



From Code to Kebaya: Implementation of Scratch Dress Up Game to Exploration of Traditional Clothing Trends

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Abstract: This study explores the fusion of cultural heritage and modern innovation in contemporary kebaya design, focusing on the exploration of design trends, materials, and silhouettes. Kebaya, as a traditional Indonesian dress, has transformed into a dynamic fashion statement, integrated into modern lifestyles while maintaining its essence. Designers today are faced with the challenge of creating works that are not only visually appealing, but also have a depth of cultural meaning and adopt sustainable practices. This phenomenon raises the question of how the identity of the kebaya is maintained while being adapted through contemporary silhouettes, innovative materials, and modern details, extending to the realm of interactive media such as game development. Scratch-based game development plays a central role in this context, simplifying complex programming into intuitive blocks. This approach overcomes students' difficulties in translating abstract concepts into concrete designs. Through Scratch's drag-and-drop interface and instant preview, students can manipulate the kebaya in real-time, deepening their understanding of style transformations and combinations. This study aims to develop the process of exploring kebaya trends, identifying natural materials, and analyzing the aesthetic results and uniqueness of kebaya trends. The findings confirm the potential of visual programming as a bridge between design theory and creative practice, strengthening the understanding of the aesthetics and functionality of modern kebaya.

Keywords: Modern kebaya, fashion design, gamification, sustainability, cultural heritage

1. Introduction

The contemporary fashion design paradigm is characterized by a fusion of cultural heritage and modern innovation, highlighting the importance of sustainability, personalization, and rich narratives (Bertola & Colombi, 2024). In this landscape, traditional clothing is no longer seen as a relic of the past, but rather as a limitless source of inspiration that can be reinterpreted to meet the demands of aesthetics and functionality in the global era (Wu et al., 2025). Designers today are challenged to create works that are not only visually appealing, but also have a depth of meaning and cultural relevance, while adopting more environmentally responsible practices (Jung et al., 2020). In the Indonesian context, the modern kebaya has emerged as an interesting case study of this fusion (Antoniette & Saffira, 2024). From the runway to social media, interpretations of the kebaya go far beyond its traditional form. The latest and most popular designs often incorporate contemporary silhouettes, innovative use of materials, and modern details, such as laser cutting techniques, three-dimensional embroidery applications, and the blending of traditional fabrics with modern textiles such as organza or sheer brocade. This phenomenon raises questions about how the identity of the kebaya is maintained and adapted, and how designers balance heritage with modern aspirations (Simarmata et al., 2024). This exploration extends into the realm of interactive media, including game development, which offers a new platform for visualizing and interacting with fashion design elements, providing an educational and recreational dimension to understanding style evolution (Choi, 2022).

Game development in this context, particularly utilizing visual programming platforms such as Scratch, plays a central role. Scratch is designed to simplify complex programming concepts into intuitive command blocks, allowing designers and non-programmers alike to build interactive applications with relative ease. The choice of Scratch directly addresses a challenge identified by academics, namely the difficulty students have in translating non-physical ideas or narrative/abstract style concepts into concrete design forms. Through Scratch's intuitive drag-and-drop interface and instant preview feature, students can manipulate kebaya silhouettes and materials in real-time, receiving immediate visual feedback showing the results of changes. This approach facilitates rapid design experimentation without physical or material risk, significantly accelerating the ideation and concept exploration stages. The integration of Scratch into game development not only supports the exploration of traditional fashion trends, but also confirms the potential of visual programming as a bridge between design theory and immersive creative practice (Rois et al., 2026).

