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Student Worksheets Microbial Concepts Based On Urban Wetlands to Improve Critical Thinking Skills at High School Levels

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ABSTRACT

Implementation of the 2013 curriculum has generally used recommended models, but the role of the work-sheets used in the learning process still does not facilitate students' critical thinking skills. The research aims to evaluate the validity, practicality, and effectiveness of the development worksheets on the microbial concepts based on urban wetlands to improve students' critical thinking skills. The development of work-sheets was carried out in 2 phases; preliminary research phase and prototype phase using the Tessmer design. Content validation uses a validation assessment sheet instrument. The practicality data of the contents was using an assessment sheet instrument on the worksheet structure. Practicality data (expectations and actual) were collected using a practicality sheet instrument obtained from students' responses to the contents of the worksheet. Effectiveness data (expectations and actual) are obtained based on the results of critical thinking skills, interpersonal skills (cooperation), and intra-personal skills (responsible). Data analysis techniques by calculating the percentage of validation refer to Akbar (2017), practicality test, and effectiveness test with criteria referring to Purwanto (2012). The results showed that worksheets for students were valid and were practical for users with the practicality of contents and practicality of expectations is good. Work-sheets was declared to be effectively used based on the results of the critical thinking skills, interpersonal skills (collaboration), and intra-personal skills (meticulous), and the value of the effectiveness of expectations is good categories too.

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A. Introduction

The 21st-century education is a digital era education also known as the era of the 4.0 Industrial Revolution. Education is required to be able to create a skilled generation using technology, can survive by using life skills (hard skills and soft skills) in it including high-level thinking skills (Trilling & Fadel, 2009).

According to the United Nations that the challenge of this century was to build knowledgeable communities (in Kusnandar, 2008); 1) The skills of understanding ICT and

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media (ICT and media literacy skills); 2) Critical thinking skills; 3) The skills to troubleshoot problems (problem-solving skills); 4) effective communication skills; and 5) skills in cooperation (collaborative skills). To anticipating the above conditions, the National Research Council (NRC) of 2011 sets 3 skills that need improvement of 1) cognitive skills (problem-solving, critical thinking, systematic thinking), 2) Inter-personal skills (Communication, social skills, teamwork, cultural sensitivity, diversity) and 3) intra-personal skills (self-management, time management, self-development, self-knowledge, self-regulatory, adaptation ability, and executive function). These three skills are the focus of the teachings on this day.

Critical thinking skills are part of the to be cognitive (Facione, 1990). Experts agree to interpret on thinking critically and critically minded ideas. They understand critical thinking as a push for self-regulatory through interstation, analysis, evaluation, inferences; such as explaining based on evidence, concepts, methodological, criteria, or conjugal considerations.

Critical thinking skills need to be improved, which among others was manifested in the 2013 curriculum. Regulation of the Minister of Education and culture number 69 in 2013 explained that the 2013 curriculum aims to prepare Indonesian human beings to have the ability to live as a person and a citizen believes, productive, creative, innovative, and contribute to the lives of people, nations, countries, and world civilization. The learning process in the 2013 curriculum includes three domains; affective (attitude), cognitive (knowledge), and psychomotor (skill).

The learning process in the 2013 curriculum has adopted the results of the NRC workshop (NRC, 2011) by accommodating a learning model that demanding and facilitating the critical thinking skills of learners, such as inquiry model, Problem based learning model, and Problem-solving model. Implementation of curriculum 2013 is already using the models above, but the role of teaching materials in the form of student worksheets used in the process of learning still does not facilitate the critical thinking skills of learners.

The most common problem is the use of learners' worksheets have not been able to maximize the learning process in achieving learning objectives. Student worksheets are created to help learners find a concept both through practicum and theory and help learners implement and integrate the concepts they have found. Permatasari (2018) reports the student worksheets that have been in circulation to contain only summaries or reviews of the subject matter, containing the exercise of the question (questions). This teaching material does not train students to conduct the research process, answer the questions that exist, not just understand the material (Mayasari, et al., 2015).

