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MICROSCOPE ON THE USAGE TRAINING AS A FORM FOR ACHIEVING SDGS FOR HIGH SCHOOL STUDENTS IN INDONESIA

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Abstract: *One of the instruments that is often not available for cell observation skills in high schools in Bekasi City is a microscope. Therefore, it is necessary to carry out community service activities (CSA) in the form of training in the use and maintenance of microscopes, making and observing cell slides, and cell observation documentation techniques for high school students in Bekasi City. This CSA method, based on Asset-Based Community Development (ABCD) and Participatory Action Research (PAR), involves planning integrated CSA programs offered to several high schools in Bekasi City. The implementation stage was carried out in 6 meetings (each meeting started from 08.00-16.00) by providing a pre-test, delivering materials, conducting a post-test, practicing microscope use, making and observing cell slides, and documenting cell slide techniques. The evaluation stage was carried out by processing qualitative and quantitative data. The results of this CSA include 30 students: 19 from Al-Muhtadin High School and 11 from Annida Al-Islamy, MA. Statistical analysis using paired t-tests produced a sig value. 0.01<0.05 or CS activities can significantly increase the average value of knowledge about microscopes, while the average value of the skills test is 76.92. This CSA concludes that providing microscope materials and training as a CS activity package can enhance the knowledge and skills of 19 Al-Muhtadin High School students and 11 Annida Al-Islamy MA students in observing cells using a light microscope.*

Keywords: *Community; Learning; Microscope; Service; Training.*

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PENDAHULUAN

The Sustainable Development Goals (SDGs) are the result of a joint agreement between the United Nations (UN) and its member countries. They aim to end poverty, protect the earth, and create, prosper, and optimize the potential and resources of both developed and developing countries[1]. The SDGs are a sustainable program with 17 goals and indicators, with a key indicator for achieving the SDGs being quality education[2].

[1] Armida Salsiah. Alisjahbana and Endah. Murniningtyas, *Tujuan Pembangunan Berkelanjutan Di Indonesia : Konsep, Target, Dan Strategi Implementasi* (UNPAD Press, 2018).
[2] Dewi Anggraini and Siwi Nugraheni, "Menuju Pendidikan Berkelanjutan: Implementasi Tujuan Berkelanjutan

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Referring to the issue of SDGs regarding education, Sekolah Tinggi Ilmu Kesehatan Mitra Keluarga, Bekasi, aims to contribute to accelerating the SDGs program through collaboration with schools in Bekasi City. The results of the partnership were discovered through a discussion with the Chairman of the Subject Teacher Conference of Bekasi Regency. It was found that high school students in Bekasi Regency lack the skills to operate microscopes in science learning. It is because high schools in Bekasi Regency do not have microscope instruments to support science learning. If there is, the microscope is in a moldy and damaged condition. It has not been calibrated for a long time, and there are a limited number of microscopes, requiring each student to use one, so students are not effectively exploring the optimal use of microscopes. In fact, in the curriculum for natural science, SMA/K/MA students are required to have essential competencies to be able to make microscopic observations of onion layer tuber cells and oral mucosal epithelium[3]. However, in reality, the SMA/K/MA Laboratory in Bekasi is not equipped with a microscope, so students miss out on learning much about cell observation skills. This problem was also obtained in several Community Service Activities that have been carried out by Kotala and Kurnia[4] Nofisulastri et al.[5] Suprapto et al.[6]; who was reported that high school students in Indonesia do not know how to use a microscope properly, and many high schools lack microscopes for science learning. The light microscope is a supporting tool for achieving students' psychomotor abilities in understanding organisms at the cellular level. In addition, microscopy skills are needed for the identification of microscopic powders of medicinal plants and biological research[7].

Natural Sciences is an inquiry process (inquiry methods) that involves scientific work [8]. One of the most fundamental scientific works proving the existence of plant and animal cells or tissues was achieved using a tool called a microscope[9]. The use of microscopes in science learning for cell and tissue observation is crucial because it provides students with opportunities to hone their ideas, creativity, and psychomotor skills in directly proving theories in the classroom[10]. The results

(SDGS) dalam Mewujudkan Berkualitas di Indonesia," *Jurnal Penelitian Pendidikan Indonesia* 1, no. 3 (April 2024): 189197, https://doi.org/https://doi.org/10.62017/jppi.v1i3.1028.

[3] (Kementerian Pendidikan, Kebudayaan, Riset & Teknologi, 2022)

[4] Kotala & Kurnia (2023),

[5] Nofisulastri et al. (2019),

[6] Suprapto et al. (2018),

[7] Agatha M. Reigoto et al., "A Comparative Study on the Use of Microscopy in Pharmacology and Cell Biology Research," *PLoS ONE* 16, no. 1 January (January 1, 2021), https://doi.org/10.1371/journal.pone.0245795.

[8] Lalu Japa, Syamsul Bahri, and Prapti Sedijani, "Mengenal Fitoplankton Untuk Penguatan Materi Kompetensi Dasar Protista Pada Siswa Jurusan IPA (Biologi) MA Hidayatul Muhsinin Desa Labulia Lombok Tengah," *Jurnal Pengabdian Magister Pendidikan*, no. 1 (2018): 88–94, https://doi.org/10.29303/jpmpi.v1i1.231.

[9] Demak Bambang Subali et al., "Implementasi Model Pelatihan Pembelajaran IPA Berbasis Digital Image Creator for Optical Microscope (DIGICOM) Pada Guru Fisika Kabupaten," *Unnes Physics Education Journal (UPEJ)* 7, no. 3 (October 2018): 1–6, https://doi.org/https://doi.org/10.15294/upej.v7i3.27696.

[10] Nurkhairo Hidayati and Lismayani Fauziyah, "Profil Kesiapan Laboratorium Biologi Untuk Mendukung Kerja Praktik Siswa Di MA Al-Ikhwan Kecamatan Kulim, Kota Pekanbaru," *Jurnal Inovasi Pembelajaran Biologi* 4, no. 2 (2023):

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concluded that the overall use of smartphone microscopes as a practicum tool increased students' creativity by 53.3%.

