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DEVELOPMENT OF TISSUE CULTURE TEXTBOOK BASED ON SCIENTIFIC LITERACY AS A STUDENT LEARNING SOURCE

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ABSTRACT

This study aims to develop and determine the feasibility of a tissue culture textbook based on scientific literacy, conducted from November 2020 to May 2021. This study used the Dick & Carrey development model, modified to the formative evaluation stage. The instrument used is a questionnaire filled out by validators (material experts, learning design experts, layout design experts), lecturers of the Network Culture course, and students majoring in biology. The results showed that 77% of students had difficulty learning about somaclonal diversity and needed additional cultural application material. From the initial survey, there were no scientific literacy-based tissue culture textbooks in the UNIMED library. Based on the survey, 76.9% of students said they liked somaclonal diversity material, 86.6% said it was challenging to study, 53.8% of the material described the interaction of science, environment, technology, and society, and 30.8% did not explain the material application of culture. As the results of textbook development, validator analysis shows 86% (very feasible) from material experts, 91% (very feasible) from learning design experts and 91% (very feasible) from layout design experts. The percentage of responses showed: 93% (very feasible) from lecturers, 86% (very feasible) from individuals, 90% (very feasible) from small groups and 89% (very feasible) from limited groups. Overall the textbook is very feasible to use.

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INTRODUCTION

Textbooks can be appointed as one factor that provides a powerful opportunity to improve learning activities to be more focused and have a positive effect. Through textbooks, students can obtain complete information related to learning materials. In line with that, textbooks should be designed to be more structured, attractive, use simple language that is easy to understand, contain discussions through high readability aspects, and use writing under applicable rules.

Based on the comparison of study results in 2012 with 2003, 2006 and 2009 by the international student assessment program, better known as PISA. Students' scientific literacy from Indonesia does not seem to show an increase in scores. The level of scientific literacy of Indonesian children for 2003 was 395, 2006 was 393 and 2009 was 383. According to the results, what happened was not an increase in score but a decrease in score. The results shown in 2012 are also the same as the scores they had in 2012. -the previous year (OECD, 2013).

Based on the literature review carried out, the level of scientific literacy possessed by students in the biology education study program is classified as poor. It can be observed based on student complaints that they are experiencing a recession when digesting or outlining study materials presented during lectures. Novitasari (2018) illustrates that the lowest percentage value is based on parameters, namely, digesting and paraphrasing the primary framing obtained 43.1%, in contrast to the parameters of studying valuable objective insights and parameters performing deductions, oracles and taking summaries based on measurable evidence, getting 71, 55% which is included in the highest percentage value. The average score received by students as Biology teacher candidates for scientific literacy is included in the "enough" category on all indicators with an average of 58, 21%.

The literacy level of Indonesian students is deficient. It can be considered a severe problem and needs special attention. The low scientific literacy of Indonesian students is caused by the learning and teaching processes used according to students' understanding are not meaningful or memorable, so they do not create a meaningful impression. The science teaching system, which is usually applied to every school, provides an understanding that science is a study material that is not integrated with their daily activities. Estimates and evaluations applied in education still prioritize the content perspective but leave the process and science context perspectives (OECD, 2013).

The way that can be done to improve the ability of Indonesian children in scientific literacy is to start by increasing the scientific literacy of their prospective educators first. It is based on the opinion of Sartika et al. (2018) that as a student, you will not achieve superior performance if there is no encouragement from a capable and professional teacher, qualified study hours, space used to move and surrounding resources that can be used for learning. The Biology education study program is an institution that produces prospective biology educators who are deemed necessary to have qualified literacy.

Zulpadly. et al. (2016) said that some biotechnology materials students cannot complete. In biotechnology, especially for the material in explaining the tissue culture process, the score obtained is 63.44%. The assessment indicator is to sequence several steps in tissue culture and identify techniques and advantages that are acceptable in the application of tissue culture.

Based on the results of research conducted by Huda. et al. (2017) on undergraduate students in the Department of Biology at the State University of Medan (UNIMED) showed that the difficulty level of tissue culture material at the C1 level was in a low category, while the C2-C6 levels were in the high category. One of the factors that make it difficult for students to study tissue culture is that the material in textbooks is considered abstract, less exciting and meaningful, so it is difficult to understand.

The results obtained from the analysis of student needs through the distribution of questionnaires to students majoring in biology at Medan State University obtained data of 77% of students experiencing difficulties in studying somaclonal diversity material and felt the need to add material regarding cultural applications. The difficulties experienced by students are understanding images and analyzing data, determining the dosage and composition of the media with the suitability of the plants to be cultured, and understanding the names of media materials and their mixtures. It illustrates that the textbooks used by students still focus on the content dimension rather than the process dimension.

