

Analysis of Biological Difficulties in Studying Tissue Culture at State University of Medan Indonesia

Ali Ihsanul Huda¹, Fauziyah Harahap^{1,*}, Syahmi Edi¹

¹Department of Biology Education, Postgraduate Program, Universitas Negeri Medan

Jl. Williem Iskandar Psr V Medan Estate-Indonesia(20221)

***Corresponding Author:** Fauziyah Harahap, Department of Biology Education, Postgraduate Program, Universitas Negeri Medan, Jl. Williem Iskandar Psr V Medan Estate-Indonesia (20221) Email: fauziyahharahap@unimed.ac.id

Abstract: This study aims to determine students' learning difficulties on tissue culture materials at the State University of Medan from cognitive aspects based on Taxonomy Bloom, learning indicators and factors causing student learning difficulties. The type of research used is field research. The population of this study is Biology's bachelor students degree who are conducting subjects Tissue culture in bachelor degree of Biology Education Program in State University of Medan. Samples are taken by using purposive sampling which are consisting of 3 classes. Technique of collecting data used is test result of student learning on tissue culture and questionnaire of learning difficulties. The results shown the percentage of students' learning difficulties at the level of knowledge (C-1) is 30.42%, the level of understanding (C2) is 60.02%, application level (C3) of 60.64%, level of analysis (C4) is 59.73%, level of evaluation (C5) is 58.91%, and level of creation (C6) is 61.38%. While the percentage of student's learning difficulties from learning indicator aspect in indicator-1 that is 48.43%, the 2nd indicator that is 69.24%, 3rd indicator is 72.63%, indicator 4th is 69.09%, 5th indicator is 36.22%, 6th indicator is 47.18%, 7th indicator is 67.40%, 8th indicator is 35.43%, indicator 9th is 52.17%, the 10th indicator is 25.20%, the 11th indicator is 55.12%, the 12th indicator is 52.95%, the 13th indicator is 60.63%, the 14th indicator is 49.21%, the 15th indicator of 62.40%, the 16th indicator of 53.54%, and at the 17th indicator of 39.96%. The causing students' learning difficulties supported the tissue culture materials; psychological factors, interests, motivation, teaching methods, teaching media, sources/books used in learning, experience, influence of friends, and role of parents.

Keywords: Learning Difficulties, Learning Indicators, Factors Influencing Learning Difficulties.

1. INTRODUCTION

Tissue culture is a branch of biology that is associated with growing plants by utilizing plant tissue. The students' understanding of biology as a science, is assumed as the science of memorization and there is no benefit in everyday life. The assumption that arise because they see biology as a science that many use Latin as a scientific language and is verbalistic (Wartono, 2004). Tissue culture is a technique to grow the plant part of either cell, tissue or organ in aseptic state in vitro. (Yusnita, 2003).

Tissue culture is affected by the substance of growth regulators, and the size of explants (Harahap, et al., 2014). The advantage of tissue culture can be used to increase the genetic variability to increase mangosteen characteristics which expected in work (Harahap, et al., 2013). In addition, tissue culture is a technique to cultivate plants which in danger of extinction such as pineapple (*Ananas comosus* L.) from Sipahutar (Nurwahyuni, et al., 2015). It can be achieved if it is done by optimal sterilization technique (Harahap, 2011).

Improving the quality of education is only possible if all components of education are learners, educators, facilities and curriculum interact well. Teaching limit factors can be: lack of expertise of educators in competence in the field, lack of experience and suitability of teaching activities, lack of resources and materials and lack of teaching time (Purwaningsih, 2009). It was reported in Australia in 2005, learning difficulties occur because limited is devoted to the material and what is the best way to teach (Cholthheart and Prior, 2006).

