Campus Entrepreneurship Service
with Batik and Mathematical Ornaments

Hanna Arini Parhusip[1], Hindriyanto Dwi Purnomo[2], Didit Budi Nugroho[3], Istiarsih Saputri Sri Kawuryan[4]

Universitas Kristen Satya Wacana
hanna.parhusip@uksw.edu

Abstrak

Populerisasi matematika dan hilirisasi penelitian dalam kewirausahaan masih sangat minim di universitas. Oleh karena itu tujuan pengabdian yang dilakukan adalah membuat aktivitas kewirausahaan kampus yang mempopulerkan matematika sebagai hilirisasi penelitian. Adapun metode yang digunakan dengan cara menyiapkan desain -desain penciri obyek dan membuat produk yang memuat dan menggunakan desain tersebut berupa berbagai barang yang dikenal masyarakat seperti batik, asesoris, souvenir dan ornamen. Aktivitas untuk sosialisasi dilakukan dengan mengikuti berbagai pameran, lomba dan memberikan pelatihan kepada siswa-siswa sekolah. Demikian pula media sosial seperti instagram, youtobe, dan shopee juga menjadi media pemasaran. Pada tahun 2022 digunakan kemitraan dengan beberapa resto serta membuat toko untuk memperluas pemasaran. Dalam 3 tahun terakhir, diperolah hasil yang signifikan dalam mempopulerisasikan matematika oleh karena adanya aktivitas pengabdian masyarakat berupa kewirausahaan kampus dalam skema Program Pengembangan Usaha Produk Intelektual Kampus (PPUPIK) dari Kementrian Pendidikan, Kebudayaan, Riset dan Teknologi(Kemendibud Ristek). Masyarakat dapat dengan mudah menemukan produk yang diberi nama Batik Inovasi Matematika (Batima) dan Ornamen Dekoratif Matematika(Odema) pada area kampus, media sosial, Malioboro Mall Jogjakarta, beberapa resto di Salatiga.

Kata Kunci: pengabdian masyarakat, kewirausahaan, matematika, batik, ornament

Abstract

The popularization of mathematics and the downstream of entrepreneurship research is still very rare in universities. Therefore, the purpose of community service is to create campus entrepreneurial activities that popularize mathematics as research downstream. The used method is by preparing object-identifying designs and making products that contain and use these designs in the form of various items known to the public such as batik, accessories, souvenirs, and ornaments. Activities for socialization are carried out by participating in various exhibitions, and competitions and providing training to school students. Likewise, social media such as Instagram, YouTube, and Shopee are also marketing media. In 2022, partnerships with several restaurants and shops were used to expand marketing. In the last 3 years, significant results have been obtained in popularizing mathematics due to community service activities in the form of campus entrepreneurship in the Campus Intellectual Product Business Development Program scheme called PPUPIK from the Ministry of Research, Technology and Higher Education Indonesia. The public can easily find products called Batik Innovation Mathematics (Batima) and Ornament Decorative of Mathematics (Odema) in the campus area, social media, Malioboro Mall Jogjakarta, and several restaurants in Salatiga.

Keywords: community service, entrepreneurship, mathematics, batik, ornament

INTRODUCTION

Mathematics from the Satya Wacana Christian University (SWCU) Science and Mathematics Faculty (FSM) has been conducting research that is integrated between mathematics and the development of learning media since 2010. The problem is that there is no significant downstream research from mathematics. Existing products are only recognized by a limited circle. So far, the public has not been able to recognize it easily. Therefore, community service activities are carried out that aim to popularize the results of research in the field of mathematics to the public. It is known from the literature that entrepreneurship component activities can be activities that provide opportunities in learning mathematics even at school (Mahmud et al., 2022). For this reason, campus entrepreneurship efforts are carried out as a means to overcome these problems. It is known that entrepreneurship is still not significant as an activity at universities where in recent years entrepreneurship is considered necessary for the academic community (Linton & Klinton, 2019)(Kuckertz, 2021). Moreover, the popularization of mathematics with entrepreneurship is not yet used to it. By participating in the Campus Intellectual Product Business Development Program (PPUPIK) since 2020, it is hoped that the popularization of mathematics and the downstream of research with campus entrepreneurship can be achieved. This is what this article demonstrates.

METHOD

The target of community service carried out is the internal campus and the community outside the campus. Service activities with campus internal partners can provide income generating for the campus where students involved get jobs that provide income for students in addition to providing additional expertise in running business units. The stages in the implementation of community service are divided into 3 main parts, namely making designs based on mathematical formulations, product preparation, and marketing.

