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Biology e-magazine integrated on wahdatul ‘ulum: Learning media on reproductive system material

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Abstract

Biology learning media that are interesting, easy to use, and effective in improving the quality of students and integrated with Islamic values such as wahdatul ‘ulum need to be developed. Wahdatul ‘ulum is one of the main concepts in the philosophy of science at the Universitas Islam Negeri Sumatera Utara (UINSU). This study aims to analyze the validity, practicality, and effectiveness of the integrated biology e-magazine on the wahdatul ‘ulum paradigm developed on reproductive system material. The type of research used is research and development (RnD) with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The instruments used in this research are interview sheets, needs analysis questionnaires of biology teachers and students, validation sheets of material experts, media experts, and wahdatul ‘ulum experts, response questionnaires of biology teachers and students, and multiple-choice question tests. The results showed that the validity of e-magazines from media experts obtained a percentage of 94.70% (very valid), material experts obtained a percentage of 95.83% (very valid), and wahdatul ‘ulum experts obtained a percentage of 87.50% (very valid). The practicality of e-magazines is that the response of biology teachers obtained a percentage of 92.50% (very practical), and the response of students obtained a percentage of 91.06% (very practical). The effectiveness of e-magazines is known from N-Gain results of 0.72 (effective). The advantages of biology e-magazines on reproductive system material developed because it is integrated with the wahdatul ‘ulum paradigm, easy to understand, attractive in design, and able to improve learning outcomes, although in the aspect of motivating students to enthusiasm for learning has not reached good criteria. Further research is needed to achieve a broader goal of shaping the positive character of students.

Abstrak. *Media belajar biologi yang menarik, mudah digunakan, dan efektif untuk meningkatkan kualitas peserta didik serta terintegrasi dengan nilai-nilai keislaman seperti wahdatul ‘ulum perlu dikembangkan. Wahdatul ‘ulum adalah salah satu konsep utama dalam filsafat ilmu di Universitas Islam Negeri Sumatera Utara (UINSU). Penelitian ini bertujuan untuk menganalisis kevalidan, kepraktisan dan keefektifan e-majalah biologi terintegrasi paradigma wahdatul ‘ulum yang dikembangkan pada materi sistem reproduksi. Jenis penelitian yang digunakan adalah penelitian dan pengembangan atau Research and Development (RnD) dengan model ADDIE (Analysis, Design, Development, Implementation, Evaluation). Instrumen yang digunakan pada penelitian ini adalah berupa lembar wawancara, angket analisis kebutuhan guru biologi dan peserta didik, lembar validasi ahli materi, ahli media, dan ahli wahdatul ‘ulum, angket respon guru biologi dan peserta didik, serta tes soal pilihan ganda. Hasil penelitian menunjukkan bahwa kevalidan e-majalah dari ahli media diperoleh persentase sebesar 94,70% (sangat valid), dari ahli materi diperoleh persentase sebesar 95,83% (sangat valid), dan dari ahli wahdatul ‘ulum diperoleh persentase sebesar 87,50% (sangat valid). Kepraktisan e-majalah dari respon guru biologi diperoleh persentase sebesar 92,50% (sangat praktis) dan dari respon peserta didik diperoleh persentase sebesar 91,06% (sangat praktis). Kefektifan e-majalah diketahui dari hasil N-Gain 0,72 (efektif). Kelebihan dari e-majalah biologi materi sistem reproduksi yang dikembangkan karena terintegrasi dengan paradigma wahdatul ‘ulum, mudah dipahami, desain menarik, dan mampu meningkatkan hasil belajar, meskipun pada aspek memotivasi peserta didik untuk semangat belajar belum mencapai kriteria baik. Penelitian lebih lanjut diperlukan untuk mencapai tujuan yang lebih luas yaitu membentuk karakter positif peserta didik.*

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A. Introduction

Learning materials are often separated from religious knowledge, while accepting and practising religious teachings is one of the core competencies of learning (Hamzah, 2016). In addition to improving the cognitive quality of students, education also needs to shape the character of positive civilians in students (Cahyani et al., 2014) because, in fact, education aims to develop the potential of students to become humans of faith, noble character, knowledge, creative and independent (Muyaroah & Fajartia, 2017). Apart from the role of teachers in teaching, the development of innovative learning resources is also needed so that the material presented is more informative, systematic, effective, efficient, and in accordance with the demands of the curriculum (Indaryati & Jailani, 2015).

