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Reconstruction of Laboratory Activity Design Using Vee Diagram Analysis on Blood Type Test Based on ABO System in High School

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Abstract: *Practicum is a series of activities that allow students to apply their skills to produce proof of a concept being studied, practicum focuses on the design of laboratory activities (DKL) that are first prepared by educators or school institutions. The purpose of this study was to analyze and reconstruct DKL blood type tests based on the ABO system taken from a collection of DKL at a school, the DKL analysis used an instrument based on the Novak & Gowin (1984) vee diagram. The method used in this study was descriptive qualitative, sampling was carried out by purposive sampling with one DKL blood type test ABO system taken from the practicum guidelines at a school compiled by the science lab team. Research activities follow the ANCOR stages (Analysis, Trial and Reconstruction). The results of the analyzed DKL research showed a value of 50% which means it is sufficient to be used, but there are deficiencies in the focus questions, records/data transformations, knowledge claims that are not in accordance with the vee diagram, so that a reconstruction is carried out which is expected to optimize the DKL in accordance with the vee diagram according to Novak & Gowin (1984) used by students and can support the objectives of the practicum activities.*

Keywords: *Laboratory Activity Design, Blood Type Based on the ABO system, Vee Diagram*

1. INTRODUCTION

Practicum is an important part and effort in achieving science learning goals. The science learning process discusses objects on earth that require activities to involve, see, handle and manipulate. In the process of implementing practicum, there are activities involving doing, acting and proving a concept, so that in this case practicum becomes a fundamental part of the science learning process (Millar, 2001; Ramadhayanti, 2020).

Practicum can be interpreted as a series of learning activities carried out by students, to be able to implement their skills, to arrive at a proof of concept. The practicum activities carried out require an effort to be able to test, apply and scientifically prove a theory studied. In addition, practicum activities also make a great contribution to building world civilization through innovative actions in knowledge (Millar, 2001). The main objectives of this practicum activity are: (1) helping students to develop knowledge about ideas, concepts and theories about science (2) helping students to learn the use of scientific tools and scientific procedures, (3) developing the understanding and knowledge that students have by using an inquiry approach (Fadlurrohman *et al*., 2022; Millar & Abrahamas, 2009). Practicum activities can help students connect two domains, namely (1) the realm of objects and (2) the realm of ideas, which is expected to be an effort to improve the understanding of material concepts, improve student learning and grow scientific attitudes. Practicum activities can also give a complete impression and the process of meaning to students (Vikram, 2020; Supriatno, 2009).

As for the process of implementing practicum activities at school, they are more likely

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to work according to the instructions given by the teacher, so that the goals and development of students through practicum have not been maximized. One of the science subjects that has the potential to be developed through practicum activities is biology learning. Biology learning in schools has a lot of content discussions, one of which is the circulatory system material. This material is at the high school level in grade XI, which generally discusses the concept of blood and the organs that play a role in it. Learning about this material is considered difficult, because it has complex discussions and complicated terms (Nisak, 2021). In the circulatory system material, there are practicum activities that can be carried out by students, one of which is the ABO system blood type test practicum. The ABO system blood type test practicum is important for students to know because it is an important thing, related to blood transfusions, organ transplants, medical emergencies, and understanding personal health. To observe the ABO system blood type test, it can be done in practicum at the high school level.

Practicum activities carried out by students, in general, refer to the design of laboratory activities (DKL) given. DKL spread across schools has several aspects that have not been maximized, such as developing, facilitating and exploring students' abilities and skills through practicum activities. This can certainly have an impact on the interpretation process of the practicum activities carried out. According to research conducted by Supriatno (2013) on the initial analysis of DKL in the form of LKS on several aspects such as (1) the objective aspect, where the practicum emphasizes more on the cognitive aspect, (2) on the aspect of the approach carried out, more on the deductive approach by verifying a concept, (3) on the procedural aspect, the research carried out more activities that lead students to instruct, So that there are no steps that students can develop independently and (4) in the material aspect, the laboratory practicum activities carried out do not develop the essence, suitability, and complexity of the material being studied. Furthermore, according to research conducted by Asrianengsi (2018), the DKL used by schools is not in accordance with the 2013 curriculum so that this can be a problem for DKL, further stating that there are several aspects that are not in accordance with the DKL, such as: (1) there is no discipline, (2) there is no approach in practicum, (3) the objectives of practicum are still general, (4) the work steps taken by students have not emphasized finding answers independently by developing systematic, critical, logical and analytical thinking skills, (6) the questions given emphasize more on memorization and remembering.

