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Chemoentrepreneurship Based Student Worksheet Development to Improve Enterprise Interest in Chemical Teachers

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ABSTRACT

The purpose of this study was the development of a chemoentrepreneurship based student worksheet (LKM) to increase the entrepreneurial interest in chemistry teacher candidates. The sample of this study was 115 students of the Department of Chemistry at the University of Riau and the State Islamic University (UIN) Sultan Syarif Kasim in the 6th semester of the 2019 academic year. The results obtained at the validation stage of MFI development were 95% with the valid category. The results of the small-scale test on the one-one test obtained an average percentage of 84.80% which was included in the very practical category. Furthermore, the lecturer response obtained an average percentage of assessment of 90.40% with the LKM category being well used in the learning process. The results of the small-scale trial assessment obtained an average percentage of the assessment of 85.16% which falls into the very practical category. The results of large-scale student assessments after using the LKM developed through filling out the student response questionnaires obtained an average score percentage of 80.63% with the practical category. The results of the increase in the entrepreneurial interest of UR students as a whole were 80.61, including the high category, and the results of the UIN students' interest in entrepreneurship as a whole were 81.64 including the very high category.

1. Introduction

Law number 12 of 2012 explains that higher education aims to develop the potential of students to become human beings who believe and fear God Almighty and have noble, healthy, knowledgeable, competent, creative, independent, skilled, competent, and cultured morals for the benefit of the nation, to produce graduates who master the branches of Science or Technology to meet national interests and increase the competitiveness of the nation.

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The goal of higher education has not been fully realized, because there are still a large number of undergraduates who are still unemployed. Quoting data from BPS, in 2017 there has been an increase in the number of unemployed people in Indonesia by 10,000 to 7.04 million people in August 2017 from August 2016 of 7.03 million people. The increase in the number of unemployed is due to an increase in the workforce in Indonesia. If seen nationally, the unemployment rate reaches 7 million people or 5.33 percent (BPS, 2017).

The phenomenon of undergraduate unemployment is basically a criticism for universities, because of its inability to create an educational climate that supports students' competitive abilities. Students generally prefer to be civil servants or private employees rather than developing their own businesses. (Maksum, 2011). The need for relevance between the quality of higher education and the needs of the industrial world is still low even though public access to tertiary education continues to increase. This is reflected in the low labor absorption of college graduates. The percentage of the population working at the tertiary level per August 2016 - August 2017 is 12.06 (BPS, 2017).

Entrepreneurship has a very important role as one of the pillars of the economy. However, given the low number of entrepreneurs in Indonesia, to set up a new mindset, it is necessary to reform the teaching and learning system in innovative tertiary institutions. Answering this challenge, in fact, is not a homework for the university itself, but requires a high and consistent commitment from several elements, namely ABG (Academia, Business, and Government). Several accelerated entrepreneurship programs have been initiated by the government, including a grant program in the form of capital for universities to produce new businesses at the student level (Bambang Pratama, 2010).

In terms of building the character of an entrepreneur, higher education should create an atmosphere that can encourage an independent attitude for the academic community. This can be achieved through; 1) Developing and getting used to work that prioritizes creative ideas in thinking and independent attitudes for students in the learning process (emphasizing exercise models, independent tasks, problem solving, how to make decisions, finding opportunities, etc.), 2) Inculcating honest attitudes and behaviors in communication and acting in every development, education, and learning activity as basic capital in building an entrepreneurial mentality in students, 3) Educational practitioners also need to share and provide support for this commitment to entrepreneurial mental education to institutions related to business services appear in society in order to truly function and truly prepare policies to facilitate and serve the community. Important education practitioners also establish close relationships with the business world so that the learning by doing process takes place (Author Team, 2013).

Based on Kepmendiknas no. 49 of 2014, one of the nine formulations of attitudes from SN DIKTI for academic education graduates, namely, internalizing the spirit of independence, struggle, and entrepreneurship (Dikti, 2014). The university's efforts to train this entrepreneurial attitude by providing entrepreneurship

education. One of the entrepreneurship education conducted by the University of Riau is making entrepreneurship courses. Entrepreneurship courses in the Department of Chemical Education, FKIP, Riau University are used as elective courses. Based on the researcher's preliminary study, Chemistry Education students did not take this entrepreneurship course.

To equip students with skills in the world of work (vocational skills), creativity is needed which can be used after completing their education. One of the lessons that has the potential to increase student creativity in entrepreneurship is chemoentrepreneurship (CEP). Chemoentrepreneurship is a learning approach developed by linking material directly to real objects or phenomena around human life as students, so that in addition to educating, the CEP approach also allows students to learn the process of processing a material into a useful, economic value, and motivating product. entrepreneurship (Supartono, 2006; Rahmawanna, et al., 2016).

