RESEARCH ARTICLE

Development of assessment instrument business proposal for students' systems thinking skills on business model canvas in bioentrepreneurship course

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Abstract: Business Model Canvas (BMC) is a business model that must be mastered by students in the Bioentrepreneurship course as an initial provision for entering the entrepreneurial world, while in compiling Business Model Canvas (BMC) systematic thinking skills are needed. This study aims to provide an assessment instrument to measure students' system thinking skills in Business Model Canvas (BMC) material. The method used in this research is exploratory mixed method with exploratory sequential design stages. The participants involved were 40 students of Biology study program who contracted Bioentrepreneur course in one of the universities in Bandung City. The instrument was developed in the form of an assessment rubric with 29 indicators of systems thinking skills in Business Model Canvas. The quality of the instrument with validity based on expert judgment obtained a value of 89.3% with a very valid category, and the quality of the instrument with inter-rater reliability based on Cronbach's Alpha value obtained a value of 0.762 to 1.000 which is categorized as very good. Students' system thinking skills can emerge and be measured in the creation of a Business Model Canvas (BMC) in a business proposal by using the developed assessment instrument. So that the novelty in this study is that the assessment instrument of students' system thinking ability in making Business Model Canvas is declared valid and feasible for use in Bioentrepreneurship courses.

Keywords: assessment instrument; system thinking skills; business model canvas, bioentrepreneurship

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Introduction

Currently, knowledge about entrepreneurship in higher education is expected to support the development of entrepreneurship, especially for students, because only one way to develop entrepreneurial potential is through education (Varamäki et al., 2015). One specific entrepreneurship program that is closely related to biology is bioentrepreneurship. Bioentrepreneurship can be defined as the utilization of living things that can be processed into business products, and can be marketed so as to produce a productive economy (Sisnodo et al., 2015). Bioentrepreneurship education is an educational program designed to teach the knowledge, skills and attitudes needed for an entrepreneur interested in the commercialization of life science products (Langer, 2014). Biology is a science that studies very broadly because it discusses all living things on the entire surface of the earth. Because of the vast scope of biology, branches of biology were formed to make it easier to learn. Where each of these branches of biology has distinctive characteristics to be developed as a business opportunity for biology and biology education students (Afriadi & Yuni, 2018). The purpose of the bioentrepreneurship program or course is to provide understanding and develop entrepreneurship in the field of biology or biology education (Supriatno et al., 2020). This goal allows Bioentrepreneurship courses to form new entrepreneurs in the field of biology. Therefore, the biology lecture program is expected to facilitate

students to develop competencies in the field of entrepreneurship based on biological science (Natadiwijaya & Rahmat, 2018).

In starting early entrepreneurship in general or in the field of biology, it is not only enough to have experience, interest, ideas, good products and financial capital, but also requires proper and systematic business planning. Business planning or business plan is a written document prepared by prospective business people that describes all relevant elements both internal and external regarding the company to start a business whose content is often an integrated plan concerning marketing, capital, manufacturing and human resources (Massa et al., 2017). According to Ibarra et al. (2018) the method used by companies to make money in the business environment is called a business model. Business models are widely applicable, relevant to entrepreneurs, business advisors, non-profit organizations, investors, and companies that want to prepare their new business lines (Massa et al., 2017). From several studies say that business models are entrepreneurial competencies to create sustainable value (Mishra & Zachary, 2015). Business model development for early entrepreneurs is the most effective factor in entrepreneurship and understanding the importance of business models is fundamental for every entrepreneur (Almeida, 2018; Zarefard & Cho, 2017). If guided by an inappropriate business model, it can result in financial losses and lost opportunities for business development. Therefore, choosing a particular type of business model is important to apply.

One of the plans that can be used as a business model application is the Business Model Canvas (BMC). Business Model Canvas (BMC) was first introduced by Alexander Osterwalder in his book entitled Business Model Generation. Business Model Canvas (BMC) is one of the business models that has succeeded in changing complicated business concepts into something simpler and easier to understand (Nurhakim et al, 2018). Using the Business Model Canvas method is expected to be able to help business actors to formulate various things to support their business to be more successful. Business Model Canvas can be used as a tool to provide proposals for new business model designs and not only used to capture the company's current business model, so that it can support the identification of business opportunities and can be used as a framework to help entrepreneurs communicate and compile information desired by investors (Ermaya & Darna, 2019; Fust et al., 2018; Joyce & Paquin, 2016; Sort & Nielsen, 2018). Based on this, Business Model Canvas (BMC) is very appropriate to be delivered in bioentrepreneur courses because Business Model Canvas (BMC) is able to create, deliver, and capture value in entrepreneurship learning (Gaus & Raith, 2016).

From various studies, it is found that Business Model Canvas (BMC) has become one of the most widely used tools to describe the process of value creation and expected benefits in the entrepreneurial world (Lima & Baudier, 2017). In addition, the Business Model Canvas (BMC) also provides a general framework for students to understand the purpose of the many sources of information available in the world of entrepreneurship (O'Neill, 2015). However, in another article written by Johan Verrue, it is stated that the Business Model Canvas (BMC) lacks consistency and strength in each of its aspects because a lot of overlap occurs in each block area caused by a fixed block framework, and too easily leads to filling exercises when applied in schools (Verrue, 2014). This is certainly a problem when the Business Model Canvas (BMC) is applied and there is no assessment to assess and measure the level of achievement of students' conceptual understanding of this material.

