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ATHG explorer: development of a web-based e-module to support students' analytical thinking in pancasila education

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ABSTRACT

This study aims to describe the development process, instructional design, and product characteristics of ATHG Explorer, a web-based electronic module designed to support students' analytical thinking in Pancasila Education. The development was motivated by the limited variety of learning resources and analytical activities identified in Grade XI at SMKN 1 Bandung Tulungagung. This study employed a Research and Development (R&D) approach guided by the Dick and Carey instructional design model, consisting of ten systematic stages. Developed using Google Sites, ATHG Explorer integrates structured learning materials, illustrations, videos, contextual cases, interactive quizzes, and self-evaluation activities. These features are designed to facilitate students' analytical thinking through differentiating, organizing, and attributing at the C4 level of the revised Bloom's taxonomy, particularly when examining Threats, Challenges, Obstacles, and Disturbances (Ancaman, Tantangan, Hambatan, dan Gangguan/ATHG). The digital prototype has been developed, while expert validation, field implementation, and empirical effectiveness testing remain to be conducted. Therefore, this study presents the instructional rationale, development framework, and design characteristics of ATHG Explorer as a foundation for further evaluation and implementation in vocational high school Pancasila Education.

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Introduction

Digital learning resources can present instructional content through text, images, video, hyperlinks, and interactive activities. However, access to digital features does not by itself ensure meaningful learning; instructional objectives, learner needs, content, learning activities, and assessment must be aligned. This issue is particularly relevant when digital resources are expected to support higher-order cognitive processes rather than simply reproduce printed materials. The present article therefore treats digital technology as an instructional environment whose educational value depends on the design of learning tasks and the alignment between objectives and assessment.

The increasing availability of web-based learning environments has further expanded the possibilities for developing digital instructional materials. Web-based media can provide centralized access to various learning components through a single digital environment. Learning materials, supporting videos, illustrations, hyperlinks, exercises, and evaluation activities can be organized systematically so that students do not have to rely exclusively on printed textbooks or worksheets. Such flexibility is particularly relevant in learning contexts

where students are expected to explore information, interpret different representations, and apply concepts to contextual situations. Nevertheless, the availability of digital features does not automatically guarantee meaningful learning. The instructional structure, sequence of content, clarity of learning objectives, and alignment between activities and assessment remain important considerations in the development of digital learning resources. Consequently, digital learning media should be developed as an instructional system rather than merely as a collection of digital materials.

Pancasila Education is one subject in which contextual, reflective, and analytical learning is important. The subject is concerned not only with students' knowledge of Pancasila values, civic concepts, and national identity but also with their ability to understand social phenomena and respond to problems as responsible citizens. Learning in Pancasila Education therefore requires students to connect conceptual knowledge with situations that occur in their families, schools, communities, and broader social environments. Such learning can provide opportunities for students to examine problems from different perspectives, identify relationships among social phenomena, and consider appropriate responses based on Pancasila values. The development of learning resources for Pancasila Education should consequently take into account the need to bridge conceptual understanding and contextual application.

Contextual learning is particularly relevant because many concepts in Pancasila Education are closely related to real-life phenomena. Students may encounter information through social media, news, community interactions, school environments, and other sources of information. These experiences may contain situations that can be interpreted in relation to civic concepts and national challenges. When learning materials are presented only through definitions and summaries, students may have limited opportunities to examine how the concepts operate in actual situations. Digital learning resources can provide an alternative by presenting contextual cases through combinations of written explanations, visual representations, videos, and interactive questions. Through such representations, students can be encouraged to move from simply recognizing a concept toward interpreting and analyzing its application in specific situations.

The topic of Threats, Challenges, Obstacles, and Disturbances (ATHG) is particularly relevant to analytical learning in Pancasila Education. ATHG involves phenomena that may appear in different forms and contexts and may require students to distinguish among categories based on their characteristics. Students may encounter situations that cannot be understood adequately through memorization alone. They need to examine the characteristics of a phenomenon, compare it with other cases, identify relevant relationships, and consider its possible causes and consequences. They may also need to determine whether a particular situation represents a threat, challenge, obstacle, or disturbance and provide a logical explanation for their classification. These learning processes create opportunities to develop higher-order cognitive skills.

The cognitive demands associated with the ATHG topic are closely related to the analyzing level (C4) in the revised Bloom's taxonomy. Anderson and Krathwohl (2001) describe analyzing as a cognitive process involving the ability to break material into constituent parts and determine how those parts relate to one another and to an overall structure or purpose. The process includes activities such as differentiating, organizing, and attributing. In the context of ATHG learning, these processes can be reflected when students distinguish relevant characteristics of different phenomena, organize information according to conceptual categories, and attribute causes or meanings to particular situations. Therefore, instructional materials for ATHG should provide learning experiences that require students to perform these cognitive processes rather than simply recall definitions.

The development of learning media that explicitly supports analytical thinking is important because higher-order thinking cannot be developed optimally when learning activities are dominated by memorization and reproduction of information. Brookhart (2018) emphasizes that higher-order thinking requires students to engage with information through reasoning, analysis, evaluation, and problem solving. In this context, learning materials should not only communicate information but also create opportunities for students to interpret information and make reasoned judgments. For the ATHG topic, students can be presented with contextual cases and guided questions that encourage them to identify relevant characteristics, compare alternative interpretations, and explain the reasoning underlying their conclusions. Such activities can strengthen the alignment between the content, instructional objectives, and expected cognitive outcomes.

The instructional challenge becomes more significant when students are accustomed to learning activities that emphasize reading, summarizing, and answering conventional questions. Preliminary identification in Grade XI at SMKN 1 Bandung Tulungagung, as documented in the development proposal, showed that learning was still largely supported by printed worksheets and summarizing activities. These activities can support students in recording and organizing information, but they may provide limited opportunities for students to interact with varied representations of ATHG phenomena. The situation indicated a need for more varied learning resources that could present ATHG concepts through interactive, visual, and contextual forms.

The need was not simply for a digital replacement of existing worksheets, but for a learning resource that could organize instructional content and activities around the intended analytical competencies.

In response to this need, ATHG Explorer was formulated as a web-based e-module for Pancasila Education. The product is designed to provide an integrated learning environment in which students can access explanations of ATHG concepts, supporting multimedia materials, contextual examples, and interactive learning activities. The use of a web-based format provides opportunities to organize these components within a structured learning sequence. Rather than presenting information as isolated digital pages, ATHG Explorer is intended to guide students through learning activities that progressively introduce concepts, provide contextual representations, and encourage students to examine ATHG-related situations.

The web-based format also provides opportunities to use multiple representations of instructional content. Text can be combined with images and videos to provide contextual information and support students' understanding of abstract or complex concepts. Interactive activities can subsequently be used to provide opportunities for students to apply the concepts they have learned. Such integration is relevant to ATHG learning because students may benefit from seeing how a concept is represented in different forms and contexts. The combination of explanations, examples, multimedia, and questions can potentially support a learning process that moves from conceptual understanding toward analysis. Nevertheless, the effectiveness of these features cannot be assumed solely from their presence; their instructional value depends on how they are organized and aligned with the learning objectives.

Previous development studies have reported the potential of website-based learning media and e-modules to provide alternative learning resources and support learning activities. Benda et al. (2022) reported the development of web-based learning media using Google Sites, demonstrating the potential of website platforms for organizing instructional materials. Cipto et al. (2022) also developed website-based learning media by considering learner characteristics and the principles of Universal Design for Learning. Similarly, Dwitya et al. (2023) developed an interactive e-module for vocational learning, illustrating the use of e-modules as structured digital learning resources. These studies indicate that web-based media and e-modules can be developed to provide learning experiences that are more varied than conventional printed materials.

