

Development of Video Tutorials as a Guide to Guided Inquiry-Based Practicum on Senior High School Biology Material

Mariani Natalina^{1*}, Hikmah Hidayah¹, Darmadi¹

¹ Biology Education Study Program, Faculty of Teacher Training and Education, Universitas Riau, Riau, Indonesia.

Received: October 31, 2023

Revised: May 27, 2024

Accepted: September 25, 2024

Published: September 30, 2024

Corresponding Author:

Mariani Natalina

mariani.nl@lecturer.unri.ac.id

DOI: [10.29303/jppipa.v10i9.5925](https://doi.org/10.29303/jppipa.v10i9.5925)

© 2024 The Authors. This open access article is distributed under a (CC-BY License)



Abstract: This study aims to produce guided inquiry-based video tutorials as practicum instructions on quality plant tissue structure and function material. The type of research conducted is Research and Development (R&D) using the ADDIE model (Analyze, Design, Development, Implementation and Evaluation) which is limited to the third stage. The instruments used in this study were validation sheets and response questionnaires. This research was conducted at SMAN 8 Pekanbaru. The assessment was carried out in the form of filling out validation sheets by two experts, namely a media expert and a biology material expert as well as two senior high school biology teachers. The video tutorial validation results obtained an average score of 3.66 with a very valid category. The video tutorial was tested on eighth semester biology education students in the limited trial phase I with a score of 3.69 with a very good category. Then the video tutorial was tested in a limited trial phase II with grade XI students with a score of 3.69 with a very good category. Based on the average score obtained from the validation and trial results, it can be concluded that the guided inquiry-based practicum video tutorial has very good quality with a score of 3.68.

Keywords: Guided Inquiry; Structure and function of plant tissues; Video tutorials

Introduction

Biology is a very in-depth study of living things and related natural phenomena. The study of biology is not only limited to theory, but also very closely related to the application of the scientific method, which is the foundation of the validity and credibility of this science (Jacob, 2022). The scientific method plays a crucial role in developing systematic scientific understanding, where one of the concrete manifestations of this method in biology learning is laboratory practicum activities (Mohzana et al., 2023; Ravista et al., 2021).

Laboratory practicum activities are an essential element in the biology learning process because they provide opportunities for students to develop critical thinking, analytical, and problem-solving skills. Through practicum, students are also invited to prove hypotheses and draw conclusions from direct

observation, which enriches their understanding of the biological concepts taught (Ahmad, 2021; Kwangmuang et al., 2021; Putri et al., 2020). In the realm of education, practicum not only supports the cognitive domain, but also the affective and psychomotor domains, where students are trained to apply theory in a real context, build scientific attitudes, and hone their technical skills (Jumrodah et al., 2023).

However, the reality in the field shows that the implementation of practicum in schools often faces various obstacles that hinder its effectiveness. One of the main problems faced is the limited time allocated for practicum, which is often insufficient if the teacher has to explain all practical work steps in detail (Alalwan et al., 2020; Turrahmah et al., 2020). This limitation can reduce the opportunity for students to gain adequate practical experience, which in turn can affect their understanding of the material being studied.

How to Cite:

Natalina, M., Hidayah, H., & Darmadi. (2024). Development of Video Tutorials as a Guide to Guided Inquiry-Based Practicum on Senior High School Biology Material. *Jurnal Penelitian Pendidikan IPA*, 10(9), 6929–6940. <https://doi.org/10.29303/jppipa.v10i9.5925>

The urgency of this research becomes very clear in the context of improving the quality of biology learning in schools. Given the importance of practicum in building students' competencies, innovations in teaching methods are needed to overcome the existing limitations (Ersin et al., 2020; González et al., 2020). One approach that can be taken is to utilize technology-based learning media, such as video tutorials. This media can act as an effective tool to optimize practicum time, so that students can prepare themselves better before entering the laboratory (Purnamasari et al., 2020; Yusuf & Widyaningsih, 2020).

This research highlights the development of practicum video tutorials using the guided inquiry learning model. This model was chosen because it is in accordance with the explorative and investigative nature of biology learning, where students are encouraged to discover and understand concepts independently through a structured inquiry process (Sutiani et al., 2021). The tutorial video developed not only helps students in understanding the steps of the practicum, but also encourages them to think critically and investigate the material more deeply (Howell, 2021; Korucu-Kış, 2021).

In class XI biology material, especially in Basic Competencies (KD) 3.3 and 4.3 which cover the structure and function of plant tissues, the application of the guided inquiry model in this video tutorial is very relevant. This material is known to have a high level of difficulty and is often perceived as complex material by students, especially because of the tendency to memorize and concepts that contain scientific terms that are difficult to understand. Statistics show that as many as 58.50% of students consider the structure and function of plant tissues to be difficult (this data provides strong evidence of the need for more effective educational interventions) (Sugianto et al., 2023).

The lack of direct experience in observing plant tissue preparations is also a factor that causes students' low understanding of this material (Safarati & Zuhra, 2023; Zebua, 2024). With the time constraints that make it difficult for teachers to provide this hands-on experience, the development of video tutorials with guided inquiry models is a solution that is not only innovative but also necessary to improve the learning process (Chandra et al., 2023). This makes this research has a high urgency in an effort to improve the quality of biology learning at the senior high school level (Karlina & Hindriana, 2023).

This research not only seeks to address practical problems that exist in the field, but also contributes to the development of teaching methods that are more adaptive and responsive to student needs. Through the use of guided inquiry-based video tutorials, it is expected that students can more easily understand

complex material, improve practical skills, and foster critical and analytical scientific attitudes in learning biology.

Method

This research uses the Research and Development (R&D) research method using the ADDIE model developed by Dick and Carry. This research aims to develop a product with structured activity stages to produce a good product according to user needs (Sugiyono, 2013). The target of this research is the development of guided inquiry-based video tutorials and practical guidebooks on the structure and function of plant tissues. The development model used is the ADDIE model. This model consists of 5 stages, namely analyze, design, development, implementation, and evaluate. This research was only carried out to the development stage because the aim of this research was only to develop quality learning media for use in learning based on expert assessments and respondent responses.