The latest learning resources developed in recent years to support learning activities are electronic magazines (e-magazines). Anggraini et al. (2022) developed an e-magazine to stimulate early childhood science skills that can be accessed online from home. Kurniawan et al. (2023) developed e-magazines to improve writing and reading literacy and support madrasah literacy programs. Gunawan et al. (2022) developed an e-magazine based on Canva Application to increase students' learning motivation.

These studies show the potential of e-magazines that can be utilized in biology learning, including being accessible from anywhere and can be integrated with specific characteristic skills or values. According to Supriyadi et al. (2018), e-magazine content can be given additional features such as images, videos, and audio. However, according to Yuhroh (2019), there have not been many e-magazine developments that are integrated with Islamic values, one of which is wahdatul 'ulum.

Wahdatul 'ulum is one of the main concepts in the philosophy of science at UINSU (Ritonga & Salminawati, 2022). Wahdatul 'ulum means all knowledge that has joined in a unity that is related and complementary and is considered important to achieve ulul albab (Nasution et al., 2024). Wahdatul 'ulum will develop if learning activities are integrated with various sciences, including Islamic values (Padang et al., 2024).

Wahdatul 'ulum is needed to maintain harmony to harmonize development and progress in the modern era with technological advances (Ritonga & Salminawati, 2022). Education needs to facilitate the integration of learning materials with wahdatul 'ulum values so that students are able to understand and live these values taught (Junaedi & Wijaya, 2021). The paradigm of wahdatul 'ulum is that there is no separation of knowledge, but all knowledge is realized as a gift from Allah as a way of faith (Brewster & Fager, 2016).

This situation is the basis for research on the importance of integrating subject matter with the concept of wahdatul 'ulum in the form of e-magazines. According to Selviani & Anggraini (2018), the advantages of this wahdatul 'ulum e-magazine are that students can understand the material according to their understanding speed, and students are more enthusiastic about participating in the learning process. Students easily understand concepts and experience increased interest in learning, and e-magazines are easily accessible anywhere and anytime. Gultom (2016); Irwandi & Fajeriadi (2019) the combination of images and text that attracts reading interest makes it easier for students to understand the material, and learning becomes more meaningful.

The results of observations and interviews with biology subject teachers, Al-Qur'an and hadith teachers, and also students at Al-Hidayah Private Senior High School (SMAS Al-Hidayah) in learning biology show the material presented has not integrated with related Al-Qu'ran verses nor learning resources that are of interest related to religion. The knowledge conveyed so far is only in reference books and also obtained information that existing textbooks so far tend to be boring for students. Learners prefer to read magazines, newspapers, and comics when they are in the library. Learners in class tend to be less interested in textbooks if there is no motivation or command from the teacher to read, so it is difficult to achieve the minimum completeness criteria (KKM) value set at 70.

The results of interviews with several students at YPI Al-Hidayah obtained information that students are less interested in reading books because reading books with too many explanations is very boring. The use of media such as PowerPoint (PPT) is not maximally utilized because it only contains text that makes students bored and also considers that biology is material that has a lot of memorizations. Learners also complain that the display of learning resources available is less attractive and prefer to learn by using varied media, namely by looking at pictures to make what is read easy to remember.

There have been many studies that have developed biology magazines. Dewi & Warso (2014) developed a green magazine on human reproductive system material for natural science (IPA) grade XI, Dani et al. (2017) developed a magazine on grade X virus material, Andriyani (2018) developed a magazine on excretory system material, and Pratiwi et al. (2017) developed a biology magazine on biodiversity material.

The magazine development research mentioned has not been integrated with wahdatul 'ulum, so it becomes a novelty in development studies in the field of biology education. Therefore, this research aims to develop wahdatul 'ulum-integrated e-magazines on reproductive system materials that are valid, practical, and effective and integrate biology learning materials with Islamic values.

B. Materials and method

The type of research used is the Research and Development (R&D) model ADDIE (Analysis, Design, Development, Implementation, and Evaluation) shown in Figure 1. The analysis stage is a needs analysis conducted through observation and interviews.

