

# Cooperative Learning Model on Developmental of Biology

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**Abstract** The purpose of this study was to determine the implementation of cooperative learning model on developmental of biology. This aim can be divide (1) to explain the management of the process of cooperative learning (2) to explain the cooperative skills of students in the learning process (3) to explain the feedback information (response) student on the implementation of cooperative learning processes (4) to explain the achievement of student learning in cooperative learning. The study begins by designing and reconstruct the course materials as (a) syllabus cooperative learning; (b) unit of cooperative learning events; (c) guidelines for student work; (d) cooperative learning evaluation sheet (e) work guidelines gazette concept maps and (f) interactive cd-oriented cooperative learning. The next phase of research is to test the validity of devices and instruments that have been made. Validity test conducted by the experts and practitioners. The results of the expert assessment shows that the average value of the validity range 2.75 – 3.58 or can be used with revision. Repairs done by removing, repairing and adding critical parts in accordance with the advice of the validator. Data obtained from the validity and practicalities will be analyzed with descriptive statistics. The results showed that all four aspects of the application performing well. Observations on the learning process of the students have been able to demonstrate their stints each with responsibility. Students are also able to motivate his fellow group members to contribute to group discussions. At the end of the lesson the students have also been able to use the agreement. These results constitute the implementation of students' skills at an early, middle and advanced stage in the cooperative learning model. The response of students to cooperative learning is very good. Students much choose to agree and strongly agree with the implementation of cooperative learning model. The implementation of cooperative learning model can improved student achievement. The process of learning, skills, responsiveness and student learning outcomes in accordance with the principles of cooperative learning. In conclusion, the implementation of cooperative learning model can improved the learning process, conitives, skills and good respons of students in developmental of biology.

**Keywords:** cooperative learning, developmental of biology

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## 1. Introduction

Selection, design and application of learning models is one way to increase the quality of the learning process. Because in the learning process will be an interaction between lecturers and student. In order to create a good interaction between lecturers and students in the learning process, required in-depth analysis of the characteristics of students, teaching materials and learning environment by the lecturer of the course. Assessment of these characteristics are also used for designing the learning model and its parts, which syntax, reaction principle, social systems, support systems and instructional impact and the impact accompaniment [10].

Analysis has been done on the characteristics of the learning process in Biology Education Studies STAIN Batusangkar. Some of the problems were discovered as a preliminary assessment of these characteristics is the first, the lack of good activities of students during the learning process and influence the learning outcomes. The

tendency of low activity will lead to lower student results. Secondly, the variation of student input. The variety of input will describe the differences in the level of mastery and understanding of the learning material as seen from the study that have been obtained by the students. The implications of variation input will also lead to lower average grade class. Third, the material developmental of biology includes facts, concepts, principles and theories require a high understanding to master. Low understanding also tends to lead to poor learning outcomes.

The use of traditional learning methods or lectures tend to make the quality of the learning process becomes low. This method also makes students bored, low learning interest and perception of poor (Students Biology of Education STAIN Batusangkar). Further result is students achievement are also less good. There are some drawbacks lecture; (a) teaching activities into verbal (the sense of the words), (b) cannot cover a wide range of types of learning of the students, (c) boring for students if too long, (d) difficult to detect or control the extent to which understanding of the protégé (e) cause students passive, (f) the material is also conventional, (g) less

excite student learning, when the teacher is not capable of speech, (h) teachers tend to be authoritarian and (i) make students dependent on the teacher [12].

The explanations above are some of the issues that must be solved. I suggest used cooperative learning. Because the learning model that fits these characteristics is cooperative learning. Cooperative learning each member has a role, of a relationship of direct interaction between students, each member of the group is responsible for learning and also friends group of students, lecturer helps develop interpersonal skills groups, lectures only interact with the group when necessary [5]. Furthermore, a group can be considered to have been implementing learning if the positive interdependence, individual responsibility, face to face, communication between members and the evaluation process of the group.

Application of methods of cooperative learning process is expected to contribute positively to the teachers' mastery of basic skills. Because of the application of cooperative learning methods to contain elements of basic skills teachers. For example, students are required to be able to communicate between members, it should have a mutually positive dependence, have a responsibility to be able to interact with the group and be able to evaluate the work. Because STAIN Batusangkar as one of the institutions producing teachers must be able to prepare prospective graduates are ready for use in schools or other educational institutions. Basic skills teacher absolutely must be mastered by prospective teachers, such as questioning skills, skills provide reinforcement, skills held variety, skill explains, skills open and close the lesson, the skills to guide small group discussions and individual, classroom management skills and skills to develop and use the media [2].