This research was carried out in the Biology Education Study Program, Department of Mathematics and Science Education, Faculty of Teacher Training and Education, Riau University from April 2023 to May 2023. This research was validated by two biology education expert lecturers and two teachers at SMAN 1 Pekanbaru and SMAN 8 Pekanbaru using a sheet, validation to determine the validity of the video tutorial that has been developed. Next, limited trials were carried out twice. Phase I limited trials or lab scale were carried out on 10 eighth semester students at the Biology Education Study Program, FKIP, Riau University. Meanwhile, the phase II limited trial was carried out on 20 class XI students at SMAN 1 Pekanbaru. Phase I and II limited trials were collected using a response questionnaire to see the use of practical video tutorial media. The criteria for making validation decisions can be seen in table 2.

Table 1. Assessment Categories by Validator (Sugiyono, 2019)

Assessment score	Category
4	Strongly Agree
3	Agree
2	Disagree
1	Don't agree

Table 2. Product Validity Criteria (Sugiyono, 2019)

Average Score Interval	Validity Category
$3.25 \leq x \leq 4$	Very Valid
$2.5 \leq x < 3.25$	Valid
$1.75 \leq x < 2.5$	Less Valid
$1 \leq x < 1.75$	Invalid

After validation, limited trials were carried out twice. Data from limited trials will be analyzed in accordance with the assessment guidelines developed. The assessment categories for limited trials can be seen in table 3 below.

Table 3. Rating Categories by Respondents (Sugiyono, 2019)

Assessment score	Category
4	Strongly Agree
3	Agree
2	Disagree
1	Don't agree

The criteria for making decisions on test results can be seen in table 4 below.

Table 4. Criteria for Trial Results (Sugiyono, 2019)

Average Score Interval	Trial category
$3.25 \leq x \leq 4$	Very good
$2.5 \leq x < 3.25$	Good
$1.75 \leq x < 2.5$	Less good
$1 \leq x < 1.75$	Not good

Next, data analysis will be carried out to determine the quality of the media that has been developed. The

Table 6. Video Tutorial Validation Results on Design Aspects

Statement Items	Statement Items	Statement Items
Suitability of practical video tutorials with basic competencies.	3.75	VV
Contains an introduction to theory in accordance with the practical activities to be carried out.	3.75	VV
Contains objectives related to student performance.	4.00	VV
Use simple, clear and easy to understand language and use good and correct Indonesian according to the General Guidelines for Indonesian Spelling (PUEBI).	3.25	VV
Load practicum tools and materials according to the practicum activities to be carried out.	4.00	VV
Suitability of practical video tutorials with the selected model.	3.75	VV
The practical video tutorial contains phase 1, namely problem orientation from guided inquiry syntax by posing problems related to the material.	4.00	VV
The practical tutorial video contains leading questions to help students formulate hypotheses (phase 2).	3.75	VV
The practicum video tutorial contains phase 3, namely collecting data from a guided inquiry syntax which contains work procedures for carrying out the practicum.	3.75	VV
The practicum video tutorial contains how to fill in the observation results table after carrying out the practicum and instructions for questions that must be answered as a follow-up to analyzing the data (Phase 4).	4.00	VV
Practical tutorial videos are presented coherently and clearly so that students can draw conclusions from the practical activities that have been carried out (Phase 5).	3.50	VV
Average	3.77	VV

Note: VV = Very Valid

Based on table 6, it shows that the video tutorial developed meets each assessment indicator. Based on these results, it is known that the overall average results from the design aspect are 3.7 very valid categories. Based on this data, it is known that the items that got the highest mean, namely items 3, 5, 7, 10, got a mean score

quality results of the video tutorials developed can be calculated using the average score formula, namely:

$$M = \frac{X1+X2}{2} \tag{1}$$

Information:

M = Average score

XI = Average value of validation results

X2 = Average value of limited trial results

Categories for determining quality can be seen in table 5.

Table 5. Product Quality Categories (Sugiyono, 2013)

Average Score Interval	Trial category
$3.25 \leq x \leq 4$	Very good
$2.5 \leq x < 3.25$	Good
$1.75 \leq x < 2.5$	Less good
$1 \leq x < 1.75$	Not good

Result and Discussion

Result

Design Aspects

The validation results for the design aspect can be seen in table 6 below.

of 4.00. The statement item that got the lowest mean, namely item 4, got a mean score of 3.25.

Aspects of Learning Quality

Aspects of learning quality can be seen in table 7 below.

Table 7. Video Tutorial Validation Results on Learning Quality Aspects

Statement Items	Statement Items	Statement Items
Students get learning assistance from the practical video tutorials presented.	4.00	VV
The practicum video tutorials presented help students to carry out practicums independently.	4.00	VV
The practical video tutorials presented can help teachers to make learning more efficient and effective with practicums.	3.50	VV
The practical video tutorials presented can help students understand practical activities.	3.75	VV
The practical video tutorials presented can increase students' learning motivation.	3.25	VV
Average	3.70	VV

Note: VV = Very Valid

Based on table 7, the quality aspect of learning in video tutorials is considered very valid by obtaining an average score of 3.70. The items that got the highest mean were items 1 and 2. The statement item that got the lowest mean got a mean score of 3.25 on item 5 with the statement that the practical tutorial video presented could increase students' learning motivation.

Design/appearance aspects

Design/appearance aspects can be seen in table 8. Based on table 8, the video tutorials developed have met each assessment indicator. The design/appearance aspect in the tutorial video was considered very valid with an average score of 3.43. The items that got the highest mean, namely items 1 and 2, got a mean score of 3.75. The statement items that got the lowest mean, namely items 3, 5, 7, 8, and 9, got a mean score of 3.25.

Table 8. Video Tutorial Validation Results on Design/Display Aspects

Statement Items	Statement Items	Statement Items
Selection of interesting video openings.	3.75	VV
Selection of interesting video transitions.	3.75	VV
The images and videos displayed have good sharpness and focus.	3.25	VV
The type of font used is appropriate so it is easy to read.	3.50	VV
The font size used is appropriate so it is easy to read.	3.25	VV
The color of the letters used is appropriate so it is easy to read.	3.50	VV
Appropriateness and integration of colors in the design in the video.	3.25	VV
The layout in the video is correct.	3.25	VV
The volume of the video is clear.	3.50	VV
The choice of music to accompany the video is correct.	3.25	VV
Average	3.43	VV

Note: VV = Very Valid

Programming Aspects

Programming aspects can be seen in table 9. The programming aspect in the tutorial video was considered very valid with an average score of 3.75. The

items that got the highest mean were items 3 and 4. The statement items that got the lowest mean got a mean score of 3.50 on items 1 and 2.