In the context of Pancasila Education, digital learning resources have also been developed as alternatives for supporting learning. Ramadhan et al. (2023), for example, developed an e-module for Pancasila Education using Canva and Flip PDF Professional. The study demonstrates the possibility of presenting Pancasila-related learning content through digital instructional materials. Mufidah et al. (2024) also developed an e-module using a contextual learning approach and a website-based Book Creator platform for Pancasila Education. These developments provide a relevant foundation for considering digital e-modules as learning resources for Pancasila Education. However, the specific development of a web-based e-module that is explicitly oriented toward students' analytical thinking in learning the ATHG topic remains an important area for further development.

Another consideration is the relationship between instructional content and the cognitive objectives targeted by the learning resource. Digital media may contain attractive visual elements and interactive features, but these characteristics alone do not ensure that students engage in higher-order cognitive processes. A product designed to support C4 analytical thinking needs to incorporate activities and assessments that correspond to the intended cognitive processes. In ATHG Explorer, the learning experience is therefore conceptually directed toward activities that require students to differentiate, organize, and attribute information related to ATHG phenomena. This alignment is important so that the digital features serve an instructional function rather than becoming merely decorative elements.

Systematic instructional design is therefore necessary in developing ATHG Explorer. The Dick and Carey model was selected because it views instructional development as a systematic process in which instructional goals, instructional analysis, learner and context analysis, performance objectives, assessment instruments, instructional strategies, instructional materials, formative evaluation, revision, and summative evaluation are interconnected (Dick et al., 2015). The model emphasizes the relationship among the components of instruction and provides a framework for ensuring that the developed product is connected to the competencies that students are expected to achieve. This characteristic makes the model relevant to the development of a digital learning resource intended to support a specific cognitive competency.

Although prior studies have examined website-based media and digital modules, the sources currently cited in this manuscript do not establish a sufficiently detailed empirical comparison of how web-based resources are designed and evaluated specifically to support C4 analytical thinking in the ATHG topic. The gap addressed here is consequently a design-focused one: to document how the instructional objectives, contextual cases, multimedia, practice activities, and planned assessment are organized within a single web-based e-module. This

article does not claim that previous products are ineffective or that ATHG Explorer is more effective; those claims require a verified synthesis of empirical studies and subsequent evaluation data.

The Dick and Carey framework also provides an important basis for evaluation and revision. A learning product may require modification after formative evaluation to ensure that its content, interface, instructional sequence, activities, and assessment are appropriate. The model recognizes that instructional development is iterative and that information obtained during evaluation should inform subsequent revision. For ATHG Explorer, this principle is important because the product is intended not merely to function technically as a website-based e-module but also to support meaningful learning processes. The development process therefore needs to consider both the technical presentation of the product and its instructional alignment with the intended C4 competency.

The development of ATHG Explorer can also be understood within the broader role of educational technology as a means of facilitating meaningful learning experiences. Educational technology is not solely concerned with the production of technological artifacts but with the systematic design, development, utilization, management, and evaluation of processes and resources intended to facilitate learning (Januszewski & Molenda, 2008). From this perspective, the development of ATHG Explorer should be evaluated according to its instructional contribution rather than simply its digital appearance. The product needs to demonstrate coherence among learning objectives, content, learning activities, media features, and assessment. Such coherence is particularly important when the intended outcome concerns a cognitive process such as analysis.

The conceptual development of ATHG Explorer therefore involves several interconnected considerations. First, the learning content needs to represent ATHG concepts accurately and in a form that is understandable for Grade XI students. Second, the presentation needs to provide contextual situations that allow students to relate the concepts to phenomena that they may encounter in their environment. Third, the learning activities need to encourage cognitive processes corresponding to the C4 level. Fourth, the web-based format needs to be used to facilitate access to multimedia and interactive components. Finally, the entire product needs to be developed systematically through an instructional design model that connects the identified learning needs with the planned evaluation process.

At the same time, the current development stage needs to be distinguished from empirical evaluation. Although ATHG Explorer has been developed as a digital learning product, field research involving students has not yet been conducted. Consequently, the current article does not report empirical evidence regarding the product's effectiveness, practicality, validity, student responses, or improvement in analytical thinking. No claims are therefore made regarding statistically significant changes in students' learning outcomes. Instead, the article focuses on the conceptual foundation, instructional design, development process, and characteristics of the resulting product. This distinction is necessary to maintain methodological consistency and avoid presenting development assumptions as empirical findings.

The absence of field implementation also creates an important direction for subsequent research. Once the product has undergone the necessary formative evaluation and revision, further research can investigate its implementation with Grade XI students. Such research may examine the feasibility and practicality of the product, students' responses to the learning environment, and its potential contribution to analytical thinking. An appropriate assessment design can subsequently be used to examine whether students demonstrate improvement in the targeted C4 processes after using ATHG Explorer. These stages should be conducted separately from the current conceptual-developmental report so that empirical conclusions are based on actual data.

Based on these considerations, the development of ATHG Explorer represents an attempt to connect digital learning technology with the cognitive and contextual demands of Pancasila Education. The product is positioned not simply as a digital container for instructional materials but as a structured learning resource designed around specific instructional objectives. Its web-based characteristics provide opportunities for integrating multimedia and interactive activities, while the Dick and Carey model provides a systematic framework for aligning the product with learner needs, content characteristics, instructional strategies, and assessment. The emphasis on analytical thinking further provides a clear pedagogical direction for the design of learning activities.

Therefore, this article aims to describe the conceptual and developmental process of ATHG Explorer using the Dick and Carey instructional design model. The article specifically discusses the rationale for developing the product, the instructional considerations underlying its design, the stages of development, the characteristics of the resulting web-based e-module, and the planned evaluation process. Since field research has not yet been conducted, the article focuses on the development process and product characteristics rather than reporting claims of effectiveness. The resulting discussion is expected to provide a conceptual and methodological

foundation for subsequent implementation and empirical evaluation of ATHG Explorer in Pancasila Education at the vocational high school level.

Method

Research Design

This study employs a Research and Development (R&D) approach to develop a web-based e-module named ATHG Explorer for Grade XI students in Pancasila Education at SMKN 1 Bandung Tulungagung. The instructional development process uses the Dick and Carey model as the primary instructional design framework. The selection of this model is based on its systematic approach to instructional development and its emphasis on the alignment among instructional goals, learner characteristics, instructional analysis, performance objectives, assessment, instructional strategies, instructional materials, and evaluation (Dick et al., 2015).

The development focuses on the topic of Threats, Challenges, Obstacles, and Disturbances (ATHG) in Pancasila Education. The instructional objective is directed toward supporting students' analytical thinking at the C4 level of the revised Bloom's taxonomy, particularly the processes of differentiating, organizing, and attributing (Anderson & Krathwohl, 2001). Accordingly, the development of ATHG Explorer considers not only the presentation of digital content but also the relationship between the learning objectives, content, learning activities, and assessment.

ATHG Explorer is developed as a web-based e-module using Google Sites. The product integrates text, images, videos, contextual examples, and interactive learning activities within a single digital learning environment. The web-based format is intended to provide students with accessible and structured learning resources while offering opportunities to engage with ATHG concepts through multiple forms of representation.

At the current stage, the digital prototype of ATHG Explorer has been developed, but field implementation has not yet been conducted. Expert validation, individual trials, small-group trials, and summative effectiveness testing are planned as subsequent stages of the development process. Therefore, this article does not report empirical data concerning validity, practicality, student responses, learning outcomes, or effectiveness. The study is presented as a developmental-conceptual report focusing on the instructional rationale, development procedure, and resulting product design.