Problems related to DKL certainly need improvement, this is one of the efforts to prepare future generations. The DKL used by students should be able to build knowledge and develop students' thinking skills through practicum (Putri, 2020). In this study, the guidelines for the preparation of DKL refer to the Vee Diagram according to Novak & Gowin (1984). Vee diagrams are visual representation tools in the form of diagrams with the letter V that are used to solve problems and understand a concept (Novak & Gowin, 1984). Vee diagrams have two parts, namely the conceptual part and the methodology part, both parts are related to theory and practice that refer to the development of knowledge and skills possessed by students (Huzaifah *et al*., 2017). So based on the above background, in this study, DKL analysis was carried out on the ABO blood type test which aims to analyze and construct DKL. The results of the DKL reconstruction are expected to maximize the objectives, provide more effective guidance and the essence of the ABO system blood type test practicum.

2. RESEARCH METHOD

The method used in this study is qualitative descriptive, while the purpose is to explain the state of the object/phenomenon obtained in depth (Sugiyono, 2012). Sampling of the research was carried out by *purposive sampling* with one DKL of the ABO system blood type test taken from the practicum guidelines in a school prepared by the science lab team. The research activity follows the ANCOR (Analysis, Trial and Reconstruction) stage which is adapted from Supriatno's (2013) research. The instrument used is adapted from Novak & Gowin (1984) based on the Vee Diagram scoring table which consists of five aspects, namely *focus question*, object/event, concept/principle, record/*transformtions* and *knowledge claim*. The rubric of examining the Vee Diagram can be seen in Table 1.

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Table 1. Vee Diagram Score Rubric (Novak & Gowin, 1984)

	Focus question
0	No focus questions identified
1	Focus questions are identified but do not guide the acquisition of events/concepts
2	Focus question teridentifikasi; memandu perolehan event/konsep; terdapat event yang salah sehingga menghasilkan data yang salah
3	Focus questions are identified and can be used to generate appropriate events and data
	Events
0	No object/event identified
1	Primary events identified but inconsistent with focus questions
2	Key events identified and consistent with focus questions
3	Major events identified; consistent with focus questions; can be used to record data
	Concept/principles
0	No concept identified
1	Concepts identified but without principles and theories
2	The concept is identified and there is one principle (conceptual/procedural); or relevant concepts and theories identified
3	Concepts and principles (conceptual and procedural) are identified; or concept, one of the relevant principles and theories identified.
4	Concepts and principles (conceptual and procedural) as well as relevant theories are identified.
	Records/transformtions
0	No record/transformation identified
1	Record identified but inconsistent with focus question/event
2	One (record/transformation) is identified and consistent with the focus question/event
3	Record/transformation identified; record according to the event; transformations are inconsistent with focus questions.
4	Record and transformation identified; record according to the event; transformations consistent with focus questions; and lab activities according to the student's level
	Knowledge claim
0	No knowledge claims have been identified.
1	Knowledge claims are not related to concepts, principles, and theories
2	Knowledge claims include concepts that can be used to relate but are inconsistent with records and transformations
3	Knowledge claims include concepts that can be used to relate to and be consistent with records and transformations
4	Knowledge claims include concepts that can be used to correlate; consistent with records and transformations; can be used to create a new focus question.

After further analysis using the Vee Diagram instrument, the data obtained is calculated using a formula and interpreted into the criteria in Table 2 below

$$\mathbf{P} = \frac{\boldsymbol{F}}{\boldsymbol{N}} \times \mathbf{100\ \%}$$

Information:
P = Number of percentage points
F = Number of points obtained
N = Total number of scores

Table 2. DKL Category Interpretation (Sugiyono, 2012)

Value Interval (%)	Criteria
81 – 100 %	Very good
61 – 80 %	Good
41 – 60 %	Enough
21 – 40 %	Less
0 – 20	Very Less

3. RESULTS AND DISCUSSION

A. Laboratory Activity Design Analysis Using Vee Diagrams

The DKL analyzed is the DKL used in a school made by the science lab team at the school. The following DKL analysis can be seen in Figure 1.