Difficulties in studying the structure of plant tissue, especially plant tissue culture caused by the absence of other learning media in addition to textbooks used as the only medium of learning. (Kurniawati and Rahayu, 2014). The results of Zulpadly, et al (2016) difficulty studying tissue culture is to explain the process of tissue culture with an indicator to sort the steps in tissue culture. At university, learning difficulties are influenced because students experience a lot of stress and the causes of stress are different from each other from each individual. The stress experienced by students has a negative impact on the physical and psychological condition of a person (Safaria, 2005).

From the observation, the main obstacle faced by the students is difficult to understand the concept of tissue culture such as cell totipotensi concept, the concept of calculation of media making, the composition of media used, the procedure of making media, sterilization eksplan, plant propagation, until the acclimatization stage. In addition, the difficulties of tissue culture learning can be seen from the scores on each aspect of the learning indicator as well as the test scores that average are still below 70 as the standard of graduation. According to Abdurrahman (2010), factors affecting learning difficulties relate to the development and difficulties of academic learning. Syah (2005) about the factors that cause learning difficulties include internal factors and external factors. The internal factors (health, intelligence, talent, interest, motivation, mental weakness). The external factors (parents, home atmosphere, family economy, teachers, tools, building conditions, curriculum, time, discipline, mass media, and social environment).

2. MATERIALS AND METHODS

2.1. Research Design

This study included non experimental research because in this study researchers did not control and manipulate research variables. The study design was an experimental design with non equivalent design pretest-posttest control group design. The population in this study is regular S1 students who are conducting the course of tissue culture in Biology Education Program S1 State University of Medan. Sampling technique purposive sampling (purposive sampling).

2.2. Study Samples

Sample used in this study were 127 students. This research has been conducted in Biology Education Program S1 State University of Medan (UNIMED), Jl. Williém Iskandar Pasar V Medan. Research time is planned in April - June 2017.

2.3. Instruments

Research Instrument used in this research, that is Test, and Non Test.

3. RESULTS AND DISCUSSION

3.1. Result

A. Student Test Results Based on Cognitive Aspects

Average Percentage of student learning difficulties viewed from the Cognitive Sphere at the Tissue Culture Course in Biology Education S1 UNIMED.

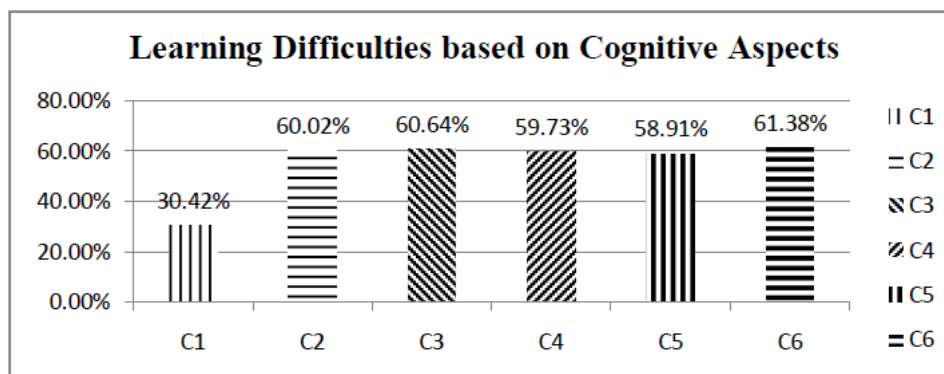


Figure1. Percentage (%) difficulties Student Learning on Cognitive Aspects

Students' difficulties level is low because the score average obtained on the problem C1 means the difficulty is 30.42%. The level of student difficulty including moderate because of the average score

obtained on the matter of C2 means the difficulty is 60.02%. The level of student difficulty including moderate because of the average score obtained on the question C3 means the difficulty is 60.64%. The level of student difficulty including moderate because of the average score obtained on the matter of C4 means the difficulty is 59.73%. The level of student difficulty including moderate because of the average score obtained on the problem of C3 means the difficulty is 58.91%. The level of student difficulty is high because of the average score obtained on the question C6 means the difficulty is 61.38%.

