Jambura Journal of Educational Chemistry
Volume 7 Issue 2, August 2025
p-ISSN: 2655-7606, e-ISSN: 2656-6427
Journal Homepage: http://ejurnal.ung.ac.id/index.php/jjec

The Effect of Integrated Chemoentrepreneurship-Based Malapat Village Ethnochemistry on Students' Entrepreneurial Interests

Tamrin Taher[1*], Nindi Arista Abdurrazak[1], Marlina Ruslan[2]

[1]*Institut Agama Islam Negeri Ternate, Maluku Utara 97727, Indonesia*
[2]*SMA Negeri 25 Halmahera Selatan, Maluku Utara 97784, Indonesia*

Article Info

Article history:
Received: 18-02-2025
Revised: 30-06-2025
Accepted: 24-08-2025
Available online: 25-08-2025

Keyword:
Chemoenterpreneurship;Etnochemistry; Interest Enterpreneurship; Project Based Learning

***Corresponding author:**
tamrin@jain-ternate.ac.id

Abstract

One of the reasons why high school and vocational school graduates are the highest contributors to the open unemployment rate is the lack of job opportunities that match their level of education and the lack of skills for alternative jobs, for example entrepreneurship. This research aims to; (1) Integrate approach *chemoentrepreneurship* with Village *ethnochemistry* Malapat in chemistry learning, (2) Knowing what is what there is difference interest entrepreneurship student after taught with the integrated *chemoentrepreneurship approach of ethnochemistry* in Malapat Village. This study uses a *preexperimental design method* through *one group pretest-post-test design*. The subjects of the study were 24 students of class XI of SMA Negeri 25 Halmahera Selatan. Data collection through an entrepreneurial interest instrument consisting of 17 items. Data analysis using descriptive statistics (*paired test*). The findings of the study indicate that the integrated *chemoentrepreneurship* approach of ethnochemistry in Malapat Village can be implemented using the *Project Based Learning model* with the following steps; 1) Identifying and determining a local culture-based product manufacturing project, 2) Planning the product manufacturing steps including analysis of materials and costs required, 3) Compile timetable product making, 4) Monitoring the implementation of product making, 5) Making reports and *business plans* for the products produced, 6) evaluating the products produced. The paired test showed a significance of pre-test and post-test of 0.026 which indicated that there was a difference in students' interest in entrepreneurship before and after participating in learning.

How to Cite: Taher, T., Abdurrazak, N. A., & Ruslan, M. (2025). The Effect of Integrated Chemoentrepreneurship-Based Malapat Village Ethnochemistry on Students' Entrepreneurial Interests. *Jambura Journal of Educational Chemistry,* 7(2), 72-78. https://doi.org/10.37905/jjec.v7i2.30657

1. INTRODUCTION

The phenomenon of teenagers becoming unemployed and not continuing their studies to a higher level is still trending today. According to the Central Statistics Agency, Indonesia's open unemployment rate in February 2023 reached 5.32%, equivalent to approximately 7.93 million people. Of this total, high school (SMA) and vocational school (SMK) graduates dominated the unemployment figures with percentages of 8.42% and 9.02%, respectively. Those in the 15-24 age range are vulnerable to contributing to the highest unemployment rate compared to other age groups (Badan Pusat Statistik, 2023). This persistent high unemployment rate among secondary school graduates points to a critical need for transformative approaches in education, particularly in developing entrepreneurial competencies during students' formative years (Amalia & von Korflesch, 2021). Entrepreneurship education teaches students to be able to innovate and create products that have economic value. Providing entrepreneurship education in schools from an early age can increase students' interest and entrepreneurial skills (Fiore et al., 2019). Instilling an entrepreneurial spirit is expected to shape students' entrepreneurial spirit so that

https://doi.org/10.37905/jjec.v7i2.30657

in the future they will be able to create something new, and have a creative and innovative spirit (Hijriah, 2016)

