

## DEVELOPMENT OF E-STUDENT WORKSHEETS BASED ON GUIDED INQUIRY ASSISTED BY AUGMENTED REALITY AND THREE DIMENSION ON HUMAN EXCRETORY SYSTEM TOPIC

Isnanik Juni Fitriyah\*, Wilda Qurrota A'yuna, Rif'atul Himmah

Natural Science Education Study Program, Faculty of Mathematics and Natural Sciences, Universitas Negeri Malang

\*Corresponding author: [isnanik.fitriyah.fmipa@um.ac.id](mailto:isnanik.fitriyah.fmipa@um.ac.id)

**Abstract.** 21st century places students as an active subjects in the learning process. Electronic Student Worksheets based on guided inquiry and assisted by Augmented Reality (AR) and three-dimensional (3D) technology can facilitate the learning process that can be students centered in the era of rapid technological developments and the pandemic covid-19. The purpose of this research was to produce an electronic student worksheets based on guided inquiry assisted by AR and 3D on valid and practical human excretory system topic to be used in science learning at the VIII grade junior high school level. This study used research and development (R&D) methods with a 4D development model consisting of the stages defining, designing, developing, and disseminating, but in this study, there was no disseminate stage. The electronic student W\worksheets was tested on a limited basis to 32 students of class VIII G SMP Negeri 24 Malang. This study E- Student Worksheet Based on Guided Inquiry Assisted By Augmented Reality and Three Dimension on valid and practical human excretory system material used in science learning at the VIII grade junior high school level. The validity of the developed E- Student Worksheet obtained a percentage of 98.02% with a very valid category. The practicality of the E- Student Worksheet in terms of the assessment process, students obtained a percentage of 97% with a very practical category. Meanwhile, the practicality of E- Student Worksheet in terms of student responses obtained a percentage of 93.25% with a very practical category.

**Keywords:** learning media, interactive power point, science generic skills.

### INTRODUCTION

In essence, the teaching and learning process is a pattern of interaction in education between students and teachers. This 21st century education demands learning where students are subjects in the learning process, so students are required to develop the ability to actively seek, build and process knowledge [1]. (Permendikbud Number 103 of 2014). Therefore, a learning system must provide opportunities for students to build cognitive knowledge. One of the learning approaches that can demand the activeness of

students in the learning process is guided inquiry. Guided inquiry learning can train students in scientific process skills, so students can learn to ask questions, collect data through observation and investigation, acquire scientific knowledge, use scientific knowledge to understand observations and formulate conclusions [2].

Learning activities that are still teacher-centered also cause students to behave passively, feel bored when studying and do not understand the learning material [3]. Therefore, a Student Worksheet is needed as a guide for students in

carrying out the learning process [4]. A student worksheet is a learning tool that contains a series of questions and information. A student worksheet is designed to guide students in implementing systematic learning activities [5]. Research on the development of a student worksheet based guided inquiry has been carried out by Masyitoh & Santoso (2012) and Selviana et al. (2016) [6]. The results of his research stated that the application of E- Student Worksheet combined with guided inquiry could make students actively involved in the learning process.

The development of technology also affects the current learning process. With the application of technology in education, it will facilitate the learning process. This condition was also exacerbated by the outbreak of the Coronavirus Disease COVID-19 pandemic which also had an impact on the education sector. The Minister of Education and Culture issued a policy through Circular No. 4 of 2020 that the learning process during the COVID-19 pandemic which was previously carried out face-to-face between students and teachers was replaced with a distance learning process. Distance learning cannot be implemented without assistive technology. Therefore, many challenges are created in the learning process, both from the teacher and student perspective. To answer these challenges, the Electronic Student Worksheet is a relevant innovation [7]. E-student worksheets is a student work guide that aims to facilitate understanding of learning material in electronic form whose application can use a desktop, laptop, or smartphone [8]. Therefore, e-student worksheets can be used flexibly anywhere and anytime, both for offline and online learning.

