International Social Sciences and Humanities
**UMJember Proceeding Series (2023)** Vol. 2 No 2: 484-490

**(KOPI) 2023**

# Development of Human Respiratory System E-Module to Prevent Students Misconception in Grade 8th

**Pipit Candrasari[1], Ika Priantari[2], Aulya Nanda Prafitasari[3]**

[1]Teacher Professional Education, Universitas Muhammadiyah Jember; pipitcandra0@gmail.com
[2] Biology Education, Universitas Muhammadiyah Jember; ikapriantari@unmuhjember.ac.id
[3] Biology Education, Universitas Muhammadiyah Jember; aulya.prafitasari@unmuhjember.ac.id

DOI: https://doi.org/10.32528/issh.v2i2.251
*Correspondence: Aulya Nanda Prafitasari
Email: aulya.prafitasari@unmuhjember.ac.id

Published: Mei, 2023

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**Abstract:** Misconception is due to the distinct early concepts known to each individual from concepts agreed upon by experts and can cause a halt to the process of acceptance of new knowledge called misconception. One concept or science material which is considered quite difficult for learners because they are unable to discern for real the processes of the respiratory organs in the human body. The purpose of this study is to know the validity of the development of the human respiratory system e-module on conception level. This type of research and development (R&D) with the borg and gall model simplified to 4 stages of a basic, planning, development and testing. Data analysis shows the level of validity of the e-modules of the human respiratory system matter has an average of 69.16 % with the "valid" category. Small scale test analysis shows learners' responses to the use of the e-module learning media in learning have an 81.4% percentage that fall into the "very valid" category.

**Keywords:** E-Module Development, Misconception, Respiratory System Matter

## INTRODUCTION

Learning activities in schools at all levels of education are currently carrying out limited offline learning or learning that is still *blended learning*. This condition makes the potential for misconceptions still exist, and this requires a solution to reduce the level. Teachers not only use printed teaching materials but are also encouraged to prepare flexible teaching media so they can be accessed anytime and anywhere. Google-based teaching materials that are widely used by students sometimes cannot be guaranteed credibility. Therefore, teachers should still use teaching media that are in accordance with material needs and have been equipped with several features to make it easier for students to build their understanding. This is important to prevent misconceptions in students. However, sometimes natural science material is abstract because a process or mechanism in a living creature's body cannot be sensed by the naked eye. In this case it is very likely that the initial concepts possessed by students are not in accordance with the concepts set by experts (Suhermiati et al., 2015)

One of the science concepts or materials that has the potential to cause misconceptions in students is the Human Respiratory System. The Human Respiratory System is considered material that is quite difficult for students because they cannot clearly know the organs and processes of breathing in the human body. So it requires the right approach to obtain maximum learning outcomes. This is supported by previous research which revealed misconceptions about the material of the human respiratory system, including research by (Dewi & Purnomo, 2021) which revealed that the percentage of students' answers to the material on the human respiratory system was 62.15%, who experienced misconceptions about the concept of structure and function of the human respiratory organs, respiratory mechanisms, respiratory frequency, respiratory volume and diseases or disorders of the human respiratory system in class VIII students from two classes at SMP Negeri 1 Sidoarjo. Factors that cause misconceptions include the students themselves, learning methods, ways of teaching and context.

Misconceptions in science material can occur in students with a range of educational levels that cannot be detected. In previous research by (Wicaksono, 2021) identified misconceptions that occurred in Jember Regency, which involved 5 schools with a recapitulation of misconception profiles in class IX human heredity material in each school, namely at SMP Muhammadiyah 1 Jember by 51.2%, at SMP Negeri 3 Jember was 20.6%, SMP 10 Jember was 60.6%, SMP Negeri 12 Jember was 31.8% and SMP Muhammadiyah 4 Tanggul was 44.3%. From the recapitulation it can be seen that SMP Negeri 10 Jember has the highest misconception profile than the other 4 schools at 60.6%. Based on the analysis of the percentage of misconceptions, the results of the misconception profile were 40.81%. The sources that caused the most misconceptions were the content and context of books that were difficult to understand at 88.50% and the media and teaching methods from teachers at 77.90%.