The purpose of this study was to determine the implementation of cooperative learning model on developmental of biology. This aim can be write (1) to explain the management of the process of cooperative learning (2) to explain the cooperative skills of students in the learning process (3) to explain the feedback information (response) student on the implementation of cooperative learning processes (4) to explain the achievement of student learning in cooperative learning. The application of the model is limited to the aspects of the use of learning syntax.

## 2. Method

### 2.1. Design Tools and Instruments

The study begins by designing cooperative learning device on developmental of biology. First, to reconstruct the course materials as materials research, which refers to the provisions of character for teaching staff has been modified [4,21,23]. Learning tools that will be reconstructed is (a) syllabus cooperative learning; (b) unit of cooperative learning events; (c) guidelines for student work; (d) cooperative learning evaluation sheet (e) work guidelines gazette concept maps and (f) interactive cd-oriented cooperative learning.

Guidelines for student work made with reference to the steps that must be done by the students in cooperative learning. Such steps are arranged sequentially from the

beginning of learning activities until the end of learning. The use of cooperative learning principles incorporated into the learning steps. The concept map on developmental of biology was used and refers to [11,14]. The main stages of concept maps are: (a) assess the concepts and main ideas in the form of a word or phrase, (b) develop concepts and main ideas are in a hierarchy, ranging from the most common, inclusive and abstracts (superordinate) to the most specific and concrete (subordinate) and all developed with arrows and (c) putting the word or phrase is in the right position and connected by arrows so as to form a circuit or prepositional or form preposition. The procedures of making interactive CD referring to measures developed by Riyana & Susilana [16]. Steps works are (a) the manufacture outline of media programs; (b) the making flowchart; (c) creation story board; (d) collecting the material required; (e) programming and (f) finishing.

Second, conduct research support instrument making. The supporting instruments, namely: (a) observation process management cooperative learning; (b) skills student cooperative and (c) student response against cooperative learning process. The management of the learning process includes the content and construct syllabus and learning unit event, introduction, core, end, and learning resources and allocation of time. Instrument in the form of cooperative skills of observation sheets made based on the number of cooperative skills done by the students, are cooperative skills, appreciate the contribution, taking turns and sharing tasks, ask questions, listen actively, and check the accuracy. The instrument contains a response to the student opinion learning process that has been implemented. Manufacture of instruments based on the principles of cooperative learning.

### 2.2. Validity and Practicality Test

The next phase of research is to test the validity of devices and instruments that have been made. Validity test conducted by the experts and practitioners. Repairs made after taking into account input and advice from a team of validators. Repairs done by removing, repairing and adding critical parts in accordance with the advice of the validator. Next, test the practicalities of the way trials are limited. The aim of this stage see any practical device or instruments that has been made. Test conducted practicalities performed by practitioners in the students of Biology Education STAIN Batusangkar. The stages of the research in this test refers to the syntax of learning that have been made previously. To help students understand the steps of learning, students are given a sheet student discussion and concept maps. With the help of three observers limited trial data obtained about the process of learning, skills and student response.

Data obtained from the validity and practicalities will be analyzed with descriptive statistics. Analysis begins with the search for the average number of experts and practitioners [13]. Furthermore, as confirmed by the mean range of scores 1-4 with the criteria of very valid, invalid, less valid and invalid (criteria such as Table 1). The following the above procedure is obtained the following criteria if the mean of  $> 3.00$  categorized as very valid, if  $2.00 < \text{mean} \leq 3.00$  considered valid, if  $1.00 < \text{mean} \leq 2.00$  categorized quite valid and if average  $\leq 1.00$  considered invalid.