Based on observations at SMPN 24 Malang, the students worksheet used is still conventional, such as printed student worksheets or usually the teacher sends student worksheets to class groups in the form of photos during online learning. This causes learning to be less efficient and effective because students cannot work on and send their work directly to the teacher. Therefore, the authors provide an alternative to using simple and attractive media that can convert conventional worksheets into interactive student worksheets,

namely Live Worksheets. Live Worksheets is a service available on Google in the form of a free website that can be used as an online interactive in live worksheets, teachers can easily create questions in various forms, ranging from; Drag and drop, Drop down, Join arrow (matching), and others [9]. Teachers also don't need to bother assessing students' answers because in live worksheets they can also assess the results e-students worksheet automatically. Live Worksheets also support the inclusion of audio-visuals in the e- students worksheet so that students will be more interested in working on the E-Student Worksheet [10]. Several e- students worksheet development studies using live worksheets have received positive responses from both teachers and students. A response from the teacher, the use of E- student worksheet assisted by live worksheets is interesting to serve as teaching material in teaching materials and working on chemical bonding questions in chemistry subjects [11]. Then research got a response from students, namely the use of E-student worksheet with live worksheets has an attractive presentation, is useful in learning mathematics with quadrilateral and triangle material, and is easy to use [12].

The human excretory system is one of the materials in the science subjects of SMP class VIII. The material of the human excretory system includes biological material related to physiological processes in the body. The material of the human excretory system is one of the difficult materials because students cannot observe it directly, so it is necessary to develop learning media that can involve many senses [12]. In addition, there is also a need for media development that allows students to be directly involved, motivate, entertain, be able to create a sense of wanting to try, want to ask questions and look alive like the original [13]. The learning media in question is Augmented Reality (AR). The general principle of AR is to combine the virtual world in real terms by inserting objects on the device into the real world with real time and visual objects are usually three-dimensional. The use of Augmented Reality (AR) as a learning medium was considered attractive and acceptable to students and teachers. The use of Augmented

Reality (AR) is also considered effective in helping the learning process of excretory system material in class because students can see 3D objects that are more realistic and blend with the real world [14].

Research on the development of AR-assisted E-student worksheet has been carried out on learning physics in the laboratory with the discovery learning model. The results of the research stated that the E-student worksheet developed was very suitable to be used as a learning tool in physics practicum activities in class X SMA [15]. Another research was also carried out reported that design innovations in E-student worksheet need to be developed so that students are motivated to participate in the learning process. Many students find it difficult to understand the concept of biology because they cannot observe it directly. So that we can use Augmented Reality technology in designing E-student worksheet as one of these innovations [16].

The various background problems above require educators to always innovate in the implementation of the learning process, one of

which is by developing student worksheets. Student worksheets can be innovated by being made electronically (E-Student Worksheets) in collaboration with AR and 3D technology. Guided inquiry-based E-Student Worksheets also supports the government's demands to develop better learning. Therefore, it is necessary to conduct a research entitled "Development Of E-Student Worksheets Based On Guided Inquiry Assisted By Augmented Reality And Three Dimension On Human Excretory System Topic".

## METHOD

This study uses *research and development* (R&D) methods because the purpose of this research is to produce E-Student Worksheets. The development model used is a 4D development model which includes the stages of define, design, develop, and disseminate [17]. But in this study, the disseminate stage was not carried out. The research was conducted at SMPN 24 Malang in March 2022, the subjects of this research were 32 students of class VIII SMPN 24 Malang. The research data and matters related to the data are presented in Table 1.

**Table 1 Research Data**

Aspects Assessed	Instrumental	Data Observed	Data Source
Validity	Validation sheet	E-student worksheet presentation validity, E-student worksheet linguistic validity, E-student worksheet content feasibility validity and E-student worksheet concept validity validity	Expert validator
Practicality	Student process assessment sheets and student response questionnaire sheets	Assessment of student processes and student responses	1 teacher and 32 students

obtained from comments and suggestions on validation sheets, student process assessment sheets and student response questionnaire sheets. Then quantitative data were obtained from validation scores, student process assessments and student responses. The results of quantitative data from the validation score for the presentation of the E-Student Worksheets, linguistic validation of the E-Student Worksheets, validation of the feasibility of the contents of the E-Student Worksheets, the assessment of the student process and student responses were then analyzed using a *Likert*, and

for the validity score of the E-Student Worksheets concept was analyzed using a scale *Guttman*. scale criteria *Likert* used in this study are presented in Table 2, while the *Guttman* used in this study are a score of 1 for true and 0 for false [18].

