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RESEARCH ARTICLE

THE EFFECT OF PROBLEM BASED LEARNING IN STUDENTS' CRITICAL THINKING OF FUNGI BIOLOGY COURSE USING CONCEPT MAPPING TECHNIQUE

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Abstract

This study aims to determine differenes critical thinking ability of high school students in fungi using Problem Based Learning with concept mapping technique between the class that uses the application of the learning model and the class that uses the lecture method. This quantitative research applied quasi-experimental with nonequivalent control group design by involving first-grader Science High School students as the experimental group and the control group. The experimental group use Problem Based Learning methode with concept mapping but the control group use lacture and assigment methode in discussion. The one-sample Kolmogorov Smirnov test and homogeneity is used to select the experimental group and the control group. The experimental group using concept mapping to help problems in the course while the control group is not using concept mapping in the course. The evaluation of the data is using Independent Sample T-Test and the result shows the significant score is <0,05. Means that H0 is unaccepted and H1 accepted so Problem Based Learning method with concept mapping technique has an effect on students' critical thinking.

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Introduction:-

Biology is an important field of learning in the curriculum because biology can help students in understanding the environment, assist students in developing, fostering positive attitudes towards the environment, scientific attitudes, and student independence (Kustiana et al., 2019). This research about learning material teaching high school biology class X one of which is a fungi. Fungi is material that conveys everything related to fungi, from understanding, grouping, reproduction, ways of life, and also roles in daily life. Material fungi have a variety of types of fungi and many classifications that use scientific words that are rarely heard by students before. Diverse fungi cause fungi to have different forms, different ways of life, and different reproduction according to their respective types. Characteristics of relatively high material and using many different terms cause fungi material is considered difficult because students have difficulties in remembering material for a long time. After all, it requires a memorization process that does not consume a little time. Fungi material needs to be understood by students well because it is closely related to daily life in the surrounding environment. Because learning is an activity between educators and students as a result of changing behavior for learning experiences to achieve learning goals (Utomo et al., 2020).

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Learning objectives that must be achieved in the 21st century, there are 3 main components that must be met, namely the first is an adaptive curriculum, an adaptive curriculum is a curriculum that is adapted to the times and is adapted to the needs of students who support students' thinking to progress and develop, which second is a more participatory learning model, the learning model is significant in the learning process because it can determine the success of students in receiving material during learning so that they can develop collaborative, interactive, creative and innovative abilities well then the third is meaningful assessment, meaningful assessment is an assessment that does not refer to the memorization of students or assessments that rely on memory. In the 21st-century, student skills needed were critical thinking 78%, information technology 77%, health and fitness 76%, innovation 74%, financial responsibility 74%, and innovation 74% (Saputra et al ., 2019). The greatest need is critical thinking, so critical thinking needs to be familiarized and assessed for the needs of work and higher education. The ability to think critically is considered important by many experts because it aims to form wise students in problem-solving and improve the quality of life in the future (Sulaiman, 2013).

Critical thinking is a thought that is involved in solving problems, formulating problems, calculating possibilities, and making decisions. Critical thinking can be the ability of students who do not develop skills with students' cognitive abilities in problem-solving, so it is an essential need in learning (Sada et al., 2016).

Comprehensive critical thinking is critical thinking that meets dispositions; these dispositions include the search for truth, an open mind, systematic, curiosity, and self-confidence (Tiruneh, 2014). Realizing critical thinking skills in students will have many good effects for students because critical thinking will synergize with cognitive, affective, and psychomotor learning outcomes (Lubis et al ., 2019).

According to Richard Paul and Linda Elder, critical thinking is an art that is used to improve thinking skills in analyzing and evaluating certain problems in learning. Someone who thinks critically will practice or accustom themselves to have the ability to formulate questions and problems clearly and precisely, collect and assess relevant and effective information for use in problem-solving, and the third is to produce logical conclusions and be able to test them using judgment by certain predetermined standards (Widana et al., 2018).

To realize critical thinking in students, a teacher must choose a learning model and convey learning with the right techniques so that learning material and learning objectives can be conveyed to students properly. Critical thinking is done in groups because by emphasizing student learning activities by exchanging ideas can describe the quality of student thinking (Pratiwi et al., 2016). The learning model and techniques used must involve students' full activeness through inquiry. Because the 2013 curriculum learning revision of a learning-centered on students and teachers as facilitators, therefore a learning model must be chosen and prepared carefully to achieve the learning objectives (Fuad et al. , 2016).