According to Andriyatin, et al. (2016), students' worksheets have added value if designed using the approach in the study cycle, since the activity of the process until the evaluation so that it can be used for a whole material learning process, as well as information In student spread sheets, can make students more active in their learning activities. Iqbal (2017) has reported that many outstanding student worksheets are currently less stressed on the learning process, but most contain a summary of the material. The presented material is not accompanied by structured steps on how a concept is formed.

The short answers on the learners' worksheets do not provide a clear example of completion, not to meet the requirements, the design is less attractive and innovative. Although it is given in the form of assignments, the nature of its duties is only one workaround. The student's spread sheet invites learners to think systematically, this can be done when learners are assigned a complex task in one bill. Nabila (2019) has pioneered using one sub-skill of several sub-skills on each of these critical thinking skills. Ideally, every critical thinking skill uses all subcritical thinking skills. If the above conditions are fulfilled then the learning that is entrusted to fulfil 21st-century thinking skills in education can be achieved. Safitri (2012) has reported the student's worksheets are valid, practical, and effective based on process skills, and student performance when working on student worksheets.

According to Suryawati, et al. (2017) based on the results of curriculum analysis and analysis of activities on the student's worksheet published by the Teacher Association of subjects obtained some less relevant activities, the student's worksheet is

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still a list of Textual questions, less practicing the skills of thinking and scientific attitudes. The questions posed in learners' worksheets are often questions that do not trigger learners to think high levels of (analysing, evaluating, or creating). Often the learners are given the task of simply filling "dots" with short words or sentences (Majid & Rochman, 2015).

Although student worksheets contain many weaknesses, both circulating and used in schools, efforts to improve them are still limited, especially if related to the local context. Student worksheets can be made more attractive and contain high scientific values if the concepts of biology are associated with a student environment, both school environment and shelter. The concepts of the world are butterfly relevant to wetland environment, environmental change relevant to the urban ecosystem material. In other words, learners' worksheets will be meaningful if they are associated with the local context in which learners are located.

To elevate the local context of composing a student's worksheet requires students to use a natural environment in providing a direct learning experience. When learning World Microbes, learners can take water samples in the school environment to observe Protista; they take samples of mud, wastewater, and even leftover food to observe bacteria. This will create meaningful concerns. A natural environment like this is found at SMA Negeri 9 Banjarmasin City. The nuance of the school's city began to feel, but the rural atmosphere is still strong, the environment in this school as a miniature urban wetland.

The Sari, et. al (2016) has reported the student worksheets circulating in the school to contain only a summary of the material and contains the exercises that are organized and designed by the issuer only. The student worksheets in the reference book have not been able to facilitate learners to obtain meaningful learning (Anggraini, et al., 2016). Students' worksheets need to be repaired that can explore critical thinking skills, and be familiar with the learners' environment. One way is to adopt a Facione model. Not only the structure should be following the prevailing structure (Daryanto, 2014).

The student worksheets developed using the Facione model are expected to be qualified. Quality indicators are valid, practical, and effective. The Facione Model is based on the theory of constructivism learning. This theory describes the creation of knowledge as a result of human construction for reality. Constructivism is an existing knowledge to be the forerunner of acquiring new knowledge (Dwiyogo, 2018). This theory explains that learners have a new experience of learning based on previous experiences. Student worksheets containing critical thinking skills are necessary so that learners have cognitive skills in the face of daily life. One way that can be done is to produce a quality student worksheet through development research with stages of improvement through micro-cycles to produce a prototype (Tessmer, 1993). The final product of development results has valid, practical, and effective criteria (High-quality Intervention) (Plomp & Nieveen, 2007). Student worksheets developed have great potential in supporting the biological learning process of this century. The problem is how does the quality of the student worksheets result in development on the concepts of the microbial world based on urban wetlands to improve high school level thinking skills?

B. Materials and Methods

Research of development of student worksheets is done by two phases; Preliminary research phase and prototype phase using Tessmer design. Preliminary research is conducted through stages: (1) Collecting some student worksheets about the concepts of the world of microbes, (2) reviewing the weaknesses and advantages of each student's worksheet, (3) Setting the guidelines of the worksheet Students to be developed, (4) compile the learners' worksheets into one unity, and (5) coordinate the form of student worksheets.

