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Chemistry Learning Module Based on Student Characteristics in The New Normal Era

K Anom W[1*], Made Sukaryawan[2], Abdurachman Ibrahim[3], Eka Ad'hiya[4]

[1,2,3,4]Chemistry Education, Sriwijaya University, Jl. Palembang-Prabumulih, Ogan Ilir Regency, Indralaya, South Sumatra, Indonesia

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ABSTRAK

Modul sangat bermanfaat bagi mahasiswa jika dikembangkan berdasarkan karakteristik mahasiswa untuk mata kuliah kewirausahaan di era new normal. Untuk itu penelitian ini bertujuan untuk mendeskripsikan pengembangan modul pembelajaran kimia berbasis STEM berdasarkan karakteristik mahasiswa kimia era new normal untuk mata kuliah kewirausahaan. Topik kewirausahaan yang dibahas dalam penelitian ini adalah pertambahan bobot badan kambing. Subyek penelitian ini adalah mahasiswa semester lima Pendidikan Kimia. Metode penelitian adalah deskriptif. Triangulasi data dilakukan berdasarkan hasil wawancara, dokumentasi dan kuesioner. Kuesioner dinyatakan valid dengan koefisien reliabilitas sebesar 0,763 lebih besar dari batas minimal 0,600. Hasil penelitian menunjukkan bahwa siswa sangat setuju suka membaca (35,7%), termotivasi (35,7), suka mencari di internet (78,57%) dan 78,57% diantaranya mempelajari topik penimbangan kambing kacang dengan modul membaca, dan 82,14% dari mereka menyukai kemitraan dalam kewirausahaan kambing. Kesimpulannya adalah bahwa modul pembelajaran kimia telah dikembangkan untuk mata kuliah kewirausahaan, dan modul tersebut didasarkan pada karakteristik siswa dan STEM, dan berkarakter kimia, yang memenuhi tujuan penelitian.

ABSTRACT

Modules are very useful for students if they are developed based on student characteristics for entrepreneurship courses in the new normal era. For this reason, the objective of this study was to describe the development of STEM-based chemistry learning module based on the characteristics of chemistry students in the new normal era for the entrepreneurship course. The topic of entrepreneurship discussed in this study was goat weight gain. The subjects of this study were the fifth semester students of Chemistry Education. The research method was descriptive. The data were triangulated based on the results of interview, documentation, and questionnaire. The questionnaire was valid with a reliability coefficient of 0.763, greater than the minimum limit of 0.600. The results showed that the students strongly agreed to like to read (35,7%), motivated (35,7), liked to search the internet (78,57%) and 78.57% of them studied the topic of gaining the weight of peanut goats by reading module, and 82.14% of them liked partnership in goat entrepreneurship. The conclusion is that the chemistry learning module has been developed for the entrepreneurship course, and the module is based on student characteristics and STEM, and is characterized by chemistry, which fulfill the research objectives.

1. INTRODUCTION

Characteristic is the basic nature, value system, and personality of human (Ernawati et al., 2019; Samrin, 2016). Student characteristics are important bases, habits, and learning styles in the development of learning modules (Budiningsih, 2011; A. K. Sari, 2014; I. T. P. Sari & Sylvia, 2020). Characteristics of students are starting to have a high intellectual and mature thinking intelligence for their future, have emotional freedom to have associations and determine their personality. Students also want to improve their achievements on campus, have responsibility and independence in completing college assignments, and start thinking about values and norms in the campus environment and in the community where they are located (I. T. P. Sari & Sylvia, 2020). Academic character can be measured from the aspect of academic

*Corresponding author
E-mail addresses: kanomwunsri@gmail.com (K Anom W)

achievement, academic honesty and student scientific attitudes (Chairiyati, 2013; Sukmawati, 2016). The most basic characteristics of entrepreneurs are creative and innovative, keen to see opportunities, likes jobs with realistic risks, work harder in tasks that requires mental ability, has responsibility, and have ethics and morals (Herwiyanti & Ulfah, 2016; Yusuf et al., 2019). Formation student character is formally carried out with efforts to prepare conditions, facilities/infrastructure, activities, education and curricula that lead to the formation of character and character the nation's young generation has a strong juridical basis (Manurung & Rahmadi, 2017; Susanti, 2013).