Table 9. Video Tutorial Validation Results on Programming Aspects

Statement Items	Statement Items	Statement Items
The practical tutorial video doesn't take long to open.	3.50	VV
The practical video tutorial is easy to use and simple to operate.	3.50	VV
Practical video tutorials can be installed or run on various hardware and software.	4.00	VV
Practical video tutorials can be used repeatedly.	4.00	VV
Video tutorials do not require special skills to use them.	3.75	VV
Average	3.75	VV

Note: VV = Very Valid

Limited Trial

The results of phase I and II trials can be seen in Table 10. Based on table 10, it shows that the limited trial phase I on the content/material aspect obtained a score of 3.68 and the media aspect 3.70. Meanwhile, in the

limited trial phase II, a score of 3.70 was obtained in the content/material aspect and 3.68 in the media aspect. Based on these results, it is known that the average results of phase I and II limited trials are 3.69 in the very good category.

Table 10. Student Responses to Tutorial Videos in Limited Trials

Aspect	Phase I Trial Average	Phase II Trial Average	Category
Content/Material Aspects	3.68	3.70	VG
Media Aspect	3.70	3.68	VG
Average	3.69	3.69	VG

Note: VG=Very Good

Tutorial Video Quality

The quality value of the tutorial videos that have been developed can be seen in table 11 below.

Table 11. Tutorial Video Quality

Stages	Average	Category
Validate video tutorials	3.66	VG
Limited trials (Phase I and Phase II)	3.69	VG
Average	3.68	VG

Note: VG=Very Good

Based on table 11, it shows that the quality value of the video tutorial developed is 3.68 in the very good category.

Discussion

The design aspect is an important component in designing the appearance and components that will be included in the video tutorial being developed. The design aspect must be considered carefully so that the video tutorial developed is interesting and arouses students' curiosity (Utari et al., 2023). This is in line with Arsyad, (2017) that video media is prepared carefully, creatively and as interestingly as possible so that students are more interested in participating in ongoing learning activities so that they can arouse students' curiosity.



Figure 1. Practice goals

The item that got the highest mean with a mean score of 4.00 was item 3 (table 6) with a statement containing goals related to student performance. In this guided inquiry-based practicum tutorial video, before carrying out the practicum activity, it must contain a

learning objective component related to the student's performance to describe something that they want to implement, prove, test or learn during the practicum activity so that the practicum implementation can be directed in accordance with the objectives to be achieved. This is in line with (Muhammad et al., 2024) that one of the components that must be included in the practicum is objectives related to the problems expressed in the introduction or related to student performance. An example of a video showing the objectives of the practicum can be seen in Figure 1.

The statement item which received a mean of 4.00 in the very valid category was item 5 with the statement containing practical tools and materials in accordance with the practical activities to be carried out. In this guided inquiry-based practicum tutorial video, the tools and materials used in the practicum are explained. Tools and materials are components needed when carrying out practicum. This explanation of tools and materials can make it easier for students to prepare or find tools and materials according to instructions or directions from the tutor (Samsu et al., 2020). Hidayati et al. (2023) stated that a laboratory certainly requires a proper set of tools to support teaching and learning activities. These supporting tools are related to practical tools and materials. An example of a video display showing practical tools and materials can be seen in Figure 2 below.

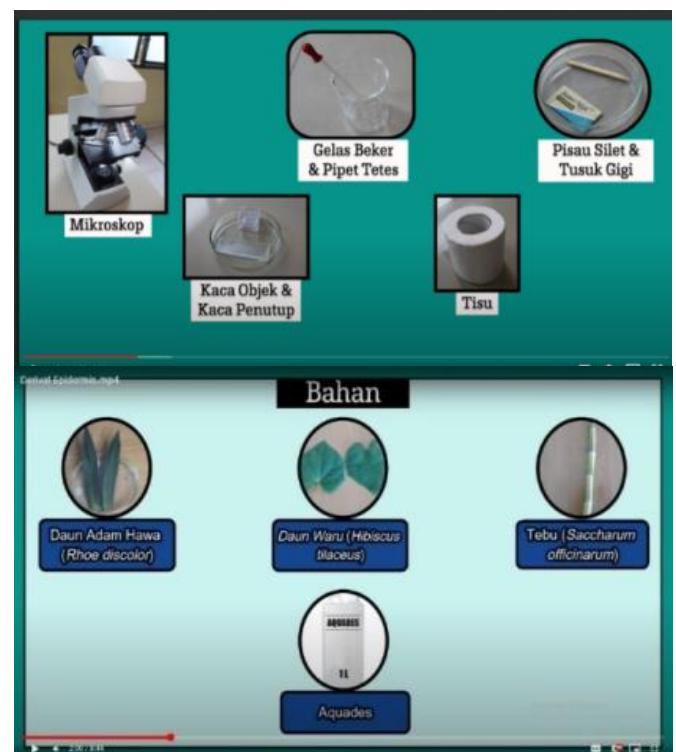


Figure 2. Practical tools and materials

The statement item that received a mean of 4.00 in the next very valid category was item 7 with the statement that the practical tutorial video contained phase 1 of the guided inquiry syntax, namely problem orientation. This guided inquiry-based practicum video tutorial presents a problem orientation which aims to provide an initial introduction to the material presented. Presenting problems using pictures that are appropriate to students' real-life situations and environments can make them more interested and easier to observe the problems presented (Mutiara et al., 2024). An example of a video display showing phase 1. Problem orientation can be seen in Figure 3 below.



Figure 3. Problem Orientation

The statement item that received an average of 4.00 in the very valid category was item 10 with the practical video tutorial statement containing how to fill in the observation table after carrying out the practicum and instructions for questions that must be answered as a follow-up to analyzing the data. In each video, after simulating practical work procedures along with the observation results obtained, examples of how to fill in the observation results table are also given so that students do not make mistakes in filling in the next table and are also instructed to answer the questions that have been provided to help in analyzing the data.

This aims to train students to develop scientific thinking skills and improve the organization of facts/data clearly and systematically (Dila & Suyanto, 2023). An example of a video showing how to fill in the observation table and answer questions to analyze data can be seen in Figure 4 below.

