RESEARCH ARTICLE

Development of e-worksheets using Canva-Heyzine flipbook on excretory system material for eleventh graders

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Abstract: This study aims to develop e-worksheet teaching materials on the excretory system, assess their feasibility, analyze teacher responses, and evaluate trial results using the e-worksheet. The research follows a Research and Development (R&D) approach, employing the ADDIE development model. The study was conducted at SMAN 8 Tanjung Jabung Timur, involving two biology teachers and class XI IPA students, divided into small groups (6 students) and large groups (27 students). Both qualitative and quantitative data were collected using questionnaires. The validation results indicate that the material experts rated the e-worksheet at 91.25% ("Very Good"), while media experts gave a rating of 87.5% ("Very Good"). The biology teachers' perceptions also yielded a 91.25% ("Very Good") rating. In the small group trial, students provided a total score of 452, equivalent to 94% ("Very Good"). In the large group trial, the total student assessment score reached 1,879, with a percentage of 87% ("Very Good"). Overall, the study demonstrates that the e-worksheet is feasible for use in learning, as validated by subject matter and media experts. Additionally, it is considered practical by teachers and students, effectively enhancing motivation, engagement, and understanding of the excretory system. Therefore, the e-worksheet serves as a valuable alternative solution to existing learning challenges in biology education.

Keywords: Canva Heyzine; excretory system; e-worksheet; teaching materials

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Introduction

The development of Information and Communication Technology (ICT) in the 21st century has brought many changes to various areas of life, including education. Increasingly advanced technology encourages the development of teaching materials used in learning (Fuadah et al., 2023; Nasabiyah et al., 2022). According to Prastowo (2013), teaching materials are a set of materials in the form of information, media and materials collected from learning sources and arranged systematically for use in the learning process. The application of technology in the use of teaching materials is carried out to make it easier for educators to convey learning and make it easier for students to understand the material (Fauziah & Sulisworo, 2022; Haleem et al., 2022; Julita & Purnasari, 2022). Teaching materials that are combined with technology are usually called electronic teaching materials, for example Electronic Student Worksheet (e-worksheet).

E-worksheet is learning material that contains a collection of activities that must be carried out by students to support understanding of the material being studied in accordance with the learning indicators that must be achieved. The worksheet used must be in accordance with Basic Competencies, attract attention and interest in learning, and can increase students' learning motivation (Prastowo, 2013). According to Nana (2022), the function of Worksheet in learning is (1) Helping students understand the material and remembering it for a long time, (2) Helping create a pleasant learning atmosphere, (3) Attracting students' attention (4) Making students are more active, (5) Developing students' way of thinking (6) Improving the quality of learning.

According to Mayasari et al (2023), most of the worksheet in schools currently only contain a general summary of the material and are not accompanied by clear instructions. The material presented is usually explained briefly without detailed explanations or supporting media. This causes students to be less

interested in the existing worksheet. Material packaging tends to be less structured causing students to have difficulty understanding the concepts of the material being studied and only memorizing the material so they easily forget and when given different cases with the same concept students will experience confusion (Astuti et al., 2018). According to Mayasari et al (2023), using interesting worksheet in learning can create a learning atmosphere that is fun, not boring, and not afraid to ask questions.

Attractive worksheet can be realized by combining learning technology in it so that worksheet is presented in electronic form (e-worksheet) which is more attractive to students. E-worksheet is equipped with materials, images, videos, audio and practice questions that students can work on directly so that they can further activate students in learning. According to Purwono et al (2014) teaching materials containing text, images, video and audio are useful in increasing students' interest, attention, activity and increasing learning activities because they visualize a process or mechanism of the material being studied clearly and interestingly. for example, in biological materials most of which study the mechanisms that occur in the bodies of living creatures.

Biology subjects emphasize learning that includes processes occurring in the bodies of living creatures in a structured and complex manner. Learning biology at school requires students to be able to understand and analyze conceptual and procedural knowledge, as well as apply it to everyday life to solve a problem (Aqil & Barat, 2017; Aripin, 2018). This requires students to understand the material both in concept, structure, mechanisms and other things that occur in living things found in everyday life. Based on the understanding of the content and concepts, students often find misconceptions when understanding material, such as the excretory system material.