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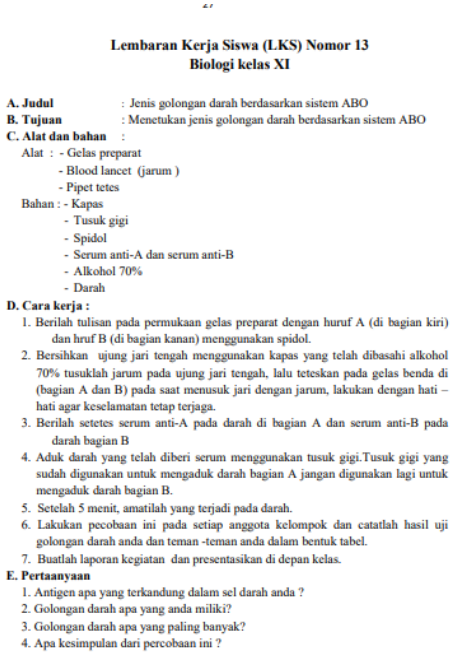

Lembaran Kerja Siswa (LKS) Nomor 13
Biologi kelas XI

A. Judul : Jenis golongan darah berdasarkan sistem ABO
B. Tujuan : Menetukan jenis golongan darah berdasarkan sistem ABO
C. Alat dan bahan :
Alat : - Gelas preparat
- Blood lancet (jarum)
- Pipet tetes
Bahan : - Kapas
- Tusuk gigi
- Spidol
- Serum anti-A dan serum anti-B
- Alkohol 70%
- Darah
D. Cara kerja :
1. Berilah tulisan pada permukaan gelas preparat dengan huruf A (di bagian kiri) dan hruf B (di bagian kanan) menggunakan spidol.
2. Bersihkan ujung jari tengah menggunakan kapas yang telah dibasahi alkohol 70% tusuklah jarum pada ujung jari tengah, lalu teteskan pada gelas benda di (bagian A dan B) pada saat menusuk jari dengan jarum, lakukan dengan hati – hati agar keselamatan tetap terjaga.
3. Berilah setetes serum anti-A pada darah di bagian A dan serum anti-B pada darah bagian B
4. Aduk darah yang telah diberi serum menggunakan tusuk gigi.Tusuk gigi yang sudah digunakan untuk mengaduk darah bagian A jangan digunakan lagi untuk mengaduk darah bagian B.
5. Setelah 5 menit, amatilah yang terjadi pada darah.
6. Lakukan pecobaan ini pada setiap anggota kelompok dan catatlah hasil uji golongan darah anda dan teman -teman anda dalam bentuk tabel.
7. Buatlah laporan kegiatan dan presentasikan di depan kelas.

E. Pertaanyaan
1. Antigen apa yang terkandung dalam sel darah anda ?
2. Golongan darah apa yang anda miliki?
3. Golongan darah apa yang paling banyak?
4. Apa kesimpulan dari percobaan ini ?

Figure 1. DKL Analyzed

The DKL analysis used refers to the Vee Diagram instrument component developed by Novak & Gowin (1984). The following are the results of the DKL analysis of the ABO system blood type test in Table 3, using the Vee Diagram.

Table 3. Results of DKL Analysis of ABO System Blood Type Test

No	Aspects observed	Score
1.	*Focus question*	3
2.	*Events*	3
3.	*Concept/principles*	2
4.	*Records/transformtions*	1
5.	*Knowledge claim*	0
	Total Score	9
	Category	50% (Enough)

Based on the results of the analysis of the existence of the Vee Diagram components contained in the DKL, it can be known that the focus question in the DKL is present and implied in the title, but in this case the focus question only reaches the level of knowing the type of blood type based on the ABO system without being associated with blood transfusion activity. The association of blood type with blood transfusion activity is described in the achievement of KD and KI. In KD, students are expected to be able to **"Explain the importance of blood type in blood transfusion activities"** and in KI, students are expected to be able to "**Conduct blood type experiments and associate them with blood transfusion activities** and make blood type experiment reports". In this case, the focus question section is still not optimal.

Objects/events in DKL if they refer to focus questions by determining the type of group based on the ABO system are appropriate. The use of tools and materials used to form objects/events is identified, but the number specifications have not been written on the tools and materials used.