**Table 1. Indicators of Eligibility and Validity Learning Tool and Instrument**

Mean percentage of Achievement and Assessment (Validity of Experts and Practitioners)	Level of Validity	Description
76 % - 100 % or $3,00 < \chi < 4,00$	very valid	can be used without revision
51 % - 75 % or $2,00 \leq \chi \leq 3,00$	valid	can be used with revision
25 % - 50 % or $1,00 \leq \chi < 2,00$	less valid	suggested not used
$< 25\%$ or $\chi < 1,00$	no valid	not used

Based on the test content validity and construct validity has been done by the experts, the result of validation has

written [Table 2](#). The results of the expert assessment shows that the average value of the validity range 2.75 – 3.58.

**Table 2. Results of Validation Tool and Instrument Cooperative Learning**

No	Type Tool / Instrument	Assessment of Experts			$\chi$	Level of Validity
		I	II	III		
1	Cooperative learning syllabus	2,70	3,00	3,00	2,90	valid
2	Unit of cooperative learning events	3,50	3,25	3,00	3,25	very valid
3	Guidelines for working students	3,25	3,25	3,25	3,25	very valid
4	Evaluation cooperative learning	2,75	2,75	3,00	2,83	valid
5	Work guidelines concept maps	3,50	3,75	3,75	2,75	valid
6	Observations cooperative learning process management	3,25	3,50	3,75	3,50	very valid
7	Skills student cooperative	3,75	3,50	3,50	3,58	very valid
8	Student response to the cooperative learning process	3,00	2,75	2,75	2,83	valid
9	CD Interactive-oriented cooperative learning	3,00	2,75	2,75	2,83	valid

### 3. Result and Discussion

#### 3.1. Observation Learning Process Management

The results of research on the management of the learning process are written in [Table 3](#). The results in [Table 3](#) shows the average value of the end of the observation of the learning process. This result also demonstrates that there are three levels of observation aspects of the value category, very good (35.89%), good (53.85%) and less good (10.26).

#### 3.2. Student Cognitives, Skills and Respons

The result of student cognitive after the test is given at the end of the learning process are the highest percentage is found at the range of 61 – 80 ( $0.54 \pm 0.32$ ). Then at the range 81 – 100 is  $0.1 \pm 0.64$ ; at the range 50 – 60 is  $0.2 \pm 0.57$ ; and at the range  $0 < 50$  is  $0.16 \pm 0.59$ . The Results of research on cooperative skills of students written in [Table 4](#). According to [Table 4](#), the skills the students are in the task undertaken by all students (100%). The smallest skills by students are taking turns and sharing tasks (41.38%).

The results of research on student responses to the process of cooperative learning is written in [Table 5](#). The opinions of students spread across four aspects of possible answers: 1 = strongly disagree with intensity  $< 25\%$ ; 2 = disagree with the intensity of 25% - 50%; 3 = agree with intensity 51% - 75%; and 4 = strongly agree with the intensity of  $> 75\%$ .

Production tools and instruments that have been done show the results valid and very valid [\[9\]](#). These results also show that the devices and instruments that have been designed in accordance with the principles of Jigsaw cooperative learning. Because these devices have described the study group members have a role, interacting, responsible, develop cooperative skills [\[5\]](#). Learning syntax prepared in events unit class and student work guidelines have also showed me the element of cooperative learning, namely the division of tasks, the

provision of expert sheets, discussion and quiz [\[18\]](#). Still, there are items that improved devices and instruments [\[8,9\]](#).

Some suggestions for improvement syllabus and events unit class of the validator is (a) the learning materials have been determined and more specific; (b) It should be carried out repairs on the main competencies, because it does not comply with the indicators of learning; (c) some items not yet operational and should be revised. Repairs carried out by using the operational tasks or the code of student work distributed after forming the group. The events unit class on the device, the type of post-test evaluation form should be written as an evaluation tool is a test given at the end of the lesson in the form of an essay. Suggestions for cooperative learning evaluation sheet of the team should answer or validator is the key to achievement test using key words. This is done with the aim to streamline the learning time. As for suggestions for work guidelines students of the team validator is (a) the number of students and the number of groups should be proportional to the area of the room; (b) The need to manufacture identification and location map practicalities when testing is done. Some suggestions for monitoring the management of the cooperative learning process of the team validator is (a) observers should be given the explanation that the teaching material has been owned by the students in the form of textbooks or other learning resources; (b) the suitability main competencies, supporting competencies and indicators between lesson plans, events unit class with the observation sheet on its appropriateness. Suggestions for students in cooperative learning activities are (a) an explanation of lecturers and students made separately; (b) we recommend that students write the guidelines written work of students or student notebooks. Meanwhile, suggestions for cooperative skills of students in cooperative learning is (a) because the number of students observed quite a lot, it is necessary to determine the proportion of the observer or student and (b) Should the student be given identification that clearly along with a site plan of the group, so that the transition process in the learning more effective. Furthermore, suggestions for the response of students to cooperative

learning process of the team should use a validator that sentences are more operational in parts of the instrument [9]. Input from validator to the interactive compact disc is necessary to add some navigation buttons as a guide in

compact disc, necessary to add some animation to clarify the material with the characteristics of the process in developmental of biology [8].