At the design stage, product design begins with making storyboards by paying attention to design and material aspects. In the development stage, the finished product is then validated by media experts, material, and wahdatul 'ulum experts to assess the validity of the valid product. The implementation stage is the application of the product in the learning process by assessing the practicality and effectiveness of the product. Implementation is carried out three times a meeting, which includes the introduction of the product at the first meeting, filling out a response questionnaire at the second meeting, and a question test at the third meeting. The evaluation stage evaluating and revising the results of the implementation of products developed for the use of products in learning.

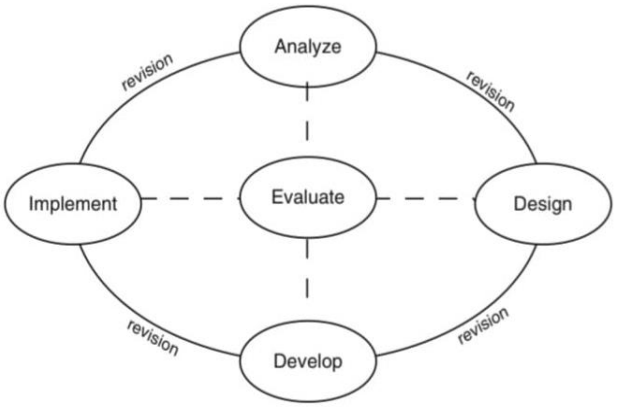

Figure 1
The ADDIE Model Stages (Source: Branch & Fitztgerald, 2000)

The test subjects in this study were the XI-grade students of SMAS AL-Hidayah Medan. The instruments used in this research are interview sheets addressed to teachers and students to obtain data on needs analysis. Then, the validation sheet consists of validation sheets of wahdatul 'ulum experts, media experts, and material experts used to collect data for product validity. Furthermore, a response questionnaire aimed at a teacher and 30 students to collect responses to e-magazines as practicality data. Effectiveness was assessed through a multiple-choice question test of 20 questions with five answer choices.

Validation data, teacher responses, and learner responses were analyzed using a Likert scale, as in Table 1. The validity and practicality of data were calculated using Formula 1. The validity is categorized according to Table 2, and practicality is categorized according to Table 3. Before categorizing practicality, the average score of student responses per aspect was calculated using Formula 2. Finally, effectiveness data was calculated using Formula 3 based on the N-Gain increase in question scores before and according to the implementation of e-magazines and categorized according to Table 4.

Table 1 Scoring guidelines on expert validation sheets and response questionnaires

Score	Description
4	Very good
3	Good
2	Quite good
1	Less good

(Source: Ritonga & Salminawati, 2022)

$$\text{Percentage} = \frac{\text{Score obtained}}{\text{Maximum score}} \text{x100\%}.....\text{Formula 1}$$

Table 2 Criteria for e-magazine validity

Percentage	Criteria	Description
0% - 44%	Invalid	Total revision
45%-64%	Quite valid	Large revision
65%-84%	Valid	Small revision
85%-100%	Very valid	No revision

(Source: Sinambela & Sinaga, 2020)

$$S = \frac{\sum p}{\sum n}.....\text{Formula 2}$$

Description:
S = Score per aspects
$\sum p$ = Total Score per aspect from all students
$\sum n$ = Number of students

Table 3 Criteria for e-magazine practicality

Percentage	Criteria
0%-59%	Not practical
60%-79%	Quite practical
80%-89%	Practical
90%-99%	Very practical

(Source: Samitra & Harmoko, 2021)

$$\text{Gain} = \frac{\text{Post}-\text{test score}-\text{Pretest score}}{\text{Maximum score}-\text{Pretest score}}.....\text{Formula 3}$$

Table 4 The N-Gain classification for e-magazine effectiveness

N-Gain score	Classification	Criteria
n ≥ 0,7	High	Effective
0,3≤ n <0,7	Medium	Quite effective
n < 0,3	low	Less effective

(Source: Hake, 1999)

C. Results and discussion

The results of interviews at the analysis stage of the biology teacher and observation of learning activities found that the learning resources so far used are only PPT, teacher's package books, and learning videos.