Based on research conducted by Machsunah and Nurdiana (2023) and Wangi et al., (2021), a Business Model Canvas (BMC) concept understanding assessment instrument was produced in the form of a scoring rubric to measure students' conceptual understanding of BMC material which consists of 9 assessment aspects, namely Customer Segment, Value proposition, Customer Relationship, Channel, Revenue Stream, Key Resource, Key activities, Key Partnership, and Cost Structure. The Business Model Canvas (BMC) conceptual understanding assessment instrument is considered valid and feasible for use in business model material for entrepreneurship courses. However, the instrument is still too general and not suitable enough to be applied to bioentrepreneur courses that emphasize the concept of biology in it. Therefore, an assessment instrument that is more specific and suitable for assessing students' ability to create business models for products with biological specialties is needed so that it can be more appropriate when used in bioentrepreneur courses.

In every educational process there are always learning objectives to be achieved. The expected course learning outcomes in the bioentrepreneurship course are to make biology and biology education product designs that have entrepreneurial potential, and also to be able to apply logical, critical, systematic, and innovative thinking in the context of developing or implementing biological science. The ability to think systematically in these learning outcomes can be trained in Business Model Canvas (BMC) material to map the strategy for making student product ideas. In the process of making a Business Model Canvas (BMC), an overview of the company's business model and the relationships that occur between blocks is presented in a more attractive way (Supriatno et al., 2020). The ability to identify and connect something between components, which in this Business Model Canvas (BMC) material is the relationship between blocks, is a system thinking ability that can emerge. Therefore, the ability to think systems in making Business Model Canvas (BMC) in bioentrepreneur courses is considered interrelated and important to be assessed using appropriate assessment instruments.

Systems thinking helps students organize their thoughts in a meaningful way and make connections between seemingly unrelated issues (Clark et al., 2017). Systems thinking skills are needed because when students have this ability, the process of linking one material with another will be easier (Schuler et al., 2018). Systems thinking ability requires understanding the multilevel structure of several concepts and the relationship between these concepts (Gilbert et al., 2019). In addition, systems thinking is the ability to solve problems by looking at other aspects of various overall sources and the relationship of concepts with other sciences. Good system thinking skills will help students in making decisions so as to avoid a mistake, because system thinking is able to help make comprehensive decisions by looking at the impact of decisions or problems in other fields (Clark et al., 2017).
From the explanation above, a quality assessment instrument is needed from various aspects of the Business Model Canvas (BMC) so that it can measure the achievements mastered by students, especially in system thinking skills. For this reason, the purpose of this research is to develop a business proposal assessment instrument to measure students' systems thinking skills in making Business Model Canvas (BMC) in Bioentrepreneurship courses delivered at the Higher Education level.

Method

Research Design

This research was conducted using the Exploratory mixed method, with Exploratory Sequential Design stages according to Creswell, (2016) as in Figure 1.

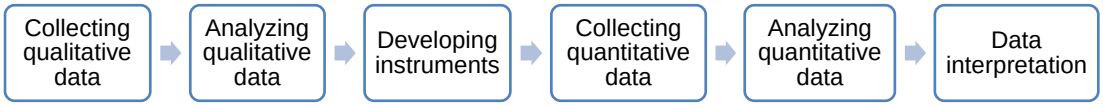

Figure 1. Exploratory Sequential Design

By using the stages in the exploratory sequential design, researchers collect and analyze qualitative data, develop instruments, collect and analyze quantitative data, and interpret the data obtained, such as the stages in Figure 1 and the steps taken are as follows:

1. Collecting qualitative data by collecting documents such as Learning Plans in entrepreneurship or entrepreneur courses from various other universities that make Business Model Canvas (BMC) as a study material in the learning process, existing student business proposal assignments in the previous semester, and also published research journal articles regarding assessment on Business Model Canvas (BMC) and systems thinking skills.
2. Analyzing qualitative data, namely analyzing the documents that have been collected. In the analysis of the Learning Plan, the learning objectives, course learning outcomes, and lecture materials used as study materials were considered. Then analyze student business proposal assignments that have existed in the previous semester to see student writing patterns in preparing business proposals. Then analyze research journal articles about the Business Model Canvas (BMC) framework and indicators of system thinking skills that can be used and can be integrated in an assessment rubric that is in accordance with the Course Learning Outcomes in the Bioentrepreneur course Learning Plan.
3. Develop a business proposal assessment instrument to measure systems thinking skills integrated with the Business Model Canvas (BMC) framework in the form of an assessment rubric.
4. Collecting quantitative data through expert judgment validity test, inter-rater reliability test, and limited trial use of the developed assessment instrument.
5. Analyzing quantitative data that has been collected from the expert judgment validity test using the scores obtained, the reliability test through the inter-rater test using the IBM SPSS Statistics 26 application, and the results of the trial use of the assessment instrument through the score of the ability to thinking systems on making student business proposal assignments.
6. Interpret all data obtained by describing the findings.

Research Procedure

Reasearch procedure as in as in Figure 2.

