

STUDENTS' CRITICAL THINKING PROCESS IN COMPETITION SCIENTIFIC WORKS

*Muhammad Hambali¹, Maulfi Syaiful Rizal², Lilik Wahyuni³

Universitas Brawijaya

Email: (¹mhambali@ub.ac.id, ²maulfi_rizal@ub.ac.id, ³lilikwahyuni@ub.ac.id)

Corresponding author: *mhambali@ub.ac.id

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Abstrak: Abstrak Proses berpikir kritis diperlukan dalam memecahkan masalah. Dalam hal ini, proses berpikir kritis terdiri atas (1) mengenali masalah, (2) menilai informasi yang relevan, dan (3) memecahkan masalah/membuat simpulan. Berdasarkan langkah ini, penelitian ini berusaha untuk mendeskripsikan proses berpikir kritis mahasiswa dalam karya ilmiah yang digunakan oleh mahasiswa untuk berkompetisi. Proses berpikir kritis dalam karya ilmiah kompetisi perlu dilakukan agar mahasiswa dapat membuat karya ilmiah yang berkualitas yang dilandasi berpikir kritis dalam memecahkan masalah. Penelitian ini menggunakan pendekatan kualitatif. Data penelitian ini berupa kalimat, gugus kalimat, paragraf, dan teks utuh yang mencerminkan proses berpikir kritis mahasiswa. Data diperoleh dari karya ilmiah mahasiswa yang dikompetisikan di luar kampus. Hasil penelitian menunjukkan bahwa dari segi proses berpikir kritis, karya ilmiah mahasiswa dapat dikategorikan menjadi empat macam, yaitu (1) karya ilmiah yang menunjukkan ketiga tahap proses berpikir kritis, yaitu tahap mengenali masalah, menilai informasi yang relevan, dan memecahkan masalah/menarik masalah; (2) karya ilmiah yang hanya terdiri atas tahap mengenali masalah dan memecahkan masalah/menarik simpulan, (3) karya ilmiah yang terdiri atas tahap mengenali masalah dan menilai informasi yang relevan, dan (4) karya ilmiah yang terdiri atas tahap mengenali informasi. Berdasarkan hasil penelitian, dapat diberikan saran agar dilakukan pendampingan kepada mahasiswa dalam proses berpikir kritis agar dihasilkan karya ilmiah dengan pembahasan yang mendalam dan akurat sehingga karya ilmiah yang ditulis menjadi karya ilmiah yang berkualitas untuk dikompetisikan.

Kata Kunci: Proses Berpikir Kritis, Karya Ilmiah, Kompetisi

Abstrak: *Critical thinking processes are needed in solving problems. In this case, the critical thinking process consists of (1) recognizing the problem, (2) assessing relevant information, and (3) solving the problem/drawing conclusions. Based on this step, this research seeks to describe students' critical thinking processes in scientific work used by students to compete. The critical thinking process in competitive scientific work needs to be carried out so that students can create quality scientific work that is based on critical thinking in solving problems. This research uses a qualitative approach. This research data is in the form of sentences, sentence groups, paragraphs and complete texts which reflect students' critical thinking processes. Data was obtained from student scientific work that was competed outside campus. The research results show that in terms of the critical thinking process, students' scientific work can be categorized into four types, namely (1) scientific work which shows the three stages of the critical thinking process, namely the stages of recognizing problems, assessing relevant information, and solving problems/drawing out problems; (2) scientific work which only consists of the stage of recognizing problems and solving problems/drawing conclusions, (3) scientific work which consists of the stage of recognizing problems and assessing relevant information, and (4) scientific work which consists of the stage of*

recognizing information. Based on the research results, suggestions can be given to assist students in the critical thinking process so that scientific work is produced with in-depth and accurate discussion so that the scientific work written becomes quality scientific work for competition.

Kata Kunci: Critical Thinking Process, Scientific Work, Competition

INTRODUCTION

One of the life skills that must be possessed in living life in the 21st Century is critical thinking. This is in line with what was stated by the US-based Partnership for 21st Century Skills (P21) which states that the life skills that a person must master in living life in the 21st Century are skills commonly called "The 4Cs", which include communication, collaboration, critical thinking, and problem solving, and creativity. These skills are thought to be able to determine a person's success in life.