Students do not have their learning resources. Furthermore, the importance of wahdatul 'ulum, which means integrating Islamic values in biology learning, strongly encourages the presentation of biology learning resources that have been integrated with the value of wahdatul 'ulum values, especially in Islamic-based schools.

The initial design of the product at the design stage is in the form of a storyboard, which is then developed into a biology e-magazine by looking at the design and material aspects. The e-magazine design already contains material and forms like a magazine. The material is arranged based on the basic competencies (KD) of reproductive system material, namely KD 3.42 and 4.12. This development research produces products in the form of learning media, such as wahdatul 'ulum-integrated biology e-magazines with reproductive system material for grade XI.

The results of media, material, and wahdatul 'ulum expert validation of the developed e-magazine can be seen in Table 5. Practicality test results from teachers can be seen in Table 6, and student responses in Table 7. Followed by the effectiveness test results in Table 8.

Table 5 Expert validation test results

Expert field	Assessment aspects	Aspect item	Score obtained	Percentage	Criteria
Media	E-magazine size	2	8	100%	**Very valid**
	E-magazine cover design	5	20	100%	
	E-magazine design	11	37	84,09%	
	Percentage average			**94,70%**	
Material	Material scope	2	8	100%	**Very valid**
	Presentation technique	6	24	100%	
	Contextual nature	2	7	87,50%	
	Percentage average			**95,83%**	
Wahdatul 'ulum	Content	2	7	**87,50%**	**Very valid**

Table 6 Practicality test results based on teacher responses

No	Indicator	Score
1	Ease of use of e-magazines in learning that has been done	4
2	Ease of understanding learning materials	4
3	Freedom to use e-magazines in learning	3
4	Learning experience gained by using e-magazine media	4
5	Desire to learn other materials with the same media, namely e-magazines	3
6	More exciting and not dull when using e-magazines	4
7	Become more active in learning activities	4
8	Making students better at learning	4
9	Students' pleasure in learning the material	4
10	Motivate student enthusiasm for learning	3
	Total score	**37**
	Percentage	**92,50%**
	Criteria	**Very practical**

Table 7 Practicality test results based on student responses

No	Indicator	Average score
1	Ease of use of e-magazines in learning that has been done	3,21
2	Ease of understanding learning materials	4
3	Freedom to use e-magazines in learning	4
4	Learning experience gained by using e-magazine media	4
5	Desire to learn other materials with the same media, namely e-magazines	4
6	More exciting and not dull when using e-magazines	4
7	Become more active in learning activities	4
8	Making students better at learning	4
9	Students' pleasure in learning the material	3
10	Motivate student enthusiasm for learning	2,21
	Total score	**36,42**
	Percentage	**91,06%**
	Criteria	**Very practical**

Figure 2
Front cover before (A) and after (B) revised according to media expert suggestions (in Indonesian)