Various community service activity (CSA) have been carried out to provide training on the proper and correct use of microscopes, including CSA[11] who conducted cell observation training with the Olympus Cx-21 microscope and documentation using smartphones for Students and Teachers of Ma Al-Muluuk Persis Telaga Kodok, Leihitu, CSA[12] Central Maluku Regency, Technical Guidance on Introduction to Microscopes and Their Use in Class X Biology Learning at SMA Negeri 1 Aluh-Aluh, Banjar Regency, CSA[13] who conducted training on the use and maintenance of microscopes at SMA N 1 Mila, Pidie, Aceh. In India and Colombia, microscope training programs effectively introduced science concepts to schools with limited facilities, where teacher involvement resulted in increased student understanding. However, various CSA previously had weaknesses, including training only carried out within 1 day, not adjusted to the standard duration of the minimum competency of skilled students using microscopes, not mentioning whether the microscope had been calibrated correctly, and whether the number of microscopes was in accordance with the ratio of the number of CSA participants.

Based on the above background, STIKes Mitra Keluarga took the initiative to conduct a school-integrated CSA to train high school students in using microscopes at the STIKes Mitra Keluarga East Bekasi laboratory in Bekasi. The novelty of this CSA, among others, is that the participants are invited to use the STIKes Mitra Keluarga laboratory facilities, the standard of the laboratory room has been adjusted to the number of participants, namely 1 : 3 (1 microscope for 3 participants), the microscope is routinely calibrated, and the duration of the training lasts for 6 times (5 practicum times, one practicum exam) so that the target indicator of participants has received material on the skills of using a measurable microscope well. This CS activity also provides participants with skills and experience in making plant and animal cell preparations as well as techniques for documenting them. The participants targeted include not only high school students but also vocational school students, particularly those in Pharmacy Vocational Schools, who need the skill to identify microscopic powders of medicinal plants. This CS activity also supports the Sustainable Development Goals (SDGs) program by reducing the gap in access to science and technology for high schools in Bekasi.

69–79, https://doi.org/10.26740/jipb.v4n2.p69-79.
[11] Seumahu et al. (2024)
[12] Kaspul et al. (2022)
[13] Agustina & Saputra (2016)

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METHODS

This CSA will be held on November 16, 2024-December 21, 2024 at STIKes Mitra Keluarga East Bekasi. The facilities and infrastructure needed for this CSA include a laboratory room with a capacity of 50 people, LCD projectors, whiteboards and markers, calibrated light microscopes (Olympus CX23LEDDRFSI), glass objects (Sail Brand 23) and glass covers, methylene blue, safranin, aquades, pipettes, razors, emulsion oil, onion tubers, and *Rhoe discolor* leaves.

This CSA method uses the Asset-Based Community Development (ABCD) and Participatory Action Research (PAR) approaches, which include identifying problems, partner strengths, and partner solutions. High school/vocational school partners were chosen because many do not have microscope facilities. The preparation stage for Community Service activities was conducted by discussing the appropriate theme for these activities with the Chairman of the Subject Teacher Conference SMA/K Bekasi Regency. If the correct title has been agreed upon, the implementation time, the number of students, and accompanying teachers will be determined. STIKes then made a plan for transportation and consumption, creating flyers with activity announcements and a Google registration form to be distributed via WhatsApp. The implementation stage of this activity includes the provision of materials and skills practice in the laboratory. The provision of material uses the lecture and demonstration method, while the training is conducted as a practicum using the contextual instruction method. Participants in the implementation were high school students in Bekasi City. Participants gathered in the STIKes Mitra Keluarga laboratory room to receive training materials focused on using microscopes and their documentation. The evaluation stage of CS activities is conducted by collecting all data, including documentation, photos, interview results, and pre-test, post-test, and skill test scores. The indicator instrument of CSA success can be seen in Table 1.

Table 1. Concept and Skills Assessment Instruments

No	Aspects Assessed	Assessment	
	Conceptual Knowledge	**True (1)**	**False (0)**
1	Definition and function of the microscope		
2	Types of objects that can be seen with a microscope		
3	Parts of a microscope		
4	Procedure for setting up a microscope slide table		
5	The function of the objective and ocular lenses		
6	The function of the macrometer and micrometer		
7	Procedure for using a microscope		
8	Procedure for observing slides with a microscope		
9	Procedure for maintaining a microscope		
10	The function of a revolver		

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No	Aspects Assessed	Assessment	
	Conceptual Knowledge	**True (1)**	**False (0)**
	Skills		
1	Making preparations of red onion (*Allium cepa*) epidermal cells		
2	Observation of red onion (*A. cepa*) epidermal cells		
3	Making preparations for the Oral epithelial smear		
4	Observation of Oral epithelial smear		
5	Making preparations of the *Rhoe discolor* epidermal cell.		
6	Observation of the *Rhoe discolor* epidermal cell.		

According to Table 1, the assessment instruments indicating the success of this activity consist of concepts and skills. Concept assessment is in the form of multiple choice, while skills are in the form of practical exams. All data are processed into tables and graphs and analyzed descriptively, quantitatively, and comparatively using paired t-tests to obtain information on the level of student knowledge and skills regarding microscope usage procedures and their documentation[14].

RESULTS AND DISCUSSIONS

This CS activity is conducted over six weeks, with sessions held every Saturday from 09:00 to 16:00. The schedule for CS activities related to microscope use training is shown in Table 2.

Table 2. Schedule of Activities for CSA Microscope Training

Day/Date	Time	Time	Penanggung Jawab
Saturday, November 16, 2024	08.00 -16.00	Microscope usage and maintenance material	Reza Anindita, S.Si., M.Si
Saturday, November 23, 2024	08.00-16.00	Oral epithelial smear preparation and observation material	Reza Anindita, S.Si., M.Si
Saturday, Desember 30, 2024	08.00-16.00	Onion bulb epidermal cell smear preparation and observation material	Reza Anindita, S.Si., M.Si
Saturday, Desember 7, 2024	08.00-16.00	*Rhoe discolor* epidermal cell smear preparation and observation material	Reza Anindita, S.Si., M.Si
Saturday, Desember 14, 2024	08.00-16.00	Microscopic starch powder preparation and observation material	Reza Anindita, S.Si., M.Si
Saturday, November 21, 2024	08.00-16.00	Review the Preparation and observation material, and closing	Reza Anindita, S.Si., M.Si

[14] Reza Anindita et al., "Simulation of Betel Leaf Extraction as a Provision of Entrepreneurship Knowledge for Students Regarding the Preparation of Raw Materials for Pharmaceutical Products," *Bubungan Tinggi* 6, no. 4 (2024): 862–72, https://doi.org/https://doi.org/10.20527/btjpm.v6i4.11875.