After the alignment, it produces a book of learners' worksheets containing the concepts of the world of microbes. Then, the student's spread sheet is done self-evaluation which includes: (1) reviewing the linguistic; vocabulary, punctuation and sentence structure, (2) Determine the reliability of the student's worksheets adjusted to the school conditions where the trial, (3) modify the task items of the student worksheets following the availability of and infrastructure, (4) Determine the availability of time and cost estimates required, and (5) carry out the

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validation of research instruments. The Instrument Validation (Table 1) aims to test the validity of the assessment instruments to be used.

In the table expressed the results of the average student worksheet instrument validation is good, so it can be used to carry out the validation of the learners' worksheets. The next step is to revise the student's worksheet book which contains the concepts of the microbial world, and produce an initial draft. Furthermore, if the validator still needs to be revised, it will be revised according to the suggested.

Data Collection Techniques

The student worksheets that have been developed need to be tested for quality through validation test, content practicality test and expectation practicality, and effectiveness test. Data collection techniques for validation tests are obtained based on expert assessment through the Validation assessment sheet instrument. The content practicality test is obtained based on the student's assessment through the assessment of the assessment sheet instrument of the student's worksheet structure. The practicality test (expectation and actual) is obtained based on the student's assessment by using a practicality sheet instrument (expectation and actual) gained from the student's response to the content of the learner's worksheet. The test of effectiveness (expectations and actual) is gained in the results of critical thinking skills, interpersonal skills (cooperation), and intra-personal (responsible) skills.

Data Analysis Techniques

The research data obtained from each instrument is analysed by:

(1) Specify the mode of each aspect that is validated.

(2) Calculating the practicality of the contents of the entire student worksheet is:

$$X = \frac{\Sigma S}{N}$$

Description:
X = Content Practicality Score
ΣS = average number of student score
N = number of learners

Categories: 1≤2 (Not good), 2≤3 (Good enough), 3≤ 4 (Good), and 4 (Very good).

(3) Calculating the practicality test (expectation and actual) with the formula:

$$P = \frac{f}{N} \text{ X } 100\%$$

Description:
P = percentage number
f = Frequency
N = number of learners by number of aspects

Categories: 85.01≤100.00% (very good), 70.01≤ 85.00% (good), 50.01≤70.00% (not quite good), 01.00≤50.00% (not good).

(4) Calculating the effectiveness test include:

(a) Critical thinking skills, using the formula: The number of scores earned: the maximum score x 100, the final result using the categories 85.01≤100.00 (very good/excellent), 70.01≤85.00 (good), 50.01≤70.00 (not quite good), and 01.00≤50.00 (not good).

(b) Calculating the frequency of inter-personal skills (co-operation), and the most intra-personal (responsible) and expressed by percentages (%). Furthermore, the categories 85.01≤100.00% (very good/excellent), 70.01≤85.00% (good), 50.01≤70.00% (not quite good), and 01.00≤50.00% (not good).

C. Results and Discussion

This research has resulted in a prototype book of learners' worksheets which contains concepts of the world-based microbial and urban wetland in enhancing the high school's critical thinking skills. The book is presented as a research supplement, has been through formative evaluation (validity, practicality, and effectiveness).

1. The validity of worksheets for students

In table 2 It is explained that the student worksheets of development are categorized as valid, even the advantages of the development results of the student's worksheet are there are two aspects of assessment that have a very good category of design and systematics of the student's worksheet. This score is obtained because the student worksheets developed

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have consistently referred to the systematics of the preparation of the student worksheets from Daryanto & Dwicahyono (2014). In their opinion that good learners' worksheets contain instructions on general instruction, learning objectives, subject matter along with details, learning tools used and learning steps to be taken. On the design aspects of the learners, the worksheet has gained an excellent category. This is because the developed student worksheets are equipped with a foreword, table of contents, and a cover page. Having a table of contents makes it easier for users. The use of pictures is very helpful in the learning process because it makes the learners enthusiastic to learn, motivated, and active so that the learning materials are easy to understand (Wahyuningsih, 2012). Cover pages are made more appealing with a variety of relevant image views to appeal to learners.