Development Procedure

The development procedure follows the ten components of the Dick and Carey instructional design model (Dick et al., 2015). The model conceptualizes instructional development as a systematic process in which the components of instruction are interconnected. The process begins with the identification of instructional goals and continues through instructional analysis, learner and context analysis, formulation of performance objectives, development of assessment instruments, instructional strategy, instructional materials, formative evaluation, revision, and summative evaluation.

For ATHG Explorer, the Dick and Carey framework was applied to translate the identified instructional needs into a structured digital learning resource. The development process began by identifying the intended instructional goal and analyzing the knowledge and skills required to achieve that goal. Learner and contextual characteristics were then considered in formulating performance objectives. These objectives subsequently informed the development of assessment activities, instructional strategies, and digital learning materials.

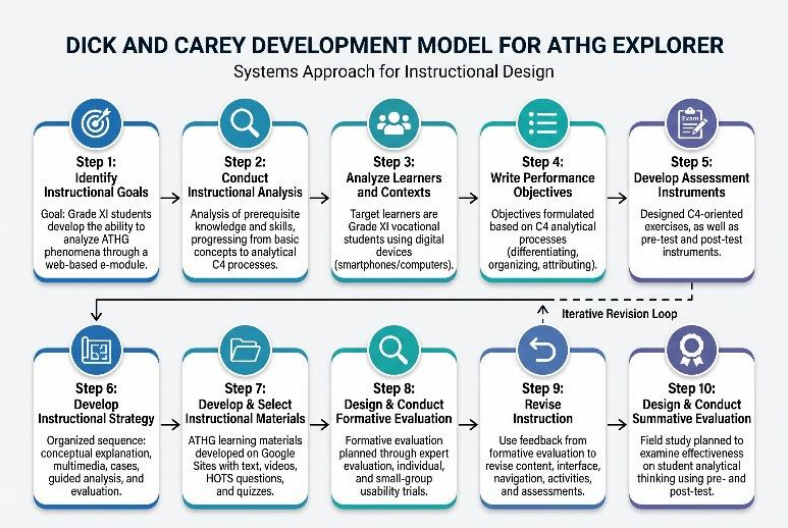

Figure 1. Dick and Carey instructional design model used in the development of ATHG Explorer.

Figure 1 presents the instructional design framework used to guide the development of ATHG Explorer. The figure should be placed before the detailed description of the ten development steps so that readers can first obtain an overall representation of the model before examining its application to the product.

The application of each component of the Dick and Carey model to ATHG Explorer is presented in Table 1.

Table 1. Application of the Dick and Carey Model in the Development of ATHG Explorer

Step	Dick and Carey Component	Application in ATHG Explorer
1	Identifying instructional goals	The general instructional goal is for Grade XI students to develop the ability to analyze ATHG phenomena through a web-based e-module.
2	Conducting instructional analysis	The instructional goal is analyzed into prerequisite knowledge and skills, beginning with understanding ATHG concepts and progressing toward differentiating, organizing, and attributing information related to ATHG phenomena.
3	Analyzing learners and contexts	The target learners are Grade XI vocational high school students. The learning context considers the use of digital devices, particularly smartphones or computers, for accessing web-based learning resources.
4	Writing performance objectives	Performance objectives are formulated based on the intended C4 analytical processes, particularly differentiating, organizing, and attributing.
5	Developing assessment instruments	Assessment activities are designed to correspond with the intended analytical competencies. C4-oriented exercises are incorporated into the product, while pre-test and post-test instruments are planned for subsequent field implementation.
6	Developing instructional strategy	The instructional sequence is organized through conceptual explanation, multimedia presentation, contextual cases, guided analysis, practice activities, and self-evaluation.
7	Developing and selecting instructional materials	ATHG learning materials are developed and organized within a Google Sites-based environment using text, illustrations, videos, contextual examples, higher-order thinking questions, and interactive quizzes.
8	Designing and conducting formative evaluation	Formative evaluation is planned through expert evaluation and subsequent individual and small-group trials to examine the content, instructional design, media characteristics, and usability of the product.
9	Revising instruction	Feedback obtained from the formative evaluation will be used to revise the instructional content, interface, navigation, learning activities, multimedia elements, and assessment items.
10	Designing and conducting summative evaluation	A subsequent field study is planned to examine the effectiveness of ATHG Explorer using appropriate measures of students' analytical thinking, including pre-test and post-test assessment.

The ten steps are treated as interconnected components rather than independent activities. The instructional goal provides the basis for instructional analysis, while the learner and context analysis provides information for determining appropriate performance objectives. The objectives then guide the development of assessment instruments and instructional strategies. These components subsequently inform the development and selection of instructional materials.

The eighth and ninth steps are particularly important for ensuring that the developed product can be improved before field implementation. Formative evaluation is intended to identify possible weaknesses in the content, presentation, navigation, instructional activities, and assessment components. The information obtained from this stage can be used to revise the product so that the digital learning resource is more closely aligned with the intended instructional objectives and learner characteristics.

Because the field evaluation has not yet been conducted, the formative and summative evaluation stages described above represent planned activities rather than completed empirical procedures. Consequently, the present article does not report numerical validation results, practicality scores, student response percentages, or effectiveness statistics. These data will only be reported after the corresponding evaluation stages have been implemented.

Development Context and Target Learners

The development is directed toward Grade XI students at SMKN 1 Bandung Tulungagung who study Pancasila Education. The selection of this context is based on the instructional need identified in the development proposal, in which learning activities were still substantially supported by printed worksheets and summarizing activities. The development of ATHG Explorer is intended to provide an alternative digital learning resource that presents ATHG concepts through more varied representations and interactive activities.

The target learners are vocational high school students who may access digital learning resources through smartphones or computers. Therefore, the product is designed as a web-based resource that can be accessed through an internet browser. The development considers the need for clear navigation, concise instructional presentation, accessible multimedia, and activities that can guide students toward the intended cognitive processes.

The content context is the ATHG topic in Pancasila Education. The instructional materials are organized to help students understand the meaning and characteristics of threats, challenges, obstacles, and disturbances and to examine relevant situations through analytical activities. The content is therefore connected to the intended C4 processes rather than being limited to the recall of conceptual definitions.

Development of Instructional Materials

The instructional materials are developed based on the performance objectives and instructional analysis conducted within the Dick and Carey framework. The materials are organized to provide conceptual explanations followed by contextual representations and learning activities. The instructional sequence is intended to help students progressively move from understanding the basic concepts of ATHG toward analyzing specific phenomena.

The digital materials integrate several forms of representation, including written explanations, images, videos, and contextual examples. The use of multiple representations is intended to provide students with different forms of information that can be examined during the learning process. Contextual cases are particularly important because students are expected to relate ATHG concepts to situations that may occur in their social and civic environment.

The interactive learning component is designed to provide opportunities for students to practice analytical thinking. Activities are conceptually aligned with the C4 processes of differentiating, organizing, and attributing. For example, students may be directed to distinguish characteristics of different ATHG phenomena, organize information according to relevant categories, and identify possible causes, impacts, or relationships associated with a particular case.

Planned Evaluation Procedure

The evaluation procedure is designed as a subsequent stage of the development process. The first planned evaluation involves expert assessment of the developed product. Experts may examine the accuracy and relevance of the learning content, the alignment between instructional objectives and activities, the quality of the instructional design, the clarity of the interface, navigation, multimedia integration, and the suitability of the assessment activities.

After expert evaluation and revision, individual and small-group trials are planned. These activities are intended to identify potential problems in the use of the e-module, including difficulties in navigation, clarity of instructions, accessibility of learning materials, and students' interaction with the learning activities. Feedback obtained from these trials will serve as a basis for further product revision.