B. Difficulties of Student Learning on the Subject of Tissue Culture Based on Indicators

Based on the seventeen indicators resulted from the difficulties Student Learning of each indicator is shown as diagram below

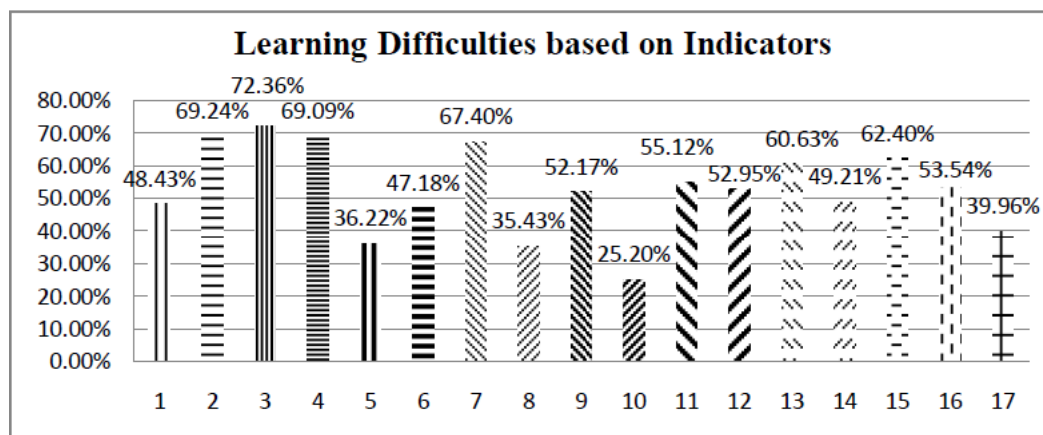


Figure2. Percentage (%) Average Difficulty in Student Learning Difficulties on Tissue Culture indicators in Biology S1 Program UNIMED

Being able to:

- 1 = construct cell theory related to tissue culture, concept of "Totipotensi sel"
- 2 = describe the design of tissue culture lab room
- 3 = write the tools used in tissue culture techniques
- 4 = sterilize tools and tissue culture eksplan
- 5 = create and organize elements of the media compiler
- 6 = identify media composition
- 7 = clarify the role of some growth regulators
- 8 = write the right source eksplan criteria
- 9 = demonstrate sterilization procedure of field eksplan
- 10 = explain the linkage between cell culture and callus culture
- 11 = write down the advantages of using haploid culture on tissue culture
- 12 = arrange the steps in carrying out protoplast culture
- 13 = express the main reason for the problem of tissue culture (incidental)
- 14 = compose the role of tissue culture on somaclonal variation induction
- 15 = clarify the benefits gained from secondary metabolite production
- 16 = establish the reasons for the use of plant tissue in the conservation of germplasm
- 17 = design and create tools used for acclimatization of in vitro cultured crops

Based on the diagram, it is shown that the Indicator had the greatest learning difficulties is the indicator 4 Can sterilize the tool and tissue culture eksplan as 68.65%, indicator 7 that is able to clarify the role of some growth regulator as 67.69%, indicator 2 is able to describe the design of

laboratory room tissue culture as 63.44%, indicator 15 is able to clarify the benefits obtained from the secondary metabolite production as 62.45%, indicator 13 is able to express the main reason of the problem of doing tissue culture (incidental) as 60.36%, indicator 3 is able write down the tools used in tissue culture technique of 60.25%.

3.2. Discussion

Based on the research is known that aspects of C1 to C6 category is very difficult. From 6 aspects, the highest difficulty level is on the aspect of creation in which the result of student achievement is 38.62%, and the difficulty level is 61.38%. While the lowest difficulty level is on the knowledge aspect where the results of the success of the students answer is 69.58% and the difficulty level is 30.42%.