Table 1 Summary of Instrument Validation of Student Worksheets

No.	Aspect Assessed	Number of Sub-indicator	Number of score	Mean score	Category
1.	Student worksheet Design	1	3	3	Good
2.	Topics	3	10	3,3	Good
3.	Linguistic	1	4	4	Excellent
4.	Appearance	1	3	3	Good
5.	Student worksheet form	1	4	4	Excellent
6.	Systematically	1	4	4	Excellent
7.	Bibliography	1	4	4	Excellent
8.	Student worksheet model	1	4	4	Excellent

Descripsion: 1 = Not quite good, 2 = Good enough, 3 = Good, and 4 = Excellent

Table 2 Summary of the result of Validation Test of the Student Worksheet

Aspects	Student Worksheet of Bacteria					Student Worksheet of Virus				Student Worksheet of Protiste				
	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5
Student worksheet Design	4	4	4	4	4	4	4	4	4	4	4	4	4	4
The truth of content (facts, concepts, scientific process)	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Systematically of topics	3	3	3	3	3	3	3	3	3	4	4	4	4	4
Linkage with STEM	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Linguistic	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Appearance	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Student worksheet form	3	3	3	3	3	3	3	3	3	4	4	4	4	4
Systematically of student worksheet	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Bibliography	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Description:

1.1 Form of Bacteria
1.2 Structure of Bacteria
1.3 Reproduction of Bacteria
1.4 Classification of Bacteria
1.5 The role of Bacteria

2.1 Characteristics (form) of the Virus
2.2 Characteristics (structure) of the Virus
2.3 Virus Replication Cycles
2.4 Viral diseases

3.1 Characteristics of Protista
3.2 Protista-like animals
3.3 Protista-like plants
3.4 Protista-like fungi
3.5 The role of Protista

Categories: 1 = Not quite valid, 2 = Quite valid, 3 = valid, and 4 = Very valid.

The validation score for aspects of linkage with STEM (Science, Technology, Engineering, and Math), is still low. In the opinion of the student worksheet validator has

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not yet shown STEM issues, so it is advisable to load activities that demonstrate simple technology. However, due to school implementation, it should be done immediately, so that it only uses the worksheets of students who have been revised early. Learning today is thought to carry STEM, as the previous research (Parwati, 2015) in the environmental context showing STEM learning can build creativity, science literacy, and highly-needed problem-solving skills in the face of the 21st century.

2. The practicality of student worksheets content

The results of the practicality test through individual tests presented in Table 3. Table 3 shows the contents of a good student worksheet and meets the practicability of the content. The same thing has been achieved by the research of Safitri (2015), Khotimah & Suliyanah (2017). The advantages of the learners' worksheets are easy to understand, the instructions are obvious, there are no typographical mistakes, and interesting cover pages. This advantage is obtained after the learners' worksheets through improved stage based on input from the validator.

The practicality of the content is done at an individual test. One-to-one evaluation is used to identify errors and problems in the early versions of learning materials. Learners at any given time play a role in multiple evaluation cycles; Students act as critics and other students to evaluate the learning materials. One-to-one evaluation can be used for all new types of learning materials in the form of early versions, from text to computer to direct learning materials. It can also be used to evaluate new versions of old learning materials or customized learning materials (Zaini, 2018).

The practicality of hope is achieved through material that learners can understand and used by learning device users following the expectations of researchers. It is in agreement with Zulyusri, et.al. (2017), stating that a small group trial as an attempt to determine the practicability of the tasks developed.