Based on observations made at SMAN 8 Tanjung Jabung Timur, it is known that there is some class XI material that is difficult to understand based on student learning outcomes. One of them is the excretory system material. The existence of various mechanisms or processes in this material means that students must understand the concepts correctly. Based on the results of the needs questionnaire, 37% of students expressed difficulty in understanding the excretory system material. Specifically, 76% of students have difficulty understanding the mechanisms of each organ, 17% of students have difficulty understanding the function of organs, and another 7% have difficulty understanding the mechanisms by which disorders/diseases arise. According to Elci et al (2021) the excretory system is one of the subject matters that is difficult to understand because it is related to the processes that occur in internal organs such as the mechanism for the excretion of metabolic waste substances such as urine, CO_2 and H_20, toxins and sweat which are difficult to understand. if only learned by reading the material.

Apart from material concepts that are difficult to understand, low learning outcomes are also caused by several other factors such as students being less motivated to learn independently (Adlini et al., 2023; Yohana & Lufri, 2022), limited learning time in class, less varied learning models and methods used by teachers, and a lack of appropriate teaching materials and learning media according to students' needs (E. Putri, 2018; Sari et al., 2020). For this reason, more interesting teaching materials are needed so that they can visualize the processes that occur in the excretory system so that students can more easily understand the material.

The solution is to develop e-worksheet excretion system material to support the learning process. Students are expected to be more motivated to study independently and understand the excretory system material more easily so that learning outcomes can improve. Making e-worksheet is done using Canva-Heyzine Flipbook software. Fahlevi et al (2022) stated that the e-worksheet developed using Heyzine flipbook is interactive and easy to access either via smartphone or laptop online. Apart from that, Banjarani et al (2020) also stated that the use of e-worksheet in learning can make students play a more active role. It can also improve process skills, independent attitudes and scientific attitudes as well as increase students' interest and motivation.

Method

This research is development research using the ADDIE development model which consists of 5 stages, namely Analysis, Design, Develop, Implementation, and Evaluation. The ADDIE development model was chosen because it has systematic and simple work procedures and can produce an effective final product (Branch, 2009). This research was conducted at SMAN 8 Tanjung Jabung Timur with the research subjects being 2 biology subject teachers and 27 class XI IPA students of SMAN 8 Tanjung Jabung Timur. The trial was carried out in two stages, namely a small group trial carried out on 6 students and a large group trial carried out on 27 students. Determining the number of students in small groups and large groups is based as according to Setyosari (2016), small group trials are carried out involving 5-8 people while large group trials are carried out involving 15-30 people. Expert validation was carried out by two expert lecturers at the Biology Education Study Program of Jambi University, consisting of subject matter experts and teaching material development experts. Validation of the material is selected based on the criteria, namely lecturers whose fields of education are in accordance with the material to be validated and who have a deep understanding of the substance of the material. While media experts are selected based on the criteria, namely lecturers who understand the extent to which the media supports

the clarity, attractiveness, and interactivity of the material presented and have knowledge of communication design, media technology, and the principles of effective and efficient information delivery.

Data collection in this study used a questionnaire consisting of material expert validation questionnaire, media expert validation questionnaire, teacher assessment questionnaire, and student perception questionnaire, each consisting of 20 questionnaire items. The data used in this research are qualitative data and quantitative data. Qualitative data was obtained from questionnaires filled out by experts in the field of teaching material development and material experts during the product validation process. This data is in the form of responses, input and suggestions for product development which are then used as indicators in making improvements or revisions to the product. Quantitative data is obtained from assessment scores using questionnaires that have been filled in by validators and test subjects.

The data analysis technique used is descriptive data analysis. Data analysis was carried out by calculating the scores obtained from the results of filling out the questionnaire and tabulating them in the form of a Likert scale. This scale is used because it is easy to use. According to Riduwan and Akdon, (2010), the Likert scale can be used to measure the perceptions, opinions and attitudes of one or a group of people regarding social events or phenomena that have been specifically determined by researchers. The scale used consists of four levels of answers (Table 1).

Table 1. Rating Weights for Each Respondent

Value Criteria	Category
4	Very Good
3	Good
2	Not Good
1	Very Not Good

Data on the feasibility of the e-worksheet excretion system was obtained from the validation results of material experts and experts in the field of teaching material development, while data on the practicality of the e-worksheet was obtained from teacher and student responses. Feasibility analysis is calculated using the following feasibility/validity percentage Formula 1 according to Riduwan and Akdon (2010).

$$\%validity = \frac{Total\ score\ obtained}{Maximum\ Score} \text{x} 100\% \quad (1)$$

From the calculations that have been described, the intervals for each assessment category used are in Table 2, Table 3, and Table 4.