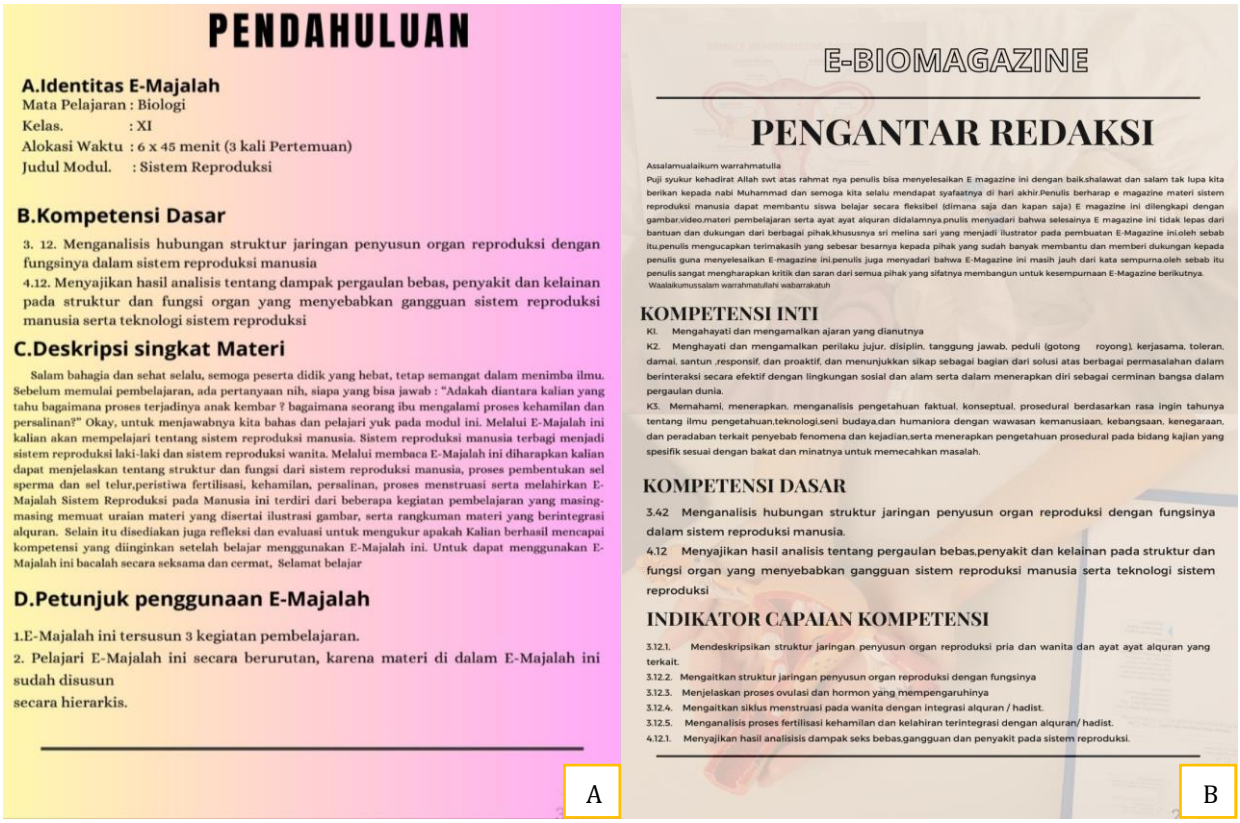

Figure 3
Example of content before (A) and after (B) revised according to the material expert's suggestions (in Indonesian)

Figure 4
Example of content before (A) and after (B) revised according to expert suggestions wahdatul 'ulum (in Indonesian)

Table 8 Effectiveness test results based on N-Gain

Average score obtained		Maximum score	N-Gain score	Classification	Criteria
Pretest	Post-test				
48.33	86	100	0.72	High	Effective

The assessment results by media experts obtained an average of 94.70% with very valid criteria. The advice given by media experts is to change the appearance of the cover of the biology e-magazine to be more in line with the content. Validation by material experts obtained an average of 95.83% with very valid criteria. The suggestion given by the material expert is to add indicator points that have not been described in the material. Furthermore, the validation results from wahdatul 'ulum experts obtained an average of 87.50% with very valid criteria.

Based on the design validator's comments, the image displayed on the cover of the e-magazine is less clear because it is too small and needs to be improved. This cover improvement is shown in Figure 2. The e-magazine material is also improved, especially in the presentation, which must begin with an introduction, KI, KD, and learning indicators so that the suitability of the material with the competencies that students want to achieve is known. Material improvements are shown in Figure 3. Finally, Figure 4 shows improvements in integrating biological material with the wahdatul ulum paradigm. Initially, the page containing the integration between biological material and wahdatul ulum contained several forms of content, changed to be simpler by only displaying biological material and related Al-Qur'an verses as a form of integration of wahdatul ulum.

The wahdatul 'ulum expert advised tidying up the Arabic writing, and e-magazines must be used according to the integration of science. Based on the validation of the material, it is also known that Islamic values are the part that gets the lowest assessment, so many revisions are made, especially in the presented Arabic verses, which must be appropriate and related to the material presented in the e-magazine. The media, material, and wahdatul 'ulum revisions resulted in a product ready to be tested for practicality and effectiveness in learning biology.

Table 6 shows that the teacher's response obtained an average of 92.50%, while the students' response obtained an average of 91.06% in Table 7. These results show that the e-magazine developed

obtained very practical criteria. Teachers and students showed a positive response to the developed biology e-magazine. According to students, the developed biology e-magazine is interesting. The material presented is explicit and straightforward, which makes it easier for them to master the material, and it encourages students to always involve the Al-Qur'an and hadith as inspiration in learning biology.