**Table 2 Likert Scale Category**

Assessment Score	Criteria
4	Very good
3	Fairly good
2	Not good
1	Very not good

Based on the results of the score, the percentage of assessment scores on each research data instrument were calculated using the following formula.

$$P = \frac{\sum x_i}{\sum x} \times 100\% \quad (1)$$

Information:

P = Percentage of assessment score  
 $\sum x_i$  = Total score obtained  
 $\sum x$  = Total score maximum

The results of the calculation of the percentage score then compared with the criteria for validity and practicality in Table 3 which is used as a guide for decision making on the results of data analysis.

**Table 3 Criteria for Validity and Practicality**

Percentage Validity	Validity Criteria	Practical Criteria
85.01 % – 100 %	Very valid	Very practical
70.01 % – 85.00 %	Quite valid	Practical enough
50.01 % – 70.00 %	Not valid	Less practical
1.00 % – 50.00 %	Invalid	Not practical

## RESULT AND DISCUSSION

This research and development resulted in a product E-student worksheets based on guided inquiry assisted by augmented reality and three dimension on human excretory system topic that was valid and practical to use for class VIII junior high school students. The following product development stages have been carried out:

### Defining Phase

The defining phase is carried out in five steps. *The first step* is an initial analysis based on the results of field observations, obtained several problems in science learning including the following: (1) student worksheet used when online learning is still conventional where the teacher sends photos from printed student worksheet to *WhatsApp*. So that students cannot work on and collect student worksheet directly. (2) Science learning in the classroom still applies conventional learning where learning is centered on the teacher, not on students. Conventional learning carried out by teachers is that students are given direct concepts and facts without getting used to the scientific process to students, resulting in students looking bored and less focused. This can be seen when the teacher asks, only a few students respond. (3) Teachers need teaching aids for human excretory system materials that can be used for online and offline learning. Based on the results of interviews, the teaching aids in the laboratory are less accommodating to use because they are difficult to carry when teaching.

*The second step* is to analyze students. Junior high school students are in the range of 13-15 years, so writing student worksheet must use language that is easy to understand according to the maturity level of students. *The third step* is the analysis of concepts on the material of the human excretory system even semester VIII. Concept analysis refers to Permendikbud No. 24 of 2016 concerning Core Competencies (KI) and Basic Competencies (KD) in the 2013 curriculum (Kemendikbud, 2016). Then identification and preparation of the main concepts are carried out to be included in the E- student worksheet systematically. *The fourth step* is a task analysis, namely by identifying the skills that students need to develop to be included in the E- student worksheet. *The fifth step* is the formulation of learning objectives which are used as guidelines in the preparation of RPP and E- student worksheet.

### Design Phase

Based on the results of the defining phase, the initial product specifications developed in this study were E-student worksheets based on guided inquiry assisted by augmented reality and three dimension. This E-student worksheets is designed based on the requirements for the preparation of the E-student worksheets, there are three requirements for the preparation of the E-student worksheet, including didactic requirements, constructive requirements, and technical requirements [19].

The didactic requirement designed in this E-student worksheets is to use activity steps that emphasize the science process. The steps used are the guided inquiry learning stage which consists of: (1) Orientation; (2) Formulating questions; (3) Formulating hypotheses; (4) Collecting data; (5) Testing the hypothesis; (6) Formulating conclusions [20]. In addition, the activities in the E-student worksheets are designed according to the content standards of the 2013 curriculum, which include: (1) spiritual attitudes (KI 1) in the E-student worksheets shown in the instructions for use where students are asked to pray before working; (2) social attitudes (KI 2) on E-student worksheets are shown by discussion activities and campaigning for the health of the human excretory system in posters; (3) knowledge (KI 3) on E-student worksheets is shown in student activities at each stage of guided inquiry; (4) skills (KI 4) on E-student worksheets are shown in the activity of making posters of the human excretory system.