**Table 3. Management of the Learning Process**

Aspect of Observation	Result
<b>Content and construct syllabus and learning unit event</b>	
1. Identity syllabus and events unit class	
a. List the name of the institution, subjects, subject	very good
b. Lists of main competency, supporting competency, indicators and time allocation	very good
c. Lists of cooperative learning model, the method of discussion / question and answer / presentation and learning approaches	very good
2. The formulation of the syllabus and learning objectives unit class event	
a. The purpose according to the indicators of cooperative learning	good
b. The objective in accordance with cooperative learning time	good
c. The purpose in accordance with the results of cooperative learning	good
d. The purpose of specifically prepared in accordance with the principles of cooperative learning	good
3. Selection of the syllabus and learning materials unit class event	
a. Learning materials according to the indicators of cooperative learning	good
<b>Introduction</b>	
1. Phase 1. Introduce the objectives and motivations	
a. Inform the purpose of learning with Jigsaw approach	good
b. Motivating students by exposing the material benefits that will be studied in the learning approach Jigsaw	good
2. Phase 2. Delivering learning	
a. Inform the principles and characteristics of the application of cooperative learning model, the method of discussion / question and answer / presentation and jigsaw learning approaches in the learning process	good
b. Remind that students learning activities in accordance with the Student Discussion Gazette	good
3. Phase 3. Organize students into cooperative groups	
a. Divide students into groups to learn the origin of Jigsaw into groups corresponding sub material studied	very good
b. Provide the same identification to students who study the same material sub (group of experts)	very good
c. Adjust the seat and the location of the original group and the appropriate group of experts who prepared the plan	good
<b>The Core</b>	
1. Phase 4. Guiding group work / study students	
a. Oversee and guide the study groups when students are in a group home	good
b. Remind students to write and draw a conclusion material concepts of learning resources in the logbook	very good
c. Provide a sign to prepare to move away from the original group to the expert group (transition)	very good
d. Help each group in order to make the transition efficiently	good
e. Encourage students to conduct cooperative skills with fellow expert group	good
f. Oversee and guide the study groups when students are in a group of experts	good
g. Assist the group of experts in understanding the key concepts of learning materials	good
h. Help group of experts answer sheet concept maps	good
i. Remind students to make conclusions of the discussion as presentation materials	very good
j. Assist explanation and conclude the concept after each group of experts make presentations	very good
k. Provide a sign to make preparations to move from a group of experts to the original group (transition)	very good
l. Help each group to perform efficiently transition	good
m. Encourage the original group to be responsible in providing an understanding of matter-controlled	good
n. Supervise and guide discussion in group home	less good
o. Charge sheets discussion and concept maps	good
p. Provide a sign to make preparations to move from initial formation to the original group studied (transition)	very good
r. Help each group in order to make the transition efficiently	good
<b>The End</b>	
1. Phase 5. Evaluation	
a. Provide an achievement test in the form of post test	very good
b. Calculate and inform the results of tests of learning in the form of scores of individual and group scores	very good
2. Phase 6. Giving award	
a. Congratulating individuals and groups who obtain good results and best	very good
b. Motivating individuals and groups obtain sufficient and not good	very good
<b>Aspects of learning resources and allocation of time</b>	
1. Learning resources in accordance with the principles of cooperative learning	less good
2. The selection of learning resources in accordance with the principles of cooperative learning	less good
3. The management of time in accordance with the principles of cooperative learning	less good
	very good = 35,89 %
	good = 53,85 %
	less good = 10,26 %
	x = Good

In this study, it was observed fourth aspects that will determine the feasibility of cooperative learning model. The fourth aspect is the process of learning, skills, the respons and student achievement. Observations on the learning process of the students have been able to demonstrate their stints each with responsibility. Students are also able to motivate his fellow group members to contribute to group discussions. At the end of the lesson the students have also been able to use the agreement,

namely the perception or opinion on the topics and issues discussed in the lecture. These results constitute the implementation of students' skills at an early stage in the cooperative learning model. The activities of the initial level of skills required by each member of the group in the learning process. For example to make it more focus on study group discussions, each member must carry out their respective duties. Another benefit is that each member contributes the same while undergoing a learning process.