Chemistry learning in the era of the Covid-19 pandemic cannot be carried out normally by face-to-face in the classroom (Lapitan Jr et al., 2021; Mulatsih, 2020). Therefore, chemistry learning uses the internet, google, with the zoom-meeting and google-meet applications. Chemistry learning after the Covid-19 Pandemic era, namely the New Normal era has now become a habit and the learning style for chemistry learning is online (on the network) although there are still some obstacles (Huzaimah & Amelia, 2021; A. K. Sari, 2014; Suryani et al., 2022; Yulianci et al., 2020). Chemistry learning in the entrepreneurship course can take place actively, creatively, critically, independently, with interest, with motivation, digitally or in digitalism, using a STEM approach, chemically characterized or nuanced, namely chemo-entrepreneurship (CEP), collaboratively, and in partnership (Fathoni et al., 2020; Iswahyudi & Iqbal, 2018; Nuraini et al., 2016; Ramadani & Syariati, 2020; Sandi, 2021; I. T. P. Sari & Sylvia, 2020; Sukaryawan & Mujamil, 2021; Suwardi, 2021; Syahrul et al., 2021). STEM approach is considered suitable to be applied to learning in the new normal because it focuses on development students' thinking skills, not only in the context of learning materials (Iaskyana et al., 2022; Nurmawanti & Kusuma, 2021). The STEM approach can guide and train students to think logically, critically, evaluatively, creatively in solve problems and take a decision related to dealing with problems of life by utilizing technology and applying it in real life (Banila et al., 2021; Ceylan & Ozdilek, 2015). The STEM approach can make learning innovative and varied related to everyday life. Students can understand environment and the problems faced by modern society which depend on the development of science and technology, including social problems (Daugherty, 2013).

Before carrying out the teaching process, the teaching staff would need to know the characteristics of the students, this is done so that educators can determine strategies and methods in carrying out the learning process (Rahmawati et al., 2017). The student characteristics in the development of chemistry learning module greatly affect the benefits of the module for the students after the module has been developed. So far, the developed chemistry learning modules for entrepreneurship courses have not had many chemical characteristics. The problem is that the seven chemistry learning modules have not presented the chemistry materials. This chemistry module is limited to only chemical formulas and certain chemical reactions (Habibillah & Mujamil, 2021; Prastika et al., 2018; Sukaryawan & Mujamil, 2021). So then, we need to develop the chemistry learning module for the entrepreneurship course has something new in terms of chemical characteristics. The materials of entrepreneurship in this study have a new topic, namely the types of feed that can increase the weight of peanut goats. Goats have an economic selling value and are very useful for having a very potential protein nutritional value (Maesya & Rusdiana, 2018; Siska & Anggrayni, 2021). The fundamental question is whether the characteristics of students could support the making of a chemistry learning module with a STEM approach for the Entrepreneurship Course at Chemical Education Study Program, Faculty of Teacher Training and Education, Sriwijaya University, in which the module includes the topic of the types of feed to increase the weight of peanut goats during the growth period (under 8 months). Therefore, it is necessary to conduct a study entitled "Developing Chemistry Learning Module for Entrepreneurship Course at the Chemistry Education, Faculty of Teacher Training and Education, Sriwijaya University, with the Topic of Types of Feed to Increase the Weight of Peanut Goats in the Growth Phase in the New Normal Era. Based on the results of the study of student characteristics, the title becomes " Developing the Chemistry Module Based on Student Characteristics in the New Normal Era" This study would be useful (1) to increase the entrepreneurial motivation of students, (2) to help find alternative employment opportunities through entrepreneurship, (3) to help the government reduce the burden of hiring government employees, because everyone after graduation wants to be a State Civil Apparatus, while the government cannot afford to accommodate all the graduates, both from high schools and universities in Indonesia.