Table 3 Summary of the Results of Content Practicality Test of the Learners' Worksheets

Aspects	Student worksheet of Bacteria					Student worksheet of Virus				Student worksheet of Protista				
	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5
Easy to understanding of each section learned	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Clarity instructions to use	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Completeness and logical order	4	4	4	4	4	4	4	4	4	3	3	3	3	3
Use easy-to-understand words	3	3	3	3	3	3	3	3	3	4	4	4	4	4
Good picture quality and easy to understand the intent	3	3	3	3	3	4	4	4	4	4	4	4	4	4
Not found typos and grammar	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Photo of the cover page is clear and understandable	4	4	4	4	4	4	4	4	4	4	4	4	4	4

Description:

1.1 Form of Bacteria
1.2 Structure of Bacteria
1.3 Reproduction of Bacteria
1.4 Classification of Bacteria
1.5 The role of Bacteria

2.1 Characteristics (form) of the Virus
2.2 Characteristics (structure) of the Virus
2.3 Virus Replication Cycles
2.4 Viral diseases

3.1 Characteristics of Protista
3.2 Protista-like animals
3.3 Protista-like plants
3.4 Protista-like fungi
3.5 The role of Protista

Categories: 1 = Not quite valid, 2 = Quite valid, 3 = valid, and 4 = Very valid.

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3. Expectation Practicality of Worksheets Learners

Data of practicality of expectations of learners' worksheets through small group test as presented in table 4. In this table explains 5 aspects are the barrier to the practicality of expectation. The practicability barrier of hope has been completed through small group tests; by fixing clues, activities, moderation, and introducing laboratory equipment. Based on this explanation and considering other aspects, the learners' worksheets are stated to fulfill the practicality of expectations (at least has a good category). The student worksheets developed have practicality with practical categories (consistent between the practicality of content, practicality of hope, and actual practicality). The advantages of the learners' worksheets are easy to understand, the instructions are obvious, there are no typographical errors, and interesting cover pages. This advantage is obtained after the learners' worksheets through an improved stage based on the input by the validator.

The practicality of hope is achieved through material that learners can understand and used by learning device users following the expectations of researchers. This is in agreement with Zulyusri, et al. (2017) who declared trials through small groups as an effort to know the practicality of tasks developed

Table 4 Summary of the Result of Expectations Practicality Test

Aspects	Student worksheet of Bacteria					Student worksheet of Virus				Student worksheet of Protiste				
	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5
Content are easy to Lear.	100	83	100	83	100	100	100	83	100	100	100	100	100	16
The given commandment can be understood.	100	100	100	100	100	83	83	67	67	100	100	100	100	83
Sufficient time available.	100	100	100	100	100	100	100	100	83	100	100	100	100	83
Equipment, procedures, material sources have been known before.	83	50	83	83	100	67	100	67	100	100	100	100	100	100
How to teach has been done.	100	100	83	100	83	100	67	100	100	83	83	83	83	67
Fun learning atmosphere.	100	100	100	100	100	100	83	83	83	100	100	100	100	100
Learning materials are interested.	100	100	83	83	83	100	83	100	83	100	100	100	100	50

Description:

1.1 Form of Bacteria
1.2 Structure of Bacteria
1.3 Reproduction of Bacteria
1.4 Classification of Bacteria
1.5 The role of Bacteria

2.1 Characteristics (form) of the Virus
2.2 Characteristics (structure) of the Virus
2.3 Virus Replication Cycles
2.4 Viral diseases

3.1 Characteristics of Protista
3.2 Protista-like animals
3.3 Protista-like plants
3.4 Protista-like fungi
3.5 The role of Protista

Categories: 1 = 85,01≤100,00% (Excellent), 70,01≤ 85,00% (good), 50,01≤70,00% (good enough), and 01,00≤50,00% (not good).

4. The Expectations Effectiveness of Students' Worksheets

The effectiveness data of student worksheet expectations based on critical thinking skills through a small group test is presented in table 5.

The table shows the results that learners' critical thinking skills are well-

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categorized. Skills to evaluate no data on the student worksheets Protista, this is following the rules of development research aimed at improving the worksheets of learners who have never been tested before. Based on this reason, research is continued to determine inter-personal and intra-personal skills.