The constructive requirements designed for the E-student worksheets are the *cover*, student identity, E-student worksheets identity, basic competence (KD), learning objectives and instructions for use in the E-student worksheets. It is intended that the E-student worksheets can be understood clearly by users, namely students [21]. In addition, the E-student worksheets is designed for three meetings, where the first and second meetings use the E-student worksheets 1 and the third meeting uses the E-student worksheets 2. The E-student worksheets 1 contains the topic of the structure and function of the excretory system organs and the E-student worksheets 2 contains the topic disorders of the excretory system and efforts to prevent or overcome them.

The first technical requirement designed for the E-student worksheets is the selection of font size

and type. The E-student worksheet is designed using *Bobby Jones* size 18 for the title section and collective font size 12 for the content section. One of the components of good writing is to use a font between 12-14 *pts* for the content and for the title according to needs [22]. The second technical requirement designed for this E-student worksheets is to present images, audio, video, Augmented Reality (AR) and three-dimensional (3D) to convey the message/content. Augmented Reality (AR) and three-dimensional (3D) are designed using the *assemblr*. Then in the E-student worksheets questions are also designed in various forms ranging from; Drag and drop, Drop down, Join arrow (matching), and others. The third technical requirement that is designed is to design the appearance of the E-student worksheets using the *Canva* then upload it to the *Live worksheets* to make it interactive. The *live worksheets* can make it easier for teachers to assess students' answers because the results of E-student worksheets work can be assessed automatically. Appearance is very important in compiling E-Student Worksheets because students will focus on appearance first, not on content [19].


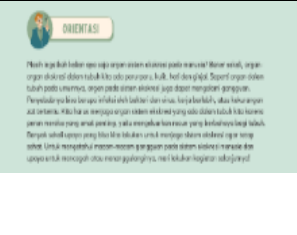









### Development Phase

Product development is carried out in the following stages: (1) drafting of the developed E-student worksheet product; (2) validation of E-students worksheet products; (3) the results of the revised draft of the E-students worksheet. The drafting of the E-students worksheet product is carried out based on the results of the *design* hat has been made. The E-students worksheet is structured with a guided inquiry learning model, the steps arranged in the E-students worksheet are presented in table 4.

**Table 4 E-Students Worksheet**

Phase	Displaying		Learning Activities
	E- student worksheet 1	E- student worksheet 2	



<p>Orientation</p>	 	<p>E- student worksheet 1: students observe the video orientation on the human excretory system</p> <p>E- student worksheet 2: Students understand reading about disorders of the human excretory system and efforts to prevent or overcome them</p>
<p>Formulating questions</p>	   	<p>E- student worksheet 1: students observe pictures of excretory system events in everyday life. Based on this incident, students formulate</p> <p>E- student worksheet 2 questions: students watch a video about the dangers of holding back urination. Then formulate questions about disorders of the human excretory system and efforts to prevent or overcome them</p>
<p>Formulate hypotheses</p>	 	<p>Students formulate hypotheses based on questions that have been made</p>
<p>Collecting data</p>	  <p style="text-align: center;"><b>AR and 3D Display</b></p> 	<p>E- student worksheet 1: students observe the structure and function of the organs that make up the human excretory system in AR and 3D forms.</p> <p>E- student worksheet 2: students understand descriptions and videos about various disorders of the human excretory system and efforts to prevent or overcome them</p>

<p>Test the hypothesis</p>			<p>E- student worksheet 1: students work on activities in the E- student worksheet, namely identify the pathway for the formation of waste substances and the parts that play a role in removing them in the human excretory system, identify the structure of the kidneys and the process of formation of urine, identify the structure of the skin and the process of sweating, identify the process of excretion from the lungs, identify the process of breaking down red blood cells in the liver. Then make answers to the results of hypothesis testing.</p> <p>E- student worksheet 2: students work on activities in the E- student worksheet, namely analyzing problems regarding disorders of the human excretory system and efforts to prevent and overcome them which are presented in the form of stories. Then make answers to the results of hypothesis testing and the answers are made in the form of posters</p>
<p>Formulating conclusions</p>			<p>Students make conclusions based on the findings that have been obtained from the results of hypothesis testing.</p>

After the drafting of the E-students worksheet product has been drafted, then the E-students worksheet product validation is carried out by an expert validator. There are two expert validators, namely material expert validators and media expert

validators who come from lecturers of the Science Education Study Program, State University of Malang. The data on the results of the validity of the E-students worksheet by material expert validators and media experts are in Table 5.