The subsequent field implementation is intended to provide empirical evidence concerning the use of ATHG Explorer in the target learning context. A pre-test and post-test design is planned to examine changes in students'

analytical thinking after learning with the developed product. The assessment instruments will be aligned with the targeted C4 processes and the learning objectives established during the instructional design process.

However, because these evaluation activities have not yet been implemented, the present article does not present the results of expert validation, individual trials, small-group trials, or field effectiveness testing. The distinction between the completed development activities and the planned evaluation activities is maintained to ensure that the article does not make unsupported empirical claims.

Results and Discussions

Overview of the Developed Product

The current development stage resulted in a functional prototype of ATHG Explorer, a web-based e-module developed for Grade XI students in Pancasila Education at SMKN 1 Bandung Tulungagung. The product was developed to provide an alternative digital learning resource for the topic of Threats, Challenges, Obstacles, and Disturbances (ATHG). Rather than functioning as a simple digital copy of printed worksheets, ATHG Explorer is organized as an integrated learning environment that combines instructional explanations, visual representations, multimedia resources, contextual examples, and interactive learning activities.

The product structure was developed based on the instructional objectives identified during the Dick and Carey development process. The learning environment is designed to guide students through several stages of learning, beginning with orientation to the learning resource, continuing with conceptual understanding, and progressing toward the examination of contextual ATHG phenomena. The final component provides opportunities for students to practice and evaluate their understanding through interactive activities.

The development of the product reflects the relationship between instructional needs, learner characteristics, cognitive objectives, and digital media features. The main content is organized around the ATHG topic, while the learning activities are designed to provide opportunities for students to examine information and cases rather than merely memorize definitions. This orientation is important because the intended learning outcome is related to analytical thinking at the C4 level.

The product is accessed through a web browser, allowing the learning materials to be presented in an integrated digital environment. The web-based format also makes it possible to combine several forms of instructional representation within one learning resource. Text can be complemented by images and videos, while interactive activities can be used to provide opportunities for students to apply the concepts presented in the learning materials.

Structure and Navigation of ATHG Explorer

ATHG Explorer consists of several interconnected components that support the overall learning process. The main components include the user guide, home page, learning materials, multimedia resources, interactive game or quiz, and developer profile. Each component has a specific function within the learning environment.

The user-guide component is intended to help students understand how to access and navigate the e-module. The guide provides information about the available sections and the sequence of activities that students can follow. This feature is particularly relevant for a web-based learning resource because students need clear directions to move between instructional components.

The home page serves as the main entry point to ATHG Explorer. It provides the product identity and directs students toward the main learning sections. The navigation is organized so that students can identify the available learning resources and access the relevant materials without having to search through separate digital files.



Figure 2. ATHG Explorer homepage

As shown in Figure 2, the homepage functions as the initial interface through which students enter the learning environment. The page is intended to provide an overview of the product and its main navigation. The arrangement of the interface is designed to make the principal learning components identifiable and accessible.

The learning environment is structured to minimize unnecessary navigation between different platforms or files. Instead, the principal learning components are organized within the same web-based environment. This structure allows students to access instructional materials, multimedia resources, and interactive activities through a unified learning resource.

Presentation of ATHG Learning Materials

The learning-material section contains the main instructional content concerning Threats, Challenges, Obstacles, and Disturbances. The material is presented through a combination of explanatory text, visual representations, contextual information, and multimedia resources. The organization of the material follows the instructional objectives established during the development process.

The presentation begins with conceptual information intended to establish students' understanding of the basic meaning and characteristics of ATHG. The material subsequently provides information that can be used by students to examine differences among ATHG categories. This structure is intended to provide a foundation before students engage with contextual cases and analytical activities.

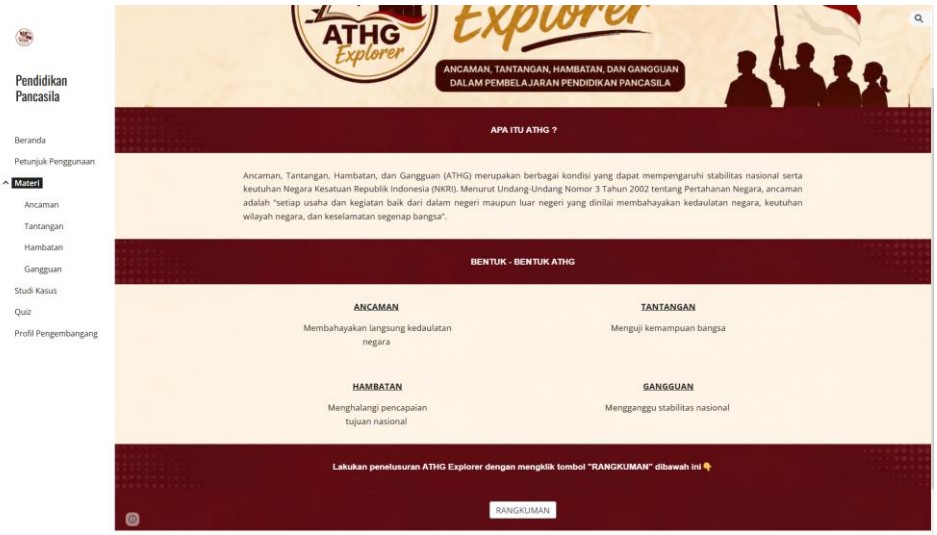

Figure 3. ATHG Explorer learning-material interface

Figure 3 presents an example of the learning-material interface. The interface organizes the instructional content in a digital format that combines written explanations with supporting visual and multimedia elements.

The presentation is intended to reduce dependence on lengthy printed explanations and provide students with multiple ways of accessing the instructional content.

The use of visual representations is also intended to support the presentation of concepts that may be difficult to understand when presented only through textual definitions. Images and other visual resources can provide contextual information that students can examine when learning about ATHG phenomena. The integration of these resources is therefore connected to the broader objective of supporting conceptual understanding before students engage in analytical activities.

The learning materials also incorporate contextual examples. These examples are important because ATHG concepts can be interpreted through situations that occur in social, civic, and everyday environments. By presenting concepts through contextual situations, the product provides opportunities for students to relate the instructional content to phenomena that are more concrete and meaningful.

Multimedia Integration

One of the characteristics of ATHG Explorer is the integration of multimedia resources within the learning materials. Videos, images, and other visual representations are incorporated to provide additional explanations and contextual information. Multimedia is used as a supporting component rather than as an independent feature.

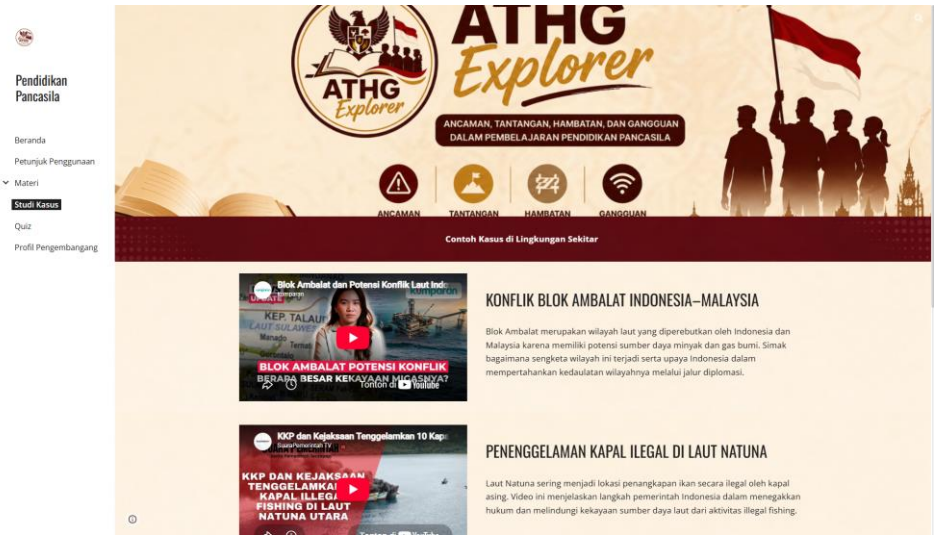

Figure 4. Multimedia content in ATHG Explorer.