Despite the evident need for entrepreneurial development, understanding entrepreneurial interest is crucial for addressing youth unemployment. Entrepreneurial interest refers to one's desire and inclination to engage in entrepreneurial activities, characterized by the willingness to take calculated risks, innovate, and create value through business ventures (Suryana & Bayu, 2012). Several key indicators measure entrepreneurial interest, including self-confidence in business abilities, results-oriented thinking, future-oriented outlook, leadership potential, and originality in idea generation (Alma, 2018). Current research indicates that entrepreneurial interest among Indonesian secondary school students remains concerningly low (Satriadi et al., 2022).

The unemployment crisis among secondary school graduates stems from several interconnected challenges in the educational system. First, the current chemistry education paradigm heavily emphasizes theoretical knowledge acquisition over practical applications, creating a significant disconnect between academic learning and real-world skill requirements (Szteinberg et al., 2014). This theoretical-practical gap often leaves graduates ill-equipped to navigate the competitive job market or identify entrepreneurial opportunities within their field. Second, there is a notable absence of local wisdom and cultural knowledge integration in chemistry education, resulting in missed opportunities for developing contextually relevant entrepreneurial ventures that could capitalize on regional resources and traditions (Sudarmin et al., 2017). Third, conventional teaching methodologies often fail to nurture students' entrepreneurial mindset and essential business skills, leaving them dependent on traditional employment pathways rather than equipped to create their own opportunities (Rauf et al., 2025). These challenges are particularly evident in Malapat Village, where abundant local resources and rich traditional chemical knowledge remain largely untapped in educational contexts

Chemistry education presents remarkable potential for cultivating students' entrepreneurial capabilities through the innovative Chemoentrepreneurship (CEP) approach (Ahmad, 2024). This educational framework emphasizes linking chemical concepts with the creation of products that have commercial potential, thus fostering an entrepreneurial mindset among students while mastering scientific principles (Dyantyi, 2023). The pedagogical approach seamlessly integrates theoretical learning with entrepreneurial dimensions, enabling students to not only grasp chemical concepts but also apply them effectively in business and industrial settings. Furthermore, the incorporation of ethnochemistry and local wisdom into CEP learning adds substantial value by connecting students with indigenous natural resources and cultural heritage, creating a more contextualized and meaningful learning experience (Gultom & Rohaeti, 2024)

Given these considerations, research on implementing ethnochemistry-integrated CEP becomes increasingly crucial, considering particularly the scarcity of comprehensive studies highlighting the unique potential of Malpat Village's traditional chemical knowledge and practices (Ead et al., 2023). This innovative educational approach holds promise as an effective solution for enhancing students' entrepreneurial interests and capabilities, potentially contributing to reducing unemployment rates among secondary school graduates while simultaneously preserving and innovating local traditional products for future generations. The Project Based Learning (PjBL) model emerges as an ideal implementation strategy, offering students structured opportunities to conceptualize and execute chemistry-based projects with tangible economic value (Bell, 2010). Through carefully designed projects, students develop not only a deeper understanding of chemical principles but also crucial entrepreneurial competencies including creative thinking, innovation capacity, business planning expertise, and marketing capabilities (Hasni et al., 2016). This comprehensive approach ensures that learning outcomes align with both academic requirements and real-world business needs

2. METHOD

This study employed a pre-experimental research design with one-group pretest-posttest design (Creswell & Creswell, 2018). This design was chosen as it allows researchers to measure the effectiveness of an intervention by comparing participants' performance before and after treatment without a control group. The subjects of the study were 24 students of class XI of SMA Negeri 25 Halmahera Selatan through a purposive sampling technique (Cohen et al., 2007). This sampling

https://doi.org/10.37905/jjec.v7i2.30657

method was chosen based on certain criteria including students' exposure to chemistry subjects and their location in the Malapat Village area. Data collection techniques using entrepreneurial interest instruments. To determine the effectiveness of the integrated chemoentrepreneurship approach, statistical analysis was conducted using paired sample t-test. This statistical method was employed to compare students' entrepreneurial interests scores between pretest and posttest measurements. The paired t-test was selected as it is appropriate for analyzing the same group of subjects under two different conditions (before and after treatment).