The learning model chosen is the Problem Based Learning (PBL) learning model. Problem Based Learning (PBL) is a model of learning that is problem-based and raises problems from real life and is a constructivist learning model. Kostruktivis refers to student-centered learning. Using problem-based learning, students can build their own knowledge and will strengthen their memories about the knowledge they have acquired (Ulger K, 2014).

The learning model Problem-Based Learning (PBL) have procedures in the conduct of learning first teacher gives problems to the students, the students identify the given problem, the three students seeking a variety of sources to solve the problem and that the four students chose to solve the problem and draw conclusions obtained (Saputra et al., 2019).

PBL can realize students' critical thinking skills because PBL focuses on proceeding beginning with problems rather than exposition or learning, combining learning experiences with cases faced, and active focus on students (Hamdan et al., 2014). Learning by giving problems to students with PBL if done continuously in all fields will realize students who have high critical thinking skills (Azmi et al., 2016)

This learning model has strengths and weaknesses, the strengths of this learning model can improve student enthusiasm for learning, make students feel challenged in solving problems faced so that students feel given more control in their learning activities (A Keziah, 2010). Can improve student learning outcomes, can train students to think critically and can make students more memories attached to the students' memories because they build their own knowledge.

While the weakness of PBL is that it makes students reluctant to solve problems if the material in question is poorly understood, so students feel less confident and afraid to solve problems (Azmi et al ., 2016) especially have a lot of discussions and there are many different terms for students as there are many scientific names in it, for example, are fungi material taken in this study. Lack of confidence from students to solve problems can be overcome by using a learning technique.

The right learning technique to overcome PBL weaknesses is the concept map technique. Mechanical map concept is a technique conceptualize the discussion in a broad outline of the material to facilitate the students to remember the material relevant when solving problems. So making a concept map at the beginning of learning becomes a provision for students to solve the given issues which are then connected to the material being studied. Using appropriate learning models and concept map techniques can require students to better understand the material being learned and is an effective technique used in learning, so as to increase student motivation (Wepe et al., 2016). Student motivation is very necessary for students because, with the motivation to learn, students will be eager to learn and have the enthusiasm for learning lessons from beginning to end smoothly.

Without a concept map, students will feel confused and unsure of being able to solve the problem they are facing because they have doubts about solving the problem. Material fungi is a subject that has a variety of contents and has many foreign languages for students or the scientific language used therein, so students will feel their memories stronger and more confident if they have previously made a concept map to remember the material outline but cover the whole.

Research Methods:-

The research conducted was a quasi-experimental study. Quasi-experiment is experimental research involving two classes. One class is used as an experimental class, and the other class is used as a control class. Before deciding which class to use, the first thing to do is make observations at the school that is estimated to be appropriate for the purpose of the study. After observing and deemed appropriate to the title of the study, further observations were made. Further observations were made by digging further information from the tutor teacher who had been appointed by the school to guide during the research. Data retrieval is then carried out with several actions, namely, continued observation, documentation, interviews, and tests.

Follow-up observations are also used to obtain data on the value of the final semester of odd biology material. The class selection starts with testing for normality and homogeneity. The normality test is carried out using the odd semester-end exam data that has been obtained, as well as the homogeneity test. After the data is proven to be normally distributed and homogeneous, random sampling is carried out to select the experimental class and the control class.

Documentation is carried out to obtain data on student grades before research or after the research is conducted, both syllabus or lesson plans, lesson photographs, and other supporting files. Interviews were conducted with the tutor teacher and also conducted to students to find out the extent of the success of the research conducted and their weaknesses and strengths. The research was carried out by a test, where the test was conducted to obtain the value data used to measure the success of the learning model used on students' critical thinking skills.

The control class was treated with a Problem Based Learning (PBL) learning model with a concept map technique. While the control class does not use PBL because it is used as a measure of the successful implementation of the Problem Based Learning (PBL) learning model in the experimental class. The difference in the treatment of the learning model applies but does not affect the material, and practical activities carried out in learning. Learning is carried out with a learning implementation plan (RPP) and other assessment instruments that have been validated before the research takes place.