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The preparation of the training activity schedule in Table 2 is adjusted to the Learning Plan (LP) for the Cell Biology course, S-1 Pharmacy Study Program, which has been tested to obtain minimum results of essential knowledge and skills in making preparations and observing them with a light microscope and documenting observation results of 78.3%, students must get at least 5x practice in creating, observing preparations using a light microscope, and reporting them. As for Table 3, the CSA lasts for 6 weeks with a training schedule every Saturday, 08.00-16.00. This CS activity aims to enhance the knowledge and skills required for preparing, using, and maintaining microscopes, as well as documenting microscopic preparations. Click or tap here to enter text. In addition, regular training will improve participants' pedagogy in using the microscope's light[15]. The application of the 5x meeting was developed to address the weakness of the simulation method, which was unable to significantly improve the skills and concepts of using microscopes[16]. The model for the stages of compiling this CSA training program can be seen in Table 3.

Table 3. Model of the stages of preparing the CSA program for training in the use of microscopes

No	Stage	Activity
1	Determining training needs	Data needs information: I lack skills in microscope usage, slide preparation, or digital data documentation techniques. Objective: improve knowledge of skills
2	Training program design	Target: High school students and accompanying teachers Training forms and methods: Lectures, simulations, contextual instruction, Materials: concepts, introduction to tools, parts, and functions, procedures for use, maintenance, preparation of slides, documentation, and reporting techniques in the form of a digital image database Training location: Standard educational laboratory with a minimum capacity of 40 people, equipped with routinely calibrated light microscopes
3	Training program evaluation	Determine assessment procedures in the form of pre-tests, post-tests, practical exams, and interviews.

[15] Gabriela Imreh, Jianjiang Hu, and Sylvie Le Guyader, "Improving Light Microscopy Training Routines with Evidence-Based Education," *Journal of Microscopy* 294, no. 3 (June 1, 2024): 295–307, https://doi.org/10.1111/jmi.13216.

[16] Yilmaz Kara, "Determining the Effects of Microscope Simulation on Achievement, Ability, Reports, and Opinions about Microscope in General Biology Laboratory Course," *Universal Journal of Educational Research* 6, no. 9 (September 1, 2018): 1981–90, https://doi.org/10.13189/ujer.2018.060917.

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Based on Table 3. In general, the reasons for choosing microscope training are in accordance with the conclusions of the results with the Head of the Bekasi Regency MGMP, Mr. Bima Ariyo, S.Pd Gr. the cause of the lack of microscope knowledge is because CSA participants only know through theory at a glance, so that students never, less, and have never known the concept of a microscope. The advantages of learning cells using light microscopes include positively impacting students' psychology, aiding students in memorizing long-term topics, and developing practical and diagnostic skills[17]. An essential aspect of designing practical microscope training is to use specimens so that students gain experience in identifying, correcting, and validating microscope conditions [18]. According to Sreevidyalatha and Shashikala[19] microscope use training must be accompanied by image-based learning to improve cell identification skills. The results of the CSA program offered to SMA/K in Bekasi City were obtained by 30 students from SMK Al-Muhtadin and MA Annida Al-Islamy Bekasi who were interested in participating in this CS activity. The description of the participants who participated in the CS activity can be seen in Table 4.

Table 4. Description of participants

School	Amount	Percentage
SMK Al-Muhtadin	19	63.30%
MA Annida Al-Islamy	11	36.67%
Total	30	100%

The results of Table 4 show the total number of CSA participants: 30 participants, consisting of SMK Al-Muhtadin 19 (63.30%) and MA Annida Al-Islamy 11 (26.92%). The number of participants from SMK Al-Muhtadin is greater than that of MA Annida Al-Islamy, as shown in Table 4. The participants who attended were then gathered in the lecture room to listen to the speech and the training program schedule. The atmosphere of the CS activity in the STIKes Mitra Keluarga lecture room is depicted in Figure 1.

[17] R. Ahmed et al., "Light Microscopy for Teaching-Learning in Histology Practical in Undergraduate Medical Education of Bangladesh-a Teachers' Perspective," *South-East Asian Journal of Medical Education* 12, no. 1 (August 1, 2018): 26, https://doi.org/10.4038/seajme.v12i1.39.
[18] (Tobin Jost & Waters, 2019)
[19] (Sreevidyalatha & Shashikala, 2024),

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Figure 1. Scene of material lecture and pre-test

Based on Figure 1. The opening of this CS activity was carried out in the lecture room of STIKes Mitra Keluarga, Bekasi. The activity began with an introduction and instructions for a pre-test consisting of 10 questions on the Google Form application, which can be accessed via an Android-based handphone. The selection of the form of pre-test assessment refers to CS[20], which states that the pre-test is an initial test tool to determine the knowledge of CS participants related to the material to be lectured. The results of the pre-test can be used as a reference for delivering CS training materials. The results of the pre-test on CS are shown in Table 5.

Table 5. Frequency distribution of pre-test scores of CSA participants

Score	Frequency	Percentage (%)
20	4	13.3
30	5	16.6
40	7	23.3
50	7	23.3
60	3	10.0
70	4	13.3
Total	**30**	**100%**

[20] Maulida et al. (2021),

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Based on Table 5. frequency distribution of CSA pre-test scores from 30 participants, there were 4 (13.3%) students with a score of 20, 5 (16.6%) students with a score of 30, 7 (23.3%) students with a score of 40, 7 (23.3%) students with a score of 50, 3 (10%) students with a score of 60, and 4 (13.3%) students with a score of 70. The standard pre-test score for this CS activity is 70, so only 4 (13.3%) students have good knowledge of the use and maintenance of microscopes. The results of this pre-test assessment prove that 30 CSA participants need to be given training on the use of light microscopes.

Delivery of material in the form of lectures, demonstrations, and practicums with the contextual instruction method. The delivery of material in the form of lectures is carried out verbally using a laptop and LCD projector[21], in the form of demonstrations carried out by demonstrating the functions and parts, as well as how to use and store the microscope, directly to CSA participants[22]. The form of practical learning is carried out with direct instruction, where the presenter provides guidance on concepts and systematic procedural knowledge regarding microscopes.

Mr. Reza Anindita, S.Si., M.Si delivered the material presentation. Several vital points delivered include the definition and function of a microscope, its images, parts, and functions, usage procedures, and maintenance. Details of the material supplied can be seen in Table 6.