Concepts/principles in DKL exist and are implied, while concepts/principles can be analyzed based on theoretical basis, test results and questions (Novak & Gowin, 1985). In addition, according to Deratama *et al* (2020) in the introduction, the existence of a theoretical foundation can direct students to the concept of practicum to be carried out and can make students more interested and challenged in the process of practicum activities carried out.

Records/*data transformations* in DKL do not yet exist. In DKL, students are only directed to record data and have not yet reached the process of **transforming** data. The process of data transformation needs to be carried out, this can help students in focusing the observation process, which leads to the process of preparing answers to focus questions and knowledge claims (Novak & Gowin, 1985). Adpaun, if there is no data transformation process, it can lead to errors or irrelevant students in claiming knowledge (Istawa *et al*., 2020).

Knowledge claims in the DKL have not yet existed, this is also in line with statements related to **records**/*data transformations*. The practicum activities carried out by students in their implementation only verify, ask about objects/phenomena that appear and observe. So that students are not directed to the process of forming theories, principles and concepts that form knowledge claims. Knowledge claims made by students can be processed in the formation of concepts and in line with the results of the inquiry which can lead to answering focus questions in the DKL (Calais, 2009).

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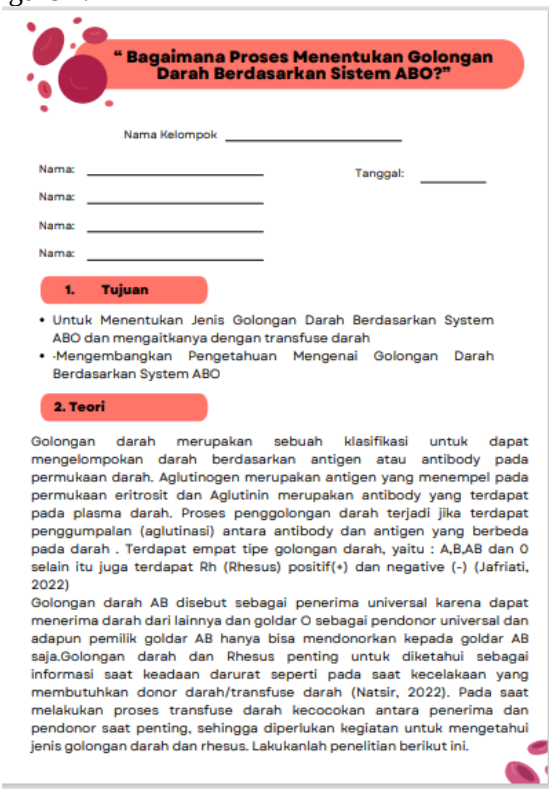
B. Laboratory Activity Design Reconstruction

In this section, it is explained about the reconstruction of the DKL, based on the results of the analysis using the Vee Diagram on the DKL blood type test based on the ABO system. Reconstruction is based on the results of analysis and trials by identifying aspects that have not been maximized in DKL. The purpose of this reconstruction is expected to optimize the use of DKL in building knowledge in students.

The preparation of DKL for laboratory activities is also expected to be a benchmark of the goals and the cognitive targets of students, in addition to the implementation of the curriculum that leads to student interaction and the content in question. The interaction of students can develop knowledge so that there is a transformation that makes practicum activities an experience, in addition to that, students also have applicative skills in transforming content into knowledge, experience and competence (Muzzaki, 2021; Rahmatilla *et al*., 2017). The following are the results of the reconstruction of the DKL of the ABO system blood type test which can be seen in Figure 2.



" Bagaimana Proses Menentukan Golongan Darah Berdasarkan Sistem ABO?"