2. METHOD

This study used a qualitative descriptive method with the following stages as shown in Figure 1. The data were obtained through the interview, questionnaire and documentation, and cross-checked by triangulation.

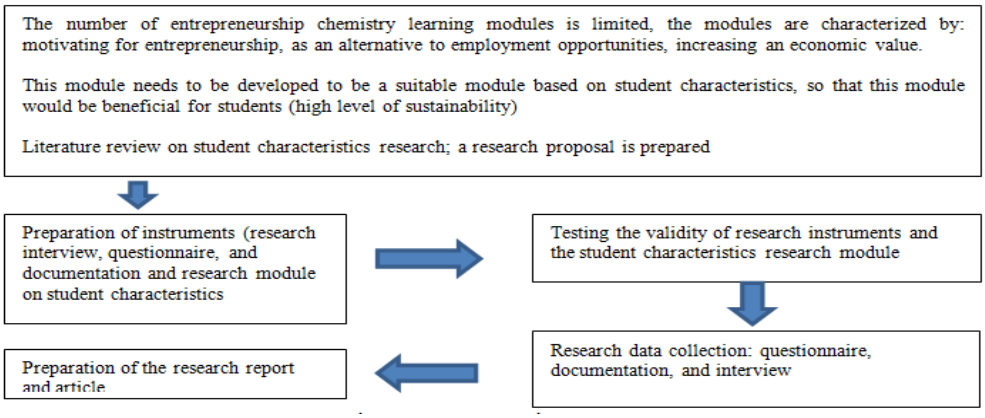

Figure 1. Research Stages

Interview guidelines were designed, then expert validation of the interview guidelines was carried out and the interview data were obtained from semester-5 Chemistry Education students, lecturers of Entrepreneurship Courses, and Coordinator of the Chemistry Education Study Program, Faculty of Teacher Training and Education, Sriwijaya University. The interview was to obtain the data of student learning styles, motivation, and habits. Questionnaire was designed, the questionnaire was validated, and the data were obtained through the questionnaire about students' motivational styles and learning habits. The respondents were semester-5 students of Chemistry Education, Faculty of Teacher Training and Education, Sriwijaya University. Search for documentation was carried out on the number, module titles and Learning Implementation Plans (RPP) from the lecturers of Entrepreneurship courses and those in the archive of Chemistry Education Study Program, Faculty of Teacher Training and Education, Sriwijaya University. Students' approaches, styles and learning habits were traced from the learning implementation plans.

3. RESULT AND DISCUSSION

Result

The results of literature review showed the characteristics of student learning: (1) student learning styles to increase the weight of peanut goats were part of the student characteristics, (2) arousing the attitudes, interests, and motivation of entrepreneurship for sustainability, (3) the entrepreneurial learning module was characterized by chemistry, (4) learning by using STEM approach in entrepreneurship, (5) entrepreneurship practice/internship with business partners was very important to inspire the students to become entrepreneurs. Based on the five characteristics, research instruments were developed and arranged in the form of interview and questionnaire.

Interview

The three interview instruments were validated by two expert lecturers of development research with the initials RE and MEH. The three instruments were for goat entrepreneurs, lecturers and students as the respondents. The values of Aiken's V validity were 0.892, 0.919, and 0.792 respectively for the interview instruments for goat entrepreneurs, lecturers and students as shown in Figure 2.