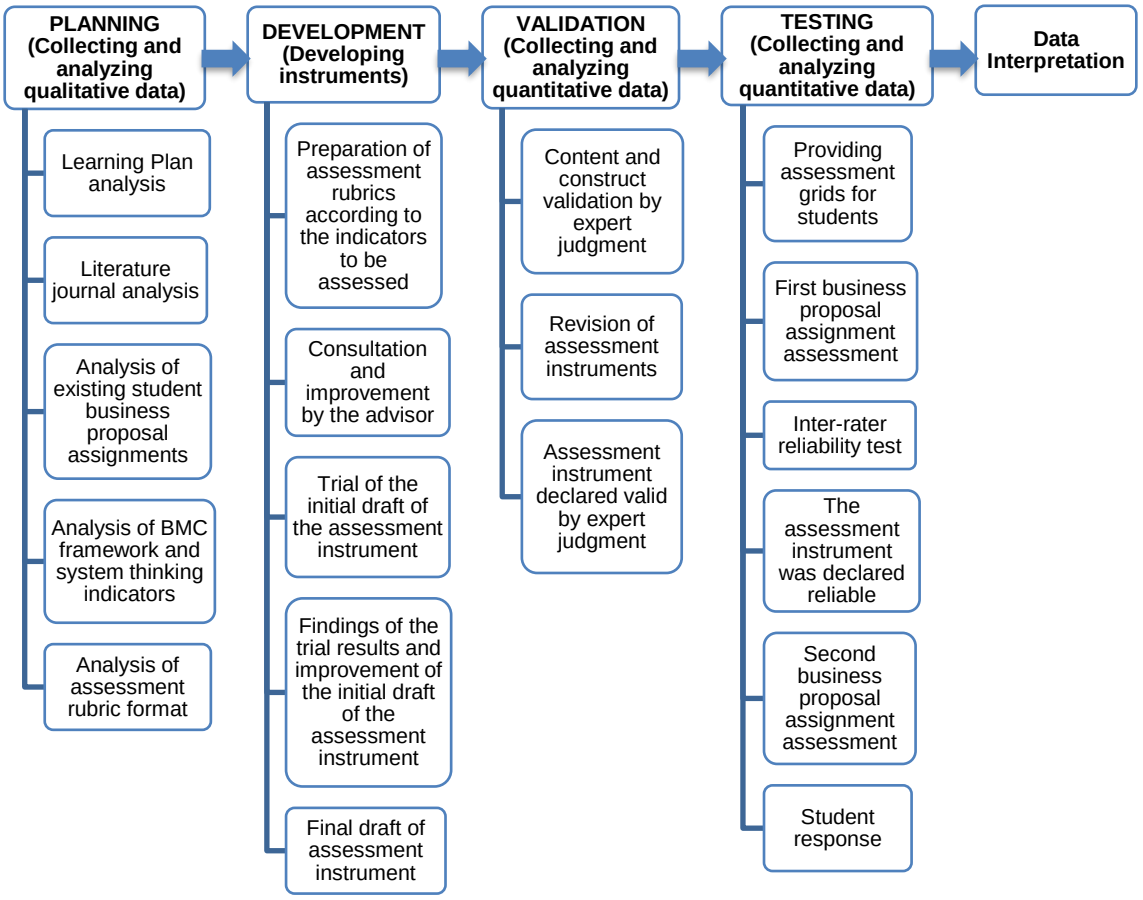

Figure 2. Research Procedure

Data Analysis

Expert Judgment Validity Test

The validity test is carried out to see how much the instrument can measure the variables to be measured (Sumintono & Widhiarso, 2015). The analysis of assessment instruments carried out is for construct validity and content validity techniques. To determine the level of logical validity based on the results of thought is done by asking for consideration of expert judgment.

The data collection stage is carried out in validation activities using validation instruments. Validation was carried out by three expert lecturer validators. The assessment instrument to be assessed is in the form of a "Yes" or "No" statement. The "Yes" assessment criteria from the Judgment are coded with the number one (1) while the "No" assessment criteria are coded with the number zero (0). Feedback from this validity test is in the form of partial or complete improvement of the assessment instrument used. The content validity of the assessment instrument states that the assessment indicator items on the instrument can assess the purpose of the measurement. The assessment instruments in this study were consulted with expert lecturers to get opinions, input, and suggestions related to the content so that the assessment instruments developed were suitable for use in research.

Data analysis techniques were carried out descriptively qualitative and descriptive quantitative. Qualitative descriptive analysis was carried out by collecting data in the form of suggestions and input from validators to be used in evaluating and improving assessment instruments. Quantitative descriptive analysis was carried out to analyze data in the form of scores obtained from validation results (Indriani & Lazulva, 2020). Responses from expert judgment have criteria such as Table 1.

Table 1. Expert Judgment Validation Sheet Assessment Criteria

Criteria	Score
Yes	1
No	0

Source: (Wijayati et al., 2013)

The scores obtained from the three validators on the items in each aspect were averaged to then determine the validity score using the Formula 1.

$$V = \sum \frac{\text{gain score}}{N} \times 100\% \quad (1)$$

Description
V: Validity
∑: Number of validator scores
N: Maximum score

Where the validity assessment criteria are as in Table 2.

Table 2. Validity Assessment Criteria

Assessment Criteria	Category
81% - 100%	Very valid
61% - 80%	Valid
41% - 60%	Valid enough
21% - 40%	Less valid
0% - 20%	Invalid

Source: (Sugiyono, 2010)

Inter-rater Reliability Test

In this study, inter-rater reliability was used as a reliability score to determine the consistency of two or more assessors in assessing students with the same assessment instrument. In this study, the reliability test was carried out by assessors consisting of 3 biology education master students. The assessors will assess using the business proposal assessment instrument developed by the researcher by filling in the assessment sheet that has been mutually agreed upon. Previously, conceptualization was carried out first with the three assessors to understand the criteria in the description of the assessment on the rubric, so that there was a common understanding in assessing. The three assessors each assessed 8 groups of students with the same business proposal assignment. The results of the assessment of business proposal assignments that have been carried out by the three assessors are then analyzed for reliability. The inter-rater reliability was determined by calculating the Cronbach Alpha value using the IBM SPSS Statistics 26 application. According to Bhatnagar et al., (2014) the Cronbach Alpha criteria used to determine instrument reliability are in Table 3.