Based on the results of the researcher's preliminary study of UR's Chemistry Education students by providing a questionnaire, it was found that they had difficulty understanding biomolecular material, core reactions and radioactive. Biomolecular material was chosen because the material is related to everyday life. Students gave the response that this biomolecular material was difficult because there was too much material and it was difficult to memorize it. Students also responded that they needed teaching materials that could be used as a reference and reading material to make it easier to understand the biomolecular material. Biomolecular material is contained in biochemistry courses. Biomolecule material is taught in basic chemistry 2 and biochemistry courses 2.

One of the teaching materials is student worksheets. Student worksheets (LKM) are a learning resource that can be developed by educators as facilitators in learning activities. MFIs that are compiled can be designed and developed in accordance with the conditions and situations of learning activities to be faced (Widjajanti, 2008).

Student worksheets (LKM) are one of the teaching materials designed to make it easier for students to understand learning material. LKM is made according to the design according to the material and student needs, besides LKM is a tool used by lecturers to help students gain knowledge during the learning process. In lectures, the previous course management team had facilitated students with LKM media in learning but it was not complete. Therefore an MFI is needed that can make biochemistry courses easier to learn, understand and activate students in the learning process. Efforts that can be done are to develop a chemoentrepreneurship-based LKM.

The development of CEP-based chemical teaching materials links chemical materials with phenomena in everyday life so that students can learn the process of processing a material into a useful product and even find other alternatives for processing a material from the concepts studied so that it is more economically valuable and cultivating an entrepreneurial spirit (Craft in Dewi Yuliana Sihite.,

2017). However, the essence of the CEP concept is not forming students to become entrepreneurs or traders, but with the CEP concept it is expected to foster entrepreneurial interest for students as provisions in solving problems (Supartono, 2006).

Entrepreneurial interest is the desire to interact and do everything to achieve goals by working hard, to be independent, to open opportunities with skills and beliefs without feeling afraid to take risks, and to learn from failures in entrepreneurship (Hendro and Kaligis, 2011).

A person's entrepreneurial interest is reflected in various things such as ability, independence (persistence, teamwork, creativity and innovation). Therefore, educators must choose and improvise teaching materials that are appropriate to the level of thinking development of students to facilitate an effective learning process and motivate students' learning (Anwar, 2016) by developing chemoentrepreneurship-based teaching materials (CEP). The CEP approach can help students acquire skills and knowledge that are very important to develop entrepreneurial interest, so that it can be used as an effort to reduce unemployment (Utomo, et al, 2015).

Based on the description above, it is important to conduct a needs analysis for the development of a chemoentrepreneurship-based student worksheet (LKM) to increase the entrepreneurial interest of prospective chemistry teachers with the hope that higher education can equip students with skills and creativity in the world of work (vocational skills).

2. Methodology

Types of research

This type of research is design research. The development model used is the Plomp development model.

Time and Place of Research

This research was conducted from March to mid-December 2019. The research sites were conducted at the University of Riau and the State Islamic University of Sultan Syarif Kasim Riau Pekanbaru.

Research Object / Population and Sample

The object of this research is the developed chemoentrepreneurship-based chemistry LKM. The population in this study were students majoring in chemistry education at UR and UIN. The sample of this research was all students majoring in chemistry UR and UIN semester 6 of the 2018/2019 academic year. There are 57 UR students and 58 UIN students. The sampling technique was random sampling technique.

Data collection technique

The data collection technique used was the LKM validation sheet and research instruments, a questionnaire (questionnaire), a practicality assessment sheet.

Data analysis technique

The data analysis technique used in this research is qualitative-quantitative descriptive analysis. The purpose of descriptive analysis is to describe the validation results provided by the validator. Validation aspects that are assessed by the validator are made in the form of a rating scale. The type of scale used is the Likert scale with a score of 1-5. This Likert scale raw data obtained in the form of a statement (qualitative) then interpreted in the form of numbers (quantitative). This scale is arranged in the form of a statement and is followed by a response that shows the level (Arikunto, 2010).

The validator's assessment of each statement on the validation sheet was analyzed using the average score formula, namely:

$$\text{Persentase} = \frac{\text{skor yang diperoleh}}{\text{skor maksimum}} \times 100\%$$

The criteria for making decisions for validating student worksheets can be seen in Table 1.

