding Seminar Nasional Matematika*, *3*, 587–590. Retrieved from https://journal.unnes.ac.id/sju/index.php/prisma/.

Hombert, J., Schoar, A., Sraer, D., & Thesmar, D. (2020). Can Unemployment Insurance Spur Entrepreneurial Activity? Evidence from France. *The Journal of Finance*, *75*(3), 1247–1285. https://doi.org/10.1111/jofi.12880

Hutabarat, W., Syahnur, S., & Dawood, T. C. (2023). How Population, Economic, Inequality and Unemployment Contribute Affect Indonesian's Poverty. *International Journal of Advances in Social Sciences and Humanities*, *2*(1), 8–14. https://doi.org/10.56225/ijassh.v2i1.92

Indrawati, S. M., & Kuncoro, A. (2021). Improving competitiveness through vocational and higher education: Indonesia's vision for human capital development in 2019–2024. *Bulletin of Indonesian Economic Studies*, *57*(1), 29–59. https://doi.org/10.1080/00074918.2021.1909692

Ismail, I., & Wa'adarrahmah, W. (2021). Analisis Peran Pengusaha dalam Mengurangi Pengangguran Terbuka Perspektif Ekonomi Islam di Kota Bima (Studi Kasus HIPMI dan TDA Kota Bima). *J-ESA (Jurnal Ekonomi Syariah)*, *4*(1), 11–26. https://doi.org/10.52266/jesa.v4i1.741

Jaenudin, A. (2023). Factors Influencing Creative Thinking In Problem-Solving. *Asian Journal of Engineering, Social and Health*, *2*(3), 161–170. https://doi.org/10.46799/ajesh.v2i3.47

Jardim, J. (2021). Entrepreneurial Skills to Be Successful in the Global and Digital World: Proposal for a Frame of Reference for Entrepreneurial Education. *Education Sciences*, *11*(7), 356. https://doi.org/10.3390/educsci11070356

Muliadi, A., Imran, A., & Sabrun, S. (2021). Bioteknologi berbasis bioentrepreneurship: Persepsi mahasiswa

biologi. *Jurnal Ilmiah Mandala Education*, *7*(4), 321–327. https://doi.org/10.36312/jime.v7i4.2461.

Muliadi, A., Sarjan, M., & Rokhmat, J. (2022). Pembelajaran IPA Berbasis Bioentrepreneur Pada Etnosains Poteng Jaje Tujak : Perspektif Filsafat. *JPIn: Jurnal Pendidik Indonesia*, *5*(2), 50–70. Retrieved from https://jurnal.intancendekia.org/index.php/JPIn/article/view/338/242.

Nurwahyunani, A., Wiyanto, W., Rusilowati, A., & Susilaningsih, E. (2021). Bioentrepreneurship Ability Profile of Students in Microbiology Learning. *Unnes Science Education Journal*, *10*(2), 97–101. https://doi.org/10.15294/usej.v10i2.43982

Puspaningtyas, D. E., Sari, P. M., Kusuma, N. H., & Helsius SB, D. (2019). Analisis Potensi Prebiotik Growol: Kajian Berdasarkan Perubahan Karbohidrat Pangan. *Gizi Indonesia*, *42*(2), 83. https://doi.org/10.36457/gizindo.v42i2.390

Puspasari, A., Susilowati, I., Kurniawati, L., Utami, R. R., Gunawan, I., & Sayekti, I. C. (2019). Implementasi Etnosains dalam Pembelajaran IPA di SD Muhammadiyah Alam Surya Mentari Surakarta. *SEJ (Science Education Journal)*, *3*(1), 25–31. https://doi.org/10.21070/sej.v3i1.2426

Reilly, J. E. (2018). Education policy perspective on entrepreneurship. In *The Palgrave Handbook of Multidisciplinary Perspectives on Entrepreneurship* (pp. 293–313). https://doi.org/10.1007/978-3-319-91611-8_14

Rifkhan. (2017). Pengaruh sikap dan motivasi terhadap minat beriwirausaha mahasiswa akuntansi Universitas Pamulang. *Jurnal Ilmiah Akuntansi Universitas Pamulang*, *5*(1), 1–34. https://doi.org/10.32493/jiaup.v5i1.645.

Rohimah, D., Suhendar, & Ramdhan, B. (2019). Profil Kemampuan Berpikir Kritis Siswa MTs KELAS VIII Dede Rohim. *Jurnal Bioeducation*, *7*(2), 45–55. Retrieved from https://eprints.ummi.ac.id/1875/

Rukanda, N., Nurhayati, S., & Ganda, G. (2020). the Influence of Studentsâ€TM Motivation on Entrepreneurship Attitude in Life Skills Program. *Empowerment: Jurnal Ilmiah Program Studi Pendidikan Luar Sekolah*, *9*(1), 47–65. Retrieved from https://doi.org/https://www.e-journal.stkipsiliwangi.ac.id/index.php/empowerment/article/view/1303

Rusdiana, A., Nasihudin, N., & Subandi, M. (2020). Management of Integration of Value and Enterpreneurs Eucation in Indonesia (Multicultural Economic Review). *International Journal of Asian Social Science*, *10*(1), 51–62. Retrieved from https://digilib.uinsgd.ac.id/31629/

Sudarmin, S., Pujiastuti, R. S. E., Asyhar, R., Tri Prasetya, A., Diliarosta, S., & Ariyatun, A. (2023). Chemistry project-based learning for secondary metabolite course with ethno-STEM approach to improve students' conservation and entrepreneurial character in the 21st century. *Journal of Technology and Science Education*, *13*(1), 393. https://doi.org/10.3926/jotse.1792

Sumarni, W., & Kadarwati, S. (2020). Ethno-Stem Project-Based Learning: Its Impact to Critical and Creative Thinking Skills. *Jurnal Pendidikan IPA Indonesia*, *9*(1), 11–21. https://doi.org/10.15294/jpii.v9i1.21754

Tresnawati, N., Saleh, I., Sudarmin, & Wardani, S. (2021). Science Batik Ciwaringin: The Implementation of Ethno-STEM PjBL Model in learning Biotechnology at PGSD Students. *Journal of Physics: Conference Series*, *1842*(1), 012063. https://doi.org/10.1088/1742-6596/1842/1/012063

Weng, X., Chiu, T. K. F., & Tsang, C. C. (2022). Promoting student creativity and entrepreneurship through real-world problem-based maker education. *Thinking Skills and Creativity*, *45*, 101046. https://doi.org/10.1016/j.tsc.2022.101046

Zainea, L. N., Toma, S.-G., Marinescu, P., & Chiţimiea, A. (2020). Combating Unemployment through Social Entrepreneurship in the European Context. *Business Ethics and Leadership*, *4*(4), 85–98. https://doi.org/10.21272/bel.4(4).85-98.2020