Despite the increasing popularity of modern kebaya, scholarly debates on the exploration of design, material, and silhouette in the context of modern kebaya are still relatively minimal (Kusumadewi & Jerusalem, 2023). The existing literature tends to focus on the history of kebaya or semiotic analysis of traditional kebaya. On the other hand, other countries such as France with its haute couture, the United States with its market-oriented design approach, Turkey with its blend of Ottoman and modern motifs, Germany with its functional and minimalist designs, and Russia with its rich ethnic fashion heritage, have had mature scholarly discourses on the evolution of their traditional clothing into modern forms (Arnold, 2024). These discussions often include aspects of material innovation, silhouette adaptation, and cultural significance in a global context. This gap is what this study seeks to fill, by bringing a comprehensive analysis of the transformation of modern kebaya in Indonesia into the academic realm, while enriching the global discourse on the adaptation of traditional clothing. This research has three interrelated and comprehensive main objectives, designed to provide an in-depth and multidimensional understanding of the evolution and innovation in modern kebaya design.

First, we seek to develop a systematic framework or exploration process for the design, material selection, and silhouette formation in the creation of modern kebaya (Sunarmi et al., 2025). This process is not simply a documentation of existing practices, but rather aims to identify creative methodologies that can proactively drive sustainable innovation, allowing designers and researchers to go beyond the conventional boundaries of traditional kebaya. We will outline in detail the stages involved, from initial inspiration and trend research, to innovative material selection, and continuous design iteration. All these stages contribute to the formulation of a kebaya that is not only relevant to contemporary trends, but also respects and integrates a rich cultural heritage.

Second, this research will specifically identify and evaluate the potential use of natural materials in the context of exploring the design, materials, and silhouette of modern kebaya (Dolez et al., 2022). The focus on natural materials is not only based on the increasingly pressing global sustainability trend, but also to rediscover and utilize the wealth of local Indonesian resources that may not be optimally utilized in the fashion industry (Adam et al., 2025). We will analyze the technical and aesthetic characteristics of various natural fibers, such as traditional weaving, plant fibers, or nature-based recycled materials, to determine their suitability in creating unique textures, drapes, and visual effects in modern kebaya. Sustainability and local uniqueness are crucial considerations in this identification, affirming the research's commitment to responsible design practices that are deeply rooted in cultural identity.

Finally, we will analyze in depth the aesthetic results and uniqueness that emerge from the implementation of the design exploration process, materials, and silhouettes in the resulting modern kebaya. This analysis will involve careful visual evaluation, objective assessment of innovation, and interpretation of the deeper meaning behind each design adaptation. We will examine how the combination of traditional and modern elements creates interesting harmonies or contrasts, how the chosen materials affect visual and tactile perceptions, and how the new silhouettes provide fresh interpretations of the kebaya form. Through this comprehensive analysis, this study aims to reveal not only "what" has changed in modern kebaya, but also "why" these changes are aesthetically and culturally significant, while highlighting the kebaya's potential as a dynamic and adaptive fashion icon on the global stage.

2. Methodology

This study adopts the ADDIE (Analysis, Design, Development, Implementation, Evaluation) framework that is specifically adapted to explore the design, materials, and silhouettes of modern kebaya in the context of interactive game development (Yeh & Tseng, 2019). This approach facilitates a structured and iterative investigation, ensuring that each stage of the research supports each other and provides comprehensive and valid data. The ADDIE model, rooted in instructional design, provides a systematic framework for developing effective learning products, which in this case is a fashion design exploration game.

2.1 Analysis Stage

The analysis phase focused on identifying needs, current characteristics of modern kebaya, and relevant market and cultural contexts. We carefully reviewed academic literature and fashion industry trends to gain an initial understanding of the evolution of the kebaya. This analysis formed a strong foundation for the design phase, ensuring that the project was scientifically relevant and based on sufficient baseline data. At this stage, we also identified the challenges faced by

students in visualizing narrative or abstract style concepts in fashion design, a problem that the development of this game attempts to bridge.

2.2 Design Stage

At the design stage, the researcher designed a modern kebaya design for a digital fashion catalog prototype as presented in Figure 1. We developed a concept for exploring modern kebaya, including design specifications, material selection, and silhouette modifications. We identified the potential of natural materials that are in line with the values of sustainability and local uniqueness. At this stage, we also designed initial drafts of various kebaya prototypes that will be tested and developed further.