Table 6. Microscope training materials

Material	Explanation
Microscope	Definition of the microscope
	Image, parts, and function of the microscope
Preparation	Procedure for using a microscope
	Maintenance of the microscope
	Making onion epidermis cell preparation (*A.cepa*)
	Making the *Rhoe discolor* epidermis cell preparation
	Making mucosal epithelial cell preparation
Documentation techniques	Procedure for documenting microscopic observation results

[21] Yovita Diva Hapsari et al., "Pengaruh Metode Pembelajaran Praktek Dan Ceramah Pada Pembelajaran Seni Kelas III SD 6 BulungKulon," *Jurnal Ilmiah Profesi Guru (JIPG)* 4, no. 2 (2023): 137–45, https://doi.org/10.30738/jipg.vol4.no2.a15396.

[22] Anindita Reza et al., "Simulation Of Manufacturing Liquid Soap From Basil Leaf Extract And Eucalyptus Oil Balsam For High School Students In Bekasi City," *Jurnal Abdi Insani* 10 (2023): 2587–94, https://doi.org/https://doi.org/10.29303/abdiinsani.v11i1.1439.

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The explanation in Table 6 refers to the microscope training CS. A light microscope is a tool used to observe microscopic objects such as bacteria, parasites, animal tissue, and plants[23]. Antony van Leeuwenhoek first invented the microscope to observe the cells of microorganisms. The essential parts of a microscope include the diaphragm, objective lens, eyepiece lens, condenser, micrometer, and stage. Based on Ramadhani[24], the condenser functions to collect light, the diaphragm functions to regulate light intensity, the macrometer functions to regulate coarse magnification, the micrometer functions to regulate fine magnification, the revolver to regulate the magnification of the objective lens, the eyepiece lens is located near the observer's eye with standard magnification of 10x, the objective lens to magnify the image of the object with a magnification of 10x, 40x, 100x. Calculate object magnification by multiplying the objective and eyepiece magnification. For example, if the objective magnification is 100x, then the user is using a magnification of 1000x. The speaker also explained the principles of using and maintaining a light microscope. 4x and 10x magnification are used to observe cell distribution, while 40x and 100x magnification are indispensable for accurate and detailed cell micromorphology[25]. The Scene of delivering material using the demonstration method can be seen in Figure 2.

Figure 2. Scene of material delivery with demonstration method

Based on Figure 2, the demonstration covers the parts and functions of the microscope, as well as the procedure for using and maintaining it[26]. Participants should consider several factors

[23] Nurtamara et al.(2024)
[24] Ramadhani (2020)
[25] (Yamamoto & Miyata, 2022).
[26] Mirko Ruščić et al., "The Use of Microscope in School Biology Teaching," *Resolution and Discovery* 3, no. 1 (November 2018): 13–16, https://doi.org/10.1556/2051.2018.00054.

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when using a microscope: moving the microscope with two hands, positioning the objective lens against the preparation, using immersion oil only at 100x objective magnification, and cleaning the lens with lens paper[27]. During practice, participants are instructed to use the trim to large magnifications from 10x to 40x, after which they continue to 100x magnification using essential oils. Fine and coarse focus settings are carefully adjusted for 40x and 100x magnifications to ensure the objective lens does not touch or press the preparation. Therefore, participants are accompanied by the CS committee, which is competent in using microscopes. Participants who have obtained the results of 40x and 100x magnification microscope preparations are instructed to document them using an Android-based smartphone. The reported results are uploaded to the Google Drive link and can be accessed by all CSA participants. Considering that this CSA aims to provide knowledge and skills regarding microscope usage procedures, the training activities were continued for five meetings. In the 2nd, 3rd, 4th, and 5th meetings, the activities focused more on preparing oral epithelial cell preparations using an object glass that was wiped with oral epithelium and then dipped in methylene blue[28], while epidermal cell preparations were made by thinly slicing the lamella of *A. cepa* bulbs[29] and *Rhoe discolor* leaves. The training Scene with the practicum method can be seen in Figure 3.

Figure 3. Training scene with a practical method

[27] Najmah et al., *Pengantar Mikrobiologi*, *EUREKA MEDIA AKSARA, JAWA TENGAH*, 2024.
[28] Risky Hadi Wibowo et al., "Pelatihan Pembuatan Preparat Segar Biologi Untuk Meningkatkan Keterampilan Guru Dan Siswa Di SMA Negeri 1 Argamakmur, Kabupaten Bengkulu Utara," *Dharma Raflesia : Jurnal Ilmiah Pengembangan Dan Penerapan IPTEKS* 19, no. 2 (2021): 389–98, https://doi.org/10.33369/dr.v19i2.18468.
[29] Jinhong Yuan et al., "Comparison of Sample Preparation Techniques for Inspection of Leaf Epidermises Using Light Microscopy and Scanning Electronic Microscopy," *Frontiers in Plant Science* 11 (February 25, 2020), https://doi.org/10.3389/fpls.2020.00133.

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During the CS activity, participants gained experience in cell preparation skills, using a light microscope with 40x and 100x magnification, and documenting observations digitally. The results of the CS participants' microscopic image documentation are shown in Figure 4.

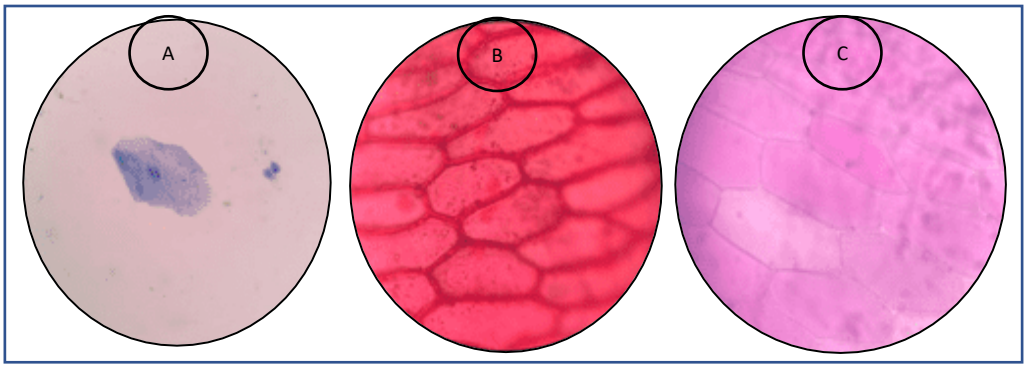

Figure 4. Example of documentation results of CSA participants. A. Oral mucosal epithelial cells. B. Epidermal cells of *A. cepa*. C. Epidermal cells of *Rhoe discolor*