Nama Kelompok _____

Nama: _____ Tanggal: _____

Nama: _____

Nama: _____

Nama: _____

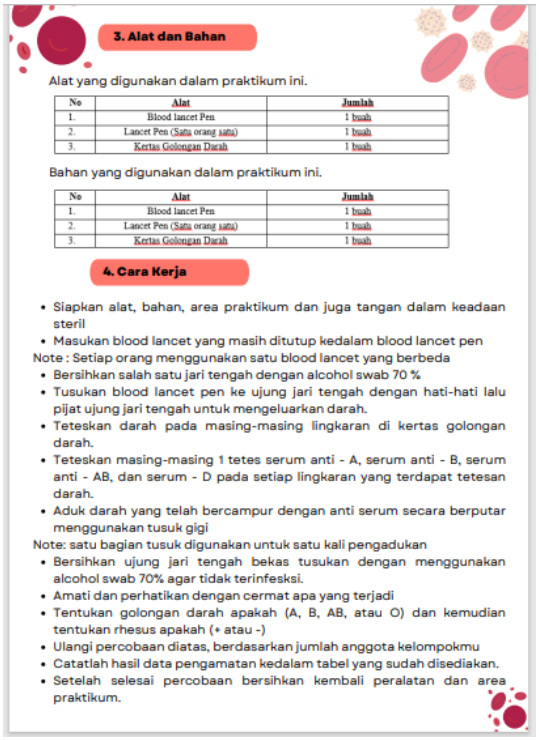
1. Tujuan

- Untuk Menentukan Jenis Golongan Darah Berdasarkan System ABO dan mengaitkanya dengan transfuse darah
- -Mengembangkan Pengetahuan Mengenai Golongan Darah Berdasarkan System ABO

2. Teori

Golongan darah merupakan sebuah klasifikasi untuk dapat mengelompokan darah berdasarkan antigen atau antibody pada permukaan darah. Aglutinogen merupakan antigen yang menempel pada permukaan eritrosit dan Aglutinin merupakan antibody yang terdapat pada plasma darah. Proses penggolongan darah terjadi jika terdapat penggumpalan (aglutinasi) antara antibody dan antigen yang berbeda pada darah . Terdapat empat tipe golongan darah, yaitu : A,B,AB dan 0 selain itu juga terdapat Rh (Rhesus) positif(+) dan negative (-) (Jafriati, 2022)

Golongan darah AB disebut sebagai penerima universal karena dapat menerima darah dari lainnya dan goldar O sebagai pendonor universal dan adapun pemilik goldar AB hanya bisa mendonorkan kepada goldar AB saja.Golongan darah dan Rhesus penting untuk diketahui sebagai informasi saat keadaan darurat seperti pada saat kecelakaan yang membutuhkan donor darah/transfuse darah (Natsir, 2022). Pada saat melakukan proses transfuse darah kecocokan antara penerima dan pendonor saat penting, sehingga diperlukan kegiatan untuk mengetahui jenis golongan darah dan rhesus. Lakukanlah penelitian berikut ini.



3. Alat dan Bahan

Alat yang digunakan dalam praktikum ini.

No	Alat	Jumlah
1.	Blood lancet Pen	1 buah
2.	Lancet Pen (Satu orang satu)	1 buah
3.	Kertas Golongan Darah	1 buah

Bahan yang digunakan dalam praktikum ini.

No	Alat	Jumlah
1.	Blood lancet Pen	1 buah
2.	Lancet Pen (Satu orang satu)	1 buah
3.	Kertas Golongan Darah	1 buah

4. Cara Kerja

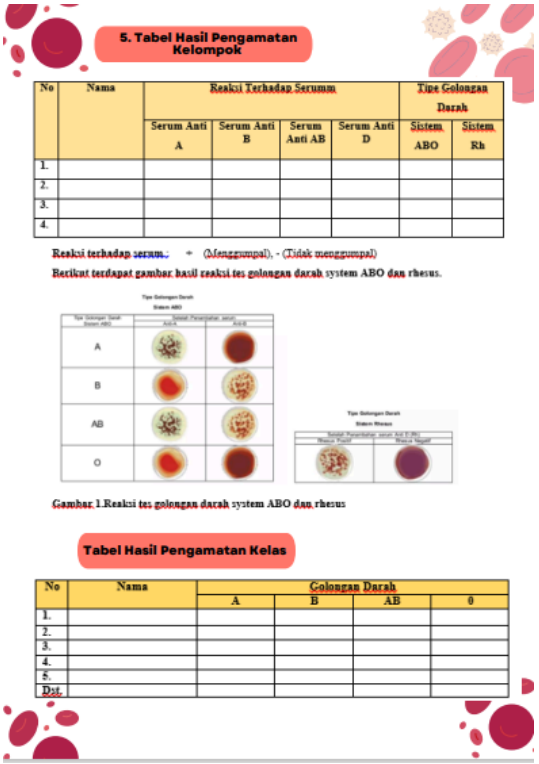
- Siapkan alat, bahan, area praktikum dan juga tangan dalam keadaan steril
- Masukan blood lancet yang masih ditutup kedalam blood lancet pen