Based on the results of Wicaksono's research (2021) it is known that as many as 60.6% of students at SMP Negeri 10 Jember experience misconceptions. Therefore we need a learning media that can prevent these misconceptions. The required teaching media must be equipped with information in the form of theory and have audio-visual features to make it easier for students to build their understanding. Until now teaching materials from teachers are still the main source of information in the learning process for students. One of the interesting teaching materials is e-module learning media. The teaching media developed must be in the form of E-Modules to support blended learning so that they can be accessed easily both via mobile phones and computers (PC). E-Modules are modifications of conventional modules by integrating the use of information technology, so that existing modules can be more interesting and interactive because with e-modules we can add multimedia facilities (images, animations, audio and video) in them. We can also add interactive test or evaluation facilities so students can interact more with their learning resources (Partono, 2019). In its preparation, an application is needed to convert material from conventional formats into e-modules that have several features. Therefore, the Human Respiratory System E-Module was developed to prevent students misconceptions in grade 8$^{th}$.

## METHOD

The research which was conducted in March – July 2022 is a *Research and Development* (R&D) type of research. Research and development is a basic research activity to obtain information on user needs and then proceed with development activities to produce products and examine the validity of these products (Merlinda, 2019) . Borg and Gall's research and development design is used in this study because it fits the needs of researchers who aim to determine the validity of the E-Module being developed.

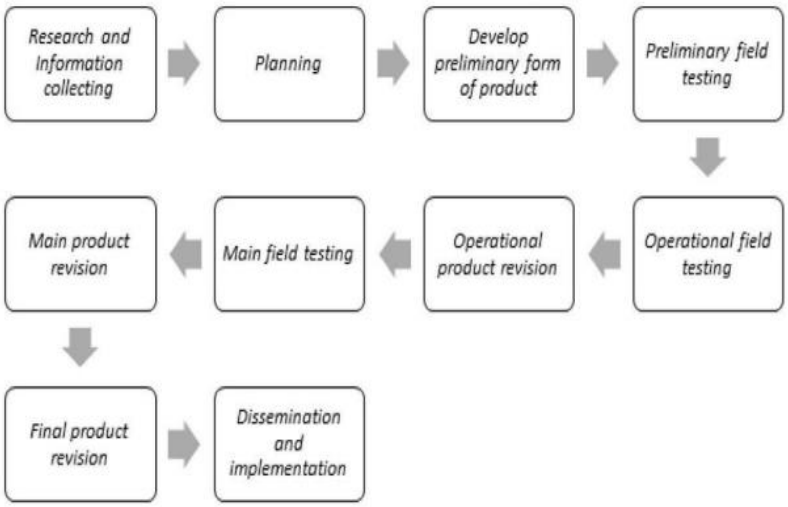



**Figure 1**. Borg and Gall Development Procedure (Assyauqi, 2020)

With regard to the limited scope of content and nature of the material in the e-module, the data obtained in the study up to the small group test was deemed sufficient to describe the research objectives.

The validity of the Human Respiratory System E-Module was obtained from the results of the questionnaire scores assessed by expert validators consisting of material experts, media experts, and science

teachers as user. Apart from expert validators, the feasibility of the E-Module also considers the results of the questionnaire from student responses. The division of the assessment criteria from the results of the questionnaire score was obtained based on the rules for determining the Likert scale criteria. The criteria for the results of the questionnaire are as follows

**Table 1.** Questionnaire outcome criteria

| **Percentage _** | **Criteria** |
|---|---|
| 82 <n ≤ 100 % | Very Worth it |
| 63 <n ≤ 82 % | Worthy |
| 44 <n ≤ 63 % | Worth less |
| n ≤ 44 % | Not Feasible |

The effectiveness of the developed Human Respiratory System E-Module can be known from small-scale tests. The subjects in this study were 8th grade students at SMP Negeri 10 Jember, who were selected by purposive sampling because previous research findings on the profile of misconceptions of junior high school students in Jember showed that students at SMP Negeri 10 Jember had the highest level of student misconceptions at 60.6% in biology material. Literature studies are also carried out to study and choose the right *software according to the needs and conditions of researchers.* In this case the application used to create the e-module is *Flip PDF Professional*.