Figure 4 is the result of documentation by CSA participants in the form of buccal mucosal epithelial cells, onion epidermis, and rhoe discolor with 40x and 100% magnification. Documentation was done using a mobile phone. Instructions for documenting cell preparation images using various microscope magnifications have provided a different and new learning experience for CS participants. This method aligns with the research findings that training in using tablet-integrated microscopes for 5 weeks has provided a new learning experience. Their excitement is evident when obtaining images with different magnifications, especially when the image appears more detailed at 100x magnification. In addition, students automatically share and compare the images obtained. The documentation technique in Figure 4 to produce Figure 5 refers to the principle of digital microscopy, namely participants who have received cell preparations with a magnification of 40x or 100x then place the handphone camera (recommended 25 Mega Pixels) above the ocular lens, the image is documented, uploaded to the Google Drive link and can be accessed by the trainer to be validated and given comments [30]This technique has the potential to be included in a digital-based curriculum. According to Modal et al.[31] at the 6th meeting, an evaluation of CS activities was carried out using a Post-test and skills test. Participants must be able to make

[30] (Sreeshyla et al., 2023).
[31] Mondal et al. (2024), students prefer slide images that have been stored in digital data because they are easy to access, study, and discuss with colleagues at any time

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three preparations, find three microscopic cells, and document them for 60 minutes. The Scene of the skills test can be seen in Figure 5.

Figure 5. Scene of the CSA participant skills test

Before taking the skills test, CSA participants were instructed to work on a 5-minute post-test. The results of the post-test and microscope usage skills assessment can be seen in Tables 4 and 7.

Table 7. Frequency distribution of CSA participants' post-test scores

Score	Frequency	Percentage (%)
40	1	3,30
70	1	3,30
80	7	23,3
90	3	10,0
100	18	60,0
Total	**30**	**100%**

Based on Table 7. frequency distribution of CSA post-test scores from 30 participants, there was 1 (3.30%) student with a score of 40, 1 (3.30%) student with a score of 70, 7 (23.3%) student with a score of 80, 3 (10%) students with a score of 90, and 18 (60%) students with a score of 100.

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The results of the analysis of the standard distribution test, homogeneity, and paired t-test can be seen in Table 8.

Table 8. Results of the analysis of the standard distribution test, homogeneity, and the paired t-test

Variable	Mean ($\bar{x} \pm$ SD)	Sig. normality	Sig. homogeneity	Sig. t-test paired
Pre-test	45.62 ± 15.47	0.177	0.458	0.01
Post-test	90 ± 14.28	0.164		

Based on Table 8, the average value of the pre-test results is 45.62. After being given training 5 times, the post-test value is produced at 90. The average value data is normally distributed (0.177 > 0.05) and homogeneous (0.458 > 0.05). The paired t-test produces a significance of 0.01 < 0.05, so that H0 is rejected, indicating that CSA activity significantly increases the average value of knowledge about microscopes. The results of the skills assessment are shown in Table 9.

Table 9. Results of the analysis of the standard distribution test, homogeneity, and the paired t-test

No	Indicator	Assessment	
		True	False
1	Preparation of onion (*Allium cepa*) epidermal cell preparations	22 (73.3%)	8 (26.7%)
2	Observing, finding, and documenting images of onion (*Allium cepa*) epidermal cell preparations	22 (73.3%)	8 (26.7%)
3	Making oral mucosa epithelial cell preparations	30 (100%)	0 (0%)
4	Observing, finding, and documenting images of oral mucosa epithelial cell preparations	30 (100%)	0 (0%)
5	Making Rhoe discolor leaf epidermal cell preparations	25 (83.3%)	5 (16.7%)
6	Observing, finding, and documenting images of Rhoe discolor leaf epidermal cells	25 (83.3%)	5 (16.7%)

Based on Table 9, it can be seen that there are six indicators of CSA participants considered skilled and unskilled in operating a microscope. The number of participants who are trained and untrained in making and observing onion bulb epidermis cells is 22 (73%) and 8 (26.7%), and in creating and observing *Rhoe discolor* leaf epidermis cells, 25 (83.3%) and 5 (16.7%). For making and observing oral mucosa epithelial cells, 30 (100%) are considered skilled. Overall, the results of the

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pre-test, post-test, and skills test evaluations conducted during the 5x CSA microscope training activities are shown in Figure 6.

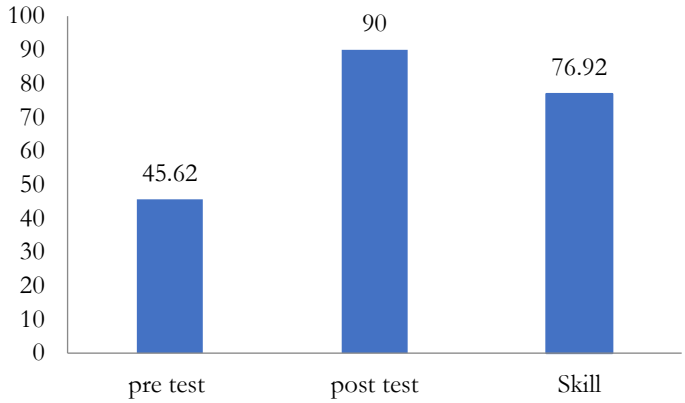

Figure 6. The overall average value of the pre-test, post-test, and skills

Based on Figure 6, it can be seen that overall, this CS activity increased the average knowledge of microscope use and maintenance from 45.62 to 90, a 97.28% increase, while the average value of the skills test was 76.92. The results of this CSA complement the activities of Anindita et al.[32] The average value of knowledge and understanding of tablet-making practice simulations increased by 43% from 54 to 97. According to Demir, the material for validating the indicator of successful use of microscopes is done by adding the skills of making cell preparations and observing them using a microscope with all magnifications[33]. During the evaluation of the skills test, participants must be skilled in operating various parts of the microscope, such as the diaphragm, lens, and fine and coarse settings, to achieve a clear image focus according to the instructions for the skills assessment form. Finally, at the end of this CS, participants are expected to be able to label and explain the parts of a light microscope, calculate the total magnification of a microscope by multiplying the magnification of the eyepiece lens (ocular lens) and the objective lens, explain the fundamental differences between plant cells and animal cells when viewed under a microscope [34]including that the participants who participated have met the target output, this CS can be integrated with New Student Admissions activities. The socialization of the need for SMK/A students to continue their studies in college involves not only material presentation but also direct microscope use training, such as 5x training. The limitations of this CSA are that the participants

[32] Anindita et al., 2023),
[33] Demir (2015),
[34] Joshua Whittaker and R Whitlow, "Microscope Investigations: An Inquiry-Based Cell Lab," vol. 8, 2023, https://doi.org/https://digitalcommons.odu.edu/inclusivestrategies/8.