Table 1. Eligibility Criteria for MFI Validation Percentage Analysis

Percentage (%)	Category
81 – 100	Very Valid
61 – 80	Valid
41 – 61	Enough Valid
21 – 40	Less Valid
0 – 20	Invalid

(Riduwan, 2011)

The data obtained will be used as a reference in revising the initial stages before the trial. Revisions will be made to the parts where the achievement of the aspects is still lacking. This can be seen from the validity criteria obtained.

3. Results and Discussion

Development research has been carried out and produced products in the field of education, namely, Chemoentrepreneurship-based Student Worksheets (LKM) which can increase students' entrepreneurial interest in biochemistry courses. This study used the Plomp model research design which consisted of three phases, namely:

A. Preliminary Research Phase

The initial investigation aims to gather information before the chemoentrepreneurship-based LKM development process is carried out.

The MFI that is developed includes several aspects that underlie the development of the MFI, namely the curriculum analysis is carried out first. The curriculum used in higher education is KKNI. Based on Kepmendiknas no. 49 of 2014, one of the nine formulations of attitudes from SN DIKTI for academic education graduates, namely, internalizing the spirit of independence, struggle, and entrepreneurship (Dikti, 2014).

The next analysis is student analysis. In this case, the development of a chemoentrepreneurship-based LKM in the biochemistry course is very suitable to be developed in students because students are taught to learn the process of processing a material into a product that is useful and has economic value. Learning with a chemoentrepreneurship approach prepares students in developing products and trains them to be able to foster student interest in entrepreneurship.

The development of CEP-based chemical teaching materials links chemical materials with phenomena in everyday life so that students can learn the process of processing a material into a useful product and even find other alternatives for processing a material from the concepts studied so that it is more economically valuable and cultivating an entrepreneurial spirit.

The next analysis was material analysis, based on the results of the questionnaire, it was found that students had difficulties with biomolecular material, core reactions and radioactive. Materials that can be developed with a chemoentrepreneurship approach are biomolecular materials. Biomolecule material is taught in basic chemistry 2 and biochemistry 2 (Figure 1). The choice of biochemistry 2 course in developing chemoentrepreneurship-based LKM is because in biochemistry 2 there is a practicum in learning so that more can develop chemoentrepreneurship-based MFIs.

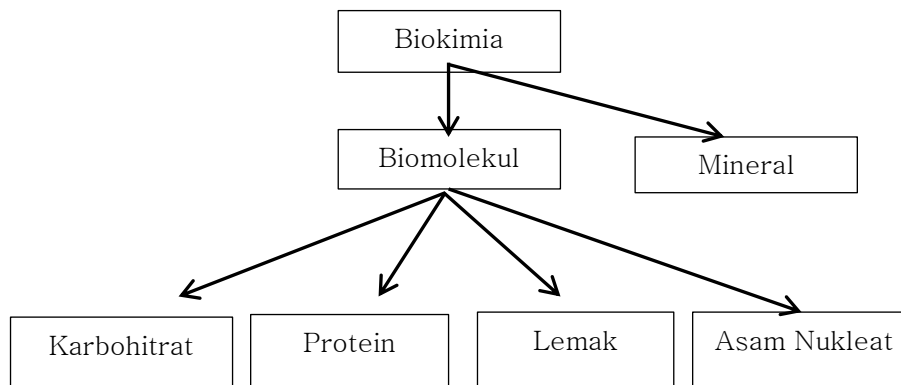


Figure 1. Biochemical Concept Map

Based on the results of the initial investigation, it was found that a chemoentrepreneurship-based LKM is needed in the learning process to help students to be able to increase their interest in entrepreneurship in students.

B. Development or Prototyping Phase

In this phase, the researcher arranges student worksheets and instruments needed in the research. At this stage the MFI development and validation instruments needed at the time of development were also carried out. The results obtained at this stage are the MFIs that are ready to be validated by experts for the next stage of assessment.

C. Assessment Phase

In this phase, the initial chemoentrepreneurship-based LKM product or what is known as prototype I is validated and tested. The validation stage can be seen in Figure 2-5.



Figure 2. Layout of a chemoentrepreneurship-based LKM before the Revision



Figure 3. Layout of chemoentrepreneurship-based LKM after revision



Figure 4. The contents of a chemoentrepreneurship-based LKM before the Revision



Figure 5. The contents of a chemoentrepreneurship-based LKM after revision

Figure 5 shows the differences in the results of the MFIs that have been developed in terms of the MFI layout. Figure 4-5 shows the improvement of the MFI in Figure 4 which is equipped with pictures that are really needed by the MFI that are not listed in Figure 4.