The used method in making the design is Surfer Software (mainly) and some supporting coding where Surfer is used to making surfaces as batik motifs or made as ornaments. With the designs obtained, various types of products are classified into 2 major groups, namely Batima (Batik Innovation of Mathematics) and Odema (Ornaments Decorative of Mathematics). As the name implies, Batima consists of batik products consisting of written batik, stamped batik, and hybrid batik. While Odema consists of souvenirs, accessories, and ornaments as well as several derivative products such as tote bags, glasses, t-shirts, key chains, pillowcases, bed linen, and tablecloths. Accessories have been made of copper, silver by 2021, and gold by 2022.

Several designs had been published in several journals a few years earlier where designs and products served as prototypes (Parhusip & Susanto, 2018),(Parhusip, 2018),(Parhusip et al., 2021). PPUPIK activities in the past 3 years have resulted in several follow-up articles, (Parhusip, 2020)(Parhusip et al., 2020). The results of this product were tested on a wider market media with university partners as a place for campus entrepreneurship which is not yet popular and not widely recognized.

The process of community service by making existing products reproduced and promoted as well as adding to the sharpness of the theory of existing products where the theory includes an understanding of the development of campus entrepreneurship and whether social and religious norms factors affect entrepreneurial interest which has been researched on students in Saudi Arabia (Azim, 2022). Activities in the process as well as those already in progress are documented both in video and in the mass media. In the first year, activities are prioritized that emphasize the provision of designs and prototypes as well as the introduction of partners who can collaborate with business units formed as spin-offs with campuses and online marketing. In the 2nd year, wider marketing was carried out. In the 3rd year, more partnerships were carried out in marketing as well as more well-documented business documents so that business transfers could be carried out on a wider scale.

In the last 1 year's activities, business processes were sharpened so that cash flow and activity evaluation could emerge. The activity for the first year (2020) has obtained 5 copyrights and monograph books and publications in accredited journals (1 journal). In the 2nd year (202), partners are developed so that the introduced motives in the last 2 years can already be part of the research contributions that have been downstream and have been easily recognized by a wider audience in Salatiga in particular, in Central Java and Indonesia in general. The integration of Community Service activities with lectures is also carried out and has provided an expansion of the knowledge built on this activity.

The community service activity team consists of lecturers from mathematics, information technology faculties, and economics. Lecturers from mathematics play a role in providing designs and publications, while the team from information technology uses Surfer software to make designs. Business activities are activities that are pursued by team members from the Faculty of Economics and Business. While the partners involved provide support in product procurement and marketing.

Indicators of the success of this activity are shown by the results of the popularization of mathematics which are expressed in various products that are easily accessible to the public, as well as various mass media that have reported on Batima and Odema products. Likewise, on the internet, this product is easy to find. While entrepreneurial activities are supporting activities that can provide a long-term product marketing process that influences efforts to popularize mathematics.

RESULT AND DISCUSSION

The sources of revenue-generating in PT that are developed

Because campus entrepreneurship activities are community service activities, revenue-generating sources at universities have been developed since 2014 by involving joint activities both within SWCU and outside

SWCU. In SWCU, for example:

i. Participated in the Krenova competition in Salatiga in 2014 and 2015 with product exhibitions in exhibition activities held by the Central Java Regional Government for being the champion in Krenova.

ii. Conducting exhibition activities around the campus every year in promotional events since 2014.

Figure 1. Ornaments as exhibition media (Science and Mathematics Faculty Open House at SWCU, October 15, 2014).

Figure 1 shows product exhibitions from 2014 activities, at local exhibitions around campus.

Figure 2. The AGMS Math Exhibition (Art, Game, Modeling, and Shop) at SWCU Noto House, February 3-4 2015.

Figure 3. The AGMS Math Exhibition (Art, Game, Modeling, and Shop) at SWCU Noto House, February 3-4 2015.

iii. Conducted community service activities in

Inoweek Junior Camp on June 10-16, 2017 in collaboration with PT Mulia Sari and Batik Tumpengan in BATIMA training for junior high school students. The total value of activities in 1 Faculty with 26 students is Rp. 125,000,000 while the introduction of BATIMA and ODEMA training for students is Rp. 30,000,000 from the Rp. 125,000,000.

iv. With the purchase of souvenirs for student activities, the souvenirs are research products in the form of bags, and glasses as gifts for participants in the activities held by SWCU FSM students.

v. Sales value is not recorded properly even though sales have been made. However, some items such as glasses, bags, and souvenirs have received a public response since 2014 where the products sold are classified as ODEMA, the estimated sales value is Rp. 25,000 x 8 = Rp. 200,000.00 in 2017. Sales in 2015-2017 are not widely documented.

vi. From the 2016/2017 research results, BATIMA prototypes have been produced in several products and stamps. After that, BATIMA uniforms were provided for SWCU FSM staff for June 2018, and June 2019 for 40 people, where each piece costs Rp. 100,000. So the total sales for SWCU FSM staff are Rp. 8,000,000 in 2 years.

vii. Likewise, individual purchases of souvenirs for relatives/colleagues amounted to Rp. 150,000 x 8 pieces in May 2019 so the total purchase was Rp. 1,200,000.

viii. MathClub group (FSM mathematics student group) and Industrial Mathematics course activities which also trade research products: Products offered in WordPress: https://matbis1.wordpress.com/

ix. The GTA Community Service (Green Team in Action) activity in Sawit Hamlet introduced the mathematical ornament innovation from the Aqua bottle in March 2018 where one of the ODEMA designs was used to decorate the Andong mountain tourist area in the Sawit hamlet area which is shown in Figure 4-5.