Based on the category based on the indicators, the students' difficulty level in the high category is on the indicators describing the laboratory room of 69.24%, writing tissue culture laboratory tools 72.36%, eksplan sterilization equal to 69,09%, grew by 67.40%. While the level of learning difficulties of students in the medium category is in the indicator of cell totipotensi theory of 48.43%, identification of media composition of 47.18%, explanation sterilization procedure of 52.17%, haploid culture advantage of 55.12%, protoplast culture procedure 52.95%, the role of tissue culture on somaklonal variation of 49.21%, secondary metabolite profit of 62.40%, and germplasm conservation of 53.54% And low learning difficulties there are indicators explaining the media elements of 36.22 %, explant source criterion of 35,43%, cell culture correlation with callus equal to 25,20% and acclimatization equal to 39,96%.

The low average acquisition of the questionnaire scores of these factors suggests learning difficulties. Internal factors that cause student learning difficulties consist of psychological, interest and motivation. The disorder may manifest itself in the form of difficulty listening, thinking, speaking, reading, writing, spelling, or counting (Suryani, 2010). This is confirmed by Bahri, et al (2016), that learning difficulties are influenced by basic psychologies such as listening, thinking, speaking, reading, writing and mathematical problems caused by audiovisual, mental, or emotional distress. In the study of Cole, et al (2004), that the motivation of learning and learning difficulties positively affect the psychological state. In science, especially in Biology the use of foreign terms provides difficulties for students to master and understand the existing learning materials (Hidayatussaadah, et. , 2016).

In addition to psychology, learning difficulties are influenced by interest. Lessons that are not interested in learners not only fail instructionally but also reduce enthusiasm in the next lesson (Hindun.I, 2012) .There is no interest in a lesson can be seen from the way the learners are following the lesson (Rahmah and Hia, 2014). Some of them are the habit of speaking in the classroom when the teacher explains the lesson and rarely notices the teacher explaining in front of the class (Sihombing, 2012).

The condition of less lively classrooms can also trigger a lack of interest in following the lesson, because the students are more silent and only listen to explanations from the teachers (Fitriana, et al, 2016). In addition to interest, motivation also serves as a supportive factor in students who will encourage them to study harder and never give up. Students who have little motivation toward learning and more fear of failure are things that show that the learners have learning difficulties (Nunez, et al, 2011). Unmotivated learners can influence their disposition in the learning process and their ability to succeed (Gbollie and Keamu, 2016).

While the external factors that affect learning difficulties are teachers / tutors / lecturers and the means available. Children who experience learning difficulties are generally shown with a slower learning process attitude. This shows the use of limited and inefficient methods in the teaching process (Bosson, et al, 2010). The results of Kim and Thompson's (2013) study, indicate that learning difficulties are caused by less intensive teaching methods and the learning process depends on the learning ability of the learner. These conditions have an impact on the low learning outcomes. In addition, learning materials are still considered abstract and difficult to understand, less interesting and meaningful (Arifuddin, et al, 2014).

Meaningful interactions between parents and their children in science-related activities in their daily lives are essential for the construction of children's scientific knowledge and the acquisition of scientific skills and attitudes. They can have a positive influence on motivation and self-regulation in learning (Lee and Nie, 2015). Older people who have full-time employment are barriers to educational involvement in the family (Weiss, et al, 2003).

Minimizing student learning difficulties can be done by assimilating new knowledge into the initial knowledge based on the knowledge and experience gained during the learning process (Trisniawati and Dermawan, 2016) and also peer involvement can influence student achievement in the learning process (Saputro and Pardiman, 2012).