Assessment of critical thinking in learning is assessed through Student Discussion Sheets (LDS) using assessments in accordance with 12 indicators of critical thinking taken 5 indicators in it. The results of the data obtained will be compared between classes one with other classes and also tested using SPSS with the Independent Sample T-Test to see the significant critical thinking skills of students.

Results:-

Normality test is conducted using the one-sample Kolmogorov-Smirnov test, and homogeneity test is done at the beginning to prove the data used is normal and homogeneous data distribution to determine the experimental class and the control class.

Significant value from class mipa 1 to mipa 7> 0.05 so that H0 is rejected and H1 is accepted. It can be interpreted that the data is normally distributed. The data is proven to be normally distributed so that homogeneity testing can proceed.

Table 2:- Homogeneity Test.

Score Significant	Information
0,827	Homogeneous

The data is proven to be homogeneous because it has a significant value> 0.05, which is 0.827, so H0 is rejected, and H1 is accepted and means that the data is homogeneous, this homogeneous data is used when the data is normally distributed.

After the data is proven to be normal and homogeneous distribution, random sampling is used, namely the determination of the experimental class and the control class at random, and the class Mipa 1 is obtained as the experimental class and Mipa 7 as the control class. Once determined, learning is carried out in accordance with the learning model in each class. The experimental class uses Problem Based Learning (PBL) through the concept mapping technique. Whereas the control class uses the STAD learning model.

The learning model has been applied and obtained the results of students' critical thinking skills throughthe Student Discussion Sheet (LDS) has done in groups and help with engineering concept mapping. Data obtained from the assessment according to aspects of critical thinking.

Table 3:- Results of Values of Critical Thinking Aspects of Experimental Classes.

Indicators of Critical Thinking	Score	Category
Identify the problem	85,71	Very critical
Analyze the problem	79,28	Critical
Evaluate the problem	70	Critical
Draw a conclusion	92,14	Very critical
Determine trusted sources	74,28	Critical
Average	**80,28**	**Very critical**

Table 3:- Results of Values of Critical Thinking Aspects of Control Classes l.

Indicators of Critical Thinking	Score	Category
Identify the problem	77,94	Very critical
Analyze the problem	61,76	Critical
Evaluate the problem	69,85	Critical
Draw a conclusion	53,67	Very critical
Determine trusted sources	61,76	Critical
Average	**64,99**	**Critical**

There is a difference in the average value of critical thinking skills between the experimental class and the control class. In the experimental class has the ability to think critically superior or higher than the control class. The results of the data were tested using the Independent Sample T-test.

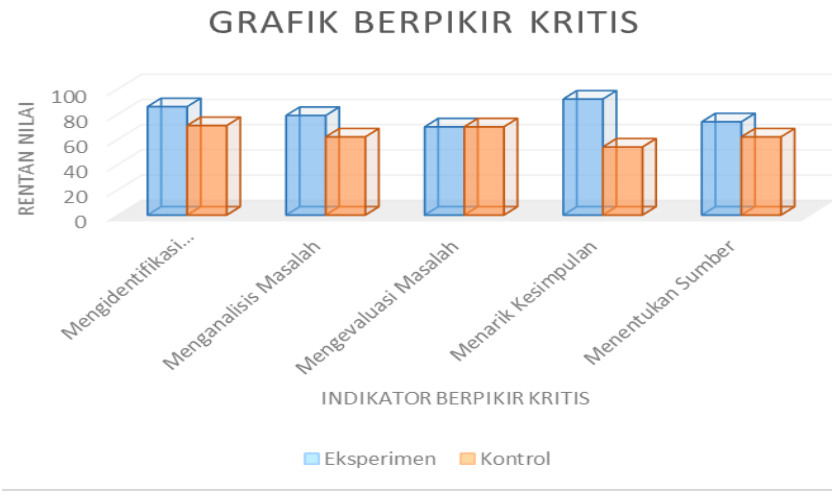
Table 5:- Test Independent Sample T-Test.

	t-test for Equality of Means			
	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
				Lower