Of the four skills stated above, the skill that students really need to master is critical thinking skills. This ability is necessary for students to carry out their academic activities. In fact, the ability to reason, think critically, make decisions, and solve problems is very much needed to support success in the world of work. Previous research results also state that in the educational context, critical thinking can prepare students to think in various scientific disciplines and can be used to prepare students for careers and real life (Changwong, et al., 2018). That is why critical thinking is one aspect that must be formed and developed in higher education.

Critical thinking can be defined as an organized mental process that plays a role in the decision-making or problem-solving process. Facione (2008) states that critical thinking is a form of self-regulation in deciding (judging) something that results in interpretation, analysis, evaluation, and inference, as well as presentation using evidence, concepts, methodology, criteria, or contextual considerations on which it is made. decision. In addition, critical thinking is also an inseparable part of problem-solving activities, creativity, investigation, and decision making (MacKnight, 2000). Therefore, critical thinking also involves aspects of problem solving, investigation, creativity, decision making, including communication.

MacKnight (2000) further stated that critical thinking skills involve communication, speaking, listening, reading, and writing. In fact, more than that, critical thinking skills can be practiced every day in various interactions (MacKnight, 2000). One of them is realized through scientific work. Moreover, scientific work is a form of expressing ideas to solve problems, investigate, create, or communicate ideas so that scientific work reflects critical thinking skills expressed

through language. In other words, students' critical thinking can be observed from the language used in writing scientific papers.

Writing scientific papers is one of the mandatory activities that students must carry out while studying at university. In fact, writing scientific papers is a mandatory requirement for student graduation. However, apart from that, there are also scientific papers written by students to create their own image, shape their character, or compete. Scientific work used for competition requires students to think critically in solving problems because the topics of scientific work for competition are usually topics that are problems in life. Therefore, scientific work for competitions must be based on critical thinking to produce scientific work that is worthy of competition and able to compete with other scientific works in the competition.

In solving problems when writing scientific papers, a thinking process or cognitive process is needed. Hager, et al (2003) mention the process or steps in critical thinking which includes three stages, namely (1) defining and clarifying problems, (2) judging relevant information, and (3) solving problems or drawing conclusions.

Based on the results of initial observations, the quality of scientific work

produced by students varies even though they are from the same institution. This means that some students' scientific works are successful in participating in the competition and some are unsuccessful. This success cannot be separated from the critical thinking process in solving problems outlined in scientific work. Each student who writes scientific papers has a different critical thinking process. Therefore, studies are needed to discuss students' critical thinking processes in scientific work

METHOD

This research uses a qualitative approach. A qualitative approach was used because this research aims to describe students' critical thinking processes in scientific work used for competition. Apart from that, this research data is in the form of verbal data and not numbers so that a qualitative approach is relevant to be used to analyze and interpret the research data.

This research data is in the form of units of ideas contained in students' scientific work. These idea units are realized in sentences, sentence groups, paragraphs and complete text. These idea units reflect students' critical thinking processes because in writing scientific papers, students go through a series of

critical thinking processes which are expressed in idea units in the form of language. Therefore, it is assumed that sentences, sentence groups, paragraphs, paragraph clusters, and the entire text reflect students' critical thinking processes.

The data source for this research is students' scientific work which is used for competitions. The selection of data sources was carried out with the consideration that the scientific work used to compete provides ample opportunities for students to think critically in solving problems. Apart from that, because scientific work is intended for competition, students tend to compose quality scientific work so that the

scientific work they prepare is worthy of competition. One of the ways in which quality scientific work is reflected is the critical thinking that students develop in scientific work. Moreover, students' scientific works used for competition usually have broad and varied topics so that students can express and explore their ideas freely in the scientific works they compose.

In this research, the Nvivo 14 instrument was used to classify research data. Research data is classified based on indicators developed from Hager, et al (2003). The instruments containing data classification indicators are as follows at Table 1.