4. CONCLUSION

Based on the results of the research, the conclusions can be stated, the level of student's learning difficulties in the material of tissue culture at the State University of Medan from the cognitive aspects of knowledge level (C1) including low difficulty category, and cognitive aspects of understanding (C2), application (C3) analysis (C4), evaluation (C5), and creation (C6) are in the high difficulty category. The level of students' learning difficulties in the tissue culture material from the learning indicator aspect of the indicators describes the laboratory space, writes tissue culture laboratory tools, explants sterilization, analysis of the role of growth regulators including into high learning difficulty categories. In indicator of cell totipotency theory, identification of media composition, eksplan sterilization procedure, haploid culture advantage, protoplast culture procedure, tissue culture role on somaclonal variation, secondary metabolite profit, germplasm conservation including moderate learning difficulty category. In the indicator describes the elements of media, explanation source criteria, the linkage of cell culture with callus and acclimatization including low learning difficulty. And the factors causing student learning difficulties that support on the material of tissue culture from internal factors that are psychological factors, interest and motivation while external factors such as books, teaching methods, friends, experiences, media are less supportive in causing student learning difficulties and role of parents, where full-time work can cause learning difficulties due to lack of time to pay attention, monitor and control their children's learning.

REFERENCES

- [1] Abdurrahman, M. 2009. *Pendidikan Bagi Anak Berkesulitan Belajar*. Jakarta : Penerbit Rineka Cipta.
- [2] Arifuddin, Efendi, dan Lagandesa. Y. R. 2014. Penerapan Metode Pembelajaran Diskusi Untuk Meningkatkan Hasil Belajar Membaca Pada Siswa Kelas IV SDN Kalukunangka. Palu: Fakultas Keguruan dan Ilmu Pendidikan Universitas Tadulako. "*Jurnal Kreatif Tadulako Vol 5 (7)*".
- [3] Bahri, L., Mirnasab, M. M., Noorazar, S., Fathi-azar, E., and Asadi, S. 2016. The Effect of Self-Management Strategies on Improving task Performance in Students with Learning Disabilities. Iran: University of Tabriz. "*J Anal Res Clin Med Vol 4 (1), page 53-56*".
- [4] Bosson. M., Hessels., Schlatter. C. H., Berger. J. L., Kipfer. N. M., and Buchel. F. 2010. Strategy Acquisition by Children With General Learning Difficulties throught Metacognitive Training. Switzerland : Faculty of Psychology and Educational Sciences University Geneva. "*Australian Journal of Learning Difficulties Vol 15 (1) page 13-34*".
- [5] Cole, M., Field, H., and Harrish, S. 2004. Student Learning Motivation and Psychological Hardiness: Interactive Effects on Students' Reaction to Management Class. Swiss: University of St. Gallen. "*Journal Academy of Management Learning and Education Vol 3 (1), page 64-95*".
- [6] Coltheart, M., and Prior, M. 2006. Learning to read in Australia. Macquarie University. "*Australian Journal of Learning Disabilities, Vol 11, Number 4 pp. 157-164*".
- [7] Fitriana. I., Nusantara. T., Qohar, A. 2016. Penerapan Pembelajaran Kooperatif Tipe STAD Berbantuan Kartu Al Khawarizmi untuk Memahami Materi Pmfaktor. Malang: Universitas Kanjuruhan Malang. "*Prosiding Seminar Nasional Pendidikan Matematika Vol 1 hal 168-176*".
- [8] Gbollie, C., and Keamu, H. 2016. Student Academic Performance: The Role of Motivation, Strategies, and Perceived Factor Hindering Liberian Junior and Senior High School Students Learning. Liberia: Foundation for Research, Education and Empowerment. "*Educational Research International*".
- [9] Harahap, F. 2011. *Kultur Jaringan Tanaman*, Medan : Universitas Negeri Medan.