**Table 5 Validity of the E-Students Worksheet by Material Expert Validators and Media Experts**

No.	Category	Validator		Criteria
		Media Expert	Material Expert	
1.	% Validity of E- student worksheet presentation	95.65 %		Very Valid
2.	% E- student worksheet linguistic validity		100 %	Very Valid
3.	% Validity of the feasibility of the contents of the E- student worksheet		96.43 %	Very Valid

4.	% Validity of the truth of the concept	100 %	Very Valid
	Average	98.02 %	Very Valid

whole shows a validity result of 98.02% with a very valid category. Validation of the presentation of E-students worksheet gets a percentage value of 96.65% with a very valid category. Based on these results, it shows that the E-students worksheet is very valid from the aspects of cover design, content design, the use of AR and 3D, as well as the use of *live worksheets*. This aspect is very important because it is closely related to the technical requirements for the preparation of E-students worksheet. Then the linguistic validation of E-students worksheet gets a percentage value of 100% with a very valid category. Based on these results, it shows that the E-students worksheet is very valid from the aspect of grammatical feasibility for junior high school students. This aspect is very important because it is closely related to the constructive requirements for the preparation of E-students worksheet. Then the validation of the feasibility of the contents of the E-students worksheet gets a percentage value of 96.43% with a very valid category. Based on these results, it shows that the E-students worksheet is very valid from the aspect of the suitability of KD and learning objectives and the suitability of the E-students worksheet with the guided inquiry learning model. This aspect is very important because it is closely related to the didactic requirements for preparing E-students worksheet. Furthermore, the validation of the truth of the E-students worksheet concept gets a percentage value of 100% with a very valid category. Based on the results of the validation of presentation, language, content feasibility and correctness of the concepts described above, it is concluded that the developed E-students worksheet is a quality E-students worksheet because it has met the didactic, constructive, technical requirements and the correctness of the concept [19].

The results of the validation and description above indicate that the developed E-students

worksheet is feasible to be tested on students. However, it is still necessary to make revisions according to the input given by the validator, including: (1) In the cover section, it is necessary to add specifications that distinguish the developed E-students worksheet from other E-students worksheet; (2) It is necessary to re-check the writing of scientific names, chemical molecules, foreign terms and adapt them to PUEBI. Then the inputs given by the material validator include: (1) In order to facilitate communication, give information "Activity A, B, C or Activities 1, 2, 3 or the like on student activities when collecting data; (2) At the stage of testing the hypothesis if it is raised it will be better, so that the syntax is clear on the E-students worksheet. Various inputs given by the validator became material for product revision before being tested on students.

### Practicality

The practicality test was carried out by conducting a limited trial on 32 students of class VIII G SMPN 24 Malang. Practicality aims to find out that the developed E-students worksheet can actually be used in learning with the guided inquiry stage. Practicality is seen from the assessment of the student's process as well as the responses given by students to the implementation of learning using the developed E-students worksheet.

### Assessment of the Student Process

Assessment of the process is viewed from the results of observing the scientific performance of students when a learning trial is carried out using guided inquiry-based E-students worksheet assisted by AR and 3D [20]. The assessment of the student process is carried out by filling out an assessment sheet by one science teacher. The results of the assessment of the student process using the E-students worksheet are presented in Table 6 as follows.