Table 2. Criteria for assessing the level of expert validation and trials by biology teachers

Value Scale	Value Range	Percentage (%)	Category
4	65 - 80	81.25 - 100	Very good
3	50 – 64.9	62.5 – 81.24	Good
2	35- 49.9	43.75-62.49	Not Good
1	20 – 34,9	25 -43.74	Very Not Good

Table 3. Assessment Criteria for Small Group Trials

Value Scale	Value Range	Percentage (%)	Category
4	390 - 480	81.25 - 100	Very Good
3	300 – 389.9	62.5 – 81.24	Good
2	210 – 299.9	43.75 – 62.49	Not Good
1	120 – 209.9	25 – 43.74	Very Not Good

Table 4. Assessment Criteria in Large Group Trials

Value Scale	Value Range	Percentage (%)	Category
4	1,755 – 2,160	81.25 - 100	Very Good
3	1,350 – 1,755	62.5 – 81.24	Good
2	945 – 1,350	43.75 – 62.49	Not Good
1	540 – 945	25 – 43.74	Very Not Good

Results and Discussion

Analyze

The analysis stage was conducted through field observations and interviews with biology teachers to identify learning challenges. Findings indicate that students struggle to understand biology concepts, particularly the excretory system, as reflected in the low average learning outcomes. The completion rate for class XI IPA students on this topic is **63.6% (40 out of 66 students)**. These difficulties stem from the complexity of the material and the **lack of suitable teaching resources**. Additionally, students exhibit low engagement, asking few questions and showing minimal response to teacher explanations. This is in accordance with the results of interviews with biology subject teachers who stated that "Students' activeness in learning is still lacking and more just listening to what the teacher says". According to Panggabean et al (2021), a teacher-centered learning system prioritizes the delivery of material by educators so that learning occurs in one direction. Using a system like this makes students less active in learning, do not dare to express their opinions, are less creative and only develop cognitive abilities. Learning objectives are not achieved properly with an average learning outcome of 63.6 which means that they have not reached the Minimum Completion Criteria of 75. Most students are not ready to start learning so they are less focused and easily get bored and tired when learning. According to Risanatul and Junaid (2022) student inactivity during learning is caused by several factors, such as lack of interest in the learning media used by teachers, learning methods that are less enjoyable so that they do not increase interest in learning, and monotonous learning makes students get bored quickly. Students need interesting teaching materials, easy to use for learning anywhere and in line with technological advances. This is supported by the results of interviews with subject teachers who stated that "In learning biology, of course, we really need new technology-based teaching materials and learning media. So that it will also attract their attention to learn". In addition, based on the results of the needs analysis conducted on students, it was found that "students need interesting teaching materials, easy to use for learning anywhere and in accordance with technological advances". Therefore, innovation in teaching materials is needed that can facilitate students' needs and make it easier to understand the material, especially the excretory system material.

Design

The stages for designing e-worksheet excretion system material are designed in the form of flowcharts and storyboards. E-worksheet is designed using Canva software and published using Heyzine software. The result is e-worksheet in the form of a flipbook which can be accessed via an online website. The design of the e-worksheet includes instructions for use, learning objectives, indicators, concept maps, work procedures, bio info, excretion system material, games, reference and reflections. In e-worksheet, several interesting learning media are combined, such as learning videos, games and quizzes designed using woodwalls, as well as experiments using virtual laboratories from olabs/edu.in. The results of students' work can then be submitted in a Google form link.

Development

The development stage is the stage for developing, validating, revising and testing e-worksheet products that have been previously designed. The resulting product is flipbook model e-worksheet teaching materials. Product validation is carried out using a questionnaire designed based on the assessment instrument grid. This is done so that the development product is valid and suitable for testing. Product validation results are in the Table 5.