Students majoring in biology at the State University of Medan (UNIMED) also think that the tissue culture textbooks used so far are good, but everyone's level of understanding will be different, so an initial explanation is needed to direct the reader to understand the contents of the book. Weaknesses in the book, such as the pictures in the book are not clear and not colorful, the language

used is too complicated, there is no explanation of scientific words in the book, and there are still few relevant examples of artistic techniques. Therefore, students hope that the textbook deficiencies can be corrected to support learning activities better.

According to Harahap (2010), in its implementation, there are some materials in this course that are still new to students, so that it gives the impression of being difficult, tedious, and the material is still in the student's imagination. It can be proven by the results of student exams in the discussion study culturing materials tool, around mixed medium, culturing organ plant parts, the creation of plants having only half of their complete genome showed an overall representative value of 6.4 (per range 1-10).

The developed tissue culture textbook contains learning materials based on the needs or abilities of students in the case of the learning and teaching process. This textbook provides additional references and insights for students in growing scientific attitudes so that better learning outcomes can be provided.

METHOD

In developing the product, namely the tissue culture textbook, the model used, namely Dick & Carrey, was modified to the eighth step, formative evaluation. The first step, analyze needs and objectives: provide a determination of the purpose of product development. The initial activity of this step is to identify things related to the facts found in the field. Second, analyzing the learning process: providing support in product development. Through activities to analyze how skills and processes, work procedures and tasks are given during teaching and learning activities. The third step, analyzing the learner or students and the context: Simultaneously carried out with learning analysis. In this case, what is considered is students' ability, attitude, and character at the beginning of learning.

The next step is to formulate performance goals: explain the objectives students must carry out after learning is complete. The fifth step, developing instruments: the assessment instrument is related to the purpose of the development. Instruments can be indicators used in estimating the degree of product development quality. The sixth step, develop learning strategies: Set the design of the developed textbooks. For example, choosing a format to design the book's contents, choosing the type of approach and sources, organizing, and compiling the contents of the textbook. The seventh step is determining study materials: Designing textbooks, including layout designs, pictures, and writings. The eighth step is to prepare and carry out formative evaluations: The products made are then validated by material experts, learning design experts, and layout design experts. Then, the product is improved until it reaches a good feasibility score. Furthermore, the product will be asked for responses by lecturers of tissue culture courses and students majoring in biology. Responses by students were divided into three groups, namely at the individual stage, small group and limited group.

The research steps of the Dick & Carrey model can be limited to formative evaluation activities and not to summative evaluation activities. Research with limiting steps to formative evaluation has also been carried out by Wiranata (2018) with the research theme "Development of WEB-Based Learning".

Only to monitor the system's effectiveness thoroughly and can be implemented if it has gone through the implementation process for an extended period and must be carried out by a special valuer who can provide an accurate assessment of the target. Therefore, product development only comes to a formative evaluation in which the design and process are considered complete.

The research implementation time starts from November to May 2021. The subjects in this study are three expert validators consisting of material experts, learning design experts and layout design experts, one lecturer in the Network Culture course, and 31 students consisting of 3 students from class Biology B 2018, 8 students from biology class B 2018 and 20 students from biology class C 2018.

The research instrument is a questionnaire using a Likert scale. The data obtained were then analyzed according to quantitative descriptive. Descriptive research was used to obtain data regarding the condition of the updated scientific literacy-based Network Culture textbooks and the results concluded based on considerations or comments submitted by 3 validators, 1 lecturer and 31 students. The data that has been obtained based on Sugiyono's (2015) questionnaire was analyzed. From the results of calculations using the formula above, a number is produced in the form of a percent. The score classification is then converted into percentage form. Then interpreted with qualitative sentences listed in Table 1.

Table 1. Criteria for the percentage of occurrences of indicators whether a textbook is appropriate

Interval Percentage	Criteria	Qualification
82% ≤ x ≤ 100%	Very proper	The product of teaching materials is ready to be used in the field, for learning activities / not revision
63% ≤ x ≤ 81%	Proper	Teaching material products can be used in the actual field for learning activities, but there are slight revisions
44% ≤ x ≤ 62%	Less proper	Revise teaching materials by reexamining carefully and looking for product weaknesses to be improved
25% ≤ x ≤ 43%	Unproper	The product failed, massively and fundamentally revised the product content.