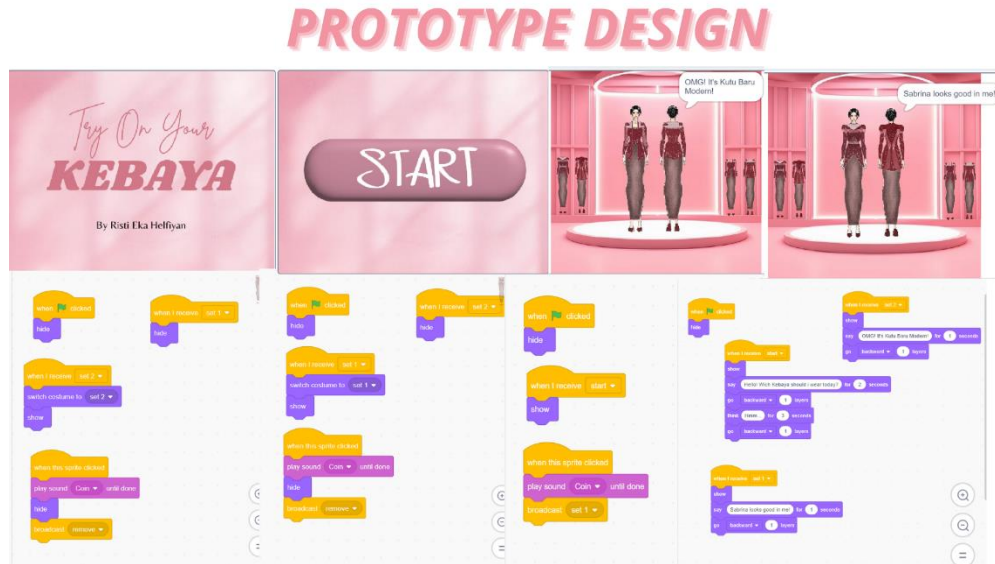


Figure 1: Prototype design

2.3 Development Stage

At this stage, the research team actively developed a functional prototype using the Scratch platform. We created digital sprites for each kebaya item and background according to the design document. Next, we designed block-based programming logic to implement drag-and-drop mechanisms, interface interactions, and other gamification features. At this stage, changes to the game mechanism resulted in changes to the coding that needed to be used so this stage emphasized the coding development process from the previous prototype to the final design. Several parts of the game have been developed, as shown in Figure 2.



Figure 2: (a) main menu page; (b) start page; (c) model preparation phase; (d) apparel fitted on the model

The initial stage, Phase (a), serves as the Splash Screen or Opening Screen. This is the very first visual presented to the user, displaying the main title "Try on Your KEBAYA" along with the designer's attribution, "by Risti Eka Helfiyan". Its primary purpose is to introduce the application and establish a compelling first impression for the user. Following the introductory splash screen, Phase (b) presents the Start Screen. Here, the user is greeted with a clear "START" button. This phase is crucial for preparing the user to embark on the virtual kebaya try-on experience. It marks the initial point of interaction, requiring the user to take a deliberate action to proceed further into the application.

Next, we move into Phase (c), which can be described as the Selection or Model Preparation phase. In this stage, a virtual model, akin to a mannequin, is prominently displayed in a basic or plain outfit. Crucially, flanking the model are distinct kebaya options – specifically, a sabrina kebaya and a kutubaru kebaya – presented as ready for selection or virtual trying-on. This phase is where the user actively engages in choosing their desired kebaya. The underlying mechanism likely involves a drag-and-drop functionality or simple clicks to apply the chosen kebaya onto the model.