**Table 6. Assessment of student process**

No.	Category	Percentage		Average	
		E- student worksheet 1	E- student worksheet 2	Percentage	Criteria
1.	Assessment at Orientation Stage	100%	100%	100%	Very practical
2.	Assessment at Formulating Question Stage	99.22%	99.22%	99.22%	Very practical
3.	Assessment at the Formulating Hypothesis Stage	92.19%	95.31%	93.75%	Very practical
4.	Assessment at the Data Collecting Stage	100%	98.44%	99.22%	Very practical
5.	Assessment at the Hypothesis Testing Stage	95.31%	96.09%	95.7%	Very practical
6.	Assessment at the Conclusion Formulation Stage	94.53%	93.75%	94.14%	Very practical
Average				97%	Very practical

Based on the data in table 6, it is known that the results of the overall process assessment using E-students worksheet 1 and E-students worksheet 2 get a percentage value of 97% with a very practical category. This shows that overall students have carried out the stages of guided inquiry in the E-students worksheet well.

At the orientation stage, overall students listen to video shows and readings contained in the E-students worksheet carefully to build initial knowledge. Then when the teacher asks questions, students show enthusiasm to answer questions and show interest in the topic to be studied. So that at this stage an assessment score of 100% is obtained for E-students worksheet 1 and E-students worksheet 2. The essence of the orientation stage is to prepare students to start learning by providing perceptions of learning material and providing motivation to build student interest in learning [21].

At the stage of formulating questions E-students worksheet 1, students formulate questions related to the structure and function of the human excretory system. Examples of questions posed by students based on the results of group discussions are: "What happens to the organs of the excretory system, what happens when glasses are foggy

when wearing a mask and glasses at the same time?"; "How is the process of sweating out of the human body?"; "Why do we urinate more often when we are in mountainous areas?" Then at the stage of formulating questions (E-students worksheet 2), students formulate questions related to disorders of the human excretory system and efforts to prevent or overcome them. Examples of questions asked by students based on the results of group discussions are: "What causes acne on the face?"; "Why do people with diabetes insipidus urinate frequently?"; "How to prevent kidney stones?". Based on the questions posed by students, we can see that students want to know about concepts, principles or relationships between variables related to the problems or facts presented by the teacher [20]. At the stage of formulating questions, an assessment score of 99.22% was obtained for E-students worksheet 1 and E-students worksheet. This is because in the E-students worksheet 1 trial there was one group that formulated one question not related to the structure and function of the human excretory system. and in the E-students worksheet 2 trial, there was one group that formulated a question not related to preventing or overcoming disturbances in the human excretory system.

At the stage of formulating hypotheses, students use science book learning resources to formulate hypotheses based on the questions that have been made. Students formulate hypotheses in groups by conducting discussions. Formulating a hypothesis is not made solely based on estimates or conjectures but based on the results of the study [20]. At the stage of formulating the hypothesis, an assessment score of 92.19% was obtained for E-students worksheet 1 and 95.31% for E-students worksheet 2. This is because there are groups who formulate hypotheses without being based on theoretical studies from learning sources.

At the stage of collecting data (E-students worksheet 1), overall students observe the structure and function of the organs of the excretory system in the form of three dimensions and augmented reality. Then at the stage of collecting data (E-students worksheet 2), students listen to videos and readings carefully to get information about disorders of the human excretory system and efforts to prevent or overcome them. However, there is one group who is less focused when watching videos in E-students worksheet 2. So that at the stage of collecting data, an assessment score of 100% is obtained for E-students worksheet 1 and 98.44% for E-students worksheet 2. The essence of the data collection stage is to encourage students to collect the information needed to test the hypotheses that have been made [21].

At the stage of testing the hypothesis, students discuss with groups to work on the activities contained in the E-students worksheet based on the results obtained from the stage of collecting data. After that, students write the answers to the results of the hypothesis test in the E-students worksheet. In E-students worksheet 2, answers to the results of hypothesis testing are also made in the form of posters to campaign for the health of the human excretory system. The essence of the hypothesis testing stage is to determine the answer that is considered acceptable based on the information or data obtained from the data collection stage [21]. At this stage, obtained an assessment score of 95.31% for E-students worksheet 1 and 96.09% for E-students worksheet 2. This is because there are

groups who are less careful and thorough in testing hypotheses, then there are also groups who make test answers the hypothesis is not based on the results of data collection that has been done.