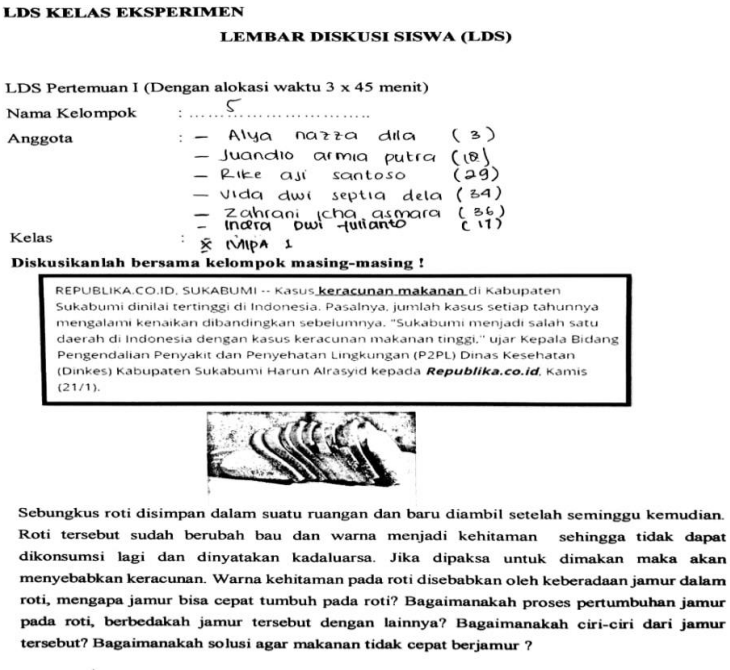
	Equal variances assumed	.000	11.91513	2.41416	7.09643
	Equal variances not assumed	.000	11.91513	2.41659	7.09075

The SPSS test results produced a significant value <0.05 that is 0,000 so that H0 was rejected, and H1 was accepted, which means there was a difference in the quality of critical thinking between the experimental class and the control class. The experimental class has higher critical thinking skills compared to the control class.
The ability to think students critically between the experimental class and the control class can be seen the difference in graphical form, so the comparison is clearly seen, where the critical thinking ability in the experimental class is higher than the control class.

Graph 1:- Differences in Students' Thinking Ability in the Experimental and Control Classes.



The assessment of students' critical thinking of the experimental class and the control class was taken through an assessment rubric that was made before implementation to assess student learning outcomes in measuring critical thinking skills.



LDS KELAS EKSPERIMEN

LEMBAR DISKUSI SISWA (LDS)

LDS Pertemuan I (Dengan alokasi waktu 3 x 45 menit)

Nama Kelompok : 5

Anggota : – Alya nazza dila (3)
– Juandio armia putra (18)
– Rike asi santoso (29)
– Vida dwi septia dela (34)
– Zahrani icha asmara (36)
– Indra Dwi Hutlanto (17)

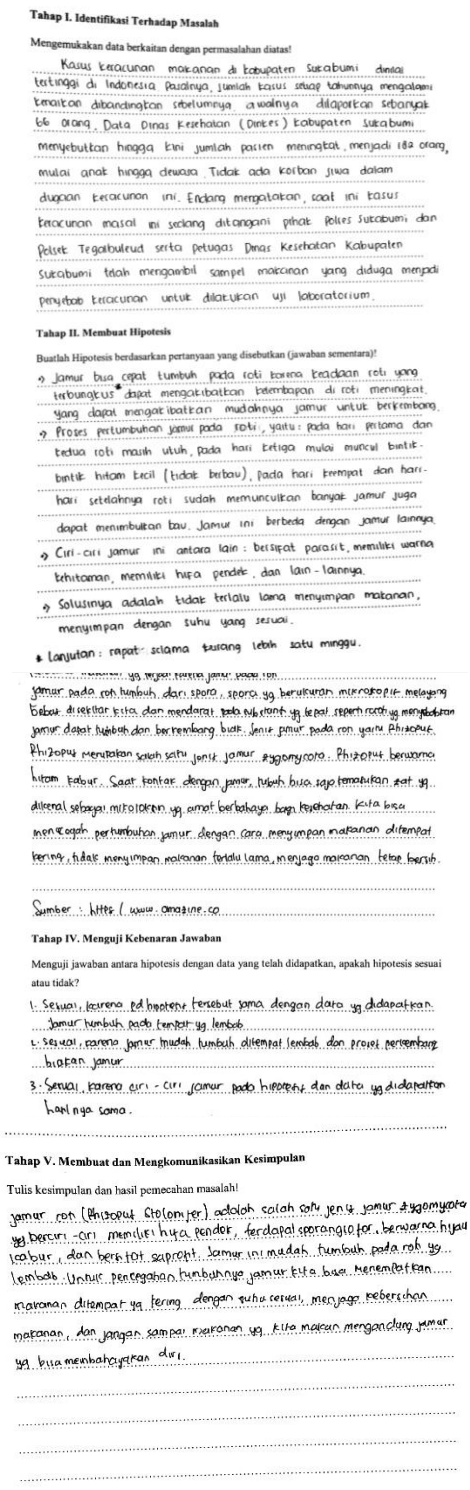
Kelas : X MIPA 1

Diskusikanlah bersama kelompok masing-masing !