The statement item that got the lowest mean, namely item 4, got a mean score of 3.25 in the very valid category. According to Sugiyono (2013) if the average validation results are in the range $3.25 \leq x \leq 4$ it is categorized as very valid. The statement in item 4 is the use of simple, clear and easy to understand language as well as using good and correct Indonesian according to the General Guidelines for Indonesian Spelling (PUEBI) (Syarifudin & Iskandar, 2023). The language used is

Indonesian which is the national language which functions as a communication tool to convey information. The use of language is very important because language is a means of absorbing and developing knowledge (Dinihari et al., 2023).

d. Hasil pengamatan

Tabel 1.1 Hasil Pengamatan Jaringan Pelindung (Epidermis)

Objek Pengamatan	Gambar dan Keterangan Hasil Pengamatan	Fungsi
Daun jagung (Zea mays) Perbesaran: 10 X 0.25		Melindungi bagian dalam organ tumbuhan dari keadaan seperti, hilangnya air karena penguapan, kerusakan mekanik, perubahan suhu, dan hilangnya zat-zat makanan.

Macam-Macam Jaringan pada Tumbuhan.mp4

Fase 4. Menganalisis Data

1. Pada kehidupan sehari-hari kita bisa melihat pohon atau tumbuhan lainnya bisa bertambah besar dan tinggi. Apakah faktor yang menyebabkan hal tersebut?

Figure 4. Observation table and data analysis

The quality of learning aspect (table 7) can be interpreted as the intensity of the systemic and synergistic relationship between teachers, students, teaching materials, media and learning systems in producing optimal learning processes and outcomes. The item that got the highest mean was item 1 with a mean score of 4.00 in the very valid category. The statement in item 1 is that students receive learning assistance from the practical video tutorials presented. The validation results show that the material delivered through guided inquiry-based video tutorials is very helpful and makes it easier for students to understand the concepts of practical activities in accordance with the material.

This inquiry-based tutorial video can make it easier for students to capture learning messages and make it easier to remember and understand practical activities. The belief among science education practitioners in the contribution of practicum to the understanding of subject matter is expressed in the motto: "I hear and I forget, I see and I remember, I do and I understand" (Huang et al., 2020). Practical videos aim to help communicate messages to provide understanding to the recipient of the message. If the video presents material

that is correct and easy to understand, then the video can be used as a learning resource (Noetel et al., 2021; Zheng et al., 2022). Delivery of material to help before the practicum activity process can be seen in Figure 5 below.

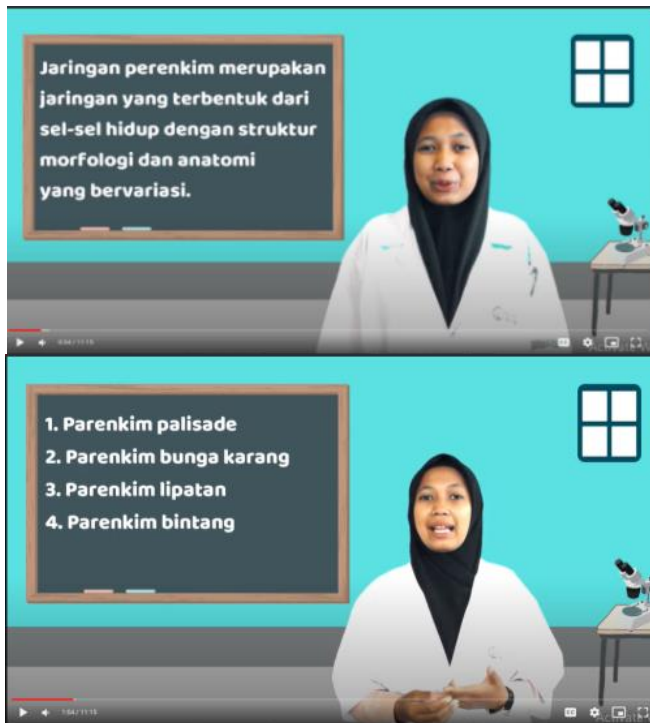


Figure 5. Delivery of material

The next statement item that got the highest average score of 4.00 was item 2 in the very valid category with the statement that the practicum video tutorial presented helped students to carry out the practicum independently because the activity was well directed through the guided inquiry stages which were presented systematically so that by watching the video tutorial This can help students easily re-do practical work procedures independently.



Figure 6. Practical procedures

This video tutorial has the advantage that students can repeat parts of practical activities that are considered unclear so that they can learn independently because they are guided by the guided inquiry stages in the video tutorial. In line with Saptriana's research in (Hafizah, 2020) states that practical videos in learning can enable students to learn independently and can encourage students to understand learning concepts. A video display showing the work procedure can be seen in Figure 6.

The item that received the lowest mean received a score of 3.25 in the very valid category on item 5 with the statement that the practical video tutorial presented could increase students' learning motivation. The video before improvements were made to item 5 received an average score of 3.00, indicating that the video still did not increase students' learning motivation. This is because the video background is too monotonous so that students are less motivated to watch the video. After improvements were made by making different object variations in each video according to the materials used in each practical activity of the four videos that had been developed, it showed that the video tutorials presented could increase students' motivation. The appearance before and after revision can be seen in Figure 7.

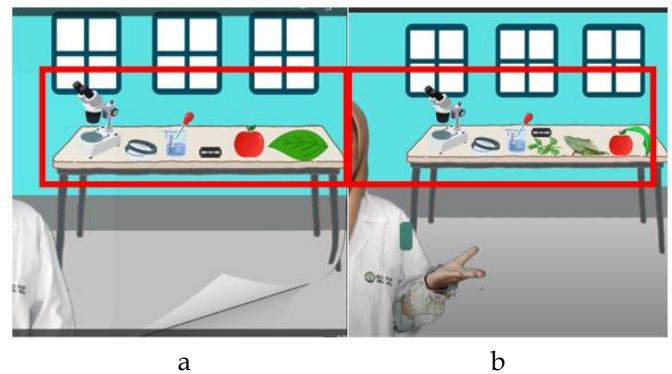


Figure 7. The appearance before revision(a) and after revision(b)

Based on table 8, the validation results of the design/appearance aspects in guided inquiry-based video tutorials have met the criteria as media that combines visuals and audio. The items that got the highest mean were item 1 about choosing an interesting video opening and item 2 about choosing an interesting video transition. This item states that the opening and transition of the guided inquiry-based practical video tutorial are interesting so that the audience is interested and does not get bored in watching the video tutorial (Meulenbroeks et al., 2024; Saekawati & Nasrudin, 2021).