Figure 4. Community service activities as GTA with the Sawit hamlet community on February 26 2018 and March 2018 together with SWCU FSM math students. Mathematics students provide training on making aqua bottles into star-shaped ornaments.

Figure 5. GTA activities with the Sawit hamlet community on February 26 2018 and March 2018 together with SWCU FSM math students. Mathematics students provide training on making aqua bottles into curtain-shaped ornaments.

x. The Mathpreneuer activity in March 2019 from the Industrial Mathematics course at SWCU FSM Mathematics which was funded by the SWCU internal PkM resulted in an existing product promotion, namely:
https://matbis1.wordpress.com/blog/.
This activity was carried out during the "Science Festival 2019" which was held on March 21-22 2019 where this activity depended on the contribution of visitors to the "Science Festival 2019" event. On the first day, there were 66 visitors and on the second day, there were 52 visitors. In

addition, several other activities were also carried out, namely batik activities to attract the attention of visitors and introduce the process of making batik with a mathematical curve drawing pattern. In this activity, several preparations were made that had to be prepared before introducing mathematical products at the 2019 Science Festival, including preparing goods for sale. Before the activity, some preparation of goods was carried out, namely, data collection on math products to be sold, product packaging, and product publication on social media (Instagram and the Web). The use of social media is known to be very supportive in today's business processes (Ramaputra, 2020)(Olanrewaju et al., 2020) The following is an example of a product publication on Instagram shown in Figure 6-7 made in 2019.

Figure 6. Product publications on Instagram in 2019.

Figure 7. Product publications on the Web in 2019.

However, these activities have not contributed significantly to income generation and cash flow calculations have not been carried out related to sales and activities funded by participants related to practicing BATIMA. Even though Batima is also documented as a downstream product of SWCU research in 2017, further development as a campus income-generating business has not been done much. This is what provides opportunities for Batima and Odema products to be developed in the Campus Intellectual Product Business Development Program (PPUPIK) activities funded by the government from 2020 to 2022. Therefore, PPUPIK activities are carried out which last 3 years from 2020.

The results of increasing popularity and entrepreneurship with PPUPIK activities

As meant the problem of the need for downstream products, especially mathematics so that entrepreneurship is carried out with greater financial support, namely from the PPUPIK activity scheme (Campus Intellectual Product Business Development Program). This program has given significance to efforts to downstream and popularizes mathematics. In 2020, CV Garisma was produced as a spin-off business unit at Satya Wacana Christian University. Similarly, up to 3 books have been published in 2 years of activity which provide monograph and catalog documentation. Scientific products in the form of articles and 11 design copyrights which are batik and ornament designs. To carry out entrepreneurial activities during a pandemic, students also use social media such as shoppe and Instagram in selling products.

In the 3rd year (2022) the rebranding activities of CV Garisma with Batima and Odema products are prioritized where CV Garisma was formed in 2020. Rebranding activities are very important in entrepreneurial activities (Kusi et al., 2022). This is done by promoting products that more often involve many students on student social media accounts to reach more masses in popularization. This is to the development of lecture activities at universities in various places where entrepreneurship is an effort to downstream lecture product results (Sudiyono, 2017) even in science fields such as mathematics (Wang et al., 2022). Students

involved are students in basic entrepreneurship courses as university-level courses, industrial mathematics courses in Mathematics in semester 2, 2021/2022 as well as 2 PKL students and 1 student using as a thesis topic and students from Economics in these 3 years related to dealing with taxation and financial reports. There is an increase in the number of students and lecturers involved as well as new partners who support this activity. Among them, is the Valhalla restaurant, Bumi Kayom restaurant which will become a mini-Gallery so that socialization is easier to do with partners. Besides that, the business web is also activated to strive for product internationalization.

As stated in the proposal, this PPUPIK activity is given the need to popularize mathematical products and downstream research results. With activities in these 3 years, it can be concluded that PPUPIK has greatly supported the expected popularization by disseminating products and developing campus entrepreneurship which is indeed very important in campus activities today.