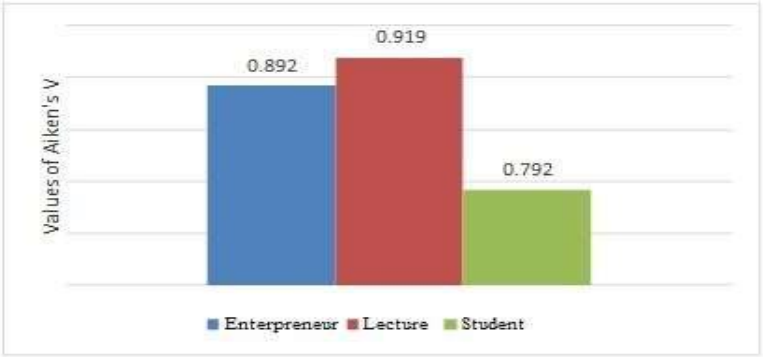

Figure 2. The calculated values of Aiken's V validity by experts regarding the interview instruments

Questionnaire

Up to now, 56 respondents had responded the questionnaire. The respondents included semester-5 students of Chemistry Education, Sriwijaya University. The validity value of the questionnaire by using SPSS 26 (Statistical Product and Service Solutions) was 0.372 with N =56 and the significance value was 0.250. The reliability value of the questionnaire with Cronbach's Alpha was 0.763 and the reliability was greater than 0.600. Then the percentages of visual, auditory, and kinesthetic learning styles were 7.66%, 3.84%, and 88.50% respectively as shown in Figure 3.

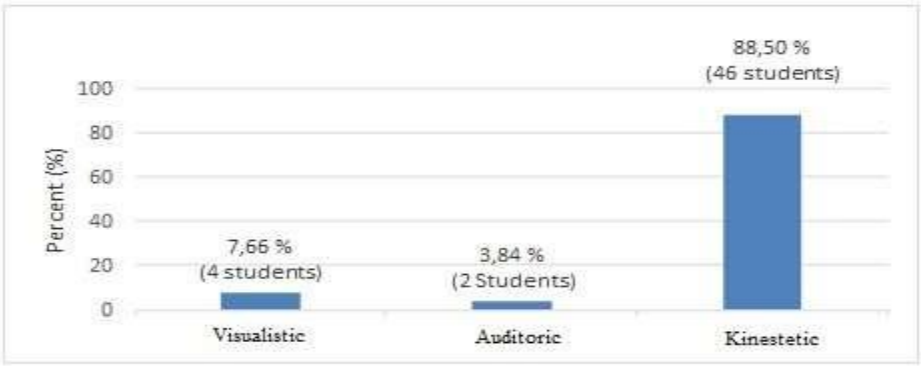

Figure 3. Student Learning Styles

Furthermore, students' visual learning style, especially the respondents liked to read and watch videos, is shown in Figure 4.

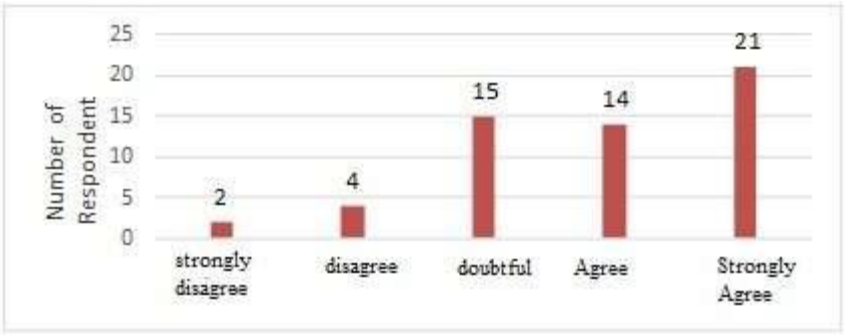

Figure 4. The respondents liked to read modules and watch videos on the internet about goat farming

In Figure 5, the respondents were motivated to become entrepreneurs of the feed for goats in the growth phase.

