

Modules To Improve Students' Higher Order Thinking Skills (Hots) On Human Reproductive System Materials

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Abstract

This study aimed to develop a Canva-based e-module that is valid, practical, and effective in improving students' Higher Order Thinking Skills (HOTS) on the topic of the human reproductive system. The research employed a Research and Development (R&D) approach using the ADDIE model, which consists of the stages of analysis, design, development, implementation, and evaluation. The research subjects were 35 eleventh-grade students of SMA Negeri 01 Gorontalo Utara. Data were collected through expert validation questionnaires (content experts, media experts, and practitioners), student practicality questionnaires, and HOTS pre-test and post-test. Data analysis was conducted using percentage calculations to determine validity and practicality, and the N-Gain test to measure effectiveness. The results showed that the e-module achieved a very valid category with an average score of 86%, a very practical category with a percentage of 92.77%, and was effective in improving students' HOTS with an N-Gain score of 0.411, which falls into the moderate category. Therefore, the Canva-based e-module is feasible to be used as a biologi learning material to support the enhancement of students' higher order thinking skills learning.



Keywords: *Canva-Based e-Module; Higher Order Thinking Skills; Human Reproductive System; Instructional Material Development*

INTRODUCTION

Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 69 of 2013 concerning the Core Competencies and Curriculum Structure for Senior High Schools/Madrasah Aliyah emphasizes that students are required to understand, apply, and analyze factual, conceptual, and procedural knowledge based on their curiosity toward science, technology, arts, culture, and the humanities. These competencies are oriented toward developing insights into humanity, nationality, statehood, and civilization, as well as applying procedural knowledge in specific fields according to students' interests and talents to solve problems (Ernawati, 2016).

However, the results of the Programme for International Student Assessment (PISA) indicate that Indonesian students' performance in reading, mathematical, and scientific literacy remains relatively low (Abraham et al., 2021). Previous studies have reported that students' low achievement in answering Higher Order Thinking Skills (HOTS) questions is primarily caused by limited conceptual understanding, difficulty in comprehending questions, and lack of accuracy in reading problem statements (Pusparini & Mistiani, 2023). These findings suggest the need for learning resources that explicitly support higher-order cognitive processes.

The topic of the human reproductive system involves understanding the structure and function of reproductive organs, gametogenesis, fertilization and menstrual processes, as well as technological developments related to reproductive health. Due to its abstract and complex characteristics, this topic requires students to engage in in-depth analysis in order to construct comprehensive conceptual understanding. Therefore, learning materials that provide realistic visualization and simulation are essential to assist students in understanding and analyzing reproductive system concepts.

Classroom observations at SMA Negeri 01 Gorontalo Utara revealed that learning activities were still dominated by conventional media such as PowerPoint presentations and student worksheets, resulting in limited variation of instructional materials. Interviews with biology teachers further indicated that printed textbooks available in the school library were the primary learning resources used. The integration of digital technology to provide diverse and interactive learning materials had not been optimally implemented.

An e-module is a technology-based instructional module that offers several advantages



over printed modules, particularly its interactive nature, ease of navigation, and ability to integrate images, audio, video, animations, and formative assessments with immediate feedback (Irmawati et al., 2023). Canva is an online graphic design application that can be accessed via desktop or mobile devices, enabling educators to design learning materials efficiently anytime and anywhere (Irmawati et al., 2023). Canva offers various templates, animations, and design features that enhance visual appeal, support creativity, save time, and allow students to revisit learning materials independently (Tanjung & Faiza, 2019 in Irmawati et al., 2023).

Despite these advantages, the systematic development of Canva-based e-modules that are explicitly designed to strengthen Higher Order Thinking Skills (HOTS) in learning the human reproductive system remains limited, particularly at the senior high school level. Therefore, this study focuses on developing a Canva-based e-module that is not only visually engaging but also pedagogically designed to enhance students' higher-order thinking skills in biology learning.

METHOD

This study employed a Research and Development (R&D) approach aimed at producing and evaluating an instructional product in the form of a Canva-based e-module on the human reproductive system. The development process followed the ADDIE model, which consists of five stages: analysis, design, development, implementation, and evaluation (Widiana & Rosy, 2021).