Table 3. Cronbach Alpha Criteria

Cronbach Alpha (α) Value	Category
α > 0,9	Very good
0,7 < α < 0,9	Good
0,6 < α < 0,7	Acceptable
0,5 < α < 0,6	Less
α < 0,5	Not acceptable

Source: (Bhatnagar et al., 2014)

Results and Discussion

Stages of Developing Business Proposal Assessment Instruments

This section explains the development process and results of the assessment instrument. The first stage in the development of this instrument is the planning stage, namely collecting and analyzing qualitative data. Based on the results of qualitative data collected in the form of Learning Plan documents, it was found that there were 4 universities that used the Business Model Canvas (BMC) as a study material for the final abilities expected in entrepreneurship courses, namely students are able to prepare business plans. This shows that the Business Model Canvas (BMC) is an important tool for designing business models for students at the university level. Based on the results of qualitative data analysis in the

Semester Learning Plan document, the researcher decided to use the Learning Plan from one of the universities as a guide for developing assessment instruments. This is because the Learning Plan has includes thinking skills in more comprehensive learning outcomes and is considered more appropriate to be used as a reference in developing assessment instruments. Learning Achievement Indicators in the Bioentrepreneur Course are presented in Table 4.

Table 4. Bioentrepreneur Course Learning Achievement Indicators

Course Learning Outcomes	Course Learning Achievement Indicators
S8	A8 Work together and have social sensitivity and concern for society and the environment.
S10	A10 Internalize the spirit of independence, struggle, and entrepreneurship.
P1.2	K1.2 Apply biological concepts, principles, theories, laws, and processes in real life situations
KU2.1	GS2.1 Able to apply logical, critical, systematic, and innovative thinking in the context of developing or implementing Biology science that pays attention to and applies humanities values in accordance with their field of expertise.
KK3.3	SS3.3 Create designs for biology products and biology education that have entrepreneurial potential.

Based on the expected Course Learning Outcome indicators in the Bioentrepreneur course, especially in the SS3.3 indicator Creating a biological product design and biological education that has entrepreneurial potential, and also GS2.1 Being able to apply logical, critical, systematic, and innovative thinking in the context of developing or implementing Biology that pays attention to and applies humanities values that are in accordance with their field of expertise. The ability to think systematically in the learning outcomes of the course can be trained in the Business Model Canvas (BMC) material to map out strategies for creating ideas or designing student products.

The Business Model Canvas (BMC) material was chosen because it has systematic and structured characteristics. In the process of making the Business Model Canvas (BMC), a picture of the company's business model and the relationships that occur between blocks is presented in a more attractive way (Supriatno et al., 2020). The ability to identify and connect something between components, which in the Business Model Canvas (BMC) material is the relationship between blocks, is a system thinking ability that can emerge. So the system thinking ability in making a Business Model Canvas (BMC) in the Bioentrepreneur course is considered interrelated and important to be assessed using the right assessment instrument.

The next stage is a review of literature journals related to similar research that aims to find out the problems and research results of previous researchers. Based on the results of the journal review conducted, it shows that systems thinking is an effective way of thinking used in several fields of economics to support a deeper understanding of business, one of which is by applying systems thinking skills to a business model because the business model innovation process requires more than just filling in the Business Model Canvas (BMC) (Halecker & Hartmann, 2014)

A review of the system thinking indicators was also conducted at this stage to determine which system thinking ability indicators are appropriate and can be used in developing assessment instruments. Based on the results of the literature review conducted, the system thinking ability indicators used are system thinking indicators based on the System Thinking Hierarchical Model developed by Assaraf and Orion (2010). After being analyzed, the system thinking indicators used in this study adapted 6 of the 8 indicators developed by Assaraf & Orion because it is considered more appropriate to the context of the Business Model Canvas (BMC) material. The indicators of hierarchical systems thinking skills used are as in Table 5.

Table 5. Hierarchical Systems Thinking Skills Indicators

No	Hierarchical Systems Thinking Skills Indicators
1	Ability to identify components of a system and processes within the system
2	Ability to identify relationships among the system components
3	Ability to identify dynamic relationships within the system
4	Ability to organize system components and processes within a framework of relationships
5	Ability to recognize hidden dimensions of the system
6	Ability to think temporally: retrospection and prediction

There are 2 indicators that are not used in this study, namely the ability to understand the nature of the system cycle and the ability to make generalizations. These indicators are considered less appropriate to the concept of Business Model Canvas (BMC) because Business Model Canvas (BMC) is not a system in the form of a cycle, but a process that is created sequentially. Another system thinking indicator that is less appropriate is the ability to make generalizations, because Business Model Canvas (BMC) is a system/tool for designing a business that will be built so that it is less appropriate if used to conclude something. Therefore, the ability to think systems will not be measured in the process of making Business Model Canvas (BMC), so the system thinking ability indicator is eliminated and not used as a reference.

In addition to conducting a study on the indicators of systems thinking, a study was also conducted on the aspects of the components or framework of the Business Model Canvas (BMC) itself. Based on the results of the literature review conducted, the Business Model Canvas (BMC) framework used was the one developed by Osterwalder and Pigneur (2010). There are 9 components used along with their subcomponents, as shown in Table 6.