The opening of the video is the first thing the audience will see when the video is first played. An interesting opening section can attract the audience to watch the video tutorial being developed. The duration

of the opening made in the tutorial video is around 10 seconds, and includes the tutor's identity by choosing a soft background color and also includes music that is suitable for intro needs. Transitions in videos are special effects created when exiting one video slide and moving to the next video slide which are used as a divider between one discussion and another. An example of the opening and transition display in a guided inquiry-based tutorial video can be seen in Figure 8 below.

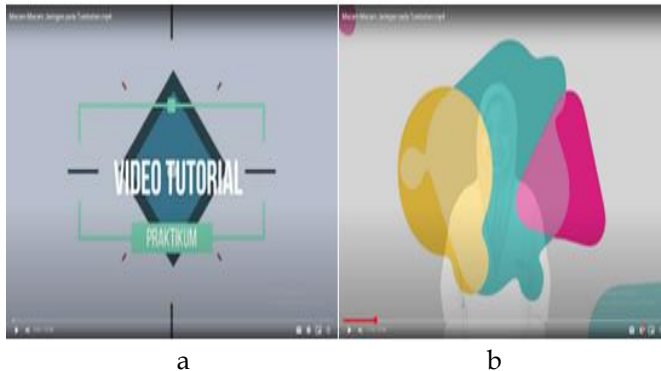


Figure 8. Opening (a) and transition (b)

The statement items that got the lowest mean, namely items 3, 5, 7, 8, and 9, got a mean score of 3.25 in the very valid category with the statement that the images and videos displayed have good sharpness and focus, the size of the letters used is appropriate so they are easy to read., the suitability and integration of colors in the design in the video, the arrangement of the layout in the video is correct, and the selection of music to accompany the video is correct. In general, Items 3, 5, 7, 8, and 9 are in accordance with the assessment criteria and are categorized as very valid. The video already has good sharpness and focus. Good image quality is obtained from the recording process using a camera. According to (Febriani & Mustofa, 2024) one of the things that must be considered in the video shooting process is image focus. The display of image quality and text size can be seen in Figure 9.

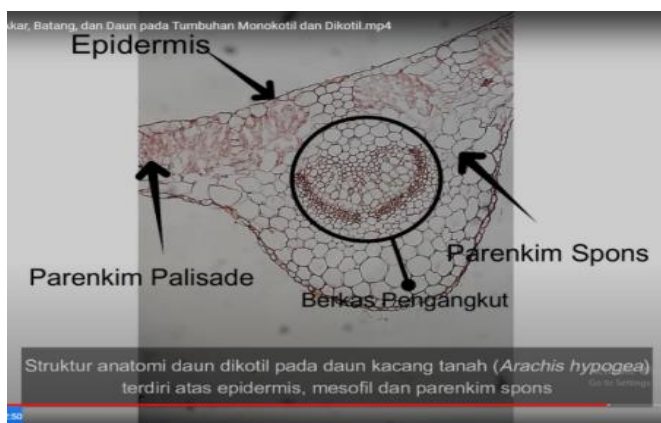


Figure 9. Image quality and text size

Based on table 9, the programming aspects in the guided inquiry-based video tutorial are overall considered very valid. The video tutorial is packaged in the form of a file with an mp4 extension that can be opened or used via a smartphone or laptop so it is easy to use.

The items that got the highest mean of 4.00 in the very valid category were items 3 and 4 with the statement that the practical video tutorial could be installed or run on various hardware and software and the practical video tutorial could be used repeatedly. These items as a whole show that the developed guided inquiry-based video tutorial can be played on the hardware and software built into a cellphone or laptop or computer and can be played repeatedly if there are still parts that are not understood. The format used for the video is MP4. As discovered by Oktavia & Dewi Madya, (2021), users who use MP4 only need to play videos on the default video player application on their laptop or cellphone without needing to install other applications. The video playback display can be seen in Figure 10 below.

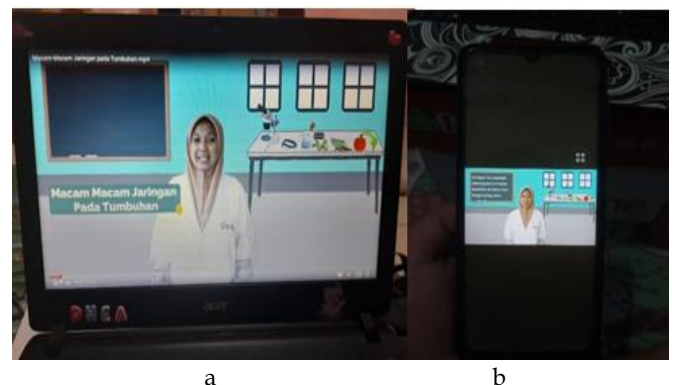


Figure 10. Laptop (a) and Handphone (b)

The statement items that got the lowest mean were items 1 and 2 with the statement that the practical video tutorial did not take a long time to open and the practical video tutorial was easy to use and simple to operate. Items 1 and 2 have met the validator assessment indicators in the very valid category. According to (Handayani et al., 2024), the ease of accessing video tutorials will encourage students to learn more independently.

The guided inquiry-based tutorial videos that have been developed will take a long time to open if they are constrained by the network. The follow-up carried out by researchers is that they are advised to download the tutorial video file before playing it so that students can watch the tutorial video anytime and anywhere without internet quota, it does not take a long time to open, it is easy to use and simple to operate without additional applications.

Limited trial

The limited trial aims to determine respondents' responses to the use of the media being developed. Based on table 10, the average assessment of guided inquiry-based video tutorials in phase I and II trials was in the very good category. This shows that the quality of the video developed is very good and received a positive response from biology education students. This is supported by the impression of a respondent named Siska Juliana that "students receive learning assistance from practical video tutorials presented." This is because the videos are arranged systematically, are interesting and can be used independently. In line with research by (Haryanti & Suwerda, 2022), the use of video tutorial-based learning media in delivering material will further help students understand the material being presented because the learning media is designed to be more interesting and students can use the media independently when outside lesson hours.