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in this CS activity are still limited, so for the next CS, it is necessary to invite more SMA/K students. In addition, based on Kirkpatrick's four-level training evaluation model, which consists of the reaction, learning, behavior, and impact stages, this CSA has only reached the learning stage and has not progressed to the behavioral and impact change stages that require pre-CSA monitoring.

CONCLUSION

This CSA aims to provide students with knowledge and skills in making cell preparations and operating microscopes. The contribution of this CSA is in the form of delivering materials accompanied by training in using microscopes for students of SMK Al-Muhtadin and MA Annida Al-Islamy was not only able to have implications to increase knowledge regarding the procedures for using and maintaining microscopes, making cell slides, and observing cell slides with a light microscope, but also increasing the skills of using and maintaining microscopes, making cell slides, and observing them using a light microscope. It was proven not only by the increase in the average score of the pre-test to post-test questions but also by the skills test results, which were 76.92 out of 100. Based on this, it can be concluded that this CS activity successfully enhanced the knowledge and skills of students at SMK Al-Muhtadin and MA Annida Al-Islamy in procedures for using and maintaining microscopes, making cell slides, observing cell slides, and documenting cell slide techniques.

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REFERENCES

Agustina, Putri, and Alanindra Saputra. "Analisis Keterampilan Proses Sains (KPS) Dasar Mahasiswa Calon Guru Biologi Pada Mata Kuliah Anatomi Tumbuhan." In *Seminar Nasional Pendidikan Sains , Surakarta 22 Oktober 2016*, 2:381-388., 2016.

Ahmed, R., K.M. Shamim, H.K. Talukdar, and S. Parvin. "Light Microscopy for Teaching-Learning in Histology Practical in Undergraduate Medical Education of Bangladesh-a Teachers' Perspective." *South-East Asian Journal of Medical Education* 12, no. 1 (August 1, 2018): 26. https://doi.org/10.4038/seajme.v12i1.39.

Alisjahbana, Armida Salsiah., and Endah. Murniningtyas. *Tujuan Pembangunan Berkelanjutan Di Indonesia : Konsep, Target, Dan Strategi Implementasi*. Unpad Press, 2018.

Anggraini, Dewi, and Siwi Nugraheni. "Menuju Pendidikan Berkelanjutan: Implementasi Tujuan Berkelanjutan (SDGS) Dalam Mewujudkan Berkualitas Di Indonesia." *Jurnal Penelitian*

doi: 10.35316/assidanah.v7i2.435-454

Pendidikan Indonesia 1, no. 3 (April 2024): 189197. https://doi.org/https://doi.org/10.62017/jppi.v1i3.1028.

Angreani, Anggi, Bambang Supriatno, and Sri Anggraeni. "Analisis, Uji Coba Dan Rekontruksi Kegiatan Praktikum Melalui Lembar Kerja Peserta Didik Struktur Dan Fungsi Sel." *Biodik* 6, no. 3 (2020): 242–55. https://doi.org/10.22437/bio.v6i3.9467.

Anindita, Reza, Maya Uzia Beandrade, Intan Kurnia Putri, Dede Dwi Nathalia, and Melania Perwitasari. "Technology Simulation Training in the Production of Drug Tablets for Pharmaceutical Vocational School Students in Bekasi City." *Journal of Community Service and Empowerment* 4, no. 2 (2023): 289–99. https://doi.org/10.22219/jcse.v4i2.25077.

Anindita, Reza, Dede Dwi Nathalia, Intan Kurnia Putri, and Melania Perwitasari. "Simulation of Betel Leaf Extraction as a Provision of Entrepreneurship Knowledge for Students Regarding the Preparation of Raw Materials for Pharmaceutical Products." *Bubungan Tinggi* 6, no. 4 (2024): 862–72. https://doi.org/https://doi.org/10.20527/btjpm.v6i4.11875.

Anindita, Reza, Siti Nurfajriah, Ria Amelia, Noor Andryan Ilsan, Maulin Inggraini, and Elfira Maya Sari. "Edukasi Dan Pelatihan Pemeriksaan Infeksi Saluran Kemih (ISK) Pada Siswa SMK Teknologi Laboratorium Medis (TLM) Di Kota Bekasi." *Jurnal Abdi Insani* 10, no. 4 (2023): 2301–13. https://doi.org/10.29303/abdiinsani.v10i4.1180.

Basriani, Agustin. "Pengaruh Pelatihan Kerja Dan Motivasi Kerja Terhadap Kinerja Pegawai Dinas Perhubungan Provinsi Riau." *Jurnal Pajak Dan Bisnis* 4, no. 1 (2023): 181–90. https://doi.org/https://doi.org/10.55336/jpb.v4i1.79.

Chou, Pao Nan, and Ping Jhen Wang. "Looking Deeper: Using the Mobile Microscope to Support Young Children's Scientific Inquiries." *Sustainability (Switzerland)* 13, no. 7 (April 1, 2021). https://doi.org/10.3390/su13073663.

Demir, Sibel. "Evaluation of Science Teacher Candidates' Level of Knowledge the Use of Microscopes." *Journal of Education and Practice* 6, no. 24 (2015): 27–29. https://doi.org/https://www.iiste.org/Journals/index.php/JEP/article/view/25255.

Durrani, Zeeshan, Lucy Pickavance, Denis Duret, Sarah Nevitt, and Karen Noble. "Evaluation of Innovative Digital Microscopy and Interactive Team-Based Learning Approaches in Histology Teaching." *Developing Academic Practice* 2021, no. March (March 2021): 1–16. https://doi.org/10.3828/dap.2021.8.

Hapsari, Yovita Diva, Sajidda Andani Rahmawati, Fidela Amelia Sani, Aldi Pramudya Baskoro, Reni Lestari, and Sarifa Nadia. "Pengaruh Metode Pembelajaran Praktek Dan Ceramah Pada Pembelajaran Seni Kelas III SD 6 BulungKulon." *Jurnal Ilmiah Profesi Guru (JIPG)* 4, no. 2 (2023): 137–45. https://doi.org/10.30738/jipg.vol4.no2.a15396.