**Table 4. Observations Skills Student Cooperative**

No	Type Cooperative Skills	Number of Students (n=61)					
		Students Performing Skills			Students Not Performing Skills		
		∑	χ	STDEV	∑	χ	STDEV
1	Students are in duty	61	1	22.75	0	0	2.4
2	Students take turns and share the task	26	41.38	5.077	35	0.57	1.99
3	Students encourage participation	45	0.74	22.94	16	0.26	2.21
4	Students use agreement	49	0.8	22.89	12	0.2	2.26
5	Students listen actively	54	0.89	22.84	7	0.11	2.32
6	Students ask	38	0.62	23.02	23	0.38	2.13
7	Students interpret	46	0.75	22.93	15	0.25	2.23
8	Students check the accuracy	50	0.82	22.88	11	0.18	2.27
9	Students expand concepts or materials	27	0.44	23.15	34	0.56	2.01
10	Students are able to make their own conclusions	38	0.62	23.02	23	0.38	2.13
11	Students connect the opinions on the topic	30	0.49	23.11	31	0.51	2.04

**Table 5. Student Response after Learning Process**

No	Statement / Question	Student Response after Learning Process							
		1		2		3		4	
		χ	STDEV	χ	STDEV	χ	STDEV	χ	STDEV
1	method / approach led to student learning has responsibility for a given task	0	0.34	0.07	1.69	0.56	4.56	0.38	2.57
2	methods / learning approaches that are used to make students able to motivate other friends	0.07	0.29	0.07	1.69	0.66	4.49	0.21	2.69
3	methods / approach led to student learning have the same perception in the group	0	0.34	0.2	1.6	0.57	4.54	0.23	2.68
4	methods / approaches are able to make student learning active listening	0	0.34	0.25	1.56	0.51	4.59	0.25	2.67
5	methods / learning approach causes students to have the ability to ask active	0	0.34	0.41	1.45	0.51	4.59	0.08	2.78
6	methods / learning approach capable of making students re-interpret or convey information with different sentences	0	0.34	0.13	1.65	0.57	4.54	0.3	2.63
7	method / approach led to student learning has accuracy or comparing answers and ensure the correct answers received	0.11	0.26	0.25	1.56	0.61	4.52	0.03	2.82
8	methods / learning approach led to a positive dependence	0.07	0.29	0.33	1.51	0.11	4.87	0.44	2.53
9	method / learning approach to improve interaction between students	0	0.34	0.03	1.72	0.48	4.61	0.49	2.49
10	methods / approach to improve the skills of individual student learning	0.05	0.3	0.08	1.68	0.67	4.47	0.2	2.7
11	methods / learning approach creates a learning environment group	0.08	0.28	0.05	1.7	0.41	4.66	0.46	2.52
12	guidelines students can work well be understood	0	0.34	0.33	1.51	0.51	4.59	0.16	2.72
13	do you interested to attend the next learning activity as it has you follow?	0.05	0.3	0.08	1.68	0.7	4.45	0.16	2.72
14	what is the learning process activities such as this add to the motivation to learn about you?	0.05	0.3	0.2	1.6	0.13	4.86	0.62	2.4

note; 1 = strongly disagree with intensity <25%; 2 = disagree with intensity 25% - 50%; 3 = agree with intensity 51% - 75%; 4 = strongly agree with the intensity of > 75%.

The learning process also showed the students have been doing activities to ask and listen actively. Both of these activities were grouped on the skill level. The existence of discussion about the lecture material during the learning process goes, requires students to be able to conduct discussions and active listening. In this study, the process of active listening is defined by using physical and verbal messages that the speaker knows the listener energetically absorbing information. Activity heard by using physical and verbal to absorb information is needed

to find solutions as problem solving. The process of asking interpreted by requesting or asking for information or clarification about the lecture material.