The aspect that got the highest average was the media aspect. This shows that the media aspect contained in this guided inquiry-based practical video tutorial is one of the advantages of video tutorials (Bakti et al., 2023; Nurmayani et al., 2018). The advantage of guided inquiry-based video tutorials from the media structure aspect is the selection of an interesting video opening. Opening video or also known as bumper is an opening animation in a video that describes the identity placed at the beginning (intro) so that with this bumper the audience will know what the content of the video is without needing a long explanation. The researcher designed the opening duration for the tutorial video to be 10 seconds, and included the researcher's identity by choosing a soft background color and also including music that was suitable for the intro needs. Choosing attractive colors and displays makes students more enthusiastic and interested when learning (Zenizela & Agustina, 2022).

The advantage of guided inquiry-based video tutorials from the next aspect of media structure is that the images and videos displayed have good sharpness and focus. The process of taking pictures and videos was recorded using a Canon DSLR camera. The video shooting technique uses a tripod to minimize movement that can make the image out of focus. Apart from that, taking pictures also takes into account lighting conditions, as well as taking videos at a certain distance and avoiding zooming in on the image so that the resulting images and videos have good sharpness and focus. The quality of the images in the video must be clear so that learning information can be conveyed clearly and easily understood by students (Bates, 2019).

The advantages of guided inquiry-based video tutorials from the next aspect of media structure are that the type, size and color of the letters used are correct so

they are easy to read, the volume of the video sounds clear, the choice of music to accompany the video is correct, the choice of video transitions is interesting, the video tutorial is not takes a long time to open, video tutorials are easy to use and simple to operate, video tutorials can be installed or run on various hardware and software, video tutorials can be used repeatedly, video tutorials do not require special skills to use them, the media created attracts students' curiosity, and the media created can increase students' learning motivation. According to Wulandari et al. (2021), through video tutorials students can use them for independent and group learning, can be operated using various devices such as cellphones and laptops/PCs, can motivate students to learn, the material is packaged with good quality content with a combination of videos, picture, audio are good.

The results of the phase II limited trial received a positive response from class XI students at SMAN 8 Pekanbaru. Respondents strongly agreed that guided inquiry-based video tutorials were interesting, easy to understand and very helpful. This is because video media makes it easier for students to know in detail the techniques and stages in practical activities, it does not require a long time to use video media, the display of the media is adjusted to the characteristics of students, equipped with instructions for using the media, the use of colors and images. It can clearly make students focus more on learning, and the material is presented completely in terms of theory and practice.

The aspect that got the highest average was the content/material aspect. This shows that what is contained in the content/material aspect of this guided inquiry-based practicum video tutorial is one of the advantages of the video tutorial. The advantages of guided inquiry-based video tutorials from the aspect of content/material structure are that the practicum tutorial videos that are developed are easy to understand and comprehend, the practicum tutorial videos that are presented increase motivation to carry out practicum activities, the practicum tutorial videos that are presented attract interest and attention to learning, students get learning assistance from the practicum tutorial videos presented, the practicum tutorial videos presented help students to understand practicum activities, use simple, clear and easy to understand language and use good and correct Indonesian according to the General Guidelines for Indonesian Spelling (PUEBI), and The steps of practical activities in video tutorials are in accordance with the syntax or stages of guided inquiry.

Tutorial Video Quality

Based on table 11, the quality of video tutorials based on guided inquiry on the structure and function

of plant tissue based on the average value of the validation results and limited trials of stages I and II obtained a very good category and can be used as a learning medium. The quality of learning media is the quality of the tools and learning materials created/used by teachers in delivering lessons so that they can attract students' interest in learning which will have a positive impact on student learning outcomes. This video tutorial is not monotonous because users (students) can control it themselves. Not just listening and watching, in this case users are invited to take an active role and respond to the sequence of material presentation (Arsyad, 2017).

Conclusion

Based on the results of the research that has been carried out, it can be concluded that guided inquiry-based tutorial videos have very good quality seen from the average results of validation by validators and limited trials by respondents on the products being developed.

Acknowledgments

During this research, the author received a lot of support, guidance, direction and input from various parties, for that on this occasion the author would like to thank the Principal of SMAN 8 Pekanbaru Mr H. Tavip Tria Candra, S.Pd, M.M who has given the opportunity and permission to carry out this research. In addition, Biology subject teacher Mrs Febni Suasty, S.Si who has guided and provided input to researchers in the smooth running of this research. As well as the students of class XI IPA1 SMAN 8 Pekanbaru in the academic year 2023/2024 as the test subjects.

Author Contributions

All authors contributed to writing this article.

Funding

No external funding.

Conflicts of Interest

No conflict interest.

References

- Ahmad, D. N. (2021). Analysis of SAVI Learning Model with the Task of Observation of Video on Science Learning in Producing Analytical Thinking and Critical Thinking Abilities. *Jurnal Penelitian Pendidikan IPA*, 7(1), 121-128. <https://doi.org/10.29303/jppipa.v7i1.543>
- Alalwan, N., Cheng, L., Al-Samarraie, H., Yousef, R., Ibrahim Alzahrani, A., & Sarsam, S. M. (2020). Challenges and Prospects of Virtual Reality and Augmented Reality Utilization among Primary School Teachers: A Developing Country Perspective. *Studies in Educational Evaluation*, 66, 100876. <https://doi.org/10.1016/j.stueduc.2020.100876>
- Arsyad, A. (2017). *Media Pembelajaran*. Rajawali Press.
- Bates, A. W. (2019). *Teaching in a Digital Age – Second Edition*. Vancouver, B.C.: Tony Bates Associates Ltd. Retrieved from <https://presVGooks.bccampus.ca/teachinginadigitalagev2/>
- Chandra, R., Syahril, S., Ambiyar, A., & Refdinal, R. (2023). Validity of Video Tutorials CNC/CAM for Learning in the Machining Engineering Department of Vocational High Schools. *Jurnal Penelitian Pendidikan IPA*, 9(SpecialIssue), 836-842. <https://doi.org/10.29303/jppipa.v9iSpecialIssue.6109>
- Dila, E. F., & Suyanto, S. (2023). The Effect of Problem Based Learning Models with Question Cards on Environmental Pollution Materials on Problem Solving Ability, Scientific Attitudes, and Student Learning Outcomes. *Jurnal Pendidikan Sains Indonesia*, 11(4), 884-896. <https://doi.org/10.24815/jpsi.v11i4.32480>
- Dinihari, Y., Rahmat, A., & Rohman, S. (2023). Filsafat dan Ilmu Pengetahuan dalam Pembelajaran Bahasa Indonesia Berbasis Web. *Prosiding Konferensi Berbahasa Indonesia Universitas Indraprasta PGRI*, 148-161. <https://doi.org/10.30998/kibar.27-10-2022.6309>
- Ersin, P., Atay, D., & Mede, E. (2020). Boosting Preservice Teachers' Competence and Online Teaching Readiness through E-Practicum during the COVID-19 Outbreak. *International Journal of TESOL Studies*, 2(2). <https://doi.org/10.46451/ijts.2020.09.09>
- Febriani, R., & Mustofa, A. A. (2024). Penggunaan Videografi Sebagai Alat Komunikasi Alternatif Dalam Penyampaian Informasi Publik. *Merdeka Indonesia Jurnal Internasional*, 4(1), 169-176. Retrieved from <https://www.merdekaindonesia.com/index.php/MerdekaIndonesiaJournalInternati/article/view/138>
- González, S. J. C., Agudelo, O. L., & Salinas, J. (2020). Key Competences, Education for Sustainable Development and Strategies for the Development of 21st Century Skills. A Systematic Literature Review. *Sustainability*, 12(24), 10366. <https://doi.org/10.3390/su122410366>
- Hafizah, S. (2020). Penggunaan dan Pengembangan Video Dalam Pembelajaran Fisika. *JPF: Jurnal Pendidikan Fisika*, 8(2), 225-240. <https://doi.org/10.24127/jpf.v8i2.2656>
- Handayani, A. E., Rufi'i, R., & Hartono, H. (2024). Pengembangan Media Video Pembelajaran Huruf Hiragana di SMAN 1 Krembung. *Journal on*