3. RESULT AND DISCUSSION

3.1. Result

Validity and Reliability Test

The entrepreneurship instrument was modified from Olufunso (2010) instrument which includes; feelings of pleasure, interest, attention and involvement. The developed instrument was then tested for validity and reliability. The validity test was carried out in 2 stages. The first stage was a content validity test by experts and the second stage was an item validity test for students of SMA Negeri 5 Kota Tidore Kepulauan. Based on suggestions and input from the validator, the entrepreneurship interest instrument was revised into 19 items. The revised instrument was then tested to determine item validity. The results of the validity test on 30 respondents showed that there were 17 valid items while 2 other items were invalid based on the calculation of SPSS 16. The reliability test was conducted using SPSS 16 with the Cronbach alpha formula. Test results The reliability test results show the calculated $r_{value.}$ (0.583) > r_{table} (0.361) so the instrument is reliable

Implementation of Learning

Chemoentrepreneurship and ethnochemistry are approaches that do not have learning steps (syntax), the implementation of both can be done by using a learning model that has a special syntax. In this study, the learning model chosen for the implementation of integrated ethnochemical chemoentrepreneurship is the project-based learning (PjBL) model. This model is considered appropriate because the implementation of both approaches requires activities that produce products. *Project-based learning* is a student-oriented model (*student center learning*), Learning that is centered on can empower students' thinking skills (Mergendoller & Thomas, 2000). The learning process is shown in the following Table 1:

Table 1. Syntax CEP-Etnochemistry Using PjbL

Syntax	Teacher Activity	Student Activities
Defining the project	Please allow student choose one type of colloid in local culture that is used as a project	Identifying colloids in the surrounding environment Determine type colloid which is used as a project
Developing a project plan	Explain project implementation steps	Designing activity project implementation
Making a schedule	Explain about time management and deadlines settlement project	Make schedule project implementation
Monitoring	Conduct supervision of student projects	Finishing project
Compiling a report	Explaining the systematic arrangement report including *business plan*	Make report project Presenting project results
Evaluating projects	Give notes student project improvement	Repair report based on input teachers and students

Student Entrepreneurship Interest

Table 2. Result of student enterpreneurship interest

		Pre_Test	Post_Test
N	Valid	24	24
	Missing	0	0
Mean		37.2083	46.8333
Median		36.5000	47.0000
Mode		36.00	46.00 [a]
Std. Deviation		3.24344	2.74522
Range		12.00	10.00
Minimum		32.00	42.00
Maximum		44.00	52.00

https://doi.org/10.37905/jjec.v7i2.30657

Table 3. Paired test

		N	Correlation	Sig.
Pair 1	Pre_Test & Post_Test	24	.453	.026

3.2. Discussion

The first project worked on by students was to identify the types of colloids in food ingredients found in Malapat Village. From the identification results, students were asked to choose one type of colloid that would be used as a project. In making the project, students looked for references related to the concept of colloids in the type of project they chose, including conducting interviews with local residents about the history, composition, and method of making the type of project they chose. The information obtained by students was then made in the form of a chart. The chart contains a description, composition, history, method of making, concept of colloids or other information about the food ingredients chosen by students in their projects like; papeda, aer gurka, walnut bread and toast. The first project focuses more on identifying local cultural products related to the concept of colloids.