Table 2. Material expert assessment indicators

No.	Indicator	Number of items
1.	Content sufficiency	2
2.	Content breadth	3
3.	Content depth	4
4.	Concept and definition accuracy	2
5.	Accuracy of facts and data	2
6.	Example and case accuracy	4
7.	Accuracy of figures, diagrams and illustrations	3
8.	Term accuracy	1
9.	Symbol accuracy	1
10.	Reference accuracy	2
11.	Content novelty	3
12.	Learning Support Materials	4
13.	Science as a body of knowledge	7
14.	Science as a Wwy of investigating	5
15.	Science as a way of thinking	7
17.	The interaction among science, technology and society	4

Source: Modified from Rahman, 2019

Table 3. Indicators of the assessment of learning design experts

No.	Item indicators	Number of Items
1.	Content sufficiency	2
2.	Content breadth	2
3.	Content depth	4
4.	Systematic content delivery	4
5.	Students as a centre of learning	4
6.	straightforward	4
7.	Narrative and dense	3
8.	A body of knowledge	7
9.	Science as a way of investigating	5
10.	Science as a way of thinking	7
11.	The interaction among science, technology and society	4

Source: Modified from Harahap, F., *et al*., 2020

Table 4. Indicators for the assessment of layout design experts

No.	Item indicators	Number of Items
1.	Pattern consistency	1
2.	Good point of view	1
3.	Good color and contrast	1
4.	Easy-to-read font size and type	1
5.	Layout and writing	1
6.	The image has a proportional shape	1
7.	Layout	3
8.	Tipografi	1
9.	Content illustration/picture	1
10.	Textbooks	2

Source: Modified from Rahman, 2019

Table 5. Lecturer response indicators

No.	Item indicators	Number of Item
1.	Figure	1
2.	Design	2
3.	attractiveness	1
4.	Confusion	1
5.	Writing clarity	3
6.	Language	6
7.	Content quality	2
8.	Motivating	2
9.	Process in learning activities	4

No.	Item indicators	Number of Item
10.	Obtaining new information	1
11.	Science as a body of knowledge	7
12.	*Way of investigating*	5
13.	*Science as a way of thinking*	7
14.	*The interaction among science, technology and society*	4

Source: Modified from Asaphani, 2019

Table 6. Student response indicators

No.	Item indicators	Number of Item
1.	Figure	1
2.	Design	2
3.	attractiveness	3
4.	Clarity	3
5.	Language	4
6.	Content material	2
7.	Motivating	2
8.	Obtaining new information	1

Source: Modified from Asaphani, 2019

RESULTS AND DISCUSSION

Needs Analysis and Goals

Based on the results of the analysis of student needs conducted through the distribution of questionnaires to students majoring in biology at the State University of Medan, it was found that 77% of students experienced difficulties in studying somaclonal diversity material and felt the need to add material regarding cultural applications.

Learning Analysis

Learning and teaching activities in tissue culture courses are already based on scientific literacy. However, this learning activity is not supported by the use of books based on scientific literacy, even though when using books based on scientific literacy, learning activities will be more focused and make it easier for lecturers to carry out learning activities based on scientific literacy. Books that can be used to support learning activities are also not easy to find in the Medan State University library.

Student Analysis

Characteristics of students majoring in Biology, State University of Medan, showed that 76.9% of students liked somaclonal diversity material in tissue culture courses, 84.6% of students stated that somaclonal diversity material was challenging to learn, 53.8% stated that tissue culture books were used in the material. Somaclonal diversity fully describes the interaction of science with the environment, technology and society, 30.8% stated that tissue culture textbooks did not explain how to apply culture.

The observations showed that 39 students were ready to take part in learning activities, 39 students paid attention to the material presented by the lecturer, but only five students were actively asking questions and seemed enthusiastic in participating in learning activities. Meanwhile, the use of textbooks in the learning process is not optimal. It is because students are only focused on reading the PowerPoint slides presented. Two competencies are challenging to develop for students, namely competencies related to case studies on tissue culture and competencies related to calculations.

Formulating Performance Goals

The performance objective of the textbooks that have been developed is to increase the ability of students majoring in biology at Medan State University in scientific literacy. The development of the book is limited to material application of culture and somaclonal diversity. This textbook aims to improve students' ability in independent study and knowledge literacy. The formulation of Performance objectives can be adjusted according to the Semester Learning Plan (RPS) for tissue culture courses. The learning outcomes of the course (CPMK) in the application of culture and somaclonal diversity are: (1) Students understand concepts, theories about cells and the concept of Totipotency; (2) students understand and explain the basic principles of tissue culture, material requirements, tools, sterilization and general conditions needed in tissue culture techniques; (3) Students understand and explain the induction of somaclonal variation.

Developing Test Instruments or Tools

The instrument was created as a guide for expert validators in determining the feasibility assessment of the developed product. The prepared questionnaires were then given to the validators (materials, learning designs, and layouts), lecturers, and students. The instruments used to measure the feasibility level of the developed textbooks were obtained from modified questionnaires from several researchers, such as a questionnaire for material expert validators and layout design from Rahman (2019), a questionnaire for learning design expert validators from Harahap, et al. (2020). A questionnaire for lecturers' responses in the tissue culture course and student responses from Ashapani (2019).

The questionnaire that has been made based on modifications from several sources before being used to collect data in the field is first validated by an expert validator, and after being declared valid, the questionnaire can be used properly.