## RESULTS AND DISCUSSION

Misconceptions occur in various learning materials, one of which is science material. Science material has many concepts that must be understood, so mastery of the concepts is very important for every student to have. Concept mastery is the ability of students to understand learning material and its application in everyday life (Irani et al., 2020). For prevent the students misconcepsion, development of teaching media for science that is in accordance with the character and material needs of teachers really needs to be done. Teaching media that can be used both offline and online are also very much needed along with the development of information technology in education. E-Module is a solution to learning needs in the digital era because it has many advantages. (Astuti et al., 2015) explained that e-Module is a form of presenting self-learning material that is arranged systematically into certain learning units, which are presented in an electronic format, where each learning activity in it is connected with a link as a navigation that makes students become more interactive with the program, complemented by the presentation of video tutorials, animations and audio to enrich the learning experience . The Human Respiratory System e-module was developed with the help of Flip Pdf Professional software and Canva. In addition to the ease of application, the selection of this application is also due to its suitability with the needs of researchers who will develop E-Modules which have several features, namely theory, pictures and learning videos in one unit.

The selected search and development model is the research and development model by the Borg and Gall. For this research, the procedure of Borg and Gall was simplified to the 4 stages - a preliminary study, planning, development and small-scale test. This preliminary study stage is a general analysis of the phenomenon of misconceptions in science learning by collecting data through literature studies, interviews and observations. The next stage in developing a learning model is to design steps to solve problems at an early stage which then proceed to the development stage. The development stage relates to the hypothetical design and the learning tools needed in the research, which is accompanied by the Validation stage by material experts, media experts, and science teachers as user. Hypothetical design form e-module has been inputted using the *Flip PDF Professional application*, so that validators can gain hands-on experience in operating and checking the quality of the material content. The following is a recapitulation of the expert validation test results presented in Table 2.

**Table 2**. Recapitulation Percentage of Expert Validation Test Results

| **Validators** | **Percentage Expert Validator** | **Criteria** |
|---|---|---|
| Material Expert | 67.5 % | Valid |

| | | |
|---|---|---|
| Media Expert Lecturer | 68.75 % | Valid |
| Science teacher | 71.25 % | Valid |

Based on the table 2 above, it can be explained that the results of each assessment from expert validation have an average value of 69.16%. Referring to the table 1 related to the criteria for the results of the e-module learning media questionnaire, it is included in the "Easy" category based on the Likert scale that has been developed. However, the developed E-Module still requires a revision stage before the e-module learning media is carried out in small-scale trials. The revisions that have been made based on criticism and suggestions from the validator are as follows

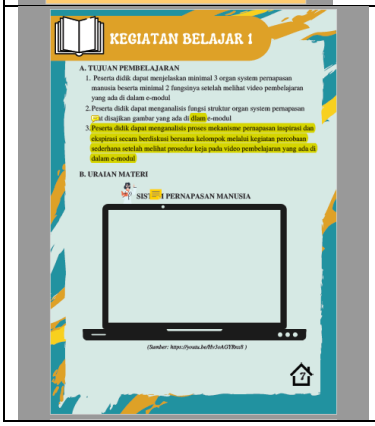
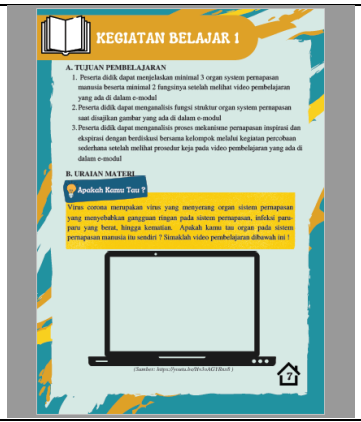
**Table 3**. Recapitulation of Criticisms and Validator Suggestions