Figure 4 illustrates the integration of multimedia within the learning environment. The combination of text, visual representations, and video provides students with different forms of information that can be examined during the learning process. This arrangement is intended to make the learning resource more varied and to provide contextual support for the concepts being discussed.

The multimedia components also provide opportunities for students to encounter ATHG phenomena through representations other than written descriptions. For example, visual or audiovisual information can be used to introduce a particular situation that students subsequently examine through questions or activities. In this way, multimedia resources can serve as a starting point for analytical activities rather than merely functioning as additional content.

The integration of multimedia is also consistent with the web-based characteristics of the product. Unlike conventional printed worksheets, the digital environment can connect students directly to video and other interactive resources. Consequently, the product combines the accessibility of web-based learning with instructional content that is organized around the specific objectives of ATHG learning.

Interactive Game and Quiz

The interactive game and quiz section provides students with opportunities to practice and review the concepts presented in the learning materials. This component is designed to move the learning process beyond the reception of information toward the application of concepts in specific situations.

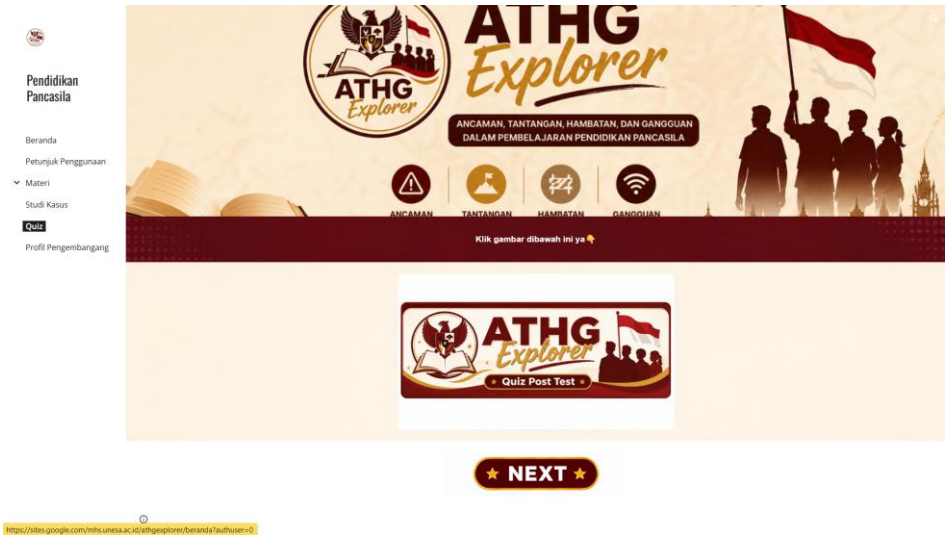

Figure 5. Interactive game or quiz in ATHG Explorer.

Figure 5 shows the interactive component of ATHG Explorer. The activity is intended to provide students with opportunities to respond to questions or situations related to ATHG. The interactive format provides a different learning experience from conventional printed exercises because students can interact directly with the digital learning environment.

The questions and activities are conceptually oriented toward the C4 analytical processes identified in the development objectives. Students may be required to differentiate between ATHG categories, organize information according to relevant characteristics, and attribute causes or impacts to a particular phenomenon. These activities are intended to provide opportunities for students to apply the concepts they have studied rather than simply reproduce definitions.

The interactive activities also provide a transition between conceptual learning and independent evaluation. After studying the material and examining contextual examples, students can use the game or quiz section to check their understanding. This structure supports a learning sequence in which explanation, contextualization, practice, and self-evaluation are connected.

Alignment of Product Features with C4 Analytical Thinking

The product characteristics are designed to correspond with the targeted analytical thinking competency. The revised Bloom's taxonomy identifies analyzing as a cognitive process that includes differentiating, organizing, and attributing (Anderson & Krathwohl, 2001). These processes provide a conceptual basis for determining how students are expected to engage with ATHG content.

The differentiating process is reflected in activities that require students to distinguish among threats, challenges, obstacles, and disturbances based on their characteristics. Students are expected to examine information and determine which characteristics are relevant to a particular category. This process moves learning beyond the simple recall of definitions because students need to identify differences among related concepts.

The organizing process is reflected in activities that require students to arrange information or cases according to relevant characteristics. Students may need to connect information from a contextual case with the appropriate ATHG category or identify relationships among elements of a particular phenomenon. Such activities require students to structure information before reaching a conclusion.

The attributing process is reflected in activities that require students to identify possible causes, meanings, or implications of a phenomenon. Students may be asked to examine a situation and determine the factors associated with its occurrence or the potential consequences that may arise. This process encourages students to construct an interpretation based on the information provided.

The relationship between the product features and the targeted C4 processes is summarized in Table 3.

Table 2. Alignment of ATHG Explorer Features with C4 Analytical Processes

C4 Process	Instructional Focus	ATHG Explorer Implementation
Differentiating	Distinguishing relevant characteristics	Activities requiring students to distinguish threats, challenges, obstacles, and disturbances

C4 Process	Instructional Focus	ATHG Explorer Implementation
Organizing	Structuring information and identifying relationships	Contextual cases and activities requiring students to organize information according to ATHG characteristics
Attributing	Identifying causes, meanings, or implications	Case-based questions requiring students to identify possible causes, impacts, or relationships
Applying analysis	Using concepts to examine a situation	Interactive exercises and quizzes based on contextual ATHG phenomena

The alignment presented in Table 3 demonstrates that the digital features of ATHG Explorer are connected to the intended cognitive outcome. The use of multimedia and interactive elements is therefore positioned within an instructional structure rather than being included solely for technological or visual purposes.

Product Components and Their Functions

The main components of ATHG Explorer and their instructional functions are summarized in Table 3.

Table 3. Components and Functions of ATHG Explorer

Product Component	Function
User Guide	Provides instructions for accessing and navigating the e-module and explains the use of the main learning features.
Home	Provides product identity, learning orientation, and access to the main sections of the e-module.
Learning Materials	Presents ATHG concepts through structured explanations, images, videos, and contextual examples.
Multimedia Resources	Provides additional visual and audiovisual representations to support conceptual and contextual understanding.
Game/Quiz	Provides interactive activities for practicing concepts and supporting C4 analytical processes.
Developer Profile	Provides information about the developer, institutional affiliation, and the developed learning product.

The structure of the product demonstrates that ATHG Explorer is designed as an integrated learning resource. Each component has a different function, but the components are connected within a single learning environment. The user guide supports navigation, the homepage provides orientation, the learning-material section provides conceptual content, multimedia resources provide additional representations, and the interactive section provides opportunities for practice and self-evaluation.

Development Outcome and Current Status

The main outcome of the current development stage is a functional digital prototype that integrates the planned instructional components into a web-based learning environment. The product has been structured around the instructional needs identified during the development process and is aligned conceptually with the intended C4 analytical competency.

However, the current results should be interpreted as product development results rather than effectiveness results. The existence of a functional prototype does not by itself demonstrate that ATHG Explorer has improved students' analytical thinking. Evidence concerning validity, practicality, student responses, usability, and learning effectiveness requires subsequent evaluation involving experts and target learners.