- [10] Harahap, F., Jussof. K., Poerwanto. R., Nusyirwan., Syarifuddin., Hasruddin. 2013. Mangosteen DNA Analysis (*Garcinia Mangostana L.*) with Molecular Markers after Gamma Ray Irradiation Treatment. Medan: Universitas Negeri Medan. “*Journal American-Eurasian of Sustainable Agriculture Vol 7 (2) page 37-44*”.
- [11] Harahap, F., Poerwanto. R., Suharsono., Suriani. C., dan Rahayu. S. 2014. In Vito Growth and Rooting of Mangosteen (*Gracinia mangostana L.*) on Medium with Different Concentrations of Plant Growth Regulator. “*Hayati Journal of Biosciences Vol 21, No 4*”.
- [12] Hidayatussaadah, R., Hidayati. S., Ummiyatie, S. 2016. Identifikasi Kesulitan Belajar Siswa pada Materi *Archeobacteria* dan *Eubacteria* di SMA Negeri 1 Muntilan. Yogyakarta: Universitas Negeri Yogyakarta. “*Jurnal Pendidikan Biologi Vol 5 (7), hal 58-68*”.
- [13] Hindun, Iin. 2012. Pengembangan Bahan Ajar Berbantuan Komputer (Computer Assisted Instruction) Sebagai Upaya Untuk Meningkatkan Pemahaman Tentang Teknik PCR. Malang: Universitas Muhammadiyah Malang. “*Procedding Seminar Nasional Cakrawala Pmbelajaran Berkualitas di Indonesia*” hal525-544 .
- [14] Kurniawati. I., dan Rahayu, E. S. 2014. Pengembangan Media “*Woody Puzzle*” untuk Meningkatkan Motivasi, Aktivitas dan Hasil Belajar Siswa Materi Struktur Jaringan Tumbuhan. Semarang: FMIPA Universitas Negeri Semarang. “*Unnes Journal of Biology Education*”.
- [15] Kim, Woo ri., and Thompson, S. 2013. The Effects of Self-Regulation on Science Vocabulary Acquisition of English Language Learners with Learning Difficulties. Republic of Korea: Seoul National University. “*Sage Journal Vol 34 (4) page 225-236*”.
- [16] Lee A.N.,and Nie Y. 2015. *The ‘Why’ and ‘How’ of Engaging Parents in Their Children’s Science Learning in Informal Contexts: Theoretical Perspectives and Applications.* In: Khine M. Singapore: Nanyang Technological University.
- [17] Nunez, J. C., Pienda, J. A., Rodriguez., Valle, A., Gonjales-Cabanach, R., Rosario, P. 2011. Multiple Goals Perspective in Adolescent Students with Learning Difficulties. Spain: University of Oveido. “*Journal Learning Disability Quarterly Vol 34 (4) page 276-283*”.
- [18] Nurwahyuni. I., Napitupulu. J. A., Rosmayati., dan Harahap. F. 2015. Identification and Screening of Citrus Vein Phloem Degeneration (CVPD) on Berastagi Citrus Variety Brastepu (*Citrus nobilis Brastepu*) in North Sumatra Indonesia. Medan: Universitas Sumatra Utara. “*Journal of Agricultural Science, Vol 7, No 4*”.
- [19] Purwianingsih, W. 2009. Identifikasi Kesulitan Pembelajaran Bioteknologi pada Guru SLTA se-Jawa Barat, Bandung: *Jurnal Kesulitan Pembelajaran Bioteknologi*.
- [20] Rahmah. A., dan Hia. Y. 2014. Faktor-faktor yang Mempengaruhi Kesulitan Belajar Mata Pelajaran Ekonomi Siswa Kelas Xii IPS SMAN 2 Sijunjung. Padang: Universitas STKIP PGRI Padang. “*Journal of conomic and Economic Education Vol 3 (1) hal 81-88*”.
- [21] Safaria. 2005. *Interpersonal intelligence: Metode Pengembangan Kecerdasan Interpersonal Anak.* Yogyakarta: Amara Books.
- [22] Saputro, S., dan Pardiman. 2012. Pengaruh Disiplin Belajar dan Lingkungan Teman Sebaya Terhadap Prestasi Belajar Mahasiswa Program Studi Pendidikan Akutansi Angkatan 2009 Fakultas Ekonomi Universitas Negeri Yogyakarta. Yogyakarta: Universitas Negeri Yogyakarta. “*Jurnal Pendidikan Akutansi Indonesia Vol 10 (1), hal 78-97*”.
- [23] Sihombing. L.B. 2012. Model Pembelajaran Kooperatif Investigasi Kelompok Dalam Menyanyikan Lagu Daerah Batak Toba (Sik- sik Sibatunikkam). Medan: Universitas Negeri Medan. “*Jurnal Generasi Kampus Vol 5 (2) hal 105-119*”.
- [24] Suryani, Y. E. 2010. Kesulitan Belajar. “*Jurnal Magistra No. 73 tahun XXII*”.
- [25] Syah, M. 2005. *Psikologi Pendidikan dengan Pendekatan Baru.* Bandung. PT. Remaja Rosdakarya.
- [26] Trisniawati, ., dan Darmawan, Handy. 2016. Peranan Dosen dalam Pembelajaran Berbasis Masalah pada Peningkatan Keterampilan Proses Sains Mahasiswa. Pontianak: Pendidikan Fisika IKIP PGRI Pontianak. “*Jurnal Edukasi Matematika dan Sains Vol 4 (2), hal 102-107*”.
- [27] Wartono, N. 2004. *Materi Integritas Sains.* Jakarta: Depdiknas.
- [28] Weiss, B. H., Mayer, E., Kreider, H., Vaughan, M., Dearing, E., Hencke., and Pinto,K. 2003. Making It Work: Low-Income Working Mother’s Involvement in Their Children’s Education. America: Harvard University. “*American Educational Research Journal Winter Vol 40 (4), page 879-901*”.