Table 1 Stages of the Critical Thinking Process and Their Indicators

No	Stage	Indicator
1	Defining and clarifying problems	a. Identifying the main issues or problems b. Comparing similarities and differences c. Selecting relevant information d. Formulating the problem
2	Judging relevant information	a. Selecting facts, opinions, and results of reasoning/judgment b. Checking the consistency c. Identifying assumptions d. Recognizing possible stereotyping factors e. Recognizing possible biases, emotions, propaganda, misinterpretation of sentences f. Recognizing possible differences in value orientations and ideologies
3	Recognize the data needed and determine whether the data is sufficient	a. Recognizing the data needed and determine whether the data is sufficient b. Predicting the possible consequences of decisions/problem solving/conclusions taken

In solving problems, a thinking process or cognitive process is needed. Hager, et al (2003) mention the process or steps in critical thinking which includes

three stages, namely (1) recognizing the problem (defining and clarifying the problem), (2) assessing the problem (judging information), and (3) solving the

problem or drawing conclusions (solving problems/drawing conclusion). In more detail, it was revealed that to carry out these steps, skills called the Twelve Essential Critical Thinking Skills (12 essential skills in critical thinking) are required as stated in Table 1.

RESULT AND DISCISSION

In this section, the results of research on students' critical thinking processes in competitive scientific work are presented. Competitive scientific work requires students to be able to think deeply so that the scientific work written is of good quality so that it is worthy of competition. For this reason, a comprehensive critical thinking process is needed. The thinking process

consists of recognizing problems, assessing relevant information, and solving problems/drawing conclusions.

Each stage of the critical thinking process has indicators. Of the three stages of the critical thinking process, there are twelve indicators. Based on the results of the analysis, not all indicators at each stage were carried out by students as part of the critical thinking process. There are indicators that are carried out by students, but there are also those that are not carried out. The results of the analysis regarding the stages and indicators of the critical thinking process are presented in Table 2 below.

Table 2 Data Analysis Results regarding Students' Critical Thinking Stages in Scientific Work

No	Stage	Indicator	Total
1	Defining and clarifying problems	a. Identifying the main issues or problems	12
		b. Comparing similarities and differences	0
		c. Selecting relevant information	11
		d. Formulating the problem	13
Total			36
2	Judging relevant information	a. Selecting facts, opinions, and results of reasoning/judgment	17
		b. Checking the consistency	0
		c. Identifying assumptions	13
		d. Recognizing possible stereotyping factors	2
		e. Recognizing possible biases, emotions, propaganda, misinterpretation of sentences	0
		f. Recognizing possible differences in value orientations and ideologies	0
Total			32
3		a. Recognizing the data needed and determine whether	16

Recognizing the data needed and determine whether the data is sufficient	the data is sufficient	
	b. Predicting the possible consequences of decisions/problem solving/conclusions taken	13
Total		29

Based on Table 2, it can be seen that the **defining and clarifying the problem stage** has a total of 36 data consisting of indicators for identifying main issues or problems, selecting relevant information, and formulating or formulating problems. At this stage, no data was found on indicators comparing similarities and differences. The **judging relevant information stage** has a total of 32 data consisting of indicators of selecting facts, opinions and reasoning results, identifying assumptions, identifying assumptions and recognizing possible stereotype factors. As for indicators checking consistency, recognizing possible bias, emotions, propaganda, misinterpretation of sentences, and recognizing possible differences in value orientation and ideology, no data was found. The **recognizing the data needed to solve the problem/drawing conclusions stage** has a total of 29 data consisting of indicators for recognizing the required data and determining whether the data is sufficient or not and predicting the possible consequences of the decisions/problem solving/conclusions taken.

The information in Table 2 shows that the defining and clarifying the problem

stage is the stage where the most data is found. This shows that the defining and clarifying the problem stage is a stage that students always go through when writing scientific papers. On the other hand, the problem solving/drawing conclusions stage is the stage with the least data. This shows that not all students have reached the stage of solving problems/drawing conclusions in writing scientific papers. The following is an example of scientific work data that does not present a problem solving/drawing conclusions stage.