Developing Learning Strategies

In a tissue culture textbook developed to be based on scientific literacy, the learning strategy that can be applied is inquiry. Inquiry is a teaching and learning strategy whose primary focus is teaching students how to search and find the science of tissue culture. This inquiry learning strategy is contained in four scientific literacy concepts: science as a body of knowledge, science as a way to investigate, science as a way of thinking, and the interaction of science, technology, society, and the environment.

The concept of scientific literacy, which consists of four parts, illustrates that improving scientific literacy starts from the exposure of learning materials as the body of knowledge. After students get complete information, the information obtained is tested first to prove the theory's validity. The results obtained from the experiment are clarified by linking theory with practice, then after the learner understands the concept of the information obtained and can put it into practice, the last thing to do is apply the knowledge gained to solve problems that exist in the surrounding environment.

The application of these four concepts has a relationship with inquiry learning strategies. The opinion of Rakhmawan, *et al*., (2015), which says that the inquiry learning approach can create the attitude of a scientist in students who always try to understand natural conditions as applied science and inform the description of things they find in real life.

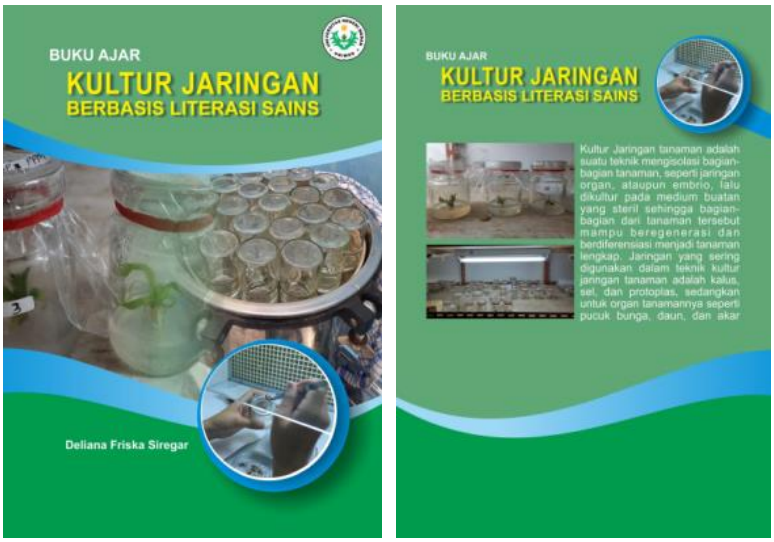

Figure 1. Front cover and back cover of the textbook

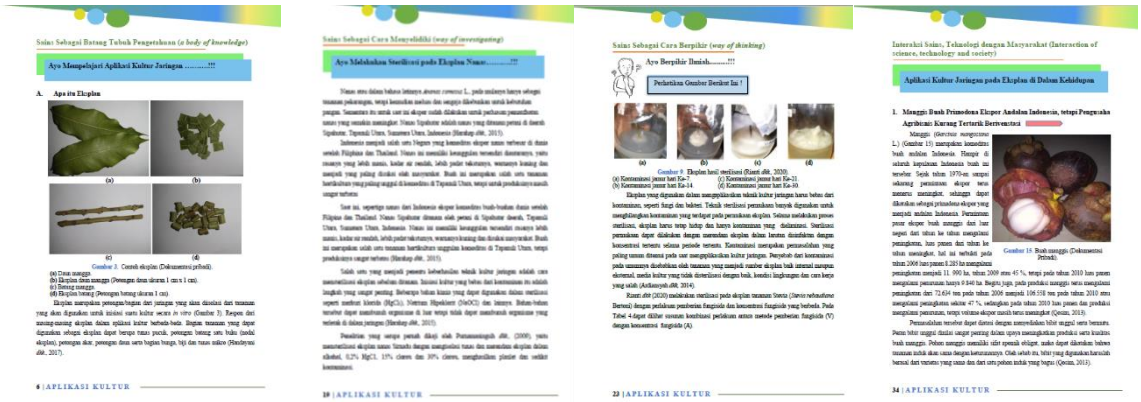

Figure 2. Sample content of the developed tissue culture textbook. The book's contents describe four concepts of scientific literacy: 1) Science as a body; 2) Science as a way of investigating; 3) Science as a way of thinking and 4) Interaction of science, environment, technology, and society.

The concept of scientific literacy presented in the tissue culture textbook developed according to Chiappetta (1991) is described as follows:

1) Science as a body of knowledge. The material in the book is the presentation of facts, concepts, and principles, then there is a presentation about hypotheses and theories and models, and there are questions that ask for part of the information received, which aims to provide the memory of knowledge or understanding. Information that has been received.
2) Science as a way to investigate. The material in the book is to guide students to answer problems with evidence obtained through an experiment.
3) Science as a way of thinking. The book's material invites students to think critically by showing the development of an idea that emphasizes the nature of the objectivity of science, discussing facts and evidence that provide cause and effect relationships.
4) Interaction of science, environment, technology, and society. The material in the book describes the use of science in solving problems in everyday life or problems that exist in society.