- Education*, 6(2), 12481–12493. <https://doi.org/10.31004/joe.v6i2.5109>
- Haryanti, S., & Suwerda, B. (2022). Pengembangan Media Pembelajaran Berbasis Video Tutorial Praktik Pada Mata Kuliah Keselamatan Dan Kesehatan Kerja. *Jurnal Pendidikan*, 10(1), 79–88. <https://doi.org/10.36232/pendidikan.v10i1.806>
- Hidayati, N., & Fauziah, L. (2023). Profil Kesiapan Laboratorium Biologi untuk Mendukung Kerja Praktik Siswa di MA Al-Ikhwan Kecamatan Kulim, Kota Pekanbaru. *Jurnal Inovasi Pembelajaran Biologi*, 4(2), 69–79. <https://doi.org/10.26740/jipb.v4n2.p69-79>
- Howell, R. A. (2021). Engaging Students in Education for Sustainable Development: The Benefits of Active Learning, Reflective Practices and Flipped Classroom Pedagogies. *Journal of Cleaner Production*, 325, 129318. <https://doi.org/10.1016/j.jclepro.2021.129318>
- Huang, Z., Liu, Q., Chen, Y., Wu, L., Xiao, K., Chen, E., Ma, H., & Hu, G. (2020). Learning or Forgetting? A Dynamic Approach for Tracking the Knowledge Proficiency of Students. *ACM Transactions on Information Systems*, 38(2), 1–33. <https://doi.org/10.1145/3379507>
- Jacob, F. (2022). *The logic of life: A history of heredity* (Vol. 62). Princeton University Press.
- Jumrodah, J., Meiana, N. A., Ashari, R., Awaluddin, A. M., Ajiza, P. D., Alia, R., Maharani, S. P., Karlina, S., & Anwar, M. S. (2023). Analisis Hambatan Guru Dalam Pembelajaran Biologi Berbasis Praktikum Di SMA. *Jurnal Penelitian Sains Dan Pendidikan (JPSP)*, 3(1), 92–104. <https://doi.org/10.23971/jpsp.v3i1.5987>
- Karlina, L., & Hindriana, A. F. (2023). Implementation of the Pancasila Student Profile in the Merdeka Mandiri Curriculum Changes in Biology Learning. *Jurnal Penelitian Pendidikan IPA*, 9(SpecialIssue), 547–553. <https://doi.org/10.29303/jppipa.v9iSpecialIssue.4708>
- Korucu-Kış, S. (2021). Preparing Student Teachers for Real Classrooms Through Virtual Vicarious Experiences of Critical Incidents During Remote Practicum: A Meaningful-experiential Learning Perspective. *Education and Information Technologies*, 26(6), 6949–6971. <https://doi.org/10.1007/s10639-021-10555-7>
- Kwangmuang, P., Jarutkamolpong, S., Sangboonraung, W., & Daungtod, S. (2021). The Development of Learning Innovation to Enhance Higher Order Thinking Skills for Students in Thailand Junior High Schools. *Heliyon*, 7(6), e07309. <https://doi.org/10.1016/j.heliyon.2021.e07309>
- Meulenbroeks, R., van Rijn, R., & Reijkerkerk, M. (2024). Fostering Secondary School Science Students' Intrinsic Motivation by Inquiry-based Learning. *Research in Science Education*, 54(3), 339–358. <https://doi.org/10.1007/s11165-023-10139-0>
- Mohzana, M., Murcahyanto, H., Fahrurrozi, Muh., & Supriadi, Y. N. (2023). Optimization of Management of Laboratory Facilities in the Process of Learning Science at High School. *Jurnal Penelitian Pendidikan IPA*, 9(10), 8226–8234. <https://doi.org/10.29303/jppipa.v9i10.5249>
- Muhammad, H., Remiswal, & Khadijah. (2024). Evaluasi Pembelajaran Pai Dalam Peningkatan Minat Dan Motivasi Belajar Siswa Mas Al Furqan Kota Padang. *An-Nahdlah: Jurnal Pendidikan Islam*, 4(1), 114–121. <https://doi.org/10.51806/an-nahdlah.v4i1.151>
- Mutiara, D., Widodo, W., & Roqobih, F. D. (2024). Multimedia Interaktif Untuk Meningkatkan Hasil Belajar Siswa Pada Materi Rotasi dan Revolusi Bumi. *BIOCHEPHY: Jurnal Pendidikan Sains*, 4(1), 321–329. <https://doi.org/10.52562/biochephy.v4i1.1128>
- Noetel, M., Griffith, S., Delaney, O., Sanders, T., Parker, P., del Pozo Cruz, B., & Lonsdale, C. (2021). Video Improves Learning in Higher Education: A Systematic Review. *Review of Educational Research*, 91(2), 204–236. <https://doi.org/10.3102/0034654321990713>
- Nurmayani, L., Doyan, A., & Verawati, N. N. S. P. (2018). Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Hasil Belajar Fisika Peserta Didik. *Jurnal Penelitian Pendidikan IPA*, 4(2). <https://doi.org/10.29303/jppipa.v4i2.113>
- Oktavia, D. M., & Dewi Madya, J. (2021). Implementation of Video Media to Improve Development of Early Religious and Moral Values of Children. *Jurnal Pendidikan Indonesia*, 2(02), 202–208. <https://doi.org/10.59141/japendi.v2i02.101>
- Purnamasari, R., Suchyadi, Y., Karmila, N., Nurlela, N., Santa, Mirawati, M., Handayani, R., Indriani, R. S., Anwar, W. S., & Kurnia, D. (2020). Student Center Based Class Management Assistance Through the Implementation of Digital Learning Models and Media. *JCe: Journal of Community Engagement*, 2(2), 41–44. <https://doi.org/10.33751/jce.v2i2.2801>
- Putri, A., Roza, Y., & Maimunah, M. (2020). Development of Learning Tools with the Discovery Learning Model to Improve the Critical Thinking Ability of Mathematics. *Journal of Educational Sciences*, 4(1), 83. <https://doi.org/10.31258/jes.4.1.p.83-92>
- Ravista, N., Sutarno, S., & Harlita, H. (2021). Validity and Practicality of Guided Inquiry-Based E-Modules accompanied by Virtual Laboratory to