After making improvements to prototype 1 based on suggestions for improvement from the validator. Then re-validation is carried out to find out whether after the improvement of the MFI has fulfilled the feasibility aspect of the teaching material. The aspects of the feasibility of teaching materials include 5 aspects, namely aspects of the feasibility of content, language, presentation, graphics, and chemoentrepreneurship. The results obtained can be seen in Table 2.

Table 2. Recap of the Average Score of the Feasibility Assessment of Chemoentrepreneurship-based MFIs

No	LKfM Feasibility Aspects	Validator Average Score (%)			Validation Average Score (%)	Information
		I	II	III		
1	Content Feasibility Aspects	93	88	98	93	Valid
2	Linguistic Aspects	94	97	100	97	Valid
3	Presentation Aspects	96	84	100	93	Valid
4	Graphic Aspects	94	86	97	92	Valid
5	Chemoentrepreneurship Aspects	100	100	100	100	Valid
Validation Overall Average Score					95	Valid

The results of the MFI validation in all aspects of the MFI feasibility assessment were categorized as valid with a 95% feasibility value.

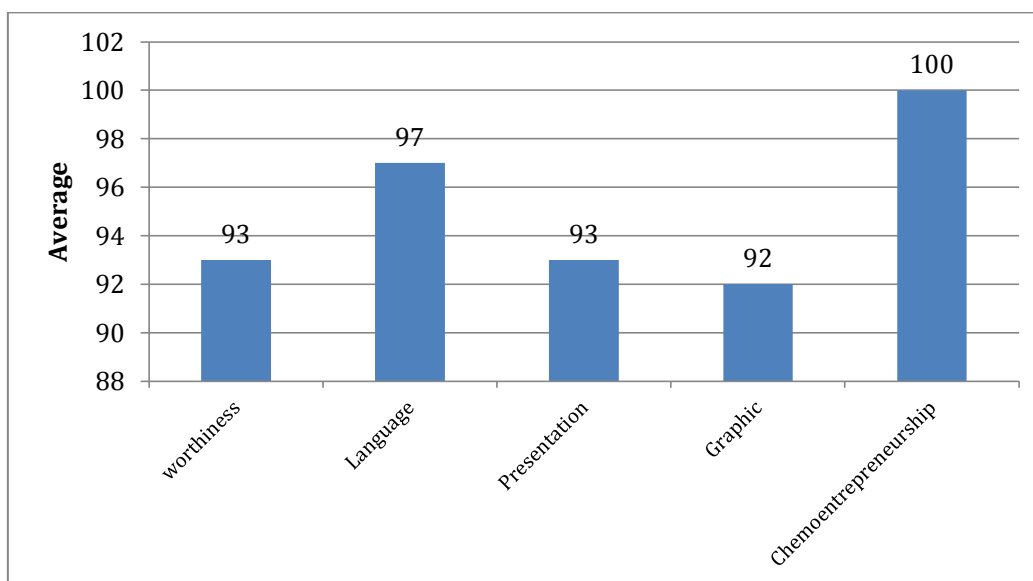


Figure 6: Graph of MFI Validation Results based on Chemoentrepreneurship

The small-scale trial was carried out in two stages, namely the one-one test and the small sample trial. Small sample trials by taking data on the response of lecturers and students to the use of MFIs that have been developed, large sample trials and testing of the effectiveness of LKM on students' interest in entrepreneurship.

The one-one test was conducted on 2 random students in the 8th semester of Chemistry Education at the University of Riau who had taken biochemistry courses. The data obtained was in the form of student responses to the chemoentrepreneurship-based LKM which was developed in the form of a questionnaire about student responses to the practicality of the LKM. The results of the one-one test assessment of chemoentrepreneurship-based MFIs obtained an average percentage of 84.80% assessment which is included in the very practical category. The lecturer response questionnaire was used to determine the applicability of using LKM. The results of the analysis of the lecturer response questionnaire data obtained an average percentage of assessment of 90.40%. Based on the results of the lecturer response questionnaire analysis, it can be explained that the chemoentrepreneurship-based LKM that has been developed is good and can be applied to the learning process.