The second project worked on by students was to create local products and create a business plan. In this activity, students were asked to create a product by considering the costs incurred and the profits to be obtained. The analysis of student-created local products reveals promising outcomes in translating chemical concepts into marketable entrepreneurial ventures. Products emerged from the project implementation: kenari jelly, aer guraka (traditional beverage), kenari bread, and kenari biscuits, each demonstrating students' ability to integrate chemical principles with local cultural knowledge. Here is an example of a student project

Figure 1. Walnut biscuits project

Figure 2. Walnut jelly project

The evaluation rubric encompassing planning, product outcomes, reporting, and presentation showed varying levels of achievement across groups, with aer guraka achieving the highest score (39), followed closely by kenari bread (38), while kenari jelly and kenari biscuits scored 30 and 29 respectively. This variation in scores findings that student performance in chemopreneurship projects often varies based on product complexity and cultural familiarity (Ahmad, 2024). The higher scores achieved by the aer guraka group reflected particularly strong performance across all assessment dimensions, demonstrating exceptional integration of chemical concepts with traditional preparation method

The product development process demonstrated students' growing entrepreneurial capabilities, particularly in terms of innovation and market awareness. Each group successfully navigated the complete product development cycle, from initial planning to final presentation, with notable strengths in different areas. The evaluation data indicates that most groups excel in physical presentation and innovation aspects of their products, observation that hands-on product development enhances both scientific understanding and entrepreneurial creativity (Dyantyi & Faleni, 2023). Particularly noteworthy was students' ability to conduct cost analysis and develop business plans, a crucial entrepreneurial skill highlighted as essential for successful chemical entrepreneurship education. The variation in scores across different assessment criteria provides valuable insights into areas where future implementations might focus additional support, particularly in aspects of systematic reporting and comprehensive business planning.

The statistical analysis of students' entrepreneurial interest revealed significant

https://doi.org/10.37905/jjec.v7i2.30657

improvements following the implementation of the integrated CEP-ethnochemistry approach, with paired sample correlation showing a p-value of 0.026 ($p < 0.05$). Additionally, the results of the paired sample test revealed a significance value of 0.000 ($p < 0.05$), further demonstrating the strong effect of the intervention on enhancing students' entrepreneurial interest. This quantitative evidence supports the effectiveness of the intervention in enhancing students' entrepreneurial mindset. The improvement pattern aligns with Suryana & Bayu (2012) theoretical framework of entrepreneurial interest development, which emphasizes the importance of hands-on experience and cultural context in fostering business inclination. The pre-test data showed initial entrepreneurial interest scores clustering around lower ranges, with the majority of students scoring between 32-40 points, reflecting Yahyadin et al., (2023) findings regarding typically low baseline entrepreneurial interest among high school students. However, the post-test results demonstrated a marked shift toward higher scores (42-52 points), suggesting that the integration of local cultural knowledge with chemical entrepreneurship effectively addressed key barriers to entrepreneurial interest development identified by (Ardianti et al., 2019), particularly the lack of practical business exposure and limited real-world context in traditional chemistry education.

The integration of chemical concepts, particularly colloid systems, with local cultural knowledge of Malapat Village demonstrates a successful bridging of scientific principles and indigenous wisdom. The study's approach to incorporating traditional products such as papeda, aer guraka, kenari bread, and kenari biscuits as learning contexts provided students with tangible examples of colloidal systems in their cultural environment. This integration aligns with (Sudarmin et al., 2017) research highlighting the effectiveness of contextualizing chemistry education within local cultural frameworks. The students' ability to identify and explain colloidal properties in traditional food preparation processes, particularly in the gel formation in papeda and the emulsion systems in kenari-based products, indicates successful knowledge integration as theorized by Kusumaningrum et al., (2022), who emphasized the rich chemical principles embedded in traditional food processing techniques

The success of this integrated approach is further explained by the synergistic relationship between its components. The ethnochemistry aspect provides a familiar cultural context that reduces the perceived complexity of chemical concepts, while CEP adds practical value by demonstrating how this knowledge can be transformed into business opportunities. When students see clear connections between scientific knowledge and economic potential, their entrepreneurial interest increases significantly (Ardianti et al., 2019) . The PjBL model strengthens this effect by providing structured experiences in product development, from concept to market analysis, addressing what identified as a critical need for practical business exposure in entrepreneurship education