REPUBLIKA.CO.ID, SUKABUMI -- Kasus keracunan makanan di Kabupaten Sukabumi dinilai tertinggi di Indonesia. Pasalnya, jumlah kasus setiap tahunnya mengalami kenaikan dibandingkan sebelumnya. "Sukabumi menjadi salah satu daerah di Indonesia dengan kasus keracunan makanan tinggi," ujar Kepala Bidang Pengendalian Penyakit dan Penyehatan Lingkungan (P2PL) Dinas Kesehatan (Dinkes) Kabupaten Sukabumi Harun Alrasyid kepada ***Republika.co.id***, Kamis (21/1).

Sebungkus roti disimpan dalam suatu ruangan dan baru diambil setelah seminggu kemudian. Roti tersebut sudah berubah bau dan warna menjadi kehitaman sehingga tidak dapat dikonsumsi lagi dan dinyatakan kadaluarsa. Jika dipaksa untuk dimakan maka akan menyebabkan keracunan. Warna kehitaman pada roti disebabkan oleh keberadaan jamur dalam roti, mengapa jamur bisa cepat tumbuh pada roti? Bagaimanakah proses pertumbuhan jamur pada roti, berbedakah jamur tersebut dengan lainnya? Bagaimanakah ciri-ciri dari jamur tersebut? Bagaimanakah solusi agar makanan tidak cepat berjamur ?

Figure 1:- Discussion Results of Experimental Class Students.



Tahap I. Identifikasi Terhadap Masalah

Mengemukakan data berkaitan dengan permasalahan diatas!

Kasus keracunan makanan di kabupaten Sukabumi dinilai tertinggi di Indonesia. Padahal, jumlah kasus setiap tahunnya mengalami kenaikan dibandingkan sebelumnya. Awalnya dilaporkan sebanyak 66 orang. Data Dinas Kesehatan (Dinkes) Kabupaten Sukabumi menyebutkan hingga kini jumlah pasien meningkat menjadi 182 orang, mulai anak hingga dewasa. Tidak ada korban jiwa dalam dugaan keracunan ini. Endang mengatakan, saat ini kasus keracunan massal ini sedang ditangani pihak Polres Sukabumi dan Polsek Tegalbuleud serta petugas Dinas Kesehatan Kabupaten Sukabumi telah mengambil sampel makanan yang diduga menjadi penyebab keracunan untuk dilakukan uji laboratorium.

Tahap II. Membuat Hipotesis

Buatlah Hipotesis berdasarkan pertanyaan yang disebutkan (jawaban sementara)!

- Jamur bisa cepat tumbuh pada roti karena keadaan roti yang terbungkus dapat mengakibatkan kelembapan di roti meningkat yang dapat mengakibatkan mudahnya jamur untuk berkembang.
- Proses pertumbuhan jamur pada roti, yaitu: pada hari pertama dan kedua roti masih utuh, pada hari ketiga mulai muncul bintik-bintik hitam kecil (tidak berbau), pada hari keempat dan hari-hari selanjutnya roti sudah memunculkan banyak jamur juga dapat menimbulkan bau. Jamur ini berbeda dengan jamur lainnya.
- Ciri-ciri jamur ini antara lain: bersifat parasit, memiliki warna kehitaman, memiliki hifa pendek, dan lain-lainnya.
- Solusinya adalah tidak terlalu lama menyimpan makanan, menyimpan dengan suhu yang sesuai.