Meanwhile, biology teachers argue that the developed biology e-magazine is very interesting because it is packaged according to real problems, the design and layout attract the attention of students, make it easier for teachers to convey material, make it easier for teachers to train students to learn based on Islamic values, and encourage teachers to always involve the Al-Qur'an and hadith as inspiration in teaching biology.

The positive response shown by biology teachers and students is in line with the research of Azhari et al. (2023), which obtained a percentage of teacher response of 92.50% and student response of 87% obtained very practical criteria. Research by Septyani et al. (2023) also received a positive response from 95.83% of teachers and 93.27% of student response to the e-magazine developed to be used as an alternative learning media. It aligns with the research results of Kurniawan et al. (2023), the positive response of students to open and read because the e-magazine was developed with an attractive design. Meanwhile, according to research by Sari et al. (2021), students' responses are related to learning activities with a percentage of 80%.

Based on the study results, e-magazines that were developed and obtained positive responses can be used as alternative learning media, supported by attractive e-magazine designs, and correlate with student learning activities. However, the learner's response to learning motivation obtained an average score that did not reach the good criteria. An effectiveness analysis follows this practicality test analysis to show its effect on students' learning outcomes.

The results of the effectiveness test showed that students obtained an average pretest score of 48.33 and an average post-test score of 86 with an N-Gain value classification > 0.72 (high) with the effective criteria (see Table 8). These results are supported by research conducted by Ardhina & Mukminan (2017), which found that learning resources in the form of magazines are effectively used in learning and can improve students' mastery of competencies. The average N-Gain obtained was 0.72, a "high" classification. Another study by Ningsih et al. (2018) showed increased learning outcomes after using science magazines, with the acquisition of post-test scores higher than pretest scores. The average pretest and post-test scores obtained were 50.70 and 80.47. Similar results were shown in the research of Sari et al. (2021) with an N-Gain result of 0.34, including the medium criteria, but these results were tested on critical thinking skills.

Based on these studies, the results of effective implementation, as evidenced by the e-magazine developed, can improve learning outcomes, mastery of competencies, and students' thinking skills. According to Azhari et al. (2023), effective learning resources improve student learning outcomes. This is supported by the statement of Pramana et al. (2020) that learning resources are worth applying in the learning process because they can improve learning outcomes. Good and effective learning tools can organize learning activities to increase student motivation and learning outcomes.

The implementation of biology e-magazines integrated with wahdatul 'ulum can make students actively involved directly in learning. This encourages students' curiosity about how biological science is discussed in studying the Al-Qur'an and Hadith. According to Sadikin (2011), the relationship between Al-Qur'an verses and material in learning activities can increase student motivation and learning outcomes. This is in line with Ridwan et al. (2018), who stated that biology learning is closely related to Islamic values because it discusses everything created by Allah SWT. Biology lessons are essentially a bridge to achieving religious truths that will support our beliefs and understanding related to the verses of the Koran. So, it can be concluded that the biology e-magazine integrated with the wahdatul 'ulum paradigm of reproductive system material can be used in the learning process and improve student learning outcomes.

Based on this analysis, it is known that the e-magazine developed meets the minimum criteria for valid, practical, and effective development products. Biology e-magazines integrated with wahdatul 'ulum positively impact the mastery of biological concepts and understanding from an Islamic perspective. This not only has the potential to improve cognitive quality but also to shape the positive character of students so that the goal of education is achieved, which is to produce humans who are faithful, noble, knowledgeable, creative, and independent. However, this potential still needs to be proven through further studies focused on assessing the characteristics of students.

D. Conclusion

The wahdatul 'ulum integrated biology e-magazine on the reproductive system material developed scored 94.70% with very valid criteria in the media, 95.83% with very valid criteria in the material, 87.5% with very valid criteria in the wahdatul 'ulum value in validity test. The practicality test scored 92.50% (teacher response) and 91.06% (student response) with very practical criteria. The effectiveness test obtained an average score of 0.72 with a high classification and was declared effective. These results

show that the developed e-magazine can be used in learning activities because it has met the minimum standards of development products, namely valid, practical, and effective. Further research is needed to prove its effect on the characteristics of students with the integration of biological material with the wahdatul 'ulum paradigm.

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