Developing and Selecting Learning Materials

The next activity is to develop and determine the study material, which consists of two design stages, namely the preparation of the material and the selection of the format.

a) Material Preparation

The material presented and developed in the Science Literacy-based Network Culture textbook is the application of somaclonal culture and diversity. The materials presented are adjusted to the subject's learning outcomes (CP-MK). Two books became the main focus in compiling the composition of the material in the development of this textbook, namely, the book Plant Tissue Culture by author Fauziyah Harahap which is the leading book used by students of the Biology Department, State University of Medan, and the book Plant Tissue Culture by author Zulkarnain. Furthermore, the material will be sought from various sources such as books and journals that can enrich the sources of information in Network Culture textbooks.

b) Format Selection

The format for presenting the textbook includes selecting paper types, fonts, textbook sizes, and pictures. The size of the textbook used is A4 (21 x 29.7 cm). There are several types of fonts used in textbooks. It starts from the front cover of the textbook, using Arial font sizes 45 pt, 30 pt, 24 pt, and 16 pt. The textbook's contents only use Times New Roman font with various sizes (16 pt, 15 pt, 14 pt, and 12 pt). The textbook's back cover uses Arial font with sizes of 35 pt, 20 pt, 16 pt, and 17 pt. The front and back cover are designed to attract attention and are equipped with images supporting the book's title, obtained from personal documentation. In the upper right corner of the front cover, there is the State University of Medan (UNIMED). The name of the author of the textbook is at the bottom left. On the back cover is given a little explanation about tissue culture. The contents use full color and are accompanied by various images adapted to the explanation of the material.

Designing and Conducting Formative Evaluation

At this stage, the researcher produces a product development that has been planned. The developed product that has been produced will then be validated by the validator (material, learning design, and layout), assessed by the Network Culture course lecturer and students.

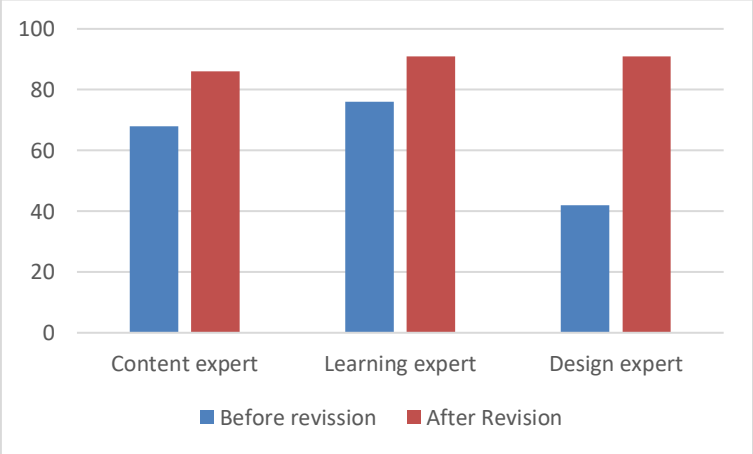

Figure 3. Percentage of validator ratings before and after revision

a) Material expert validation

Content validation by Dr. Elimasni, M.Si. The percentage of the material expert's assessment of the feasibility of the material obtained before the revision was 68% with the "Fair" category. At the same time, after being revised, it was 86% in the "Very Eligible" category, so that the designed book was very suitable for use as a reference in learning.

b) Validation of Learning Design Experts.

Expert validation of learning design by Prof. Dr.rer.nat. Binari Manurung, M.Si. The learning design expert's assessment of the feasibility of learning is that the percentage before revision is 76% with the "Fair" category, while after being revised it is 91% with the "Very Eligible" category so that the book design is very suitable to be used as a reference in learning.

c) Layout Design Expert Validation

Validation of layout design experts by Adek Cerah Kurnia Azis, S.Pd., M.Pd. The percentage of layout design experts' assessments of Layout Feasibility obtained the percentage before revision was 42% with the "Very Less Appropriate" category. At the same time, after being revised, it was 91% in the "Very Eligible" so that the designed book is very suitable for use as a reference in learning.

d) Response of Lecturer of Network Culture Course

The results of data analysis from lecturers' responses to textbooks designed to study the application of culture and somaclonal diversity got a percentage value of 93% with the "very feasible" criteria.

e) Student Response

The results of data analysis from student responses regarding the designed textbooks were divided into three groups, namely individuals, small groups, and limited groups. Individual student responses get a percentage score of 86%, small groups get a percentage value of 90%, and a limited group gets a percentage value of 89%.