Data 1

Dewasa ini penggunaan tisu menjadi salah satu hal yang tidak bisa dilepas dalam kehidupan sehari-hari. Tisu merupakan benda yang dibutuhkan hampir di setiap tempat seperti di rumah, rumah makan, rumah sakit, tempat umum, dan lain-lain. Kita menggunakan tisu karena lebih praktis dibandingkan dengan barang yang berbahan kain. Namun seiring dengan berkembangnya waktu, berkembang pula limbah yang dihasilkan. Maka dari itu kelompok kami memulai sebuah kegiatan usaha dimana usaha ini cukup menjanjikan yaitu meminimalisir penggunaan tisu sekali pakai yang berdampak buruk bagi lingkungan dengan memanfaatkan serat sintesis dari pelepah pisang. (PKMK 2)

(Nowadays, the use of tissue has become one of the things that cannot

be removed in everyday life. Tissue is an item that is needed in almost every place, such as at home, restaurants, hospitals, public places, and so on. We use tissue because it is more practical compared to items made from cloth. However, as time progresses, the waste produced also increases. Therefore, our group started a business activity which is quite promising, namely minimizing the use of single-use tissue which has a bad impact on the environment by using synthetic fibers from banana stems.) (PKMK 2)

Data 1 is an example of the background of scientific work prepared by students. The title of the scientific work written by the students is *Utilization of Banana Leaf Waste to Make Reusable Tissue in Ngrejo Village, Tulungagung Regency*. Against this background, the author points out the problem that is currently occurring, namely the increasing use of tissue and the resulting consequences, namely the increasing amount of waste produced. Based on these considerations, the author provides a solution in the form of making tissue made from synthetic fiber from banana stems as seen at the the sentences *Maka dari itu kelompok kami memulai sebuah kegiatan usaha dimana usaha ini cukup menjanjikan yaitu meminimalisir penggunaan tisu sekali pakai yang berdampak buruk bagi lingkungan dengan memanfaatkan serat*

sintetis dari pelepah pisang. (Therefore, our group started a business activity which is quite promising, namely minimizing the use of single-use tissue which has a bad impact on the environment by utilizing synthetic fiber from banana stems). However, in providing this solution, the author does not provide sufficient data and consideration for the proposed solution through sentence excerpts. Apart from that, the author was also unable to predict the consequences of the solution offered. This makes the accuracy of the solution to the problem offered not clearly visible. This also shows that the author has not demonstrated a sufficient critical thinking process considering that critical thinking does not only describe the ability to think logically, but also the ability to solve real life problems (Karakoc, 2016).

Based on the results of the analysis, the critical thinking processes found in students' scientific work vary. This diversity can be classified as follows: (1) scientific work that shows the three stages of the critical thinking process, namely the stages of recognizing problems, assessing relevant information, and solving problems/drawing out problems; (2) scientific work which only consists of the stage of recognizing problems and solving problems/drawing conclusions, (3)

scientific work which consists of the stage of recognizing problems and assessing relevant information, and (4) scientific work which consists of the stage of recognizing information. These findings are explained in the following data.

Data 2

Indonesia merupakan negara tropis yang menerima sinar matahari dengan intensitas yang tinggi. Intensitas paparan sinar matahari yang tidak diimbangi dengan upaya merawatnya dapat menyebabkan kulit mengalami perubahan warna menjadi lebih gelap, tampak kusam, dan menyebabkan sel kulit mati, dan merusak kesehatan kulit. (PKMK 1)
(Indonesia is a tropical country that receives high intensity sunlight. Intensity exposure to sunlight that is not balanced with efforts to care for it can cause the skin to change color to a darker color, appear dull, and cause skin cells to die, and damage skin health.) (PKMK 1)

Data 3

Sel kulit mati disebabkan karena menumpuknya hasil dari terjadinya regenerasi tersebut (Pangaribuan, 2016). Hal ini menyebabkan kulit tampak gelap dan mengurangi rasa percaya diri. (PKMK 1)
(Dead skin cells are caused by the accumulation of the results of regeneration (Pangaribuan, 2016). This causes the skin to appear dark and reduces self-confidence.) (PKMK 1)