Hidayati, Nurkhairo, and Lismayani Fauziyah. "Profil Kesiapan Laboratorium Biologi Untuk Mendukung Kerja Praktik Siswa Di MA Al-Ikhwan Kecamatan Kulim, Kota Pekanbaru." *Jurnal Inovasi Pembelajaran Biologi* 4, no. 2 (2023): 69–79. https://doi.org/10.26740/jipb.v4n2.p69-79.

Imreh, Gabriela, Jianjiang Hu, and Sylvie Le Guyader. "Improving Light Microscopy Training Routines with Evidence-Based Education." *Journal of Microscopy* 294, no. 3 (June 1, 2024): 295–307. https://doi.org/10.1111/jmi.13216.

Japa, Lalu, Syamsul Bahri, and Prapti Sedijani. "Mengenal Fitoplankton Untuk Penguatan Materi Kompetensi Dasar Protista Pada Siswa Jurusan IPA (Biologi) MA Hidayatul Muhsinin Desa Labulia Lombok Tengah." *Jurnal Pengabdian Magister Pendidikan*, no. 1 (2018): 88–94. https://doi.org/10.29303/jpmpi.v1i1.231.

doi: 10.35316/assidanah.v7i2.435-454

Kara, Yilmaz. "Determining the Effects of Microscope Simulation on Achievement, Ability, Reports, and Opinions about Microscope in General Biology Laboratory Course." *Universal Journal of Educational Research* 6, no. 9 (September 1, 2018): 1981–90. https://doi.org/10.13189/ujer.2018.060917.

Kaspul, Kaspul, Aulia Ajizah, and Amalia Rezeki. "Bimbingan Teknis Pengenalan Mikroskop Dan Penggunaannya Pada Pembelajaran Biologi Kelas X Di SMA Negeri 1 Aluh-Aluh Kabupaten Banjar." *Bubungan Tinggi: Jurnal Pengabdian Masyarakat* 4, no. 2 (2022): 289. https://doi.org/10.20527/btjpm.v4i2.4811.

Kotala, Sarmawaty, and Tri Santi Kurnia. "Training of Making Wet Mount Slide and Use of A Microscope at SMAN 45 Central Maluku." *Journal Mangente* 2, no. 2 (May 2023): 2962–9888. https://doi.org/https://doi.org/10.33477/mangente.v2i2.4071.

Kuswarini Suprapto, Purwati, Mufti Ali, and Egi Nuryadin. "Pelatihan Penggunaan Dan Pemeliharaan Mikroskop Bagi Guru-Guru IPA Madrasah Tsanawiyah (MTS) Di Wilayah Kabupaten Tasikmalaya." *Jurnal Pengabdian SIliwangi*, no. 1 (2018): 43–50. https://doi.org/10.37058/jsppm.v4i1.435.

Maulida, Ervina, Adnan Kasofi, and Balqis. "Increasing Young Generation Understanding and Readiness To Face the Challenges of the Digital." *JPM Bakti Parahita : Jurnal Pengabdian Masyarakat Bakti Parahita* 2, no. 2 (2021): 148–59. https://doi.org/https://doi.org/10.54771/jpmbp.v2i02.228.

Mondal, Saini, Soniya Adyanthaya, Devika Jayarajan, Sudeendra Prabhu, and Pallavi Sabarad. "The Comparison of Digital Microscopy with Conventional Microscopy in the Teaching of Oral Pathology: A Questionnaire-Based Study." *Oral and Maxillofacial Pathology Journal,* 15, no. 2 (December 2024): 169–72. https://doi.org/https://doi.org/10.1016/j.jds.2024.03.022.

Najmah, Asriyani Ridwan, Tacik Idayanti, Emelda, Ni Made Sri Dwijastuti Dwi Setianingtyas, Syandrez Prima Putra, Dwi Krihariyani, Aini, and Kristanti Parisihni. *Pengantar Mikrobiologi. Eureka Media Aksara, Jawa Tengah*, 2024.

Nofisulastri, Siti Rabiatul Adawiyah, and Akhmad Haolani. "Pendampingan Operasional Mikroskop Dasar Di Sma Islam Al Azhar Nw Kayangan." *Jurnal Abdi Mas TPB* 1 (June 2019): 52–55. https://doi.org/https://doi.org/10.33477/mangente.v2i2.4071.

Nurtamara, Luthfiana, Sri Amintarti, Aulia Ajizah, Riya Irianti, and Dewi Widiyastuti. "Pelatihan Penggunaan Mikroskop Cahaya Bagi Mahasiswa Pendidikan Biologi FKIP ULM Dengan Menggunakan Preparat Segar A Workshop on the Utilization of Light Microscope for Biology Education Pre-Service Students of FKIP ULM through the Use of Wet Mount Prepar." *Kayuh Baimbai : Jurnal Pengabdian Masyarakat* 01, no. 02 (2024): 18–22. https://doi.org/https://ejurnal.unukase.ac.id/index.php/kbjpm.

Oktaviani, Lulud, Styawati Styawati, Lathifah Lathifah, Yuni Tri Lestari, and Yulian Khadaffi. "PKM Peningkatan Pemahaman Guru Mengenai Penelitian Tindakan Kelas Dan Kualitatif Di MAN 1 Pesawaran." *Jurnal Widya Laksmi: Jurnal Pengabdian Kepada Masyarakat* 1, no. 2 (2021): 98–103. https://doi.org/10.59458/jwl.v1i2.20.

Payne-Tobin Jost, Anna, and Jennifer C. Waters. "Designing a Rigorous Microscopy Experiment: Validating Methods and Avoiding Bias." *Journal of Cell Biology*. Rockefeller University Press, May 1, 2019. https://doi.org/10.1083/jcb.201812109.

Pendidikan, Kementerian, and Dan Teknologi. *BIOLOGI SMP SMA/MA Kelas XI*, 2022. https://buku.kemdikbud.go.id.

Prasetya, Dheny, and Lina Herlina. "The Use of Microscope Flash Media in Biology Laboratory

doi: 10.35316/assidanah.v7i2.435-454

Works." *Journal of Biology Education* 6, no. 3 (December 2017): 357–63. https://doi.org/https://doi.org/10.15294/jbe.v6i3.21240.

Ramadhani, Sulistyani Puteri. *Pengelolaan Laboratium*. Edited by Yiesa Media Karya. *Yayasan Yiesa Rich Jl. Bima, Kecamatan : Sawangan, Kelurahan Bedahan Depok Jawa Barat*. Cetakan pe., 2020.