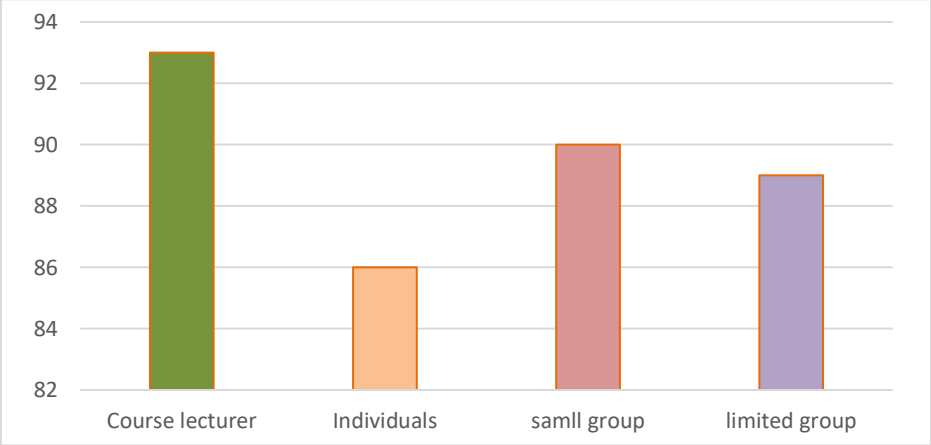

Figure 2. Percentage of Response of Network Culture Lecturers and Students

. The results obtained from analyzing the needs and goals of 77% of students had difficulty studying somaclonal diversity material and felt the need to add material regarding cultural applications. It is equivalent to the argument of Harahap, et al. (2020), the cause of tissue culture is considered difficult to understand because it requires initial knowledge related to basic science from different fields of science. This field of science will later build unity and have a relationship with one another, such as the science that discusses the physiology, morphology, and anatomy of plant and unique genetics and laboratory techniques.

The difficulties experienced by students during the learning and teaching process for tissue culture courses cannot be separated from the use of textbooks in learning, given that learning and textbooks are related. Shehab & Boujaoude (2016) argue that using books specifically for the learning and teaching process provides opportunities for students to review a competency in a structured manner and adjust how the material being studied works. The textbooks can provide instructions so that students can fully and systematically understand all competencies.

The standard of ability that students must achieve can be determined in the textbook by conducting student analysis first. According to Imaniah & Bariah (2019), the analysis produces data from a list of knowledge, skills, and attitudes that are still not and need to be mastered by students. Student analysis is also used to formulate performance goals to be achieved. It can help improve student achievement and character, as suggested by Harahap. et al. (2019) related to the importance of textbooks in the learning process.

Network culture is included in matters related to science learning, so the books used to support teaching and learning activities in the classroom cannot be separated from the content of books that have standards to improve students' scientific

literacy. It is equivalent to Sumarni & Supanti's (2021) argument that the presentation of books to support learning and teaching activities contextually can encourage students to get the relationship between some of the concepts taught and the facts found in their daily lives that need attention. Also conveyed a similar opinion Harahap, et al. (2019) that innovation and the development of effective and efficient learning resources are urgently needed.

The activities carried out in developing the product are carried out in two stages, namely the selection of materials and formats. According to Husamah. et al. (2015), the selection of material in textbooks is adjusted to the learning outcomes of the subject, the materials compiled are obtained from various reading lists, such as classic books that store study materials. The information obtained is then compiled into a framework of a textbook that has been adapted to students' needs.

Eligibility assessed by material experts received a percentage value of 86% because it matched the indicators contained in the material expert instruments such as indicators of completeness, breadth, and depth of discussion presented in textbooks that were under the learning outcomes of the subject and the accuracy of the material (facts, data). Examples, cases, pictures, terms, and symbols) have been met. The presentation of learning outcomes at the beginning of the chapter in the developed textbook aims to make it easier for students to determine the skills that must be possessed after completing learning through textbooks. It is related to Sungkono's opinion (in Lestari and Hartati, 2017) that the principle of presenting material must include the requirements that the material must be in line with the core of competence, the material does not go out of line from the scope of the topic of discussion, the form of presentation is reasonable and structured, and see the situation and attract students' reading interest.

The feasibility of the assessment by the learning design expert got a percentage value of 91% because it followed the indicators contained in the learning design instrument, such as the systematic delivery of material. According to Lakapu. et al. (2020), the form of arrangement in presenting the material makes it an aspect that has a fundamental role when compiling textbooks. A structured series of materials will make it easier for students to understand the meaning of the material presented. Dewi and Arini (2018) respond that textbooks with a high level of reading interest certainly influence readers, especially students, so their desire to learn and their ability to remember will increase.

Feasibility assessed by the layout design expert got a percentage value of 91% because it matched the indicators in the layout design expert's instrument, such as cover design and textbook content design. The textbooks produced on both the front and back covers and the contents present clear and colorful pictures and writing. It makes the book look more attractive and increases the reader's focus. It is in accordance with Harahap. et al. 2020) that the color game requires special attention when presenting textbooks. According to Sulton (in Prasetiyo and Perwiranigtyas, 2017), in compiling books used when learning and teaching, one should look at the glasses of linkage between pictures and paragraphs. In determining the image to be included in the textbook, some conditions must be met, such as the image must have a relationship with the study in the reading paragraph and must use the original image.