Data 4

Penggunaan bahan kimia secara intens dapat meninggalkan racun pada kulit. Kandungan Sodium Lauryl Sulfate (SLS) berpotensi meninggalkan iritasi kulit. (PKMK 1)
(Intense use of chemicals can leave toxins on the skin. The Sodium Lauryl

Sulfate (SLS) content has the potential to cause skin irritation.) (PKMK 1)

Data 2—4 is an example of the problem recognition stage. Data 2 is the stage of recognizing problems in the indicator of recognizing the main issue or problem. In this data, the author shows the main problem discussed in this scientific work, namely the condition of Indonesia, which is a tropical country with high sun intensity which can cause dull skin. The stage of recognizing the issues stated in Data 2 is then continued by formulating the problem as stated in Data 3. In Data 3, the author shows the factors that cause skin to become dull. Furthermore, in Data 4, the author formulates the problem, namely that the use of chemicals in cosmetics used to treat dull skin can actually cause skin irritation.

Based on Data 2-4, the author provides relevant information related to the issue discussed, namely the causes of dull skin along with the facts that exist so far. This stage of recognizing detailed issues will make the reader understand the topic being discussed because the information presented is accurate. Moreover, this scientific work is a competitive scientific work so the author needs to convince readers that the issues discussed are indeed important for further study (Syahrin, et al., 2019).

At the stage of assessing relevant

information, the author presents information that is relevant to the issues discussed in the scientific work. At this stage, the author presents facts, opinions, results of reasoning, or assumptions that support the propositions presented by the author in his scientific work. The stage of assessing the information presented in Data 5-7 below.

Data 5

Beberapa produk keratin treatment mengandung formalin. Menurut badan kesehatan Amerika Serikat, Centers of Disease Control (CDC), formalin dapat berfungsi menghaluskan dan meluruskan rambut tersebut umumnya tidak berwarna, berbau gas pekat, dan banyak digunakan untuk bahan material bangunan. Formalin berpotensi menyebabkan kanker bila terekspos dalam waktu yang cukup lama pada bagian tubuh. Maneli et al., (2014), menyatakan kandungan formalin dalam bahan kosmetik tidak lebih dari 0.002%. (PKMK 5)

(Some keratin treatment products contain formaldehyde. According to the United States health agency, the Centers of Disease Control (CDC), formalin can function to soften and straighten hair. It is generally colorless, smells of thick gas, and is widely used as building materials. Formalin has the potential to cause cancer if exposed to parts of the body for a long time. Maneli et al., (2014), stated that the formaldehyde content in cosmetic ingredients is not more than 0.002%.) (PKMK 5)

Data 6

Ketika menjalani kehidupan di penjara, WBP sering mendapatkan stigma negatif dari masyarakat masyarakat. Seseorang yang berstatus mantan WBP atau narapidana sulit mendapatkan kepercayaan dan tanggung jawab dari masyarakat sehingga mereka sulit mendapat pekerjaan setelah masa hukuman selesai (Utari et al., 2013). Dampaknya, banyak di antara mantan WBP yang kembali melakukan tindak kriminal karena himpitan ekonomi dan stigma negatif menyebabkan mereka tidak bisa mendapatkan pekerjaan. (PKMPM 1)

(When living life in prison, inmates often receive negative stigma from the community. It is difficult for someone who has the status of a former WBP or convict to gain trust and responsibility from the community, so it is difficult for them to get a job after their sentence is over (Utari et al., 2013). As a result, many former PWBPs return to committing crimes because economic pressure and negative stigma mean they cannot find work.) (PKMPM 1)