Table 6. Framework Business Model Canvas Framework

No	Business Model Canvas Framework
1	Customer Segment
2	Value Proposition
	a. Newness
	b. Price
	c. Accessibility
	d. Convenience/Usability
3	Channels
4	Customer Relationship
5	Revenue Stream
6	Key Resources
	a. Physical resource
	b. Financial resource
	c. Human resource
7	Key Activities
8	Key Partnership
9	Cost Structure

Based on the results of qualitative data collection and document analysis results in the form of Learning Plans and research articles related to systems thinking skills and also Business Model Canvas (BMC), indicators were then developed for assessing systems thinking skills in Business Model Canvas (BMC) into 29 indicators. The matrix of systems thinking skills indicators in Business Model Canvas (BMC) is presented in Table 7.

Table 7. Systems Thinking Skills Indicator Matrix in Business Model Canvas (BMC)

Course Learning Achievement Indicators	Systems Thinking Skills Indicators (Assaraf & Orion, 2010)	Business Model Canvas Framework Osterwalder & Pigneur (2010)		Systems Thinking Skills Indicators in the Business Model Canvas (BMC) that was developed
GS2.1 Able to apply logical, critical, systematic, and innovative thinking in the context of developing or implementing Biology science that pays attention to and applies humanities values in accordance with their field of expertise.	Identifying the components of a system and the processes within the system (1)	Customer Segment		1. Identifying the Customers Segment components of the Business Model Canvas system and the processes within it
	Identifying dynamic relationships in a system (3)	Value Proposition Canvas (PVC)	Problems and needs of society (Pain & Gain)	2. Identifying the dynamic relationship between problems and community needs (Pain & Gain) from the Value Proposition Canvas (PVC) in the Business Model Canvas system.
			Product solutions with biological value (Pain Relievers & Gain Creators)	3. Identifying the dynamic relationship between Product Solutions and biological values (Pain Relievers & Gain Creators) from the Value Proposition Canvas (PVC) in the Business Model Canvas system.

Course Learning Achievement Indicators	Systems Thinking Skills Indicators (Assaraf & Orion, 2010)	Business Model Canvas Framework Osterwalder & Pigneur (2010)		Systems Thinking Skills Indicators in the Business Model Canvas (BMC) that was developed
SS3.3 Create designs for biology products and biology education that have entrepreneurial potential.	Understanding the hidden dimensions of the system (5)	Value Proposition	Noble Purpose	4. Identifying the Noble Purpose as a hidden dimension of the Value Proposition component in the Business Model Canvas system
	Identifying the components of a system and the processes within the system (1)		Newness	5. Identifying the Newness component of the Value Proposition component and its process in the Business Model Canvas system
			Convenience/ Usability	6. Identifying the Convenience/ Usability component of the Value Proposition component and its process in the Business Model Canvas system.
			Accessibility	7. Identifying the Accessibility component of the Value Proposition component and its processes within the Business Model Canvas system.
			Price	8. Identifying the Price component of the Value Proposition component and its process in the Business Model Canvas system
		Channels		9. Identify the Channels components of the Business Model Canvas system and the processes within it.
		Customer Relationship		10. Identifying the Customers Relationship components of the Business Model Canvas system and the processes within it
		Revenue Stream		11. Identify the Revenue Stream components of the Business Model Canvas system and the processes within it.
		Key Resources	Physical resources	12. Identifying the Physical resource components from the Key Resources components and their processes in the Business Model Canvas system.
			Financial resources	13. Identifying the Financial resource components from the Key Resources components and their processes in the Business Model Canvas system.
			Human resources	14. Identifying the Human Resource components from the Key Resources components and their processes in the Business Model Canvas system.
		Key Activities		15. Identify the Key Activities components of the Business Model Canvas system and the processes within it.
		Key Partnership		16. Identifying the Key Partnership components of the Business Model Canvas system and the processes within it
		Cost Structure		17. Identify the Cost Structure components of the Business Model Canvas system and the processes within it.
	Identifying relationships between system components (2)	Value Proposition with Customers Segment		18. Identifying the relationship between Value Proposition components and Customer Segments
		Channels with Customers Segment		19. Identifying the relationship between Channels and Customers Segment components
		Customer Relationship with Customers Segment		20. Identifying the relationship between Customer Relationship components and Customer Segments
		Customer Relationship with Channel		21. Identifying the relationship between Customer Relationship components and Channels
		Revenue Stream with Customers Segment		22. Identifying the relationship between Revenue Stream components and Customer Segments
		Revenue Stream with Channel		23. Identifying the relationship between Revenue Stream components and Channels
		Cost Structure with Key Activities		24. Identifying the relationship between Cost Structure components and Key Activities
		Key Activities with Key Resources		25. Identifying the relationship between Key Activities and Key Resources components
		Channels with Value Proposition		26. Identifying the relationship between Channels components and Value Proposition

Course Learning Achievement Indicators	Systems Thinking Skills Indicators (Assaraf & Orion, 2010)	Business Model Canvas Framework Osterwalder & Pigneur (2010)	Systems Thinking Skills Indicators in the Business Model Canvas (BMC) that was developed
		Key Activities with Value Proposition	27. Identifying the relationship between Key Activities components and Value Proposition
	Organizing system components and processes within a relationship framework (4)		28. Organizes the components and processes of the Business Model Canvas system within a relationship framework.
	Thinking in the interim, retrospective and predictive (6)		29. Temporary thinking and predictions from the Business Model Canvas design

As seen in Table 7, the Business Model Canvas (BMC) systems thinking skills indicator column, found 29 assessment indicators developed by the researcher. These indicators were then used to create a scoring rubric in an assessment instrument with a more detailed assessment description to assess students' business proposal assignments. This is in line with Mahmudi (2018) which states that before creating an assessment rubric, it is necessary to formulate assessment indicators first. The formulation of assessment indicators has certain limitations so that it can be developed into an assessment instrument in the form of questions, observation sheets, and/or assessment of work or product results (Hartini, 2013). The assessment instrument developed in this study is a scoring rubric to assess students' business proposal assignments. The development of this scoring rubric refers to the steps in developing a rubric according to Wolf and Stevens (2007) which is presented in Table 8.