During the analysis stage, needs analysis was conducted to examine students' learning characteristics, curriculum requirements, characteristics of reproductive system content, and existing learning media. The design stage involved formulating learning objectives, organizing content, preparing assessment criteria, and developing a storyboard and framework for the e-module. The developed design was then validated by content experts and media experts to obtain feedback and recommendations for improvement.

Following the validation process, revisions were made to improve the quality and feasibility of the e-module. The revised product was subsequently implemented in a limited-scale trial involving one class of eleventh-grade students at SMA Negeri 01 Gorontalo Utara. The implementation employed a One-Group Pretest–Posttest Design, where students' HOTS were measured before and after the use of the e-module (William & Hita, 2019).

Data collection instruments included expert validation questionnaires, student practicality questionnaires, and HOTS achievement tests. Data analysis was conducted using descriptive quantitative and qualitative methods. Percentage analysis was used to determine the validity and practicality of the e-module, while the N-Gain test was applied to measure its effectiveness in



improving students' Higher Order Thinking Skills.

RESULTS

Validity of the Canva-Based E-Module

The validity of the Canva-based e-module was evaluated by content experts, media experts, and a biology teacher as a practitioner. The validation results indicated that the developed e-module met the criteria of validity to high validity. The content expert assessment showed a score of 90%, categorized as *very valid*, indicating that the learning materials were systematically organized and aligned with curriculum objectives. The integration of conceptual explanations and HOTS-oriented exercises facilitated students' understanding of the human reproductive system.

Validator	Skor (%)	Kategori
Ahli Materi	90	Sangat Valid
Ahli Media	80	Valid
Praktisi (Guru Biologi)	88	Sangat Valid
Rata-rata Keseluruhan	86	Valid

The media expert validation resulted in a score of 80%, categorized as *valid*, reflecting appropriate visual design, layout consistency, navigation clarity, and effective integration of multimedia elements. Meanwhile, the practitioner (biology teacher) provided a validation score of 88%, classified as *very valid*, confirming that the e-module was suitable for classroom implementation and aligned with students' learning needs. The overall average validity score of 86% indicated that the Canva-based e-module was feasible for use in biology learning.

Revisions were conducted based on validators' qualitative feedback, including improvements to content clarity, color contrast, typography, glossary completeness, HOTS question quality, and the integration of supporting videos and hyperlinks.

Practicality of the Canva-Based E-Module

The practicality of the e-module was evaluated through student response questionnaires involving 35 eleventh-grade students. The results demonstrated that the e-module achieved a very high level of practicality, with an overall average score of 92.77%, categorized as *very practical*.



Aspek Kepraktisan	Skor (%)	Kategori
Pembelajaran	91.14	Sangat Praktis
Kualitas	91.85	Sangat Praktis
Fungsi	93.10	Sangat Praktis
Tampilan	95.00	Sangat Praktis
Rata-rata Keseluruhan	92.77	Sangat Praktis

All assessed aspects—learning process, quality, functionality, and visual appearance—received scores above 90%. These findings indicate that students perceived the e-module as easy to use, engaging, and helpful for independent learning. The interactive features and clear presentation enabled students to access learning materials efficiently and revisit content as needed, supporting self-directed learning.

Effectiveness of the E-Module in Improving HOTS

The effectiveness of the Canva-based e-module in enhancing students' Higher Order Thinking Skills was measured using pre-test and post-test scores analyzed through the N-Gain formula. The results showed an increase in the average HOTS score from 39.43 (pre-test) to 64.00 (post-test).

Tabel 7. Rata-rata N-Gain Score HOTS Siswa

Parameter	Nilai Pre-test	Nilai Post-test	N-Gain Score	Kategori
Rata-rata	39.43	64.00	0.411	Sedang

Tabel 8. Distribusi Kategori N-Gain Score HOTS Siswa

Kategori N-Gain	Jumlah Siswa	Persentase (%)
Tinggi (> 0.7)	3	8.57
Sedang (0.3 - 0.7)	18	51.43
Rendah (< 0.3)	14	40.00
Total	35	100.00



The N-Gain analysis yielded an average score of 0.411, which falls into the *moderate* category. Further analysis revealed that 8.57% of students achieved high improvement, 51.43% demonstrated moderate improvement, and 40.00% showed low improvement. These results indicate that the e-module contributed positively to improving students' HOTS, particularly in analytical and evaluative thinking skills.