The effectiveness of student worksheet expectations based on inter-personal and intra-personal skills is shown in table 6. The results of observation of inter-personal skills and intra-personal skills are obtained at least a good category. Previous research (Hendrik & Elmansyah, 2018) reported that students' interpersonal skills can be improved through peer tutor activities. Based on the scores gained, learners are expected to have the skills to establish and maintain relationships with others and to interact effectively. Natalina & Yusuf (2013) reported that to improve cooperation, thorough, tolerance, confident, and responsible attitude can be done using a guided inquisitors model. This research is in line with Apriya (2013) which states that with a good cooperation attitude, students' learning outcomes are also better.

Table 5 Summary of results of the expected effectiveness test (critical thinking skills).

Skills	Score Max.	Student worksheet of Bacteria			Student worksheet of Virus			Student worksheet of Protista		
		Mean	Score	Category	Mean	Score	Category	Mean	Score	Category
Interpretation	14	12.04	86	Excellent	9,69	69,21	Good	11,67	83,36	Good
Analysis	10	7,71	77,1	Good	9,06	90,60	Excellent	9,71	97,10	Excellent
Evaluation	20	17,17	85,85	Excellent	19,33	96,65	Excellent	No data		
Inference	24	16,89	70,37	Good	19,25	80,21	Good	20,57	85,71	Excellent
Explanation	20	14,69	73,45	Good	17,67	88,35	Excellent	18,15	90,75	Excellent
Self-regulatory	12	9,77	81,42	Good	9,59	79,92	Good	12,00	100,00	Excellent

Categories: 85,01≤100,00 (Excellent), 70,01≤85,00 (Good), 50,01≤70,00 (good enough), and 01,00≤50,00 (not good).

Table 6 Average Results of the Expectations Effectiveness Test (interpersonal and Intrapersonal Skills)

Topic	Cooperation (%)	Category	Thorough (%)	Category
Bacteria	84,50	Good	84,50	Good
Virus	88,33	Good	86,33	Good
Protiste	86,33	Excellent	88,33	Excellent

Categories: 85,01≤100,00 (Excellent), 70,01≤85,00 (Good), 50,01≤70,00 (good enough), and 01,00≤50,00 (not good).

5. The Actual Practicality of Students' Worksheets

Actual practicality data of learners' Worksheets through field tests (table 7). In the table, there are still 3 obstacles to the actual practicality barrier; that is a limited time, less understanding of orders, and still requires exercise using laboratory equipment. The action performed is to moderate the instructional activities of the student worksheets, adding learning using laboratory activities.

6. The Actual Effectiveness of Students' Worksheets

Actual effectiveness Data of learners' worksheets based on critical thinking skills through field trials (table 8). In that table, it is a good category of learners' critical thinking skills, although they are quite well-found. For this have been doing repairs.

The effectiveness of the students' final stages (actual effectiveness) gained from the results of students' critical thinking skills, intrapersonal skills, and interpersonal skills (cooperation). The learners' critical thinking skills have good categories. In the worksheets of learners Protista not obtained data or in other words, did not find student's answers to the skills of evaluating. It is possible that students not have the skills to evaluate their skills, such. The student's worksheets are created aimed at fixing the ones that have

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never been tested before. The students' critical thinking skills have different categories, this is just the same as in previous research (Nuraini, 2017; Susilowati, et al., 2017) explained that each critical thinking skill has varying scores and criteria on each skill.

According to the NRC (2011) there are 3 skills expected to students to be able to face the challenges of the 21st century, and these skills need to be improved; i.e. 1) critical thinking skills, 2) interpersonal skills, and 3) intra-personal skills. These three skills became the focus of learning in the face of 21st-century education and have been adopted in learning through the 2013 curriculum.

Table 7 Summary of Results of Actual Practicality Test

Aspects	Student worksheet of Bacteria					Student worksheet of Virus				Student worksheet of Protiste				
	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	3.5
Content are easy to learn.	83	100	100	83	100	100	100	100	83	100	100	100	100	83
The given commandment can be understood.	100	100	100	100	100	67	50	83	67	100	100	100	83	83
Sufficient time available.	67	83	100	67	83	100	100	100	100	100	100	100	100	100
Equipment, procedures, material sources have been known before.	100	100	100	100	100	100	100	100	100	83	100	100	83	67
How to teach has been done.	100	100	100	100	100	100	100	100	100	83	83	83	83	67
Fun learning atmosphere.	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Learning materials are interested.	83	100	100	100	100	100	100	100	100	100	100	100	83	83