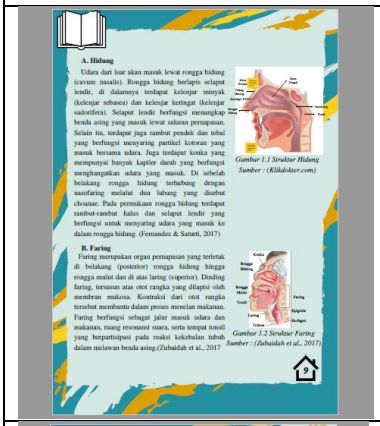
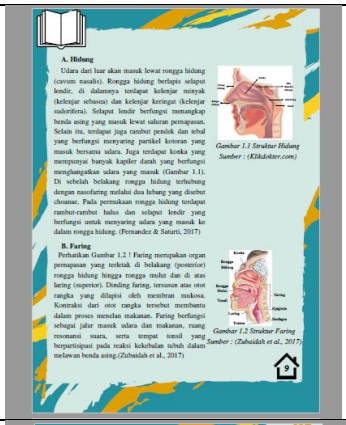
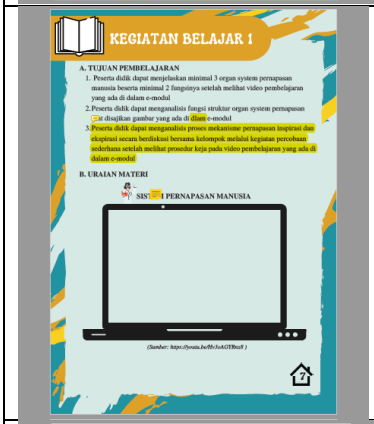
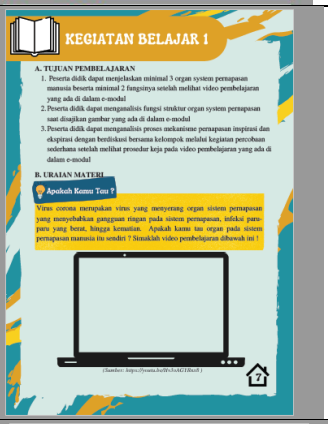
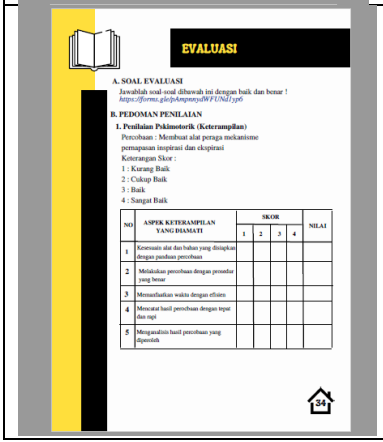
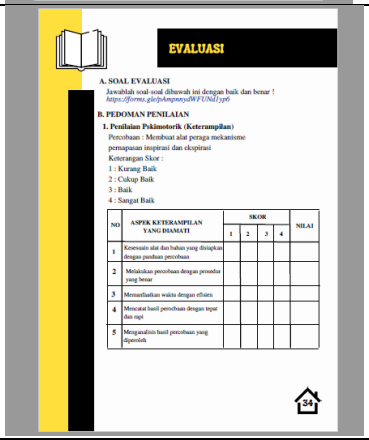
| **Validators** | **Suggestions / Feedback** | **Revisions that have been made** |
|---|---|---|
| Material Expert | Material that you want to highlight related to misconceptions needs to emphasize material that can cause misconceptions | More emphasis on the material on the four tier diagnostic test with CRI instrument question indicators which causes misconceptions |
| | The part or content of the module between activity 1 and activity 2 is not consistent | More consistency between the contents of activity 1 and activity 2 by aligning with the learning objectives of each learning activity. |
| | Each activity should be given a subtitle | Add subtitles on different pages with an attractive design |
| | There are no task assessment instruments from making posters and attitude assessments | Adding assessment instruments for assignments and exercises in the e-module and placing them in the evaluation section of the e-module. |
| | Less communicative, ideally the module language is spoken language | Adding more communicative words in the e-module, such as in the information box section using the word "Did you know?", then in the simple experiment section with the word "Let's do it! ” |
| | Images, videos and animations seem to stand alone because they are not mentioned in the text at all | Adding words in the text that refer to the intended learning images or videos |
| | Navigation that can make it easier for students to go between sections, for example from activity 1 to activity 2 | The navigation provided is limited to adding hyperlink transmissions on one page to another. |
| Media Expert | Needs a neater and more attractive arrangement | Neatly organize each chapter into sub-chapters and the pictures and learning videos listed |
| | Compatibility with indicators | Adjusting learning objectives with achievement indicators |
| | The depth of the material needs to be generated with reference to the latest research journals | Adding the latest references regarding covid-19 which is also a disorder of the human respiratory system. |