* Lanjutan: rapat selama seorang lebih satu minggu.

jamur pada roti tumbuh, dari spora, spora yg berukuran mikroskopik melayang bebas di sekitar kita dan menempel pada substrat yg lembab seperti roti yg menyebabkan jamur dapat tumbuh dan berkembang biak. Jenis jamur pada roti yaitu Rhizopus. Rhizopus merupakan salah satu jenis jamur zygomycota. Rhizopus berwarna hitam kabur. Saat kontak dengan jamur, tubuh bisa saja terkontaminasi zat yg dikenal sebagai mikotoksin yg amat berbahaya bagi kesehatan kita bisa mencegah pertumbuhan jamur dengan cara menyimpan makanan ditempat kering, tidak menyimpan makanan terlalu lama, menjaga makanan tetap bersih.

Sumber : https://www.amazine.co

Tahap IV. Menguji Kebenaran Jawaban

Menguji jawaban antara hipotesis dengan data yang telah didapatkan, apakah hipotesis sesuai atau tidak?

1. Sesuai, karena pd hipotesis tersebut sama dengan data yg didapatkan jamur tumbuh pada tempat yg lembab.
2. Sesuai, karena jamur mudah tumbuh ditempat lembab dan proses pertumbuhan jamur.
3. Sesuai, karena ciri-ciri jamur pada hipotesis dan data yg didapatkan hampir sama.

Tahap V. Membuat dan Mengkomunikasikan Kesimpulan

Tulis kesimpulan dan hasil pemecahan masalah!

jamur roti (Rhizopus Stolonifer) adalah salah satu jenis jamur zygomycota yg bercirі-ciri memiliki hifa pendek, terdapat sporangiofor, berwarna hijau kabur, dan bersifat saprofit. Jamur ini mudah tumbuh pada roti yg lembab. Untuk pencegahan tumbuhnya jamur kita bisa menempatkan makanan ditempat yg tering dengan suhu cerah, menjaga kebersihan makanan, dan jangan sampai makanan yg kita makan mengandung jamur yg bisa membahayakan diri.

Figure 2:- Discussion Results of Control Class Students.

LDS KELAS KONTROL

LEMBAR DISKUSI SISWA (LDS)

Nama Kelompok : 3

Anggota Kelompok : 1. Anastasya Kusuma Wardani (03)
2. Dio Maulana Afandi ( )
3. Faizatun Nizak (12)
4. Farrel Rayanara (18)
5. Intan Armania (19)

Kelas : X MIPA 7

LEMBAR DISKUSI SISWA (LDS)

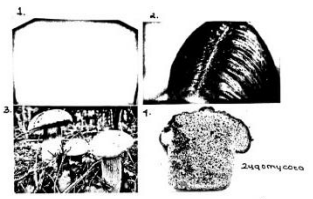
LDS Pertemuan I (Dengan alokasi waktu 3 x 45 menit

Diskusikanlah bersama kelompok masing-masing !

1. Makanan kadaluarsa dapat meracuni konsumen ada beberapa faktor yaitu bahan yang digunakan sudah kadaluarsa, makanan basi karena terlalu lama disimpan. Apakah kemungkinan lain yang menyebabkan makanan dapat meracuni tubuh dan bagaimana hubungannya dengan jamur?

2. Jamur memiliki dua macam bentuk yaitu jamur mikro dan jamur makro, dalam lingkungan sekitar yang dapat diketahui dengan mudah oleh masyarakat adalah jamur makro yang dapat dikonsumsi ataupun tidak dapat dikonsumsi, jamur dan tumbuhan dapat tumbuh dan berkembang biak dan bertahan hidup dilingkungan sekitar, sama atau berbeda antara jamur dan tumbuhan ?

3. Hidup dan bertahan hidup ditempat yang berbeda-beda sesuai dengan bentuk jamur dan ciri-ciri jamur yang berbeda. Dibawah ini terdapat 4 gambar yang memperlihatkan berbagai kondisi jamur bertahan hidup dan berkembang biak ditempat yang berbeda yaitu pada tubuh manusia dalam bentuk panu pada kulit, ketombe pada kulit kepala manusia, jamur yang dapat dikonsumsi yang hidup ditanah secara liar, dan terdapat jamur pada makanan yang sudah basi atau kadaluarsa. Berdasarkan fenomena tersebut hal apakah yang menyebabkan perbedaan tempat hidup dan bertahan hidupnya jamur?



Jawaban !