Figure 5. The respondents were motivated to become entrepreneurs of the feed for goats in the growth phase

In Figure 5, the respondents were motivated to start a peanut-goat business after they had the apprenticeship at a partner's place; this was in accordance with the results of previous research (Iswahyudi & Iqbal, 2018). There were balanced percentages of 35.7% strongly agree; 26.8% agree; and 25% in doubt, possibly because the respondents had not participated in apprenticeship or field work

practice of goat farming as the main cause. Furthermore, the data in Figure 6 showed the respondents strongly agreed, agreed, hesitated, disagreed, and strongly disagreed with seeking chemical identification reactions in the feed to increase peanut-goat weight on the internet, as the chemical characteristic. Graph 5 showed the respondents liked to search the internet for chemical identification reactions in the feed to increase the weight of goats.

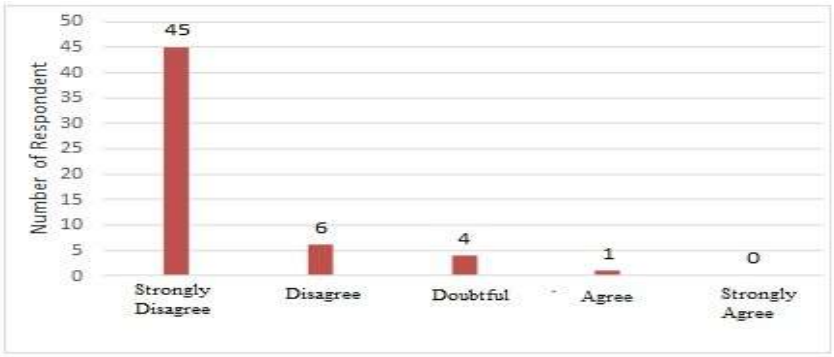

Figure 6. The respondents liked to search the internet for chemical identification reactions in the feed to increase the weight of goats

The data in Figure 7 showed that 56 respondents worked on the assignments from the STEM initial stage to the final stage. All assignments were attached to the appendix of the Chemistry Learning Module as the results of this study.

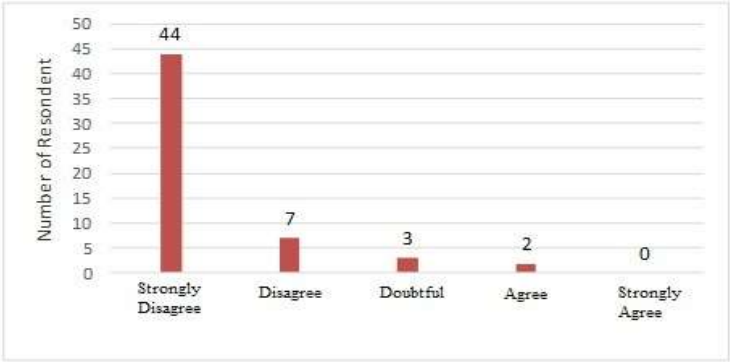

Figure 7. Respondents studied the module topic of increasing the goat weight by reading the STEM-nuanced module

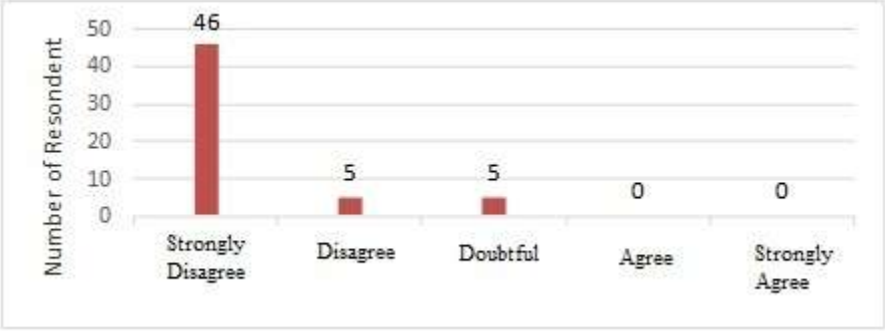

Figure 8. Respondents' partnership in goat entrepreneurship

The student characteristics data about partnership cooperation with entrepreneurs who had been in the goat farming business. In Figure 8, 82% of the respondents strongly agreed with apprenticeship or field work practice to implement partnership cooperation with goat farmers currently running the goat farming business.