4. CONCLUSION

Chemoentrepreneurship approach of Malapat Village can be implemented using the *Project Based Learning model.* with the steps; 1) Identifying and determining a project for making products based on local culture, 2) Planning the steps for making products based on local culture including analysis of materials and costs. required, 3) Compile timetable product manufacturing based on culture local, 4) Monitoring the implementation of product manufacturing, 5) making reports and *business plans* for the products produced, 6) evaluating the products produced for improvement. The results of the paired sample test showed a significance value of 0.026 for the pre-test and post-test comparison, indicating a significant difference in students' entrepreneurial interest before and after participating in learning activities using the integrated chemo-entrepreneurship ethnochemical approach in Malapat Village. Furthermore, the results of the paired sample test revealed a significance value of 0.000 ($p < 0.05$), demonstrating that the integrated chemo-entrepreneurship ethnochemical approach has a significant effect on students' entrepreneurial interest.

Future research should focus on expanding the range of local products and chemical concepts while investigating the integration of digital technologies in program delivery. This expanded scope should be accompanied by efforts to develop standardized frameworks that can help other schools implement similar culturally-integrated entrepreneurship education programs while maintaining local relevance. Such frameworks would facilitate broader adoption while

ensuring that the essential elements of cultural preservation and entrepreneurial development are maintained across different contexts.

5. ACKNOWLEDGEMENTS

We would like to express his gratitude to the principal, chemistry teacher and students of State Senior High School 25, South Halmahera who provided assistance during the research.

6. REFERENCES

Ahmad, N. J. (2024). *Innovation And Chemical Entrepreneurship : Chemistry Learning Motivation Innovation And Chemical Entrepreneurship : Chemistry Learning Motivation Booster*. *July*.

Alma, B. (2018). Manajemen pemasaran dan pemasaran jasa edisi Revisi. In *Cetakan Kelima. CV. Alfabeta. Bandung*.

Amalia, R. T., & von Korflesch, H. F. O. (2021). Entrepreneurship education in Indonesian higher education: mapping literature from the Country's perspective. *Entrepreneurship Education*, *4*(3), 291–333. https://doi.org/10.1007/s41959-021-00053-9

Ardianti, S. D., Wanabuliandari, S., Saptono, S., & Alimah, S. (2019). A needs assessment of edutainment module with ethnoscience approach oriented to the love of the country. *Jurnal Pendidikan IPA Indonesia*, *8*(2), 153–161. https://doi.org/10.15294/jpii.v8i2.13285

Badan Pusat Statistik. (2023). Keadaan Ketenagakerjaan Indonesia Februari 2023. *Badan Pusat Statistik*, *35*.

Bell, S. (2010). *Project-Based Learning for the 21st Century : Skills for*. 39–43. https://doi.org/10.1080/00098650903505415

Cohen, L., Manion, L., Lecturer, P., Morrison, K., & Lecturer, S. (n.d.). *Research Methods in Education*.

Dyantyi, N. (2023). *Research in Business & Social Science Entrepreneurship education to stimulate entrepreneurial mindset in chemistry students*. *12*(10), 209–216.

Dyantyi, N., & Faleni, N. (2023). Entrepreneurship education to stimulate entrepreneurial mindset in chemistry students. *International Journal of Research in Business and Social Science (2147-4478)*, *12*(10). https://doi.org/10.20525/ijrbs.v12i10.3110

Ead, H. A., Ramadan, M., & Elbadry, A. M. M. (2023). *Integrating entrepreneurship into chemistry education - Cairo University post- graduate students ' case study*. *2*(June). https://doi.org/10.9770/IRD.2023.5.2(5)CITATIONS

Fiore, E., Sansone, G., & Paolucci, E. (2019). Entrepreneurship education in a multidisciplinary environment: Evidence from an entrepreneurship programme held in turin. *Administrative Sciences*, *9*(1). https://doi.org/10.3390/admsci9010028