Tabel 9. N-Gain Score HOTS Individu Siswa

NO	Inisial Siswa	N-gain Score	Kategori
1	APK	0,222222	Rendah
2	ACA	0,25	Rendah
3	AY	0,222222	Rendah
4	CRD	0,25	Rendah
5	DAB	0,125	Rendah
6	ERTH	0,2	Rendah
7	FH	0,333333	Rendah
8	FA	0,142857	Rendah
9	NSL	0,125	Rendah
10	PDA	0,25	Rendah
11	PALA	0,285714	Rendah
12	RRA	0,125	Rendah
13	SAH	0,25	Rendah
14	SBS	0,25	Rendah
15	TNAD	0,2	Rendah
16	AM	0,666667	Sedang
17	AAPR	0,5	Sedang
18	DSIM	0,4	Sedang
19	FRS	0,666667	Sedang
20	FO	0,5	Sedang
21	FAG	0,666667	Sedang
22	IAM	0,571429	Sedang
23	KF	0,333333	Sedang
24	MSIA	0,333333	Sedang



25	MB	0,571429	Sedang
26	MRYT	0,428571	Sedang
27	NSK	0,5	Sedang
28	RK	0,6	Sedang
29	RS R. T	0,625	Sedang
30	SAHP	0,375	Sedang
31	SNP	0,5	Sedang
32	ZGK	0,5	Sedang
33	MASA	0,714286	Tinggi
34	LRY	1	Tinggi
35	PH	0,714286	Tinggi

Duties appropriately amidst the everyday turmoil of plentiful data (Couros, 2009; Garcia et al., 2012).

DISCUSSION

The high validity scores obtained from content experts, media experts, and practitioners indicate that the developed Canva-based e-module meets academic and pedagogical standards. The *very valid* rating from content experts confirms that the learning materials are coherent, scientifically accurate, and systematically structured. The integration of HOTS-oriented tasks supports students' ability to analyze, evaluate, and create, which are core components of higher-order thinking as described in Bloom's taxonomy (Ariyana et al., 2018).

The media expert validation highlights that Canva effectively supports the development of visually appealing and user-friendly learning materials. The use of multimedia elements enhances students' motivation and engagement, which aligns with previous studies emphasizing the role of digital media in improving learning outcomes (Wulandari & Mudinillah, 2022). Practitioner validation further confirms the relevance and applicability of the e-module in real classroom contexts.

Practicality of the Canva-Based E-Module

The very high practicality scores indicate that the e-module is easy to use and supports the learning process effectively. The modular design allows students to learn independently and at their own pace, which is consistent with the characteristics of effective instructional modules



outlined by the Ministry of Education (Kemendikbud, 2017).

The interactive and multimedia-rich nature of the Canva-based e-module addresses the lack of variation in conventional learning materials, which often limits students' engagement and conceptual understanding. By presenting content in a visually structured and interactive format, the e-module supports students' critical thinking, problem-solving skills, and motivation to learn.

Effectiveness of the Canva-Based E-Module on Students' HOTS

The moderate N-Gain results indicate that the Canva-based e-module effectively enhances students' Higher Order Thinking Skills. The improvement in post-test scores demonstrates that the e-module supports students in moving beyond rote memorization toward higher cognitive processes such as analysis and evaluation.

Although some students showed low improvement, the overall findings suggest that the e-module benefits students across different levels of prior knowledge. The variation in learning gains highlights the importance of differentiated instruction and teacher facilitation to maximize the effectiveness of digital learning materials. Overall, the results underscore the potential of Canva-based e-modules as effective instructional tools for addressing low HOTS achievement in biology education.

CONCLUSION

This study concludes that the Canva-based e-module developed for the human reproductive system meets the criteria of being **valid, practical, and effective** for improving students' Higher Order Thinking Skills (HOTS). Expert validation results confirmed that the e-module is pedagogically sound, systematically structured, and visually appropriate for biology learning at the senior high school level. Student responses further indicated that the e-module is highly practical, easy to use, and supportive of independent learning.

In terms of effectiveness, the implementation of the Canva-based e-module resulted in a **moderate improvement in students' HOTS**, as evidenced by the N-Gain score. The findings demonstrate that the integration of interactive content, multimedia elements, and HOTS-oriented tasks can facilitate students' analytical and evaluative thinking processes. Therefore, the Canva-based e-module is feasible to be used as an alternative and innovative instructional material to support biology learning and the development of higher-order thinking skills in senior high schools.



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