Documentation

The documentation data were obtained from lecturers of entrepreneurship courses. There are 7 modules of entrepreneurship courses. The seven modules are entitled: (1) catfish, (2) tilapia, (3) goldfish, (4) free-range chicken eggs, (5) catfish, (6) carp, and (7) cows. The seven modules do not include chemical identification as the main feature of chemistry learning modules. The seven modules are characterized by the STEM approach: problems, problem solving plans, problem solving trials, and reporting the results of problem solving trials. The seven modules have not listed partnership cooperation of entrepreneurs or businessmen with the Sriwijaya University's Chemical Education Study Program. The data in the Semester Implementation Plans with the STEM approach for the entrepreneurship courses have been available at the Chemistry Education Study Program, Sriwijaya University since 2017 until now.

Discussion

The interview instruments were modified ones. The values of Aiken's coefficients were 0.892, 0.919, and 0.792 by two research validation experts with the initials of RE and ARI. The interview instruments were for goat farming entrepreneurs in Sukomoro, lecturers of entrepreneurship courses, and students. The three validity values were classified as high when compared to the table with the value range of 0.68 to 1.00. Figure 2 clearly showed the results of calculated validity values of Aiken's coefficients of the interview instruments. The results of interview with the students as respondents showed that 94.64% (53 students) were not interested and motivated to become goat farming entrepreneurs. This was because the respondents did not have the family background of goat farmers. Besides, the respondents did not have adequate space or land facilities for goat pens. If the land is not adequate, then the waste and smell of goats will disturb the neighbors. The results of research in 2018 showed that taking entrepreneurship courses had no effect on interest and motivation in entrepreneurship, but participating in fund training or apprenticeship would have an effect on entrepreneurship (Ahmed et al., 2020; Iswahyudi & Iqbal, 2018). The results of interview with the owner with the initial JMR of a goat and cow farming business showed that he was from a family involved in the traditional animal husbandry business. There were 3 people in his family raising the animals until then. This family was domiciled in Sukomoro Village, Talang Kelapa District, Banyuasi Regency, South Sumatra. This family had enough area to raise the animals, far enough from neighbors, so that the animal waste would not bother them. However, the animal waste needed to be processed. This waste could be processed into organic fertilizer (Nurhapsa et al., 2020; Pamungkas & Pamungkas, 2019; Yuliyanto et al., 2022). A business entity must have good and correct waste management to get the Indonesian National Standard Certificate. Furthermore, 5.365% (3 students) were willing to raise goats if the facility requirements for raising livestock had been met as an alternative job opportunity before becoming a chemistry teacher. Keeping animals free on the street would disturb public order. Based on Regency Government Regulation No. 4 of 2014 in Gorontalo, stock farmers who violate this regulation are fined Rp. 100,000. and Rp. 150,000. per head per one day for each goat and cow. If after 14 days the animals have not been picked up, the owner is threatened with imprisonment for 6 months. Other regulations regarding this prohibition are Articles 278-279 of the revised Criminal Code and the animal owner is fined Rp. 10,000,000. for animals entering people's land.