A small-scale trial was carried out on 13 random students of 8th semester of Chemistry Education at Riau University and 16 students of 8th semester of Chemistry Education at State Islamic University randomly who had taken biochemistry courses. The results of the small-scale trial assessment of chemoentrepreneurship-based MFIs obtained an average percentage of an assessment of 85.16% which falls into the very practical category. A large-scale trial of the product that has been produced in this development research is a chemoentrepreneurship-based student worksheet in the biochemistry course. The MFI developed is applied to 6th semester chemistry education students who are currently taking biochemistry courses at the Riau University and the State Islamic University. Based on the student's assessment after using the LKM which was developed through filling out the student response questionnaire, it was obtained an average score percentage of 80.63% with the practical category.

Prototype I, which has been valid and practical based on the results of the validator's assessment and the responses of lecturers and students, is then tested in the real class to find out whether the development of a chemoentrepreneurship-based LKM is effective in increasing student interest in entrepreneurship. The effectiveness test was carried out by taking data on student entrepreneurial interest using a questionnaire.

Entrepreneurial interest in students is seen through a questionnaire given to students after learning activities using chemoentrepreneurship-based LKM. The entrepreneurial interest questionnaire consists of 28 questions. The maximum value is 5 and the minimum value is 1.

The results of the questionnaire on the entrepreneurial interest of UNRI students can be seen in Table 3.

Table 3. The results of the questionnaire on the entrepreneurial interest of UNRI students

No	Category	UNRI students	
		Total	Percentage
1	Very high	25	44 %
2	High	32	56 %
3	Moderate	0	0
4	Low	0	0
5	Very low	0	0
Total		57	100

Table 3 shows that there are no students who have moderate, low and very low interest in entrepreneurship. There are 25 very high category of entrepreneurial interest with a percentage of 44%. Meanwhile, students in the high category were 32 with 56%.

This is because learning with the CEP approach allows students to learn the process of processing a chemical into a product that is useful and has economic value. In accordance with the research results of Kusuma and Kusoro (2010), learning using CEP-oriented teaching materials can improve student learning outcomes, increase entrepreneurial enthusiasm, and improve student-specific life skills. This is reinforced by the results of research by Mulyani (2011) which states that the success of entrepreneurship education programs is through the achievement of students who have high entrepreneurial character and behavior.

The results of students' interest in entrepreneurship as a whole are in the high category. The high interest in entrepreneurship is a positive impact of the use of chemoentrepreneurship (CEP) -based MFIs in the learning process that is designed to be entrepreneurial and feel enjoyable by students. This is because the chemoentrepreneurship (CEP) oriented concept is a contextual chemistry learning approach, namely a chemistry learning approach that is associated with real objects so that in addition to educating, this chemoentrepreneurship (CEP) approach allows students to learn the process of processing a material into a useful product, economic value, and foster an entrepreneurial spirit (Supartono, et al, 2009). With this chemoentrepreneurship (CEP) orientation, teaching chemistry will be more fun and provide opportunities for students to optimize their potential to produce a product (Wikhdah, 2015). The results of the UIN student entrepreneurial interest questionnaire can be seen in Table 4.

Table 4. The results of the UIN student entrepreneurial interest questionnaire

No	Category	UNRI students	
		Total	Percentage
1	Very high	27	47 %
2	High	31	53 %
3	Moderate	0	0
4	Low	0	0
5	Very low	0	0
Total		57	100

Table 4 shows that there are no students who have moderate, low and very low interest in entrepreneurship. There are 27 people with very high interest in entrepreneurship with a percentage of 47%. Meanwhile, students with high category were 31 with 53%.

Classically, the level of student interest in entrepreneurship is in the very high category. These results indicate that CEP-oriented learning has a positive impact in fostering student entrepreneurial interest (Sunarya, et al, 2018). The application of CEP in learning makes learning activities more meaningful because this learning invites students to study chemistry in groups and links the material with daily life, so as to increase students' interest in entrepreneurship (Rahmawanna, et al., 2016).

Based on the results of the analysis of student entrepreneurial interest, UIN students' entrepreneurial interest is higher than UNRI students' entrepreneurial interest. This is because UNRI students carry out learning using chemoentrepreneurship-based LKM for only one meeting, whereas UIN students carry out learning using chemoentrepreneurship-based LKM three times. UNRI students are limited in doing biochemistry practicum using LKM because independent practicum is only done once, each group of students chooses one independent practicum in LKM and does not do independent practicum entirely due to limited learning time. The practicum for making transparent soap was not chosen by UNRI students because independent practicum was carried out at home, so they could not make transparent soap at home because of the limited tools and materials used in making transparent soap.

4. Conclusion

Based on the results of MFI development research, it was found that a valid LKM could be used in the learning process. Furthermore, MFIs that have been developed based on the results of distributing questionnaires can have an effect on students' interest in entrepreneurship.

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