Data 7

Pernikahan dini di lingkungan remaja cenderung berdampak negatif baik dari segi sosial ekonomi, mental/psikologis, fisik, terutama bagi kesehatan reproduksi sang remaja tersebut. Dampak dari pernikahan usia dini kesehatan reproduksi salah satunya yaitu perempuan usia 15-19 tahun memiliki kemungkinan dua kali lebih besar meninggal saat melahirkan dibandingkan yang berusia 20-25 tahun, sedangkan usia di bawah 15 tahun kemungkinan meninggal bisa lima kali. Perempuan muda yang

sedang hamil akan mengalami beberapa hal, seperti akan mengalami pendarahan, keguguran, dan persalinan yang lama atau sulit (Lubis & Nurwati, 2021), Usia minimal menikah yang baik menurut Badan Koordinasi Keluarga Berencana Nasional (BKKBN) adalah 21 tahun untuk perempuan dan usia 25 tahun untuk laki-laki (Gusti, 2016). Upaya yang dilakukan oleh BKKBN dalam upaya pencegahan pernikahan dini adalah melalui program Pendewasaan Usia Perkawinan (PUP). (PKMPM 3)

(Early marriage among teenagers tends to have a negative impact both from a socio-economic, mental/psychological and physical perspective, especially on the reproductive health of the teenager. One of the impacts of early marriage on reproductive health is that women aged 15-19 years are twice as likely to die during childbirth as those aged 20-25 years, while those aged under 15 years are five times more likely to die. Young women who are pregnant will experience several things, such as bleeding, miscarriage, and long or difficult labor (Lubis & Nurwati, 2021). The minimum age for marriage according to the National Family Planning Coordinating Board (BKKBN) is 21 years for women. and age 25 years for men (Gusti, 2016). The efforts made by the BKKBN to prevent early marriage are through the Marriage Age Maturation (PUP) program.) (PKMPM 3)

Data 5—6 is an example of critical thinking process data at the stage of assessing relevant information. In this data, the author presents facts relevant to the issue or topic of scientific work in the form of quotations from various sources. Apart from that, in Data 5-6, the author also shows

reasoning in looking at the issues discussed. Providing reasoning is an important stage in critical thinking because critical thinking is an ability related to assessing, assessing, or evaluating a problem or topic, as well as evaluating your own reasons (DeWaelche, S.A., 2015). In other words, critical thinking is an attempt to make sense of the proposition put forward by the author. Being reasonable means showing reasonable reasons or judgments which are carried out by involving your reasoning power to evaluate or assess the validity of the information and opinions encountered (Priyatni & Martutik, 2018). Therefore, critical thinking is an attempt to involve information and values from outside to evaluate the propositions offered which are ultimately accepted as truth (Facione, 2015). That is why critical thinking is also called logical thinking and analytical thinking (Cotton, 1991).

In this research, scientific works were also found with data and facts that were not relevant to the issue or topic of the scientific work. This shows that students are unable to recognize problems so that students are unable to recognize relevant information and the problem solutions offered are not relevant to the supporting data presented. The following is an example of the data.

Data 8

Dari data di atas menunjukkan bahwa SMA Negeri 1 Kota Malang

memiliki 7 ekstrakurikuler, 967 peserta didik, 66 guru, dan 26 karyawan. Selain itu, SMA Negeri 1 Kota Malang juga menyelenggarakan kelas lintas minat bahasa asing, antara lain yaitu: kelas Bahasa Jerman, Prancis, Arab, Jepang, dan Mandarin. Namun, menurut studi lapangan yang telah dilakukan, kelas bahasa asing tidak berjalan dengan baik. Khususnya pada kelas Bahasa Mandarin. Hal ini ditandai dengan kurangnya kemampuan tenaga ahli dalam memberikan materi mengenai kebudayaan dan Bahasa Mandarin. Tim telah mewawancarai narasumber alumni dari SMA Negeri 1 Malang, narasumber mengatakan dalam partisipasinya, sebanyak 30 siswa mengikuti kelas Bahasa Mandarin. Namun, kelas tersebut berjalan dengan kurang baik dikarenakan keterbatasan jumlah pengajar berbanding terbalik dengan banyaknya siswa/i yang harus diajar. (PKMPM 4)