The lecturer's response got a percentage value of 93% because it matched the indicators in the lecturer's response instrument. This matter is based on an investigation conducted by Gagne (in Irmayati, 2018) which shows that the best learning resources in the world cannot fulfill their function if a teacher does not like the learning resource. The assessment results from lecturers who teach tissue culture courses, textbooks that are designed are appropriate and can be used when learning and teaching.

According to Aqil (2017), the characteristics of books based on scientific literacy are as follows. First, the scientific information contained in the textbook must be in accordance with the development of science and things that have just been discovered in the world of science. Second, build a framework by displaying pictures to provide curiosity, including tests and summaries between concepts to make it easier for students to appreciate each concept. Third, students can learn more enthusiastically by giving quizzes that involve students to think sensibly and examine the ability to grasp the meaning of students' basic ideas based on interrogative sentences that exist in science as a way of thinking. Fourth, look for the relationship of the contents through scientific research, technology, and society by explaining the process aspects of science that are carried out and the position of science in life.

The percentage of student responses from the three groups, namely individuals, small groups, and limited groups, received the "very feasible" criteria. It provides instructions for developing textbooks that can be used in teaching and learning activities. This matter is based on Hartati and Safitri's (2017) arguments. Student responses must be considered, considering that students are consumers of

textbooks, so this textbook must be tested to see if it is in line with the needs and character of students.

CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that 77% of students have difficulty in studying somaclonal diversity material and feel the need to add material regarding the application of culture, teaching, and learning activities used are already based on scientific literacy but the textbooks used do not support learning activities. And teaching based on scientific literacy and books that can be used as support for learning activities are also not easy to find in the Medan State University library, 76.9% like somaclonal diversity material, 84.6% say somaclonal diversity material is challenging to learn, 53,8 % stated that the tissue culture textbooks used in somaclonal diversity material fully describe the interaction of science with the environment, technology and society, 30.8% stated that the tissue culture textbooks did not explain how to apply culture, as many as 39 students were ready to In participating in learning activities, 39 students paid attention to the material presented by the lecturer, but only 5 students were actively asking questions and seemed enthusiastic in participating in learning activities, according to the material expert validator it was declared very feasible with a percentage value of 86%, according to the learning design expert validator it was stated very feasible with a percentage value of 91%, according to the layout design expert validator it was declared very feasible with a percentage value of 91% and according to the response of the tissue culture course lecturer it was declared very feasible with a percentage value of 93%, according to student responses individually, small groups and limited groups were declared very feasible with percentage values of 86%, 90% and 89%.

REFERENCE

Aqil, D.I. (2017). Literasi Sains sebagai Konsep Pembelajaran Buku Ajar Biologi di Sekolah. *Jurnal Pemikiran, Penelitian Pendidikan dan Sains*, 5(2), 160-171.

Ashapani,F. (2019). *Pengembangan Buku Suplemen Berbasis Riset tentang Serangga Penyerbuk pada Tanaman Cabai Merah (Capsicum annum L.).*Thesis, Pendidikan Biologi, Universitas Negeri Medan, Medan.

Chiappetta, E.L., Sethna, G.H. & Fillman, D.A. (1991). A Quantitative Analysis of High School Chemistry Textbooks for Scientific Literacy Themes dan Expository Learning AIDS. *Journal of Research in Science Teaching*, 28(10): 939-951.

Dewi, N.R., & Arini, F.Y. (2018). Uji Keterbatasan pada Pengembangan Buku Ajar Kalkulus Berbantuan Geogebra untuk Meningkatkan Kemampuan Pemecahan Masalah dan Representasi Matematis. *Prosiding Seminar Nasional Matematika*, Universitas Negeri Semarang.

Harahap, F. (2010). Implementasi Kompetensi Mahasiswa Jurusan Biologi dalam Upaya Mengatasi Kesenjangan Pengajaran Materi Kultur Jaringan di SMA. *Jurnal Tabularasa Pps Unimed,* 7(1), 45-56.

Harahap, F., Insani, H., Diningrat, D.S., Nasution, N.E.A., Poerwanto, R., & Hasibuan, R.F.M. (2019). Needs Assessment of Teaching Book Development Based on Plants Multiplication Research in Plant Tissue Culture Course. *The 2nd Educational Sciences International Confetnce (ESIC)*. Samarinda: FKIP Universitas Mulawarman.

Harahap, F., Nurliza., & Nasution, N.E.A. (2020). Pengembangan Ensiklopedia Perbanyakan Tanaman Melalui Kultur Jaringan Sebagai Sumber Belajar Tambahan Untuk Siswa SMA. *Jurnal Pelita Pendidikan*, 8(1): 52-61.