Therefore, the present results describe what has been developed and how the product is structured. The screenshots presented in Figures 1–5 provide visual documentation of the developed product, while Tables 3 and 4 describe the relationship between the product features and the intended instructional functions. Further empirical research is required to determine whether the developed product achieves the intended learning outcomes when implemented in an actual classroom setting.

The next stage of development will involve formative evaluation and field implementation. Expert evaluation can provide information regarding the content, instructional design, and media quality of the product, while individual and small-group trials can identify usability and instructional issues. Following revision, field implementation can be conducted to examine the contribution of ATHG Explorer to students' analytical thinking through an appropriate empirical research design.

The development of ATHG Explorer demonstrates that the use of digital technology in learning should be accompanied by clear pedagogical and instructional considerations. A web-based learning environment should not merely function as a digital repository of materials, but should be designed to facilitate meaningful interactions between learners, content, learning activities, and assessment. In this development, Google Sites is used as a technological environment for integrating instructional materials, multimedia resources, contextual cases, interactive activities, and assessment components into a more structured learning experience. This approach is consistent with the broader perspective of educational technology, in which technology is positioned

as a means of facilitating and improving learning processes rather than as an end in itself (Januszewski & Molenda, 2008).

The development of ATHG Explorer is also based on the consideration that Pancasila Education requires learning experiences that are connected with situations encountered by students in their social environment. The topic of threats, challenges, obstacles, and disturbances (ATHG) contains concepts that can be understood more meaningfully when students are encouraged to examine concrete phenomena rather than merely memorize definitions. A digital environment can provide opportunities to present such phenomena through text, images, videos, and contextual cases. Consequently, the developed product attempts to transform ATHG content from predominantly conceptual information into learning material that can be explored through multiple representations.

This orientation is particularly relevant to the development of analytical thinking. In the revised Bloom's taxonomy, analyzing is categorized as a higher-order cognitive process at the C4 level and involves processes such as differentiating, organizing, and attributing (Anderson & Krathwohl, 2001). These processes require learners to examine information, identify relevant characteristics, establish relationships among elements, and determine possible causes or implications. Brookhart (2018) similarly emphasizes that higher-order thinking involves the ability to process information and use it in situations that require reasoning rather than simple recall. Therefore, the learning activities in ATHG Explorer are conceptually directed toward encouraging students to examine ATHG phenomena through analytical processes.

The emphasis on C4 is reflected in the relationship between the learning content and the activities provided in the product. For example, when students are presented with a contextual case, they may be asked to distinguish the characteristics of the phenomenon and determine whether it is more appropriately categorized as a threat, challenge, obstacle, or disturbance. A further activity can require students to organize several cases based on their characteristics. Students can also be encouraged to attribute possible causes, relationships, or consequences associated with a particular phenomenon. These activities are not intended merely to test whether students remember ATHG terminology, but to create opportunities for them to use the information in an analytical manner.

The integration of multimedia is another important aspect of the developed product. Digital learning materials can provide information through combinations of written explanations, visual representations, video, and interactive activities. Such integration may help present abstract or contextual content in forms that are more accessible to learners. Arsyad (2019) and Batubara (2021) explain that learning media can support the presentation of information and facilitate learners' interaction with instructional content. However, multimedia should remain functionally connected to the learning objectives. In ATHG Explorer, multimedia elements are therefore positioned as supporting components of the instructional sequence rather than as decorative features.

The use of contextual cases is also important because analytical thinking requires students to work with information and situations that can be examined from different perspectives. In the context of ATHG, a single phenomenon may involve several dimensions and may require students to consider its characteristics, causes, consequences, and relationships with other phenomena. By presenting cases in a structured digital environment, ATHG Explorer provides a conceptual space in which students can move from understanding the basic concepts toward examining their application in contextual situations. This design is consistent with the principle that higher-order thinking should involve meaningful tasks that require learners to interpret and reason about information rather than simply reproduce previously presented knowledge (Brookhart, 2018).

The development of ATHG Explorer also has similarities with previous studies on web-based and digital learning resources. Research on Google Sites-based learning media has indicated the potential of web-based environments to provide accessible and structured learning resources. Benda et al. (2022), for example, examined the practicality of Google Sites-based learning media and demonstrated its relevance as a web-based learning environment. Similarly, website-based instructional media have been developed by considering learner characteristics and instructional design principles (Cipto et al., 2022). These studies provide a conceptual foundation for the selection of a website-based environment in the present development.

Previous studies on e-modules also support the relevance of interactive digital learning resources for educational contexts. Fathoni and Marpanaji (2018) developed an interactive e-book for vocational students, demonstrating the relevance of digital instructional materials for vocational education. Other studies have similarly explored the development of interactive e-modules to support student learning. However, the contribution of ATHG Explorer is not simply the conversion of conventional instructional materials into a digital format. Its development is specifically directed toward integrating the ATHG topic with analytical-thinking objectives and contextual learning activities.

The relationship between the present development and previous research should therefore be interpreted carefully. The findings of previous studies provide conceptual and developmental support for the use of digital and web-based learning media, but they cannot be interpreted as evidence of the effectiveness of ATHG Explorer. Each product has its own instructional objectives, content characteristics, learner characteristics, and development procedures. Therefore, the current study uses previous research primarily as a basis for designing the product and identifying relevant characteristics of digital learning resources.

Another important consideration is the use of the Dick and Carey systematic instructional design model. The model provides a structured framework for connecting instructional goals with instructional analysis, learner characteristics, performance objectives, assessment instruments, instructional strategies, instructional materials, and evaluation (Dick et al., 2015). Such alignment is important in the development of ATHG Explorer because the product is intended to support a specific cognitive objective rather than simply provide online access to learning materials.

In the present development, the general instructional goal of analyzing ATHG is connected to more specific C4 processes. These processes are subsequently reflected in the selection of learning content, contextual examples, multimedia resources, interactive activities, and assessment tasks. This alignment illustrates the function of systematic instructional design: each component of the product is expected to contribute to the intended learning outcomes. The Dick and Carey model therefore provides a conceptual structure for ensuring that the technology, instructional strategy, learning materials, and assessment are developed as interconnected components.

The systematic nature of the model is particularly important because the development of digital learning media involves more than designing an attractive interface. A visually appealing website may not necessarily provide an effective learning experience if its content, activities, and assessment are not aligned with the intended competencies. In ATHG Explorer, the development process therefore begins with the identification of instructional needs and objectives and continues toward the development of materials and learning activities. This approach strengthens the pedagogical foundation of the resulting product.

The current development also illustrates the importance of distinguishing between product development and empirical effectiveness testing. Although ATHG Explorer has reached the prototype stage, field implementation has not yet been conducted. Consequently, the present study cannot establish whether the product significantly improves students' analytical thinking, whether students respond positively to the product, or whether the product is more effective than conventional instructional approaches. Any such conclusion would require empirical evidence obtained through systematic evaluation.

This limitation is particularly important in research and development because a developed product should pass through evaluation and revision before conclusions about its effectiveness are made. Dick et al. (2015) emphasize the role of formative evaluation in identifying weaknesses in instructional materials and providing a basis for revision. In the context of ATHG Explorer, formative evaluation can subsequently involve expert review, individual evaluation, small-group evaluation, and field evaluation. The results of each stage can be used to identify aspects of the product that require improvement before broader implementation.

Expert evaluation is expected to examine several dimensions of the product, including the accuracy and relevance of the content, the alignment between objectives and learning activities, the suitability of the language, the quality of the interface, navigation, multimedia integration, and technical functionality. Such evaluation is necessary because a digital learning product may contain both pedagogical and technical aspects that cannot be adequately assessed through content review alone.