(From the data above, it shows that SMA Negeri 1 Malang City has 7 extracurricular activities, 967 students, 66 teachers and 26 employees. Apart from that, SMA Negeri 1 Malang City also holds cross-interest foreign language classes, including: German, French, Arabic, Japanese and Mandarin classes. However, according to field studies that have been conducted, foreign language classes are not running well. especially in Mandarin classes. This is characterized by a lack of expert ability in providing material regarding culture and Mandarin. The team interviewed alumni sources from SMA Negeri 1 Malang, sources said that in their participation, as many as 30 students took Mandarin classes. However, the

class did not run well because the limited number of teachers was inversely proportional to the number of students who had to be taught.) (PKMPM 4)

Data 8 is an example of critical thinking process data that is not relevant to the issues raised in scientific work. The issues raised in this scientific work are the introduction of Chinese clothing culture and learning Mandarin for students at SMA Negeri 1 Malang. However, the information presented is information about the number and effectiveness of extracurricular activities at SMA Negeri 1 Malang, the location discussed in the scientific work. This scientific work does not specifically discuss the introduction of Chinese culture as is the issue raised in the scientific work. This shows that the author cannot recognize the issues being discussed so that the information presented is not in line with the issues raised. In fact, providing relevant information and evidence is an important part of the critical thinking process in scientific investigation (White, et al., 2011).

The results of the analysis show that in the scientific work being analyzed there is a stage of solving the problem/drawing conclusions, although most of it only consists of indicators for recognizing the required data and determining whether the data is sufficient. Only some scientific

works present indicators predicting the possible consequences of decisions/problem solving/conclusions taken. The following is an example of critical thinking process data at the problem solving/drawing conclusions stage.

Data 9

Berdasarkan permasalahan tersebut penulis berinisiatif untuk merancang program *Lapas Farmers* guna memberikan edukasi bagi pengelola lapas guna mempunyai keterampilan tentang cara mengajar dan mendampingi WBP belajar *agriprenurship*. Dalam *Program Lapas Farmers* penulis memberikan program edukasi berupa kegiatan *edupreneur* berbasis akuaponik yang dapat diterapkan di dalam Lapas. Pelaksanaan program *Lapas Farmers* dilakukan dengan memberikan edukasi budidaya tanaman berbasis akuaponik mulai dari penanaman, perancangan bisnis, hingga pemasaran. Adapun sasaran dari program pelatihan ini adalah beberapa pengelola lapas yang akan dibantu oleh Warga Binaan. Akuaponik merupakan sistem akuakultur yang dikombinasikan dengan budidaya tanaman tanpa tanah. Pada sistem ini nantinya akan dilakukan budidaya lele yang dikombinasikan dengan tanaman sayur. Keberadaan system ini cocok diterapkan di lapas ini mengingat, terbatasnya lahan pertanian yang dimiliki. (PKMPM 1)

(Based on these problems, the author took the initiative to design the Prison Farmers program to provide education for prison managers to have skills on how to teach and assist inmates in learning agriprenurship. In the Farmers Prison Program, the author provides an educational program in the form of aquaponics-based educational activities that can

be implemented in prisons. The implementation of the Lapas Farmers program is carried out by providing education on aquaponic-based plant cultivation starting from planting, business planning, to marketing. The targets of this training program are several prison managers who will be assisted by inmates. Aquaponics is an aquaculture system combined with cultivating plants without soil. In this system, catfish cultivation will be carried out in combination with vegetable crops. The existence of this system is suitable to be implemented in this prison considering the limited agricultural land it has.) (PKMPM 1)

Data 10

Lembaga Pemasyarakatan merupakan sarana untuk Warga Binaan untuk memperbaiki diri sebelum mereka terjun ke masyarakat. Melalui program edukasi berbasis *agriprenurship* yang diedukasikan bagi pengelola lapas Bersama warga binaan agar dapat menjadi bekal bagi warga binaan untuk memberikan keterampilan menciptakan lapangan pekerjaan baru di tengah-tengah masyarakat. Sehingga hal tersebut dapat mengurangi stigma negative dan menjadikan profesi tersendiri bagi mereka. Kurangnya kemampuan warga binaan serta kurang optimalnya Lembaga pemasyarakatan dalam memberikan pelatihan keprofesian agar dapat menjadi keterampilan khusus bagi warga binaan menjadi alasan utama perumusan program ini. Melalui program ini penulis memberikan edukasi berupa program edukasi *agriprenurship* berbasis akuaponik. Dengan adanya program para pengelola lapas dapat memberikan edukasi bagi warga binaan yang nantinya dapat berguna

ketika mereka terjun ke masyarakat. Mengingat peluang dari bisnis berbasis akuaponik yang berpotensi baik, serta efisien untuk diterapkan di Lapas karena tidak membutuhkan biaya besar serta lahan yang luas. (PKMPPM 1)