Hartati, T.A.W., & Safitri, D. (2017). Respon Mahasiswa Budi IKIP Budi Utomo terhadap Buku Ajar Matakuliah Biologi Sel Berbantuan Multimedia Interaktif. *Jurnal Pendidikan Biologi Indonesia*, 3(2), 166-173.

Huda, H.I., Harahap, F., & Edi, S. (2017). Analysis of Biological Difficulties in Studying Tissue Culture at State University of Medan Indonesia. *International Journal of Humanities Social Sciences and Education (IJHSSE),* 4(1): 65-71.

Husamah., Rochman, F., & Utomo, H. (2015). Development of Enrichment Book of Animal Ecology Based on Collembola Community Structure Research Throughout Watershed Brantas Upstream of Batu City. *Prosiding Seminar Nasional Pendidikan Biologi 2015*, Universitas Muhammadiyah Malang.

Imania, K.A.N., & Bariah, S.K. (2019). Rancangan Pengembangan Instrumen Penilaian Pembelajaran Berbasis Daring. *Jurnal Petik*, 5(1): 31-47.

Irmayati. (2018). *Pengembangan Buku Ajar Mikrobiologi Berbasis Literasi Sains pada Mahasiswa Jurusan Biologi FMIPA UNIMED*. Thesis, Pendidikan Biologi, Universitas Negeri Medan, Medan.

Lakapu, M., Fernandez, A.J., Djong, K.D., Fernandez, M., & Gawa, M.G.M. (2020). Pengembangan Bahan Ajar Berbasis Etnomatematika Materi Persamaan dan Pertidaksamaan Linear Satu Variabel. *Jurnal Pendidikan*, 4(1), 50-55.

Lestari, P.B., & Hartati, T.W. (2017). Analisis Pengembangan Bahan Ajar Mikrobiologi Berbasis Inkuiry di IKIP Budi Utomo Malang. Bioedukasi, 10(2): 1-6.

Novitasari, N. (2018). Profil Kemampuan Literasi Sains Mahasiswa Calon Guru Biologi. *Jurnal Tadris Pendidikan Biologi*, 9(1), 36-44.

OECD. (2013). PISA 2012 *Assessement and Analytical Framework: Mathematics, Reading, Science, Problem Solving and Financial Literacy*. Kanada: OECD.

Prasetiyo, N.A., & Perwiraningtyas, P. (2017). Pengembangan Buku Ajar Berbasis Lingkungan Hidup pada Matakuliah Biologi di Universitas Tribhuwana Tunggadewi. *Jurnal Pendidikan Biologi Indonesia*, 3(1), 19-27.

Rahman, A.F. (2019). *Pengembangan Buku Ajar Buku Suplemen Berbasis Penelitian Lapang Mengenai Arthropoda Tanah pada Matakuliah Ekologi Hewan di Universitas Negeri Medan*.Tesis, Pendidikan Biologi, Universitas Negeri Medan, Medan.

Rakhmawan, A., Setiabudi, A., & Mudzakir, A. (2015). Perancangan Pembelajaran Literasi Sains Berbasis Inkuiri Pada Kegiatan Laboratorium. Jurnal Penelitian dan Pembelajaran IPA, 1(1): 143-152.

Sartika, D., Kalsium, U., & Arsyad, A.A. (2018). Analisis Kemampuan Literasi Sains Mahasiswa Program Studi Pendidikan Fisika Universitas Sulawesi Barat. *Jurnal Wahana Pendidikan Fisika*, 3(2), 8-12.

Shehab, S.S., & Boujaoude, S. (2016). Analysis of the Chemical Representations in Secondary Lebanese Chemistry Textbooks. *International Journal of Science and Mathematics Education,* 15(5), 797-816.

Sugiyono. (2015). *Metode Penelitan dan Pengembangan (Research and Development/ R&D)*. Bandung: Alfabeta.

Sumarni, W., & Supanti, S. (2021). Pengembangan Buku Ajar Kimia Bahan Pangan Terintegrasi Etnosains sebagai Sumber Belajar Mahasiswa Calon Guru. Jurnal Inovasi Pendidikan Kimia, 15(1): 2695-2705.

Wiranata, A.A. (2018). Pengembangan Pembelajaran Berbasis WEB Matakuliah Sistem Belajar Terbuka untuk Jurusan Kurikulum dan Teknologi Pendidikan Universitas Negeri Jakarta. *Jurnal Teknologi Pendidikan*, 7(1), 1-24.

Zulpadly., Harahap, F., & Edi, S. (2016). Analisis Kesulitan Belajar Siswa Materi Bioteknologi SMA Negeri Se-Kabupaten Rokan Hilir. Medan: Universitas Negeri Medan. *Jurnal Pendidikan Biologi*, 1(6), 242-248.