Table 5. Material Validation Results

Assessment Aspects	Stage Validation Results		
	(%)	(%)	(%)
Content quality	53	75	92
Accuracy of Questions and Additional Activities	50	75	100
Grammar	62.5	68.75	81.25
Feasibility of Presentation	25	75	87.5
Final Percentage	**51.25**	**73.75**	**91.25**
Category	**Not Good**	**Good**	**Very Good**

This validation was carried out three times. The total percentage in the first stage of validation was 51.25% with the category "Not Good", so improvements need to be made based on suggestions from the validator regarding the material in the e-worksheet. Several things that are the focus of this improvement are related to the correctness of the material concept, adjustment of the e-worksheet format

properly based on experts, activity instructions and improvements to evaluation questions. After the improvements were made, the second stage of validation was carried out and the results of the product quality percentage were 73.75% with the category "Good". Based on suggestions from the validator, the e-worksheet product still needs to be improved in terms of the activity instructions and evaluation questions. The results of the third stage of material validation obtained a percentage of 91.25% with the category "Very Good" and can be tested in the field without revision. Referring to the results of the material validation that has been carried out, it is known that the e-worksheet material on the excretory system that was developed has been declared valid or feasible because it has a concise material explanation and is in accordance with the concept of the excretory system material both in explanations through text, images, and videos. In addition, the developed e-worksheet has various activities that can train cognitive abilities and are interesting for students to do, such as discussion activities, case studies, games, and quizzes. There are experimental activities that can increase the activeness, cognitive, affective, and psychomotor abilities of students while learning. Involving students in experimental or research activities can improve critical thinking skills, because in experimental activities students conduct experiments and then write practical reports as the results of their own learning. Students develop their critical thinking skills to analyze the experimental results obtained so that they become a report that is correct and in accordance with the experimental concept (Hamdani et al., 2019; Mariya, 2023; Mataniari et al., 2020; Putri, 2023). In addition, the developed e-worksheet is equipped with evaluation questions. Evaluation questions in e-worksheet are made using HOTS indicators so that they can be used to measure students' understanding of the excretory system material effectively (Table 6).

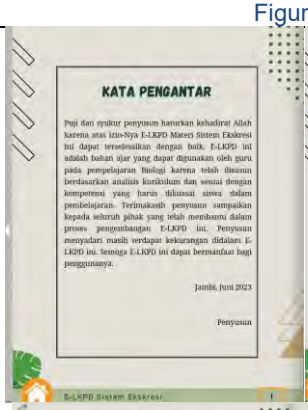
Table 6. Media Validation Results

Assessment Aspects	Stage Validation Results	
	1 (%)	2 (%)
Coherence	83	91.6
Graphic design	82	89
Content Design	68	78,5
Technical Quality	100	100
Final percentage	**80%**	**87.5%**
Category	**Good**	**Very Good**

Further validation was carried out by media experts or experts in the field of teaching material development. The first stage of media validation obtained a percentage of 80% with the category "Good". Based on the validator's suggestions in the first stage, there were several parts that needed to be improved, including improving image quality, element layout, adding interesting images, reducing text that was too long, and paying attention to the use of language according to students' language development, such as changing image captions from foreign languages to Indonesian so that they were easy to understand. The results of the second stage of media validation obtained a product quality percentage of 87.5% with the category "Very Good" so that the e-worksheet product for the excretory system material could be tested in the field without revision. The description of the media developed in this study is presented in Table 7.

Tabel 7. E-Worksheet Design

No	Module Section	Figure
1	Cover	

No	Module Section	Figure
2	The opening section of the module contains 1) foreword, 2) instructions for using the module, 3) table of contents, 4) competencies & learning objectives.	   
3	Material Content	 
4	The closing section is the final part of the module which consists of a glossary and bibliography.	 

The products that have been declared feasible by the material and media validator were then tested on teachers and students at SMAN 8 Tanjung. Jabung Timur. The results of the teacher assessment questionnaire are presented in Table 8.

Table 8. Teacher Assessment Results

Assessment Aspects	Score
Material	22
Question accuracy	16
Grammar	10
Design	10
Utilization	15
Final Percentage	**91.25%**
Category	**Very Good**

The results of the teacher assessment obtained a percentage of 91.25% in the "Very Good" category. The teacher gave positive comments and stated that the e-worksheet developed was very interesting, could help students in learning and could increase students' learning motivation if used in learning.
Based on the results of student responses in small groups (Table 9), the total assessment score from students was 452 with a percentage of 94% in the "Very Good" category. Student responses and assessments in the large group trial obtained a total assessment score of 1,879 with a percentage of 87% in the "Very Good" category. From this score, students agreed that the developed e-worksheet had very good quality, was attractive and easy to use.