Gultom, H., & Rohaeti, E. (2024). *The Effectiveness of the Ethnochemistry-based Problem Based Learning Model on Students ' Problem-Solving Ability in Chemistry Learning : A Meta-analysis Study in 2021-2024*. *10*(7), 508–514. https://doi.org/10.29303/jppipa.v10i7.8089

Hasni, A., Bousadra, F., Belletête, V., Benabdallah, A., Nicole, M., & Dumais, N. (2016). Trends in research on project-based science and technology teaching and learning at K – 12 levels : a systematic review. *Studies in Science Education*, *September*, 0. https://doi.org/10.1080/03057267.2016.1226573

Hijriah, H. Y. (2016). Spiritualitas Islam dalam Kewirausahaan. *TSAQAFAH*, *12*(1). https://doi.org/10.21111/tsaqafah.v12i1.374

Kusumaningrum, A., Amri, A. F., Nurhikmat, A., Susanto, A., & Prayogi, S. (2022). Thermal Processing and Chemical Characteristics of Canned Traditional Foods Based on Beef: Rawon, Kuah gandul and Empal gentong. *Proceedings of the 6th International Conference of Food, Agriculture, and Natural Resource (IC-FANRES 2021)*, *16*. https://doi.org/10.2991/absr.k.220101.001

Mergendoller, J. R., & Thomas, J. W. (2000). Managing project based learning: Principles from the field. *Annual Meeting of the American Educational Research Association*, 1–51. http://www.bie.org/images/uploads/general/f6d0b4a5d9e37c0e0317acb7942d27b0.pdf

Olufunso, O. (2010). *Graduate Entrepreneurial Intention in South Africa : Motivations and Obstacles*. *5*(9), 87–98.

Rauf, R., Raheni, C., Setiawan, L., & Rodliyatun, M. (2025). *Entrepreneurship education and digital transformation , opportunities and challenges in Indonesia Entrepreneurship education and digital transformation , opportunities and challenges in Indonesia*. *January*. https://doi.org/10.24294/jipd.v8i12.7740

Satriadi, S., Almaududi Ausat, A. M., Heryadi, D. Y.,

Widjaja, W., & Sari, A. R. (2022). Determinants of Entrepreneurial Intention: A Study on Indonesian Students. *BISNIS & BIROKRASI: Jurnal Ilmu Administrasi Dan Organisasi*, *29*(3). https://doi.org/10.20476/jbb.v29i3.1323

Sudarmin, Febu, R., Nuswowati, M., & Sumarni, W. (2017). Development of Ethnoscience Approach in the Module Theme Substance Additives to Improve the Cognitive Learning Outcome and Student's entrepreneurship. *Journal of Physics: Conference Series*, *824*(1). https://doi.org/10.1088/1742-6596/824/1/012024

Suryana, Y., & Bayu, K. (2012). *Kewirausahaan: Pendekatan Karakteristik Wirausahawan Sukses Ed.2 - - Google Books*. KENCANA.

Szteinberg, G., Balicki, S., Banks, G., Clinchot, M., Cullipher, S., Huie, R., Lambertz, J., Lewis, R., Ngai, C., Weinrich, M., Talanquer, V., & Sevian, H. (2014). *Collaborative Professional Development in Chemistry Education Research: Bridging the Gap between Research and Practice*. https://doi.org/10.1021/ed5003042

Yahyadin, M., Hanafi, H., Sianipar, C., Putra, A. A. N. S., Mandra, M., & Zaki, L. A. (2023). Study of Students' Entrepreneurship Interest As an Indicator of Opportunity for Establishing Business Incubators in Lombok Tourism Polytechnic. *Ecobisma (Jurnal Ekonomi, Bisnis Dan Manajemen)*, *10*(1), 121–135. https://doi.org/10.36987/ecobi.v10i1.4001