Table 8. Steps for Rubric Development

Rubric development steps according to Wolf & Stevans (2007)	Steps for developing a rubric carried out by researchers
Identify clear and manageable task criteria	There are 6 aspects of systems thinking ability assessment integrated with the Business Model Canvas (BMC) components totaling 29 assessment criteria in the rubric developed in this study.
Adjusting performance levels	The scoring used is on a scale of 3, 2, 1, and 0. If the quality of the task and aspects assessed in each aspect of the assessment are very good, the highest score is given at 3 and if it does not meet the assessment criteria, the lowest score is given at 0.
Creating a job description	The job description in the scoring rubric is adjusted to the tasks given and the assessment aspects. And made more in-depth and detailed according to the indicators of systems thinking skills and aspects of the Business Model Canvas (BMC) components.

The rubric developed in this research is in the form of a rating scale, as expressed by Otaya (2017) that in general, there are three categories of rubrics that can be used when assessing performance tests, namely checklists, rating scales, and comprehensive assessments. In the development of the assessment rubric instrument in this study, the indicators of systems thinking skills and aspects of the Business Model Canvas (BMC) components assessed in the instrument allow the assessor to give a score to each aspect of the assessment in the business proposal task. The use of rubrics in the assessment will provide a real description of the student's abilities. The advantage of the rubric is that it provides real information on the achievement of the student's learning outcomes that they have obtained. The use of rubrics can motivate students to achieve high achievements and know the shortcomings and advantages that have been achieved. With the rubric, students can find out the learning targets that must be achieved and the criteria for achieving their learning goals (Suwarno & Aeni, 2021). An assessment instrument can be said to be good when the instrument can describe the real abilities of students. An instrument cannot be used directly, but its validity must be tested first. This is done to prove that the instrument used to measure something is valid and suitable for use (Maulana, 2022). Therefore, the next stage in this study is to determine the quality of the assessment instrument based on the validity of expert judgment, and based on inter-rater reliability.

Quality of Business Proposal Assessment Instruments based on Expert Judgement Validity

In testing the validity of the business proposal assessment instrument to measure the ability to thinking systems in making the Business Model Canvas (BMC) that was developed, it was done by looking at the considerations and decisions of experts (expert judgment) or validators consisting of three expert lecturers. The assessment instrument can be considered valid if it has met the criteria given by expert judgment. According to Sugiyono (2014), to test the validity of the construction, expert opinions (judgment experts) can be used. The instrument that has been constructed about the aspects to be measured based on a certain theory, then consulted with experts. The data obtained from the score in the validity of the assessment instrument will be the data that will be developed in the research. The data that has been collected is divided into two, namely quantitative data and qualitative data. Qualitative data comes from suggestions given by expert judgment which will be analyzed descriptively. While quantitative data is analyzed based on percentages using a formula. Based on the results of the expert judgment validity test, the following validation score results were obtained, as in Table 9.

Table 9. Expert Judgment Validity Results

Subject	Judgment 1	Judgment 2	Judgment 3
Average judgment's score	3,7	4,7	5
Acquisition score		13.4	
Maximum score		15	
Percentage		89.3%	

From the data processing, a score of 13.4 was obtained from a maximum score of 15. From the percentage calculation, the results showed that the Business Model Canvas (BMC) systems thinking ability assessment instrument developed obtained a validity value of 89.3% with a very valid category. From the validation results by expert judgment, there were also several indicators and rubrics that needed to be improved based on suggestions for improvement regarding the use of words or writing used. These suggestions for improvement are used so that the resulting assessment instrument has good quality and can be more easily understood.

Thus, the business proposal assessment instrument to measure systems thinking skills in making the Business Model Canvas (BMC) is considered valid based on the validity of expert judgment because it has met the validation score and has also been repeatedly improved according to the validator's suggestions and also the findings of two trials of business proposal assignment assessments on previously existing assignments, at the instrument development stage. This is in line with Slamet (2022) which states that a test or measuring instrument can be said to have high validity if the tool carries out its measuring function, or provides measurement results that are in accordance with the purpose of the measurement. Repeated improvements to the instruments developed in this study are considered sufficient to measure students' ability to think systems in making Business Model Canvas (BMC).

Quality of Business Proposal Assessment Instruments Based on Inter-Rater Reliability

After obtaining an instrument that is declared valid and has been made several improvements to the assessment rubric based on suggestions from expert judgment and findings from the trial results in the development stage, the next step is to test the quality of the instrument based on reliability. Reliability testing is a test or test to determine the accuracy or consistency of the test, meaning that whenever the test is used it will give the same or relatively the same results (Slamet & Wahyuningsih, 2022). Determination of the reliability of the instrument developed in this study was carried out using the inter-rater method, to determine the consistency between raters in assessing student assignments.

This reliability assessment trial was assisted by three raters/assessors, namely biology education master's students. The assessment was carried out by the assessor by giving a check mark on the score for each aspect of the assessment of the business proposal assignment that had been collected by students on Google Drive using the agreed observation sheet. The results obtained were then determined by the Cronbach Alpha value using the IBM SPSS 26 application which was then analyzed and categorized into the Cronbach Alpha criteria according to Bhatnagar et al., (2014). The Cronbach Alpha value obtained for the Business Model Canvas (BMC) systems thinking ability assessment instrument is presented in Table 10.