(Correctional Institutions are a means for inmates to improve themselves before they enter society. Through an agripreneurship-based education program that is provided for prison administrators together with inmates so that they can provide provisions for inmates to provide skills to create new jobs in the community. So this can reduce the negative stigma and make it a separate profession for them. The lack of ability of the inmates and the lack of optimality of correctional institutions in providing professional training so that they can become special skills for the inmates are the main reasons for the formulation of this program. Through this program the author provides education in the form of an agripreneurship education program based on aquaponics. With this program, prison administrators can provide education for inmates which will later be useful when they enter society. Considering the opportunity for an aquaponics-based business that has good potential and is efficient to implement in prisons because it does not require large costs and large areas of land.) (PKMPPM 1)

Data 11

Dari permasalahan di atas, tim mengusulkan kegiatan program pengenalan negara Cina dengan mengenalkan kebudayaan Cina dan Bahasa Mandarin itu sendiri di salah satu SMA Negeri di Malang.

(PKMPPM 4)

(Based on the problems above, the team proposed an introduction to China program by introducing Chinese culture and the Mandarin language itself at one of the state high schools in Malang.) (PKMPPM 4)

Data 9 is an example of the critical thinking process at the stage of solving problems/drawing conclusions on the indicators of recognizing the data needed and determining whether the data is sufficient. In Data 9, the author draws conclusions about the problem solving efforts offered along with a description of the implementation of the problem solving. Furthermore, the author also predicts the consequences of the solution offered as stated in Data 10. In Data 10, the author shows things that might happen due to the implementation of the solution offered in Data 9. Predicting the consequences of the solution taken is also an important stage of critical thinking remembering that critical thinking is a working mechanism for the brain to discover real experiences (Maltepe, 2016).

In contrast to Data 10, Data 11 only shows the stage of solving the problem, but is not followed by predicting the possible consequences of the solution taken. The author also does not indicate what will be done for the solution taken so that the data

presented to solve the problem is still not enough. In fact, Ennis (1987) states that critical thinking is reasonable and reflective thinking that focuses on making decisions on what to believe or do. In this case, providing sufficient data greatly influences decision making and what should be done regarding that decision making.

CONCLUSION

Based on the results of data analysis, it can be concluded that the critical thinking processes contained in students' scientific work are varied. Various critical thinking processes in student scientific work are in the form of (1) scientific work that shows the three stages of the critical thinking process, namely the stages of recognizing problems, assessing relevant information, and solving problems/drawing out problems; (2) scientific work which only consists of the stage of recognizing problems and solving problems/drawing conclusions, (3) scientific work which consists of the stage of recognizing problems and assessing relevant information, and (4) scientific work which consists of the stage of recognizing information. The differences in critical thinking processes contained in students' scientific work cause the quality of students' scientific work to also vary so that there are scientific works that are able to compete in competitions and some that are not. The incompleteness of the critical thinking

process causes the scientific work produced to be less accurate and less logical, making it less suitable for use in competitions.

The results of this research show that not all student scientific works used for competition contain sufficient stages of critical thinking. Therefore, recommendations can be given to accompanying lecturers or institutions to provide intensive assistance while students are writing scientific papers so that the critical thinking process is presented comprehensively so that quality scientific work is produced. In addition, this research does not compare the process of scientific work based on scientific knowledge. Therefore, recommendations can be given to future research to compare critical thinking processes in scientific work based on knowledge groups so that a comprehensive picture of the critical thinking process in scientific work based on knowledge groups can be obtained.

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