At the stage of formulating conclusions, students discuss with groups to make conclusions based on the results of hypothesis testing and are linked to the concepts covered in the problems discussed. Then students write conclusions in the formulation of conclusions that are easy to understand. Formulating conclusions is a process of describing the findings obtained from the results of hypothesis testing [21]. At this stage, an assessment score of 94.53% was obtained for E-students worksheet and 93.75% for E-students worksheet. This is because there are groups that still have not shown the findings of hypothesis testing in the formulation of conclusions made.

Observers (science teachers) also provide comments on the assessment sheet. According to observers, the E-students worksheet model like this is already good and in accordance with the demands of the times. This 21st century education demands learning where students are subjects in the learning process (Permendikbud Number 103 of 2014). In this E-students worksheet there are guided inquiry steps that are able to develop students' abilities actively to seek, construct and process knowledge. In addition, this E-students worksheet also applies technology where the E-students worksheet is made electronically (E-students worksheet) using *live worksheets* and in the E-students worksheet there are interactive features with video, audio, three-dimensional (3D) images and *augmented reality* (AR). So that with these features it can make science learning able to keep up with current technological developments.

Student responses were obtained after a trial of learning implementation using guided inquiry-based E-students worksheet assisted by AR and 3D. Assessment of student responses was carried out through the distribution of *google forms* to 32 students of class VIII G SMPN 24 Malang. The results of student responses are presented in Table 7.

**Table 7. Results of Student Responses**

No.	Components	Components	Components
1.	Presentation of E-student worksheet	91.72%	Very Practical
2.	Language of E-student worksheet	92.97%	Very Practical
3.	Content of E-student worksheet	95.05%	Very Practical
Average		93.25%	Very Practical

Based on the recapitulation of the results of student responses, it is known that on average students give a positive response to the developed E-students worksheet. The average value of the overall percentage of the results of student responses is 93.25% with a very practical category.

The presentation aspect of E-students worksheet received a very practical response with a percentage of 91.72%. This shows that students are interested in the display, video, images, *augmented reality* (AR), three-dimensional (3D), *Liveworksheets features*, type and size of the letters contained in the E-students worksheet. However, the percentage obtained still has not reached the maximum (100%) because some students find it difficult to read small writing, then some students also experience network problems so that it is rather difficult to access *Augmented Reality* (AR). E-student worksheet with an attractive presentation can increase students' enthusiasm and motivation to learn [22].

The linguistic aspect of E-students worksheet received a very practical response with a percentage of 92.97%. This shows that students are easy to understand the language, information, work instructions, statements and terms contained in the E-students worksheet. However, the percentage obtained still has not reached the maximum (100%) because some students feel unfamiliar with the biological terms in the E-students worksheet that they hear for the first time. the use of clear sentence structures and the use of language appropriate to the maturity level of students are characteristics of a good student worksheets [19].

The content aspect of E-student worksheets received a very practical response with a percentage of 95.05%. This shows that students can

carry out each stage of guided inquiry using the E-student worksheets. However, the percentage obtained still has not reached the maximum (100%) because students are still not used to carrying out learning with the guided inquiry stage, especially at the stage of formulating the hypothesis that gets the lowest score. At the time of testing the implementation of learning using E-student worksheet, there were still many students who did not understand how to formulate good and correct hypotheses, so the role of the teacher was very important to guide students in the learning process. If inquiry learning is applied to students without teacher guidance, it will cause chaos during the learning process. So to make learning more optimal, it is necessary to have teacher guidance during inquiry learning which is given the term guided inquiry [23].

Students also provided comments in the questionnaire, many students felt happy learning to use the E-student worksheets and found it helpful to understand the material on the human excretory system using the E-student worksheets. There are also students who hope that the form of questions like those in the E-student worksheets can be applied to the exam. This shows that E-Student Worksheets Based On Guided Inquiry Assisted By Augmented Reality And Three Dimension is practical to be used in learning the material of the human excretory system.

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