| Validators | Suggestions / Feedback | Revisions that have been made |
|---|---|---|
| | Lots of capitalization errors | Improve the use of capital in sentences according to the general guidelines for Indonesian spelling |
| | Inconsistent use of words | Correct the repetition of words in sentences |
| | Logical order | Fix the order in logical learning objectives according to operational verbs |
| Science teacher | Improved layout, more attractive illustrations and colors | Improved the layout and added more non-monotonous colors |
| | Needs to be clarified for skills assessment assignments | Added pricomotor (skill) assessment criteria in the evaluation section |
| | It should start with an interesting motivation that displays various events related to the material | Provides the latest information about covid which is associated with the human respiratory system and adds learning videos. |

The developed e-module is in the form of a link which will require internet access for its application. This e-module is multiplatform which can be accessed using *a mobile phone* or computer or laptop. This e-module contains material on the human respiratory system which is equipped with self-learning videos and exercises for students so that students can learn independently. Learning activity 1 discusses the organs and mechanisms of human respiration which begins with the presentation of the learning objectives to be achieved and then a description of the material.

**Table 4**. E-Module Revision

| BEFORE REVISED | AFTER REVISION | INFORMATION |
|---|---|---|
|  |  | Add subtitles on different pages with an attractive design. |
|  |  | Adding more communicative words in the e-module, such as in the information box section using the word "Did you know?", then in the simple experiment section with the word "Let's do it! ” |

| BEFORE REVISED | AFTER REVISION | INFORMATION |
|---|---|---|
|  |  | Adding words in the text that refer to the intended learning images or videos |
|  |  | Adding the latest references regarding covid-19 which is also a disorder of the human respiratory system. |
|  |  | Added pricomotor (skill) assessment criteria in the evaluation section |

Small-scale tests were conducted to see how students responded to the e-module learning media developed in this study. Respondents were selected in a small-scale test from grade 8 SMP Negeri 10 Jember. This student response questionnaire consists of 10 statement items containing positive and negative statements. Respondents' answers in the form of statements strongly agree (SA) are worth 5, agree (A) are worth 4, Neutral (N) are worth 3, Disagree (D) are worth 2 and Strongly Disagree (SD) are worth 1. The following is a recapitulation of student response questionnaires:

**Table 5.** Student Response Questionnaire Recapitulation

| Statement | SA | A | N | D | SD | Total score | Percentage (%) |
|---|---|---|---|---|---|---|---|
| 1 | 6 | 4 | - | - | - | 46 | 92 % |
| 2 | 5 | 3 | 2 | - | - | 43 | 86 % |
| 3 | 5 | 3 | 2 | - | - | 43 | 86 % |
| 4 | 4 | 3 | 3 | - | - | 41 | 82 % |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | 5 | 4 | 1 | - | - | 44 | 88 % |
| 6 | 4 | 3 | 3 | - | - | 41 | 82 % |
| 7 | 6 | 2 | 2 | - | - | 44 | 88 % |
| 8 | 3 | 1 | 4 | 2 | - | 35 | 70 % |
| 9 | 5 | - | 2 | 3 | - | 37 | 74 % |
| 10 | 3 | 1 | 2 | 4 | - | 33 | 66 % |
| Percentage (%) | | | | | | | 81.4 % |

Based on the table 5 shows that the response of students to the use of e-module learning media in learning has a percentage of 81.4%. If referring to the table 1 related to the interpretation of the criteria for the student response questionnaire, it is included in the "Very Valid" category based on the Likert scale criteria that have been developed. This satisfaction from students who using e-modules supported by (Nainggolan, 2017) research that states In the student textbook, an explanation of the function of the structure of the organs of the human respiratory system does not show pictures of the nasal organs in order to further clarify students' understanding.

## CONCLUSION

The Human Respiratory System E-Module was declared valid based on the results of the validation questionnaire assessment from material experts, media experts, and teachers as user who showed results of 69.16% before revision. As for the percentage of eah expert is Material Expert 67.5%,Media Expert Lecturer 68.75 % and from Science Teacher is 71.25 %. The e-module developed in this study was also declared effective according to the results of the student response questionnaire which showed a percentage of 81.4% with very valid criteria based on the Likert scale criteria that had been developed.

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