- [29] Yusnita. 2003. *Kultur Jaringan Cara Memperbanyak Tanaman Secara Efisien*. Jakarta : Agromedia Pustaka.
- [30] Zulpadly., Harahap, F., Edi. S. 2016. Analisis Kesulitan Belajar Siswa Materi Bioteknologi SMA Negeri Se-Kabupaten Rokan Hilir. Medan: Universitas Negeri Medan. "*Jurnal Pendidikan Biologi No.1 Vol 6*".

AUTHORS' BIOGRAPHY



Ali Ihsanul Huda, S. Pd, is a Biology Education Postgraduate student at Postgraduate Programe of Universitas Negeri Medan (Medan State University), Medan, North Sumatera, Post code 20221, Indonesia. He obtained his Sarjana Degree (S1) in Biology Education from Universitas Negeri Medan (Medan State University), his obtaining Master Programe in Biology Education on Universitas Negeri Medan (Medan State University).



Dr. Fauziyah Harahap, M. Si, is a Lecturer at Graduate and Postgraduate Programe of Universitas Negeri Medan (Medan State University), Medan, North Sumatera, Post code 20221, Indonesia. She obtained her Sarjana Degree (S1) in Biology Education from IKIP Medan, her Master Degree (S2) in Biology Programe from Universitas Gadjah Mada and her Doctor Degree (S3) Biology Programe from Institut Pertanian Bogor. (Corresponding author)



Dr. Syahmi Edi, M. Si, is a Lecturer at Graduate and Postgraduate Programe of Universitas Negeri Medan (Medan State University), Medan, North Sumatera, Post code 20221, Indonesia. He obtained his Sarjana Degree (S1) in Biology Programe from Universitas Negeri Andalas, his Master Degree (S2) in Biology Programe from Institut Pertanian Bogor and his Doctor Degree (S3) in Biology Programe from Institut Pertanian Bogor.

Citation: Ali Ihsanul Huda et al. " Analysis of Biological Difficulties in Studying Tissue Culture at State University of Medan Indonesia " *International Journal of Humanities Social Sciences and Education (IJHSSE)*, vol 4, no. 11, 2017, pp. 65-71. doi: <http://dx.doi.org/10.20431/2349-0381.0411007>.

Copyright: © 2017 Authors. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.