1. Karna roti tersebut dapat menghasilkan alcohol melawi Proses Fermentasi. Pertumbuhannya akan berhenti pada saat kadar alcohol mencapai 4%-5% . Hubungannya dengan jamur adalah Jamur Saccharomyces yg berperan dalam fermentasi alcohol.
2. Beda, karna Jamur tidak memiliki klorofil sehingga tidak dapat menghasilkan makanan sendiri. Sedangkan tumbuhan dapat menghasilkan makanan sendiri
3. 1) Ascomycota kebanyakan hidup sebagai parasit pada organisme lain, dan ada yg hidup berambiosis dengan alga hijau berasal satu. Berkembang biak secara seksual.
   2.) Basidiomycota merupakan kelompok jamur yang mempunyai tingkat perkembangan yang tinggi bila dibandingkan dengan kelompok jamur lainnya. Jamur ini berkembang biak secara seksual dan aseksual.
   3) Anggota divisi zygomycota biasanya hidup sebagai saprofit pada roti nasi, dan bahan makanan lainnya, serta ada yg hidup sebagai parasit. berkembang biak secara seksual dan aseksual.

It can be seen from the results of discussions undertaken by students having answers to the problem solving with different qualities and by different answers. Because the learning model used is different, and the application is also different. This shows that in the same material and the same target students will produce different abilities according to the accuracy of the learning model used in classroom learning

Discussion:-

This study aims to measure and see students' critical thinking skills on the subject of fungi with the Problem Based Learning (PBL) learning model through the concept map technique. Critical thinking is a thought that is involved in the problem-solving process and is an intellectual thought process that deliberately evaluates the thinker using reflective, independent, clear, and rational thinking. Critical thinking assessments are obtained from student discussion sheets given by the teacher to students in groups. Student discussion sheets contain problem-solving in learning and are designed in groups to train students in critical thinking and can compete with one another with members of the argument so that the ability to think critically will be honed more. Research results in students' critical thinking skills that differ between the experimental class and the control class. The value of critical thinking

follows in accordance with the assessment of students' critical thinking indicators consisting of 12 indicators and 5 indicators taken in this study. These indicators are identifying problems, analyzing problems, evaluating problems, drawing conclusions, and determining reliable sources.

Table data. 3 and tables. 4 proves that in the experimental class using the Problem Based Learning (PBL) learning model through concept maps can realize students who have the critical thinking skills needed to prepare students who are more able to compete in the future and for each future when faced with problems both in everyday life or work life. In the experimental class, the critical thinking value with an average of 80.25 is classified as very critical, while in the control class, 64.99 is classified in the critical category, but it differs significantly from the ability produced in the experimental class. This can happen because use appropriate learning models, if at collaborate with the right material, then can produce targeted capabilities that result in increased critical thinking skills. Such as the use of the Problem Based Learning (PBL) learning model, which is able to increase students' enthusiasm in realizing critical thinking skills supported by concept maps to overcome the weaknesses that exist in PBL. With concept maps, students can facilitate learning material in an outline with a good concept in order to avoid students' misconceptions of the material being studied with the problem being solved, so that when students solve problems in PBL, they do not experience difficulties and doubts related to the learning material.

The learning model used in the experimental class is different from the control class, the experimental class uses the Problem Based Learning (PBL) learning model through the concept map technique while the control class does not, because the control class is used as a benchmark of success and improvement in students' critical thinking skills. In the experimental class applied concept mapping at the beginning of learning as a provision or handle in solving problems in learning fungal material. After making a concept map, students work on the problems given by the teacher in groups according to PBL syntax regarding real problems that exist in daily life, so that students' critical thinking skills can be sharpened well. While the control class does not apply concept mapping at the beginning of learning, but listens to the teacher's brief explanation and then solves the problem given by the teacher but does not conform to PBL syntax.

The results of the student discussion were assessed in accordance with the assessment rubric made earlier, after data obtained in the assessment of critical thinking skills in accordance with the specified indicators then proceed with the Independent Sample T-Test to see that there was a significant increase in critical thinking skills and to distinguish between increased abilities think critically from both of these classes. The test results are in the table. 5. The test shows the significance of critical thinking is 0,000. P sig <0.05 so that it can be concluded that H0 is rejected, and H1 is accepted, which means there is a significant difference in critical thinking skills, and the experimental class has a higher value than the control class. The test used was the Independent Sample T-Test because no pre-implementation tests were carried out on the students but instead compared the results between the experimental class and the control class with different treatments. The factors that influence the difference in ability according to what has been explained because of the application of an appropriate learning model that is Problem Based Learning (PBL) is supported by appropriate techniques to balance between the learning model undertaken with the learning material implemented so that learning objectives can be met well and affect the quality of students' critical thinking.