The learning process also showed the students have been doing activities to interpret and check the accuracy. Both of these activities are being categorized skills. Cooperative learning process led to the student reiterated information with different sentences and compare answers, ensuring that the correct answer. This activity is seen during a presentation made by the students in the class.

Advanced level of skills shown by the student in the learning process. The skill is the ability to expand the concept of the student or the material covered, make your own conclusions and connecting the opinions with a specific topic or issue related to the material covered. Although the championship with an average value is quite low, these results show that integrative learning process is able to make the students perform advanced level skills. The existence of students' skills at the beginning, middle and proficient reveal the impact the achievement of the instructional model of learning. In accordance with the conceptual framework that has been written before, the mastery of skills are categorized into instructional impact. Students' skills is considered to be a direct impact in the learning process [7].

Skills are performed by the students shows that cooperative learning model is able to help students in learning in accordance with the principles of cooperative learning described by Carin [5], Slavin [18]. This statement is supported by the findings of the eight skills performed by over half (> 50%) students. Eighth types of skills are (a) students are in the task; (b) students encourage participation; (c) students use agreement; (d) students active listening; (e) student asked; (f) student interprets; (g) students examine the accuracy and (h) the student is able to make their own conclusions. Skills conducted by approximately half (<50%) of students are (a) students take turns and share the task; (b) students expand concepts or materials, and (c) students connect the opinions on the topic.

The response of students to cooperative learning is very good. Students much choose to agree and strongly agree with the implementation of cooperative learning model. These results also demonstrate cooperative learning is able to help students in learning in accordance with the principles of cooperative learning described by Carin [5], Slavin [18].

The findings of these three aspects are learning, skills and response in accordance with the findings of student results. The number of students who scored above 60 amounted to 62.07%. This result shows that the model of cooperative learning is applied is able to make the students gain a better learning outcomes. Students allegedly better able to understand the learning material with good developmental of biology because of the aid application of interactive compact disc in the learning process. Absorption characteristics of material at a faster process carried out by the students with the implementation of an interactive compact disc.

Associated with the use of interactive compact disc, this study is the focus of research development to (a) the development programs or products; (b) suppression part of the process of designing, development and evaluation; (c) emphasis on techniques and equipment and (d) organization or arrangement the material as a product [15]. The product also explains that the development of different learning undertaken by the development of simple learning. Because research and development is defined as the systematic study of the processes of design, development, program evaluation and learning products that must meet the criteria of internal consistency and effectiveness ([17], p. 127).

For the attainment of practicality devices and instruments necessary to improve this research. Because

when the data collection is done, it is feared there are confounding variables or nuisance variables. To support the achievement of practicality devices and instruments, this research should be equipped with data display test results of a comprehensive study. Because the learning process is evaluated in the form of cognitive, affective and psychomotor [24]. While researchers, a new evaluation of the learning process of cognitive and affective aspects only. Thus, needs to be improvement in the evaluation sheet.

Test the practicalities of devices and instruments of learning should be continued with the testing effectiveness. Thus, devices and instruments designed to describe a model of learning, such as learning of model learning community [22], thematic learning model [1] and a model of learning contract [3]. The results of these studies have demonstrated the effectiveness of the application of devices and instruments are designed. Furthermore, comparison of the learning outcomes of the jigsaw method with other methods [6,19,24] needs to be done to look at the effectiveness of the learning device.

## 4. Conclusion

The implementation of cooperative learning model in developmental of biology done good premises. Management of the process of cooperative learning, cooperative skills of students in the learning process, student response to the implementation of cooperative learning process and the learning outcomes of students considered good. For the perfection of the study, necessary to test effectiveness. Thus, a learning model has not been fully formed from devices and instruments that have been prepared.