Table 9. Product Trial Results

Assessment Aspects	Small Group (%)	Large Group (%)
Material	91	87
Display	94	86.75
Language	96	88
Utilization	97	87
Final Percentage	**94**	**87**
Category	**Very Good**	**Very Good**

From the trial results, the percentage of data in the small group trial was higher than in the large group trial. This difference can occur due to the difference in the number of students who took part in the trial. In the small group trial, only 6 students were involved so that the trial could run conductively and students were more focused on using e-worksheet. While in the large group trial, 27 students were involved so that the situation was less conducive, and students were less focused on using e-worksheet. This is in line with the opinion of Wahyuningsih et al., (2020) that if the number of students in one class is too many, it will have an impact on the lively learning atmosphere and affect the effectiveness of learning. Therefore, appropriate teaching materials such as e-worksheet are needed to improve the effectiveness and quality of learning.

Implementation

The next stage is implementation which is carried out to determine the feasibility of using the developed teaching materials in learning. The data obtained is used to improve the products being developed so that they are better quality. This stage was carried out with several limitations, including implementation which was only carried out until the process of introducing e-worksheet to teachers and students, the results of students' work were obtained from working on several components carried out in e-worksheet. This was done because the researchers had limited time in conducting research and also because the learning material on the excretory system had been completed so that the overall implementation could not be carried out. Comments and suggestions from both teachers and students will then be used as reference material in improving e-worksheet in the future.

Evaluation

The evaluation stage carried out in this research is formative evaluation. According to Kaniawati et al., (2023) formative evaluation is an evaluation carried out after a set of lesson programs have been taught. The main aim of this formative evaluation is to determine the success of developing teaching materials after all ADDIE stages have been carried out. Based on the evaluation results for each.
Based on the results above, it is known that the perception of teachers and students towards e-worksheet on the excretory system material is feasible and practical if used as additional teaching materials in biology learning in class XI because it is very interesting, practical, motivating and increases interest in learning and can increase students' knowledge of the excretory system material. This is in line with previous research such as according to Damayanti and Ratnasari, (2021) that e-worksheet which contains supporting components such as videos and animated images according to the substance of the material made by considering the selection of design, color and layout makes the appearance attractive so as to increase students' interest in learning. In addition, Rakhmaningtyas and Rahayu, (2022) in their

research found that the Interactive e-worksheet based on flipbooks on the material on plant growth and development in training critical thinking skills that were developed was declared feasible based on validity values, practicality values, and effectiveness values. One of the advantages of e-worksheet is that it is practical to use. This is in line with the research of Hamidah et al., (2023) which states that e-worksheet is easy to use in learning because it is accessed via a Google link so that it can be used anywhere by students to learn independently. Also supported by activities such as practicums, quizzes, practice questions and explanations of material using videos so that students can repeat the material at any time so that it is easier to understand the material. This is also in line with the opinion of Nana (2022) who stated that e-worksheet is said to be good if the activities contained are in accordance with KD and learning indicators, interesting and not boring, presenting varied and systematic activities and can be measured, presenting material in accordance with the concept of related material, and able to develop students' cognitive, affective, and psychomotor abilities.

Conclusion

Based on the research and development of e-worksheet teaching materials on the excretory system material, several important conclusions were obtained. This research produced a product in the form of e-worksheet designed using Canva and converted into a flipbook with Heyzine. This e-worksheet can be accessed via various devices, such as smartphones, laptops, and computers, using HTML links. This product is equipped with an excretory material system that is presented in an attractive manner, supported by interactive learning media such as images, videos, games, and relevant quizzes. In terms of feasibility, material validation obtained a score of 91.25% and media validation of 87.5%, both in the "Very Good" category. The biology teacher's perception of this e-worksheet also showed positive results, with a score of 91.25% in the "Very Good" category, indicating that this e-worksheet is suitable for use in biology learning. Student perceptions of e-worksheet showed consistent results, with a score of 94% in the small group and 87% in the large group, both in the "Very Good" category. These results indicate that the developed e-worksheet for the excretory system can be an effective open material in helping students understand the excretory system material.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Author Contributions

A. Hamidah: writing original draft preparation and analysis data; **N. P. S Asnia**: writing original draft preparation and analysis data production of research articles; **R. Mataniari**: interpretation data, review and editing.

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