CONCLUSION

This article shows community service activities in the form of campus entrepreneurship. The activity begins with the preparation of a design that contains a mathematical identity on a limited scale. This is done to popularize mathematics by downstream research products which are still rarely done on campus. Based on these designs, products that can be reached by the public, such as batik and accessories are made. Community service activities in the form of the Campus Intellectual Product Business Development Program (PPUPIK) from the Indonesian government in 3 years which have succeeded in popularizing mathematics to the community on campus and outside campus through various activities to the community through competitions, training, and social media where products called Batik Innovation Mathematics (Batima) and Mathematical Decorative Ornaments (Odema). Success is shown by the ease with which people can get these products in the campus area and several restaurant areas in Salatiga and the use of social media with the keywords Batima and Odema.

REFERENCES

Azim, M. T. (2022). Role of religiosity, social factors, and perceived subjective norms on entrepreneurial intention : a study on tertiary level students. *J Glob Entrepr Res*, 1–24. https://doi.o rg/https://doi.org/10.1007/s40497-022-00333-1

Kuckertz, A. (2021). Why we think we teach entrepreneurship - and why we should teach it. *Journal of Entrepreneurship Education*, 24(3), 1–7. https://www.abacademies.org/articles/why-we-think-we-teach-entrepreneurship--and-why-we-should-really-teach-it-10333.html

Kusi, S. Y., Gabrielsson, P., & Baumgarth, C. (2022). How classical and entrepreneurial brand management increases the performance of internationalizing SMEs? *Journal of World Business*, *57*(5), 1–60. https://doi.org/10.1016/j.jwb.2022.1013 11

Linton, G., & Klinton, M. (2019). University entrepreneurship education: A design thinking approach to learning. *Journal of Innovation and Entrepreneurship*, *8*(1), 1–11. https://doi.org/10.1186/s13731-018-0098-z

Mahmud, M. S., Maat, S. M., Rosli, R., & Sulaiman, N. A. (2022). The Application of Entrepreneurial Elements in Mathematics Teaching : Challenges for Primary School Mathematics Teachers. *Frontiers in Psychology*, *13*(March), 1–9. https://doi.org/10.3389/fpsyg.2022.7535 61

Olanrewaju, A. S. T., Hossain, M. A., Whiteside, N., & Mercieca, P. (2020).

Social Media and Entrepreneurship Research: A literature Review. *International Journal of Information Management, 50*(May 2019), 90–110. https://doi.org/10.1016/j.ijinfomgt.2019.05.011

Parhusip, H. . (2018). *Algebraic Surfaces for Innovative Education Integrated in Batik Art* (J. Yoga Dwi, A. Rodliyati, P. Mauludi Ariesto, S. Anna, & K. Corina (eds.)). AIP Conference Proceedings. https://aip.scitation.org/doi/abs/10.1063/1.5062781

Parhusip, H. ., Hindriyanto, D. ., Nugroho, D. ., & Istiarsi Saptuti, S. K. (2020). Learning geometry through surface creation from the hypocycloid curves expansion with derivative operators for ornaments. *Desimal: Jurnal Matematika*, *1*(1), 29–37. https://doi.org/10.24042/djm

Parhusip, H. ., Purnomo, H. ., Nugroho, D. ., & Kawuryan, I. S. . (2021). Modern Ethnomathematics Mainstreaming through Mathematics Entrepreneurship Using Mathematical Ornaments. *IJEME, 1*(2), 21–23. http://journal.uad.ac.id/index.php/IJEME/article/view/15118

Parhusip, H. A. (2020). Efek Diskritisasi pada Modifikasi Hypocycloid Menjadi CSCPP (Curve Stitching Connected Pseudo Polygon). *Jambura Journal of Mathematics*, *2*(2), 60–72. https://doi.org/10.34312/jjom.v2i2.4385

Parhusip, H. A., & Susanto, B. (2018). Inovasi Geometri sebagai Media Pembelajaran Matematika Kreatif. *Jurnal Matematika Kreatif-Inovatif*, *9*(1), 63–70. https://doi.org/https://doi.org/10.15294/kreano.v9i1.14047

Ramaputra, R. (2020). The Effect of Social Media Marketing And Online Travel Agents Towards The Booking Intention of Hotel In Surabaya. *Jurnal Entrepreneur Dan Entrepreneurship*, *9*(2), 91–98. https://doi.org/10.37715/jee.v9i2.1409

Sudiyono, L. (2017). The Urgency of Entrepreneurial Learning Model to Instill the Independence of Santri at Ibnu Fatah Orphanage, Pengasih, Kulon Progo. *Mediterranean Journal of Social Sciences*, *8*(3), 197–201. https://doi.org/10.5901/mjss.2017.v8n3p197

Wang, M., Soetanto, D., Cai, J., & Munir, H. (2022). Scientist or Entrepreneur? Identity centrality, university entrepreneurial mission, and academic entrepreneurial intention. *Journal of Technology Transfer*, *47*(1), 119–146. https://doi.org/10.1007/s10961-021-09845-6