Note : Setiap orang menggunakan satu blood lancet yang berbeda

- Bersihkan salah satu jari tengah dengan alcohol swab 70 %
- Tusukan blood lancet pen ke ujung jari tengah dengan hati-hati lalu pijat ujung jari tengah untuk mengeluarkan darah.
- Teteskan darah pada masing-masing lingkaran di kertas golongan darah.
- Teteskan masing-masing 1 tetes serum anti - A, serum anti - B, serum anti - AB, dan serum - D pada setiap lingkaran yang terdapat tetesan darah.
- Aduk darah yang telah bercampur dengan anti serum secara berputar menggunakan tusuk gigi

Note: satu bagian tusuk digunakan untuk satu kali pengadukan

- Bersihkan ujung jari tengah bekas tusukan dengan menggunakan alcohol swab 70% agar tidak terinfeksksi.
- Amati dan perhatikan dengan cermat apa yang terjadi
- Tentukan golongan darah apakah (A, B, AB, atau O) dan kemudian tentukan rhesus apakah (+ atau -)
- Ulangi percobaan diatas, berdasarkan jumlah anggota kelompokmu
- Catatlah hasil data pengamatan kedalam tabel yang sudah disediakan.
- Setelah selesai percobaan bersihkan kembali peralatan dan area praktikum.



5. Tabel Hasil Pengamatan Kelompok

No	Nama	Reaksi Terhadap Serumm				Tipe Golongan Darah	
		Serum Anti A	Serum Anti B	Serum Anti AB	Serum Anti D	Sistem ABO	Sistem Rh
1.							
2.							
3.							
4.							

Reaksi terhadap serum : + (Menggumpal), - (Tidak menggumpal)

Berikut terdapat gambar hasil reaksi tes golongan darah system ABO dan rhesus.

Gambar 1.Reaksi tes golongan darah system ABO dan rhesus

Tabel Hasil Pengamatan Kelas

No	Nama	Golongan Darah			
		A	B	AB	0
1.					
2.					
3.					
4.					
5.					
Dst.					

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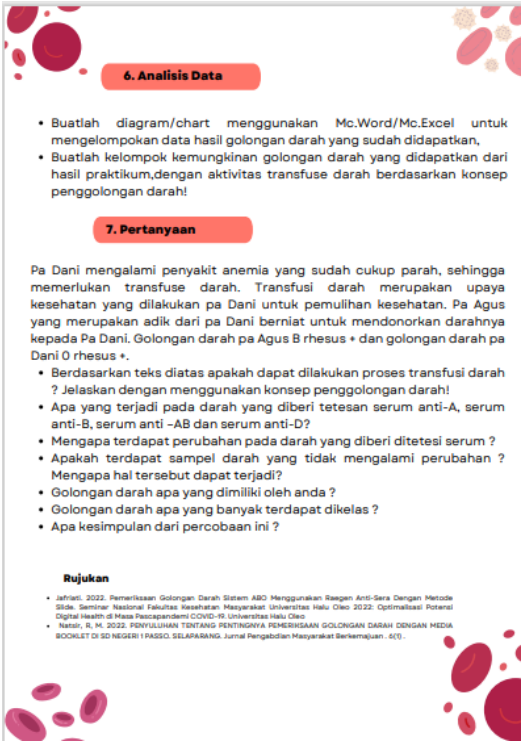

Figure 2. Results of DKL Reconstruction of ABO System Blood Type Test

DKL used as a practicum guide should be able to provide opportunities to students and develop the abilities that students already have in the acquisition of objects (*events*) that are observed that lead to the formation of knowledge (Supriatno, 2018).

4. CONCLUSION

Practicum activities are an effort to optimize learning, but there are still many DKL that are scattered and cannot cover the components that should exist. Based on the results of the analysis of one DKL blood type test based on the ABO system in a school using the Vee Diagram, it can be concluded that there are still components that are not in accordance with and have not achieved the goals of the practicum activities in accordance with the Vee Diagram. DKL reconstruction is needed to focus students on the development of the concept and process of determining blood classification based on the ABO system by linking it to the concept of blood in the circulatory system material in addition to serum which is a reagent in the blood type test. In addition, this blood classification practicum activity is associated with blood transfusion activities that are in accordance with the demands of KD and KI. It is hoped that the DKL that has been reconstructed can be an alternative used to achieve goals and expectations in the implementation of practicum activities in schools.

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