Description:

1.6 Form of Bacteria
1.7 Structure of Bacteria
1.8 Reproduction of Bacteria
1.9 Classification of Bacteria
1.10 The role of Bacteria

2.5 Characteristics (form) of the Virus
2.6 Characteristics (structure) of the Virus
2.7 Virus Replication Cycles
2.8 Viral diseases

3.6 Characteristics of Protista
3.7 Protista-like animals
3.8 Protista-like plants
3.9 Protista-like fungi
3.10 The role of Protista

Categories: 1 = 85,01≤100,00% (Excellent), 70,01≤ 85,00% (good), 50,01≤70,00% (good enough), and 01,00≤50,00% (not good).

Table 8 Summary of Actual Effectiveness Test Results (Critical Thinking Skills)

Skills	Score Max.	Student worksheet of Bacteria			Student worksheet of Virus			Student worksheet of Protiste		
		Mean	Score	Catergory	Mean	Score	Category	Mean	Score	Category
Interpretation	14	12,5	89,28	Excellent	11,61	82,93	Good	10,94	78,14	Good
Analysis	10	7,66	76,60	Good	9,60	96,0	Excellent	9,52	95,20	Excellent
Evaluation	20	10,67	53,35	Good enough	19,33	96,65	Excellent	No data		
Inference	24	12,56	52,33	Good enough	21,08	87,83	Excellent	21,13	88,04	Excellent
Explanation	20	13,69	68,45	Good	19,33	96,65	Excellent	17,82	89,01	Excellent

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Skills	Score Max.	Student worksheet of Bacteria			Student worksheet of Virus			Student worksheet of Protiste		
		Mean	Score	Catergory	Mean	Score	Category	Mean	Score	Category
Self-regulatory	12	10,94	91,17	Excellent	10,0	83,33	Good	12,00	100,00	Excellent

Categories: 1 = 85,01≤100,00% (Excellent), 70,01≤ 85,00% (good), 50,01≤70,00% (good enough), and 01,00≤50,00% (not good).

Table 9 Summary of Actual Effectiveness Test Results (Interpersonal and Intrapersonal Skills)

Topics	Names	Collaboration (%)	Category	Thorough (%)	Category
	Deswita	100	Excellent	88	Excellent
	Jauhar	77	Good	100	Excellent
	M.Reza	77	Good	77	Good
Bacteria	Nurlaila	88	Excellent	77	Good
	Putri Apridah	77	Good	88	Excellent
	Risnawati	88	Excellent	77	Good
	Rata-rata	84,50	Good	84,50	Good
	Mutma'inah	100	Excellent	100	Excellent
	Mutia Puteri	88	Excellent	88	Excellent
	Juwita	88	Excellent	77	Good
	Muhammad Fikri	88	Excellent	77	Good
Virus	Putri Sabila	77	Good	100	Good
	Natalia Margareta Ndun	77	Good	88	Excellent
	Rata-rata	86,33	Good	88,33	Good
	Anita	88	Excellent	88	Excellent
	Haliza	88	Excellent	77	Good
	Muhammad Reza	77	Good	77	Good
	Muhammad Gilang	88	Excellent	88	Excellent
Protiste	Novia	100	Excellent	100	Excellent
	Vera	88	Excellent	88	Excellent
	Rata-rata	88,17	Excellent	86,33	Excellent

Categories: 1 = 85,01≤100,00% (Excellent), 70,01≤ 85,00% (good), 50,01≤70,00% (good enough), and 01,00≤50,00% (not good).

D. Conclusion

The developed student worksheets have valid categories, covering aspects of design, content, systematically, linguistic, and presentation, as well as a bibliography. The Student worksheets developed are practical to be used based on the students ' opinions, which are supported by the practicality of content and practicality of hope which is also good. The student worksheets developed are considered effective to be used based on (1) the results of critical thinking are well-categorized, (2) interpersonal skills (cooperation) is good, and (3) intra-personal skills (thorough) which are also good.

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