The results of the student learning style questionnaire in studying the chemistry learning module in the entrepreneurship course with the topic of the feed to increase the weight of peanut goats in the growth phase (under 8 months of age) in the new normal era at Chemistry Education Study Program, Sriwijaya University are shown in Figure 3. 88.50% of the students preferred kinesthetic learning style, meaning that the students preferred a lot of direct practice and application rather than just theories; this was in accordance with the results of previous research (Handayani et al., 2020). The validity value of the questionnaire was 0.372 and the significance value was 0.250 with the significance level of 0.05, meaning that the 90-item questionnaire for the students was valid and feasible to be used in research concerning student characteristics to develop the chemistry learning module. The r-calculated value of questionnaire reliability with Cronbach's Alpha was 0.763 and the reliability was greater than 0.600, meaning that the questionnaire was reliable and feasible. Furthermore, the results of the questionnaire with the scales of strongly agree, agree, hesitate, disagree, and strongly disagree concerning the auditory learning style where the students listened and watched videos of raising goats were shown in Figure 4. The percentages of 38%, 25%, and 27% for strongly agree, agree, and quite doubtful were balanced and not so sharply different as those of the kinesthetic learning style. Auditory learning style percentages were 3.84% and 88.5% (Iswahyudi & Iqbal, 2018). In Figure 5, the respondents were motivated to start a peanut goat farming business after they had apprenticeship at a partner's place; this was in accordance with the results of previous research (Iswahyudi & Iqbal, 2018). The balanced percentages of 35.7% strongly agree, 26.8% agree; and 25% doubtful were possibly because the respondents had not participated in

apprenticeship or field work practice of goat farming as the main cause. In Figure 6, the percentage of 80% strongly agree to look for information on the internet was a habit of today's students. Even without being told, the students were accustomed to using cellphones almost all the time; only when sleeping and bathing they did not use cellphones. Therefore, seeking reactions and procedures for identifying chemical compounds from the internet was a very massive and good student character.

Chemical characteristics in this module were very important to address because there were qualitative and quantitative data of chemistry practicum on the identification of carbohydrates to determine saccharose, sucrose, glucose, maltose, and fructose from the internet. This practicum was very common, so there was no need to do it for chemistry education students because it would be a waste of money and time, and the chemical waste from this practicum would pollute the environment. There were many videos about this practicum on the internet, and they could be downloaded from the internet. This method was something that needed to be promoted in the new normal era. Simple tests of substances could be done at the Chemical Laboratory belonging to the Center for Environmental Health Engineering and Disease Control Class 1, located at Jl. Sultan Mahmud Badaruddin II KM.11 No.55, Alang Alang Lebar, Alang-Alang Lebar District, Palembang City, South Sumatra 30961. For residents of Palembang and its surroundings, the cost is fairly low because it is owned by the government (there is a subsidy). The center is under the Ministry of Health Services. This center needs to become a partner of the Chemical Education Study Program of Sriwijaya University. Many things concerning chemical identification could be conducted at this center so that it was important for this study to get the chemical characteristics. This center has Inductively Coupled Plasma (ICP) spectrometers, and has apprenticeship and field work practice cooperation with educational institutions for their students. Field Work is a form of systematic and synchronous implementation of the practice between educational programs at schools/campuses and mastery of skills acquired through work directly in the world of work to achieve a certain level of expertise, that field Work activities greatly increase students' professional awareness (Arifin, 2014; Sukanti, 2014). Soft skills can be honed and improved over time with learning experience (Mustika et al., 2017). This research is relevant to previous study stated that where in a limited-scale trial, students use teaching materials actively and find it easy to understand the materials in the teaching materials (Dewi et al., 2019; Nugraheni & Winarni, 2019). The materials in the character-based science teacher preneurship teaching materials are relevant to the needs of students in making innovations in the field of science. These innovations arise from the character-based student learning activities. Other research results show that the concept of character education can be integrated into learning by presenting in the Social Sciences Basic Concept Book so that Learning Social Science Basic Concepts is more meaningful and can be one of the reading materials character for students (Gherardini & Frima, 2019).

4. CONCLUSION

The chemical learning module for the entrepreneurship course has student characteristics, is STEM-based, and has chemical characteristics that fulfill the research objectives. The results showed that the students strongly agreed to like to read, motivated, liked to search the internet and most of them studied the topic of gaining the weight of peanut goats by reading module, and most of them liked partnership in goat entrepreneurship. It is suggested that the findings need further investigation, especially instruments validation for developing the chemical learning module on the topic of feed types to increase the goat weight in the growth phase.

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