## References

- [1] Akbar, S., Utama, I. W., & Pujiyanto. (2010). Pengembangan Model Tematik untuk Kelas 1 dan Kelas 2 Sekolah Dasar. *Jurnal Pendidikan dan Pembelajaran*, 17(1), 32-40.
- [2] Asril, Z. (2013). *Microteaching* (5th ed.). Jakarta: Rajawali Press.
- [3] AT, A. M. (2010). Model Kontrak Belajar Bermuatan Nilai Sosial Budaya dalam Bimbingan Akademik Mahasiswa. *Jurnal Pendidikan dan Pembelajaran*, 17(1), 48-58.
- [4] Badan Nasional Standar Pendidikan. (2006). *Dokumen Standar Pendidikan Nasional*. Jakarta: Departemen Pendidikan Nasional Republik Indonesia.
- [5] Carin, A. (1993). *Teaching Modern Science*. New York: Macmillan Publishing Company.
- [6] Carpenter, J. M. (2006). Effective Teaching for Larger Class. *Journal of Family and Consumer Science Education*, 24(2), 13-23.
- [7] Drake, S. M., & Burns, R. C. (2004). *Integrated Curriculum, Meeting Standards Through*. Virginia USA: Association for Supervision and Curriculum Development.
- [8] Haviz, M., & Maris, I. M. (2012). *Pengembangan CD Interaktif Berorientasi Pembelajaran Kooperatif pada Biologi Perkembangan Hewan*. Batusangkar: Centre for Research and Community Service STAIN Batusangkar.
- [9] Haviz, M., Lufri, Helendra, & Sumarmin, R. (2011). Pengembangan Perangkat Model Pembelajaran Kooperatif pada Biologi Perkembangan Hewan. *Ta'dib*, 14(1), 7-15.
- [10] Joyce, B., Weil, M., & Showers, B. (1992). *Models of Teaching* (4th ed.). Needham Height Massachusetts: Ally and Bacon.
- [11] Lufri. (2005). Pengaruh Pembelajaran Problem Solving yang Diintervensi dengan Peta Konsep terhadap Hasil Belajar Mahasiswa. *Jurnal Pembelajaran*, 28(1), 47-65.
- [12] Lufri. (2009). *Strategi Pembelajaran Biologi, Teori dan Praktek*. Padang: Universitas Negeri Padang.

- [13] Mulyardi. (2006). *Pengembangan Model Pembelajaran Matematika Menggunakan Komik di Kelas 1 Sekolah Dasar (Disertasi Doktor)*. Universitas Negeri Surabaya, Program Pascasarjana . Unpublishers.
- [14] Okebula, P. A. (1993). Can Good Concept Mappers be Good Problem Solvers in Science Research. *Science and Technology Education, 10*(2), 153-170.
- [15] Richey, R. C., Klein, D. K., & Nelson, W. A. (2002). Developmental Research: Studies of Instructional Design and Development. In D. Jonassen (Ed.), *Handbook of Research on Educational Communications and Technology* (pp. 1101-1130). Association Education Communication and Technology.
- [16] Riyana, C., & Susilana, R. (2007). *Media Pembelajaran, Hakikat, Pengembangan, Pemanfaatan dan Penilaian*. Bandung: CV. Wacana Prima.
- [17] Seels, B. B., & Richey, R. C. (1994). *Instructional Technology: the Definition and Domains of the Field*. Washington: Association for Educational Communications and Technology.
- [18] Slavin, R. E. (2005). *Cooperative Learning, Teori Riset dan Praktik (Indonesian Version)*. (N. Yusron, Trans.) Bandung: Nusa Media.
- [19] Slish, F. D. (2005). Assessment of the Use of the Jigsaw Methode and Active Learning in Non-Majors, Introductory Biology. *Bioscene, 31*(4), 4-10.
- [20] Students Biology of Education STAIN Batusangkar. (2011). Use Strategy of Instructional. (M. Haviz, Interviewer).
- [21] Suparman, A. (2005). *Desain Instruksional*. Jakarta: Pusat Antar Universitas Direktorat Jenderal Pendidikan Tinggi Depdiknas RI.
- [22] Supriyadi. (2010). Model Belajar Learning Community untuk Meningkatkan Keterampilan Menulis Ilmiah Mahasiswa. *Jurnal Pendidikan dan Pembelajaran, 17*(1), 11-22.
- [23] Trianto. (2010). *Mendesain Model Pembelajaran Inovatif-Progresif*. Jakarta: Kencana Prenada Media Grup.
- [24] Wong, K., Driscoll, C., & Maryanne. (2008). A Modified Jigsaw Method: An Active Learning Strategy to Develop the Cognitive and Affective Domains through Circular Review. *Journal of Physical Therapy Education, 12*(2), 24-35.