Reigoto, Agatha M., Sarah A. Andrade, Marianna C.R.R. Seixas, Manoel L. Costa, and Claudia Mermelstein. "A Comparative Study on the Use of Microscopy in Pharmacology and Cell Biology Research." *PLoS ONE* 16, no. 1 January (2021): 1–13. https://doi.org/10.1371/journal.pone.0245795.

———. "A Comparative Study on the Use of Microscopy in Pharmacology and Cell Biology Research." *PLoS ONE* 16, no. 1 January (January 1, 2021). https://doi.org/10.1371/journal.pone.0245795.

Reza, Anindita, Dwi Nathalia Dede, Uzia Beandrade Maya, Kurnia Putri Intan, Melania Perwitasari, and Rizki Amalia Harahap Nofria. "Simulation Of Manufacturing Liquid Soap From Basil Leaf Extract And Eucalyptus Oil Balsam For High School Students In Bekasi City." *Jurnal Abdi Insani* 10 (2023): 2587–94. https://doi.org/https://doi.org/10.29303/abdiinsani.v11i1.1439.

Riduan, Bintang Senja, and Fitria Rosmi. "Penggunaan Model Pembelajaran Direct Instruction Untuk Meningkatkan Hasil Belajar Menulis Surat Undangan Tidak Resmi Siswa Kelas V SD Lab School FIP UMJ." In *Seminar Nasional Dan Publikasi Ilmiah 2024 FIP UMJ*, 191–202, 2024.

Rifatul Masrikhiyah. "Peningkatan Mutu Pengetahuan Siswa Mengenai Natural Science Di Mi Ikhsaniyah Kupu: Pengenalan Dan Praktik Penggunaan Mikroskop." *Randang Tana - Jurnal Pengabdian Masyarakat* 2, no. 1 (2019): 39–45. https://doi.org/10.36928/jrt.v2i1.280.

Ruščić, Mirko, Antonio Vidović, Goran Kovačević, and Damir Sirovina. "The Use of Microscope in School Biology Teaching." *Resolution and Discovery* 3, no. 1 (November 2018): 13–16. https://doi.org/10.1556/2051.2018.00054.

Samsuar, Samsuar, Silvi Puspa Widya Lubis, Ammar Zaki, Suci Ramadhana, and Ameliana Ameliana. "Keterampilan Berpikir Kreatif Siswa Menggunakan Mikroskop Smartphone Berbasis Stem Sebagai Alat Praktikum." *EDUPROXIMA : Jurnal Ilmiah Pendidikan IPA* 6, no. 3 (2024): 976–85. https://doi.org/10.29100/.v6i3.5044.

Schneckenburger, Herbert, and Christoph Cremer. "Keeping Cells Alive in Microscopy." *Biophysica* 5, no. 1 (January 6, 2025): 1. https://doi.org/10.3390/biophysica5010001.

Seumahu, Cecilia Anna, Handy Erwin Pier Leimena, Dece Elisabeth Sahertian, and Abdul Mahid Ukratalo. "Training on Cell Observation Using Olympus CX-21 Microscope and Cell Documentation Using Smartphones for Students and Teachers of MA Al-Muluuk Persis Telaga Kodok, Leihitu, Central Maluku Regency." *Innovation for Community Service Journal* 2, no. 1 (2024): 56–61. https://doi.org/https://doi.org/10.30598/icsj.v2i1.12486.

Sreeshyla, Huchanahalli, Hegde Usha, Priyanka Nitin, S. V. Sowmya, Dominic Augustine, and Vanishri Haragannavar. "Digital Microscopy: A Routine Mandate in Future? A Leaf out of Covid-19 Pandemic Laboratory Experience." *Journal of Oral and Maxillofacial Pathology*. Wolters Kluwer Medknow Publications, January 1, 2023. https://doi.org/10.4103/jomfp.jomfp_111_22.

Sreevidyalatha, G M, and P Shashikala. "Fostering Proficiency in Cell Identification: A Comparative Analysis of Diagrams and Microscopic Images for Optimal Cytopathology Learning in Competency-Based Medical Education Curriculum." *Journal of Medical Sciences and Health* 10,

doi: 10.35316/assidanah.v7i2.435-454

no. 1 (April 15, 2024): 47–51. https://doi.org/10.46347/jmsh.v10.i1.23.377.

Subali, Demak Bambang, Ian Yulianti, Susilo, Ellianawati, Mosik, and Alvian. "Implementasi Model Pelatihan Pembelajaran IPA Berbasis Digital Image Creator For Optical Microscope (DIGICOM) Pada Guru Fisika Kabupaten." *Unnes Physics Education Journal (UPEJ)* 7, no. 3 (October 2018): 1–6. https://doi.org/https://doi.org/10.15294/upej.v7i3.27696.

Whittaker, Joshua, and R Whitlow. "Microscope Investigations: An Inquiry-Based Cell Lab." Vol. 8, 2023. https://doi.org/https://digitalcommons.odu.edu/inclusivestrategies/8.

Wibowo, Risky Hadi, Sipriyadi Sipriyadi, Fatimatuzzahra Fatimatuzzahra, Reza Wahyuni, Redo Setiawan, Annisa Prastika, and Rizawati Rizawati. "Pelatihan Pembuatan Preparat Segar Biologi Untuk Meningkatkan Keterampilan Guru Dan Siswa Di SMA Negeri 1 Argamakmur, Kabupaten Bengkulu Utara." *Dharma Raflesia : Jurnal Ilmiah Pengembangan Dan Penerapan IPTEKS* 19, no. 2 (2021): 389–98. https://doi.org/10.33369/dr.v19i2.18468.

Yamamoto, Masashi, and Shogo Miyata. "Influences of Microscopic Imaging Conditions on Accuracy of Cell Morphology Discrimination Using Convolutional Neural Network of Deep Learning." *Micromachines* 13, no. 5 (May 1, 2022). https://doi.org/10.3390/mi13050760.

Yuan, Jinhong, Xiaoduan Wang, Huihui Zhou, Yulin Li, Jing Zhang, Shuxin Yu, Mengni Wang, et al. "Comparison of Sample Preparation Techniques for Inspection of Leaf Epidermises Using Light Microscopy and Scanning Electronic Microscopy." *Frontiers in Plant Science* 11 (February 25, 2020). https://doi.org/10.3389/fpls.2020.00133.