The Problem Based Learning (PBL) learning model is compatible with fungi material. Material that has a lot of discussions really requires the concept of map techniques in learning, such as fungi material. Where ministers fungi have a lot of material and coupled with scientific language alien to students because they have not heard before, so need time and process to know him. The scientific names contained in fungi such as fungi are Ascomycota, Basidiomycota, Zygomycota and deuteromycota, saccharomyces cerevisiae, and classification as well as different names that use scientific names, such as rhizopus sp., Fusarium, Volvariella volvacea, saccharomyces cerevisiae and the other. Such material will be easily forgotten by students because the memorization system is less effective. However, this technique is not only done for this material and can be done on similar material in other subjects. Characteristics of fungi material that has many scientific terms and has many types of fungi and how to breed, get nutrition, different places of life cause students to need extra memory to solve problems and memorize. Fung classification has a sequence and accompanied by features that are increasingly developing between the classification of species with one another type. The development of these materials must be well known by students because fungi are related to the daily lives of students both at school, at home, or in the surrounding environment. Because fungi have many kinds and must be known and understood by students. Each type of fungi has different

breeding and way of life so that extra memory capabilities are needed, so there is a need for techniques to make it easier by using concept map techniques.

The role of concept maps in PBL is to help the PBL process because PBL is a learning model with the demands of students to solve problems that are given properly and correctly, but not apart from existing theories. In order to facilitate students' memories on a large amount of material and to be able to synchronize material and problem solving, a concept map is needed. Concept maps are done at the beginning of learning before students receive a little material or LDS. Through the concept map, students are required to more easily master the material even though the material faced a lot, and there are many scientific terms as well. Using the concept map technique can also increase students' motivation to be more enthusiastic in learning.

Concept maps are different from mind maps. The difference is the concept map is the beginning of learning while the main map at the end of learning. The concept map is simpler but covers the whole while the main map is more detailed with brief understandings contained therein. Concept maps are used and intended for capital in solving problems in PBL that are done after making the concept map.

The implementation of learning using the Problem Based Learning (PBL) learning model was successful even though in the experimental class there were still some that were considered less while in the control class there were some students who were considered to have more ability than others, but from the average value the experimental class had the ability which is superior to the control class. There is one equivalent indicator between the experimental class and the control class that is evaluating the problem. From this it can be seen that students of the experimental class and the control class have the same ability in learning, because basically the way students solve problems is the same, but with the application of an appropriate learning model and not right will affect the development and ability of students further. So it is really needed the right learning model for students in accordance with the material that they are dealing with.

There is an obstacle in the implementation of the difficulty in dividing time well in the implementation of learning in class with learning in the laboratory, because students who are new to understanding scientific words and new things need more time to understand the material and must slowly to through the syntax of the model learning so that learning objectives can be achieved properly.

The effectiveness of the application of the Problem Based Learning (PBL) learning model to fungi material has been proven through LDS work on students in groups and presented data in the form of tables or graphs wherein the tables and graphs there are indicators of critical thinking assessment taken by a total of five applicators covering the whole in the assessment Critical thinking of students in accordance with the LDS that has been made. The graphs and tables clearly show that the critical thinking skills of experimental class students are higher than those of the control class. In this way, it has been proven that the learning model can improve students' critical thinking skills so that the learning model can be applied to other similar material.

With the PBL and concept maps in the discussion, students' critical thinking can be achieved well in accordance with the 21st Abd learning target that expects critical thinking to be controlled by each student with a large percentage.

Conclusion:-

Based on the results of the discussion, it can be seen that students' critical thinking skills can be fulfilled and achieved due to the application of the Problem Based Learning (PBL) learning model with concept maps techniques that support the discussion of fungi.

Problem Based Learning (PBL) learning models that prioritize real-world problems to students. PBL has strengths and weaknesses; one of the weaknesses is that it can cause doubts and fears of students in completing learning because students lack confidence in their memories. Weaknesses are overcome with concept maps, which can also overcome many fungal materials, and there are many scientific languages in them. By applying the learning model then produced high critical thinking skills with a significant 0,000 and with an average of 80.28. From the data, the Problem Based Learning (PBL) learning model through the concept map technique can improve the quality of students' critical thinking.

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