Table 10. Reliability of the Business Model Canvas (BMC) Systems Thinking Skills Assessment Instrument

Business Model Canvas (BMC) Systems Thinking Skills Indicators	*Cronbach Alpha Value*	Category
1	0.915	Very good
2	0.884	Good
3	0.835	Good
4	0.891	Good
5	0.891	Good
6	0.826	Good
7	0.932	Very good
8	0.902	Very good
9	0.974	Very good
10	0.795	Acceptable
11	0.926	Very good
12	-	Very good
13	0.865	Good
14	0.978	Very good
15	-	Very good
16	0.940	Very good
17	0.762	Acceptable
18	0.840	Good
19	1,000	Very good
20	0.899	Good
21	0.884	Good
22	0.889	Good
23	0.947	Very good
24	0.910	Very good
25	0.891	Good
26	0.810	Good
27	0.891	Good
28	0.890	Good
29	1,000	Very good

From the data in Table 10, it can be seen that the Cronbach Alpha value of the assessment instrument developed is between 0.762 and 1.000. Most of the aspects assessed have a very good and good reliability category, there are only two aspects with an acceptable reliability category. In indicators 12 and 15, the Cronbach Alpha value was not obtained when the scores were processed using the IBM SPSS Statistics 26 application, this happened because all assessors gave the same score to all groups, so it can be said that the Cronbach Alpha value on this aspect is close to 1 and its reliability can be categorized as very good, as expressed by Sugiono, et al. (2020) that a test is said to have high reliability if the test provides data with consistent results even if it is given at different times to the same respondents.

In the assessment instrument developed in this study, overall it has reliability with a very good and good category, this can be caused by the assessment carried out by the assessor tends to be easy, namely by giving a score to each aspect of the business proposal that has been worked on by students. In addition, the instructions for use and rubrics on the assessment instrument can be well understood by the assessor. Based on the results of the Cronbach Alpha value obtained, the assessment instrument

developed in this study can be stated as reliable or consistent in assessing student abilities as expressed by Slamet and Wahyuningsih (2022) that the reliability test is used to determine the consistency of the measuring instrument, whether the measuring instrument used is reliable and remains consistent if the measurement is repeated. A measuring instrument is said to be reliable if it produces the same results even though measurements are taken many times. After the assessment instrument is declared valid and reliable, the next stage in this study is a trial of the assessment instrument in assessing students' business proposal assignments to see students' abilities in systems thinking in making Business Model Canvas (BMC).

Profile of Students' Systems Thinking Skills in Creating Business Model Canvas (BMC) in Business Proposal Assignments

In the trial phase, this assessment instrument was used to measure students' systems thinking skills in creating a Business Model Canvas (BMC) on a business proposal assignment by calculating the scores obtained by students on each assessment indicator that had been developed on the assessment instrument in the form of a rubric. The task given by the lecturer in charge of the Bioentrepreneur course to students was to create a business proposal in groups. There were 8 groups of students with each group consisting of five members. The task of creating a business proposal was the final task after students were previously assigned to create a Value Proposition Canvas (VPC) and also a Business Model Canvas (BMC) first by the lecturer in charge of the Bioentrepreneur course. Because the process of compiling the three tasks is interrelated, a systematic thinking ability is required. This is in line with Schuler et al (2018) which states that systems thinking skills are very necessary because when students have this ability, the process of linking one material to another will be easier.

After students conduct market segment analysis and problem analysis contained in the Value Proposition Canvas (VPC), then a product/service idea design is carried out which aims to provide solutions and overcome problems from customers. There are 8 biological product ideas offered by student groups in the Bioentrepreneur course which are presented in Table 11.

Table 11. Student Biology Product Ideas in Bioentrepreneur Course

No	Product Name	Product Images	Product Description
1	Casa Facia		Casa Facia is a water-soluble paper-shaped facial soap product. This product is made from papaya extract (*Carica papaya*). Paper-shaped facial soap products are very efficient to carry anywhere without fear of leaking or spilling.
2	Chaleraque		Chaleraque is an organic shampoo with a combination of soapberry fruit extract (*Sapindus rarak*) and kombucha which can reduce dandruff and hair loss.
3	Cucurum		Cucurum is a facial serum made from organic ingredients, namely cucumber extract, aloe vera, and rice water.
4	Smell Shield		Smell Shield is a liquid that removes odor from garbage with a citrus aroma that contains microbes as an odor-decomposing agent.

No	Product Name	Product Images	Product Description
5	Paradise Soap		Paradise Soap is an organic soap made from aloe vera, coconut oil and coffee which is useful for fading scars.
6	LEZIM		LEZIM is a paper soap made from 100% organic ingredients that uses a combination of soap nuts and ecoenzymes that function as a natural, environmentally friendly hand washing soap.
7	Crystal Herb Jelly		Crystal Herb Jelly is an innovative product in drinking herbal medicine that is more practical but still efficacious. This product is a candy in the form of colorful crystal jelly made from cekok herbal medicine so it provides many benefits.
8	COPEN		COPEN is an environmentally friendly pencil innovation made from coffee grounds waste and is also a greening agent because it contains seeds that can be planted inside.