Individual and small-group trials can subsequently provide information about the usability of the product from the learner's perspective. These stages may reveal practical problems that are difficult to identify during the development process, such as unclear instructions, confusing navigation, readability problems, insufficient explanations, broken links, inappropriate multimedia duration, or question difficulty that does not correspond to the learners' level. The identification of such problems would provide an empirical basis for subsequent product revision.

Following formative evaluation, field implementation would be necessary to examine the potential contribution of ATHG Explorer to students' learning. In particular, an empirical study could compare students' analytical-thinking performance before and after using the product or compare learning outcomes between students using ATHG Explorer and those receiving conventional instruction. Appropriate instruments would also be needed to measure the intended C4 processes. Only after such evidence has been collected would it be academically appropriate to discuss the effectiveness of ATHG Explorer in improving students' analytical thinking.

The absence of field data is therefore not treated as a weakness that should be concealed, but as an important boundary of the present development report. The current study contributes primarily through the design and development of an instructional prototype grounded in identified learning needs, cognitive objectives, digital-media principles, and systematic instructional design. Reporting the development status transparently prevents the product from being presented as empirically validated when the required evaluation stages have not yet been completed.

From a technological perspective, ATHG Explorer also illustrates how a relatively accessible web platform can be organized into a more systematic instructional environment. The use of Google Sites makes it possible to organize content through interconnected pages and navigation structures while incorporating external multimedia and interactive resources. However, the pedagogical value of the platform depends on how these technological affordances are used. The platform itself does not guarantee analytical learning; rather, the instructional design determines whether students are provided with meaningful opportunities to analyze information.

The development consequently highlights the importance of the relationship between technology, pedagogy, content, and cognitive objectives. The technology provides the environment, the content provides the subject matter, the instructional strategy provides the learning process, and the cognitive objectives determine the type of thinking that learners are expected to demonstrate. In ATHG Explorer, these elements are brought together through the Dick and Carey framework. This integration distinguishes the product from a website that merely stores learning materials.

Another potential contribution of ATHG Explorer is its orientation toward vocational high school learners. Students in vocational education require learning experiences that are not only conceptually meaningful but also connected to real-world contexts. Presenting ATHG through contextual cases and multimedia resources can provide opportunities for students to examine social and civic phenomena in forms that are closer to the information environments they encounter in everyday life. Nevertheless, the extent to which this orientation actually improves engagement or analytical performance remains an empirical question that should be addressed in subsequent research.

The development also has implications for Pancasila Education. Learning Pancasila should not be limited to the memorization of principles, concepts, or definitions. Students need opportunities to interpret social phenomena, examine problems, consider relationships between causes and consequences, and formulate reasoned judgments. The ATHG topic provides a particularly relevant context for this purpose because students can encounter various social, national, technological, economic, and environmental phenomena that may be interpreted through the framework of threats, challenges, obstacles, and disturbances.

Accordingly, ATHG Explorer can be positioned as a digital instructional resource designed to create opportunities for analytical engagement with Pancasila Education content. Its contribution at the current stage lies in the systematic organization of learning resources and activities around a clearly defined cognitive objective. The product provides a foundation for subsequent empirical investigation rather than serving as final evidence of learning effectiveness.

Overall, the development of ATHG Explorer demonstrates the potential of combining a web-based e-module with systematic instructional design to address the need for more analytical and contextual learning in Pancasila Education. The Dick and Carey model provides a structured basis for aligning learning objectives, learner characteristics, instructional strategies, materials, and assessment. The integration of contextual cases, multimedia, and interactive activities further supports the intended C4 orientation. Nevertheless, these design characteristics should be distinguished from empirical evidence of effectiveness.

Thus, ATHG Explorer should currently be interpreted as a theoretically grounded and systematically developed instructional prototype rather than an empirically proven intervention. The next stage of research should focus on formative evaluation, product revision, and field implementation to obtain evidence regarding validity, usability, learner response, and effectiveness. This sequential approach will allow future research to determine whether the instructional potential identified in the present development is realized in actual classroom learning.

Conclusions

ATHG Explorer has been developed as a Google Sites-based e-module for Grade XI Pancasila Education, focusing on Threats, Challenges, Obstacles, and Disturbances (ATHG). Its design is organized around the Dick and Carey instructional design framework and connects the intended C4 analytical-thinking processes with structured content, contextual cases, multimedia resources, and interactive practice activities. The current

product outcome is a digital prototype containing a user guide, homepage, learning materials, multimedia content, contextual examples, interactive quizzes, and developer information. These features represent intended instructional functions; their presence does not demonstrate learning gains or validated usability. The development also demonstrates the potential of a web-based e-module to integrate different forms of instructional resources within a single learning environment. Textual explanations, visual and multimedia materials, contextual cases, and interactive exercises can be organized through a structured navigation system to support the intended learning objectives. However, these design characteristics represent the intended instructional function of the product and should not yet be interpreted as evidence of learning effectiveness. The principal limitation is that expert validation, individual and small-group trials, and classroom implementation have not yet been conducted. Consequently, the article cannot report empirical evidence of content validity, practicality, student response, or effectiveness, and it cannot conclude that analytical-thinking performance has improved. Further work should begin with documented expert review of content, instructional design, media, and assessment alignment; proceed to individual and small-group usability trials; and use the resulting feedback to revise the prototype. A subsequent classroom study should define the target population and sample, specify a validated C4 assessment instrument and scoring rubric, describe the study design and data-analysis procedures, and report results transparently before making effectiveness claims. The contribution of this article is therefore limited to documenting the rationale, design organization, and current prototype of ATHG Explorer. Its educational value remains a question for future evaluation rather than an established outcome.

References

Abrami, P. C., Bernard, R. M., Borokhovski, E., Waddington, D. I., Wade, C. A., & Persson, T. (2015). Strategies for teaching students to think critically: A meta-analysis. Review of Educational Research, 85(2), 275–314. https://doi.org/10.3102/0034654314551063

Andreucci-Annunziata, P., Riedemann, A., Cortés, S., Mellado, A., del Río, M. T., & Vega-Muñoz, A. (2023). Conceptualizations and instructional strategies on critical thinking in higher education: A systematic review of systematic reviews. Frontiers in Education, 8, Article 1141686. https://doi.org/10.3389/feduc.2023.1141686

Anggraheni, D., Makarim, S., Anandha, A., & Yogatama, A. (2026). Reinforcing digital citizenship literacy through exploration and reflection in civic education. Journal of English Language and Education, 11(1). https://doi.org/10.31004/jele.v11i1.1796

Arum, Habibullah, M. R., & Rofi'ah, F. Z. (2025). Design and development of a Pancasila e-module based on Google Sites and Blooket to enhance students' critical thinking skills in civic education. Al-Aulad: Journal of Islamic Primary Education, 8(2). https://doi.org/10.15575/al-aulad.v8i2.49258

Bernard, R. M., Abrami, P. C., Borokhovski, E., Wade, C. A., Tamim, R. M., & Surkes, M. A. (2009). A meta-analysis of three types of interaction treatments in distance education. Review of Educational Research, 79(3), 1243–1289. https://doi.org/10.3102/0034654309333844

Biamba, C. N., Chidimma, O. N., Chinwe, O. V., Kelechi, M. C., & Chinyere, N. A. (2021). Assessing democratic classroom practices among secondary school civic education teachers in the Global South: Case study of South East Nigeria. Cogent Education, 8(1), Article 1896425. https://doi.org/10.1080/2331186X.2021.1896425

Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, M. (2021). Mapping research in student engagement and educational technology in higher education: A systematic evidence map. International Journal of Educational Research, 105, Article 101794. https://doi.org/10.1016/j.ijer.2020.101794