- Empower Critical Thinking Skills. *Jurnal Penelitian Pendidikan IPA*, 7, 331-339. <https://doi.org/10.29303/jppipa.v7iSpecialIssue.1083>
- Saekawati, R., & Nasrudin, H. (2021). Effectiveness of Guided Inquiry-Based on Blended Learning in Improving Critical Thinking Skills. *Jurnal Penelitian Ilmu Pendidikan*, 14(1), 53-68. <https://doi.org/10.21831/jpipfip.v14i1.36947>
- Safarati, N., & Zuhra, F. (2023). Use of Problem-Solving Based Physics Comic Media on Global Warming Material in Increasing Learning Motivation and Students' Understanding Concept. *Jurnal Penelitian Pendidikan IPA*, 9(11), 9193-9199. <https://doi.org/10.29303/jppipa.v9i11.4828>
- Samsu, N., Mustika, D., Nafaida, R., & Manurung, N. (2020). Analisis Kelayakan dan Kepraktisan Modul Praktikum Berbasis Literasi Sains untuk Pembelajaran IPA. *Jurnal IPA & Pembelajaran IPA*, 4(1), 29-40. <https://doi.org/10.24815/jipi.v4i1.15546>
- Sugianto, Natadiwijaya, I. F., Yuliana, E., Aripin, I., Ratnasari, A., Kurniawan, G. E., & Rachman, D. F. (2023). Plant Anatomy Practicum Assisted by Online Microscope Viewer to Enhance Students' Kinesthetic Bodily Intelligence. *Jurnal Penelitian Pendidikan IPA*, 9(8), 6020-6027. <https://doi.org/10.29303/jppipa.v9i8.4487>
- Sugiyono. (2013). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Alfabeta.
- Sutiani, A., Situmorang, M., & Silalahi, A. (2021). Implementation of an Inquiry Learning Model with Science Literacy to Improve Student Critical Thinking Skills. *International Journal of Instruction*, 14(2), 117-138. <https://doi.org/10.29333/iji.2021.1428a>
- Syarifudin, S., & Iskandar, M. R. (2023). Impelementasi Permen No 50 Tahun 2015 Tentang Pedoman Umum Ejaan Bahasa Indonesia Pada Mata Kuliah Bahasa Indonesia/ Teknik Penulisan Karya Ilmiah di Institut Agama Islam Qamarulhuda Bagu Lombok Tengah 2023. *JUPE: Jurnal Pendidikan Mandala*, 8(2). <https://doi.org/10.58258/jupe.v8i2.5418>
- Turrahmah, N., Pujani, N. M., & Selamat, K. (2020). Pengelolaan Laboratorium Ilmu Pengetahuan Alam (IPA) SMP Negeri 2 Singaraja. *JPPSI: Jurnal Pendidikan Dan Pembelajaran Sains Indonesia*, 3(2), 118-129. <https://doi.org/10.23887/jppsi.v3i2.29592>
- Utari, H. S. T., Budiharti, R., Sukarmin, S., Wahyuningsih, D., & Haryani, F. F. (2023). Development of Learning Media Moodle-Based on Static Fluids. *Jurnal Penelitian Pendidikan IPA*, 9(10), 8713-8721. <https://doi.org/10.29303/jppipa.v9i10.4367>
- Wulandari, S., & Fitria Rahma, I. (2021). Efektivitas Media Video Kine Master Terhadap Hasil Belajar Matematika Siswa Secara Daring. *Jurnal Analisa*, 7(1), 33-45. <https://doi.org/10.15575/ja.v7i1.11956>
- Yusuf, I., & Widyaningsih, S. W. (2020). Implementing E-Learning-Based Virtual Laboratory Media to Students' Metacognitive Skills. *International Journal of Emerging Technologies in Learning (IJET)*, 15(05), 63. <https://doi.org/10.3991/ijet.v15i05.12029>
- Zebua, N. (2024). Pengembangan E-LKPD Struktur dan Fungsi Tumbuhan Berbasis Higher Order Thinking Skills Untuk Peserta Didik Sekolah Menengah Pertama. *ORYZA: Jurnal Pendidikan Biologi*, 13(1), 106-115. <https://doi.org/10.33627/oz.v13i1.1852>
- Zenizela, Z., & Agustina, D. K. (2022). Pengembangan Media Video Pembelajaran Bangun Ruang untuk Pembelajaran Daring Matematika Kelas V Sekolah Dasar. *Jurnal Pendidikan: Riset Dan Konseptual*, 6(4), 609. https://doi.org/10.28926/riset_konseptual.v6i4.582
- Zheng, S., Cui, J., Sun, C., Li, J., Li, B., & Guan, W. (2022). The Effects of the Type of Information Played in Environmentally Themed Short Videos on Social Media on People's Willingness to Protect the Environment. *International Journal of Environmental Research and Public Health*, 19(15), 9520. <https://doi.org/10.3390/ijerph19159520>