Based on the results of the students' business proposal making assignments collected via Google Drive, overall the students have been able to make business proposals quite well. The business proposal assignments that have been collected were tested using a business proposal assessment instrument that has been developed by the researcher. The results of the score and value are presented more clearly in the graph in Figure 3.

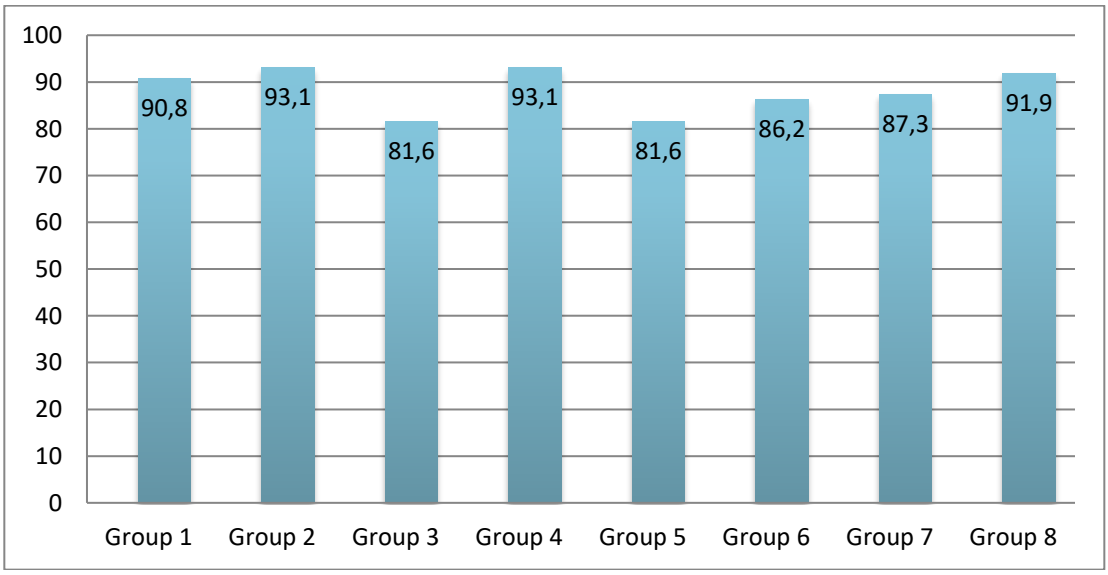

Figure 3. Student Group Business Proposal Assignment Value

Based on the data in Figure 3, the results show that the average score of the student group in the business proposal making task is 88.2 with each group getting a score above 80. Based on the results of the business proposal assignment assessment that has been carried out in this study, students have been able to describe the background of the problem, the purpose of making the product, the novelty of the product, and also the target consumers targeted by the product they will make into a business more completely and clearly.

Based on the results of the research that has been conducted, a novelty was found, namely that the ability to think systems (system thinking) is very relevant in making Business Model Canvas (BMC). There are several relationships between the ability to think systems and the making of Business Model Canvas, namely the ability to think systems possessed by students helps in understanding how each component in the Business Model Canvas (BMC) is interrelated and influences each other. For example, how the value offered to customers (value proposition) relates to the resources needed (key resources) and the activities carried out (key activities). In addition, the ability to think systems possessed by students helps in identifying how changes in one component of the Business Model Canvas (BMC) can affect other components. For example, how changes in distribution channels (channels) can affect operational costs or how changes in the cost structure (cost structure) can affect the profits obtained. By thinking systems, students can see the Business Model Canvas (BMC) as a complete system, not just a collection of separate component parts. This allows students to design a more robust and integrated business model.

The findings of this study are in line with Andriani and Hamdu (2021) which states that with the ability to think systems, students will better understand that changes in one part of the system can affect other parts, namely that everything is interconnected. Systems thinking can lead us to enter a transition in seeing problems from not only seeing components, but also being able to see the relationships between components, then seeing interconnected relationships, until finally seeing interdependent relationships between components. This ability allows humans to understand problems better, and better understanding can open up opportunities for better solutions (Bungsu & Rosadi, 2021). Thus, students' systems thinking skills can be measured in creating a Business Model Canvas (BMC) in a business proposal assignment by providing a broader and deeper view of the relationship between components in a business model.

Conclusion

Based on the research that has been conducted, the business proposal assessment instrument to measure the ability to think systems in making Business Model Canvas (BMC) was developed through several stages. Starting from the planning stage, development stage, validation stage, and trial stage. At the development stage, the business proposal assessment instrument contains 29 assessment indicators in the form of a scoring rubric to assess students' ability to think systems in making Business Model Canvas (BMC) in the Bioentrepreneur course. The assessment indicators are obtained from the results of the planning stage, namely RPS analysis, student business proposal assignments that have been in the previous semester's learning, and research journal articles as references adapted by the researcher. In testing the quality of the assessment instrument based on expert judgment validity, the instrument developed has been declared valid based on a validation score of 89.3% and also the results of repeated improvements. In testing the quality of the instrument based on inter-rater reliability, it has also been declared reliable in assessing students' ability to think systems with a score of 0.762 to 1,000 which is categorized as very good, thus meeting the criteria for a good instrument and is suitable for use. The results of the trial showed that the business proposal assessment instrument developed can be used to measure students' systems thinking skills in creating a Business Model Canvas (BMC) which is assessed in students' business proposal assignments.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Author Contributions

L. D. M. Rahmayuni: author, data collection, data analysis, and interpretation of result: **S.Srityati and D. Kusumawaty:** provide direction on data analysis, interpretation of analysis result, directing and providing on the presentation of the results and discussion and academically responsible for the overall results of the contents of this article.

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