Bowyer, B., & Kahne, J. (2020). The digital dimensions of civic education: Assessing the effects of learning opportunities. Journal of Applied Developmental Psychology, 69, Article 101162. https://doi.org/10.1016/j.appdev.2020.101162

Choi, M., Glassman, M., & Cristol, D. (2017). What it means to be a citizen in the internet age: Development of a reliable and valid digital citizenship scale. Computers & Education, 107, 100–112. https://doi.org/10.1016/j.compedu.2017.01.002

Dahliyana, A., Cahyati, S., Kurniawaty, I., Warlim, & Thambu, N. A. L. (2026). Measuring civic competence in digitally mediated civic learning: Evidence from a participatory online education model. Frontiers in Education, 11, Article 1823357. https://doi.org/10.3389/feduc.2026.1823357

Dahliyana, A., Cahyati, S., Warlim, W., Rahmasari, N., & Dianti, N. H. (2026). Project citizen digital: A learning model of civic education in digital age. Jurnal Civics: Media Kajian Kewarganegaraan, 23(1), 347–358. https://doi.org/10.21831/jc.v23i1.89599

Fadhilah, N. R., Amreta, M. Y., & Habibullah, M. R. (2026). Development of Google Sites-based e-module integrated with Educandy for Pancasila Education subject on "We Are Diverse but Remain One"

material for 2nd grade. Journal of Practice Learning and Educational Development, 6(1), 637–645. https://doi.org/10.58737/jpled.v6i1.781

Fajri, I., Budimansyah, D., & Komalasari, K. (2022). Digital citizenship in civic education learning: A systematic literature review. Jurnal Ilmiah Peuradeun, 10(3). https://doi.org/10.26811/peuradeun.v10i3.755

Finkel, S. E., Neundorf, A., & Rascón Ramírez, E. (2024). Can online civic education induce democratic citizenship? Experimental evidence from a new democracy. American Journal of Political Science, 68(2), 613–630. https://doi.org/10.1111/ajps.12765

Fitri, Q., & Setiawan, A. M. (2026). Development of Google Sites e-module based on PBL on respiratory system to improve critical thinking skills of middle school students. Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram, 14(1), 34–56. https://doi.org/10.33394/j-ps.v14i1.16086

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. The Internet and Higher Education, 2(2–3), 87–105. https://doi.org/10.1016/S1096-7516(00)00016-6

Ghozali, B. S., Supeno, & Farisi, M. I. (2024). Pengembangan e-modul berbasis Google Sites untuk meningkatkan kemampuan penalaran berbasis bukti dalam pembelajaran IPA di sekolah dasar. ELSE (Elementary School Education Journal): Jurnal Pendidikan dan Pembelajaran Sekolah Dasar, 8(2). https://doi.org/10.30651/else.v8i2.22631

Gumilar, A. T., Suherman, A., & AM, H. N. (2026). Strengthening high school students' digital citizenship through social media-based civics education. Journal Civics and Social Studies. https://doi.org/10.31980/z1987t64

Halimi, M., Rahmat, R., Nugraha, R. A., & Pratiwi, E. D. (2022). Young digital citizen answers: Can online learning improve the quality of civic education learning? Jurnal Civics: Media Kajian Kewarganegaraan, 19(1), 99–109. https://doi.org/10.21831/jc.v19i1.40140

Hardianti, R., & Alyani, F. (2023). Pengembangan e-modul berbasis Google Sites pada materi rangka manusia kelas V sekolah dasar. Pendas: Jurnal Ilmiah Pendidikan Dasar, 8(1). https://doi.org/10.23969/jp.v8i1.8707

Huber, C. R., & Kuncel, N. R. (2016). Does college teach critical thinking? A meta-analysis. Review of Educational Research, 86(2), 431–468. https://doi.org/10.3102/0034654315605917

Kong, S. C. (2014). Developing information literacy and critical thinking skills through domain knowledge learning in digital classrooms: An experience of practicing flipped classroom strategy. Computers & Education, 78, 160–173. https://doi.org/10.1016/j.compedu.2014.05.009

Martin, F., & Bolliger, D. U. (2018). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. Online Learning, 22(1), 205–222. https://doi.org/10.24059/olj.v22i1.1092

Means, B., Toyama, Y., Murphy, R., & Baki, M. (2013). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. Teachers College Record, 115(3), 1–47. https://doi.org/10.1177/016146811311500307

Mihailidis, P., & Thevenin, B. (2013). Media literacy as a core competency for engaged citizenship in participatory democracy. American Behavioral Scientist, 57(11), 1611–1622. https://doi.org/10.1177/0002764213489015

Pedraja-Rejas, L., Muñoz-Fritis, C., Rodríguez-Ponce, E., & Laroze, D. (2024). Mobile learning and its effect on learning outcomes and critical thinking: A systematic review. Applied Sciences, 14(19), Article 9105. https://doi.org/10.3390/app14199105

Prasetiyo, W. H., Naidu, N. B. M., Sari, B. I., Mustofa, R. H., Rahmawati, N., Wijaya, G. P. A., & Hidayat, O. T. (2021). Survey data of internet skills, internet attitudes, computer self-efficacy, and digital citizenship among students in Indonesia. Data in Brief, 39, Article 107569. https://doi.org/10.1016/j.dib.2021.107569

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online university teaching during and after the Covid-19 crisis: Refocusing teacher presence and learning activity. Postdigital Science and Education, 2, 923–945. https://doi.org/10.1007/s42438-020-00155-y

Ratnawati, K., Artini, N. L. P., & Kusuma, I. P. I. (2024). Interactive e-modules assisted by Google Sites in EFL: Its effect on students' critical thinking and learning engagement. Indonesian Journal of Educational Development, 5(2), 194–207. https://doi.org/10.59672/ijed.v5i2.4032

Schindler, L. A., Burkholder, G. J., Zimmerman, C., O'Shea, P., & Kehrwald, N. (2017). Use of technology in higher education: A systematic review. Computers & Education, 112. https://doi.org/10.1016/j.compedu.2017.07.001

Setianingsih, D., Siswono, T. Y. E., & Yumiati. (2024). Development of web-based learning media (Google Sites) to improve critical thinking skills and digital literacy of Grade V elementary school students. ELSE

(Elementary School Education Journal): Jurnal Pendidikan dan Pembelajaran Sekolah Dasar, 8(2). https://doi.org/10.30651/else.v8i2.23179

Solehuddin, M., Rahman, A., Santosa, T. A., Ilwandri, & Ali, G. (2023). The effect of STEM-based e-learning on students' higher order thinking skills in Indonesia: A meta-analysis. International Journal of Education and Literature, 2(2). https://doi.org/10.55606/ijel.v2i2.72

Sung, Y.-T., Chang, K.-E., & Liu, T.-C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. Computers & Education, 94, 252–275. https://doi.org/10.1016/j.compedu.2015.11.006

Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and validation study. Review of Educational Research, 81(1), 4–28. https://doi.org/10.3102/0034654310393361

Yang, Y.-T. C., Newby, T. J., & Bill, R. L. (2009). Using Socratic questioning to promote critical thinking skills through asynchronous discussion forums in distance learning environments. The American Journal of Distance Education, 23(3), 126–137. https://doi.org/10.1080/08923640903026834

Wijayati, A. Y., Widodo, W., & Istianah, F. (2025). The effectiveness of STEM-based e-modules in enhancing critical thinking skills of elementary school students. Attadrib: Jurnal Pendidikan Guru Madrasah Ibtidaiyah, 8(3). https://doi.org/10.54069/attadrib.v8i3.1053