Finally, the images in the bottom row, though not explicitly labeled with a letter, represent the "Try-On" or "Preview" phases. The image on the left, which we can designate as Phase (d), showcases the Try-On / Preview of Kebaya 1. Here, the virtual model is depicted already adorned in the sabrina kebaya. This visual outcome is a direct result of the try-on process, allowing the user to clearly visualize how the chosen kebaya appears on the model. This perspective is vital for users to evaluate the kebaya's aesthetics. Similarly, the image on the right, Phase, illustrates the Try-On / Preview of Kebaya 2.

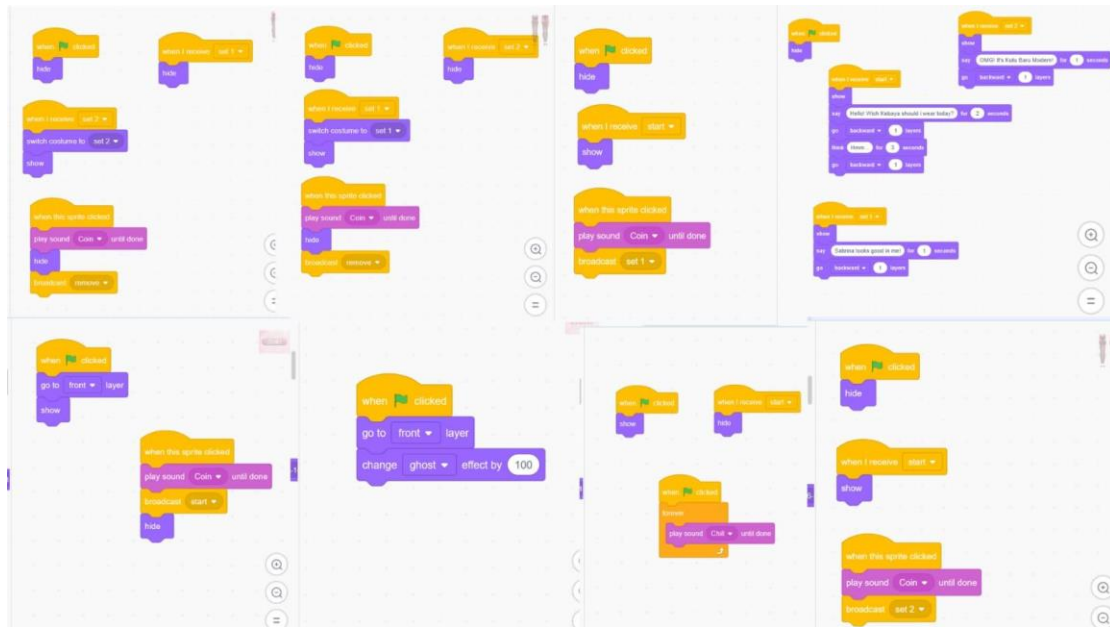


Figure 3: Coding for elements looks and to switch interactive objects

2.4 Implementation

The implementation stage involves introducing the game prototype to a group of participants. In the context of this research, the initial implementation was conducted in guided testing sessions with some of the same experts involved in the analysis stage. The goal is to demonstrate how their abstract concepts have been realized in an interactive medium. During these sessions, researchers observe the participants' interactions with the game and collect initial feedback on the clarity, usability, and appeal of the prototype.

2.5 Evaluation

The evaluation phase involved thematic analysis of the qualitative data collected from the interviews. We systematically identified patterns, recurring themes, and key insights from participant responses. This analysis process included transcribing interviews, systematically coding the data, and developing key themes relevant to the research objectives. Thematic analysis allowed us to draw valid and comprehensive conclusions about the aesthetic outcomes and uniqueness of the design, material, and silhouette explorations of the modern kebaya that had been developed, as well as assessing the effectiveness of the Scratch game as an exploration tool. The findings from this evaluation will provide valuable input for further research and the development of the sustainable fashion industry in Indonesia.

3. Results and Finding

This section presents the main findings emerging from in-depth interviews we conducted with five key respondents, representing the perspectives of fashion industry experts, design practitioners and academics (see Table 1 in Methodology for details of respondents). We conducted qualitative data analysis thematically, integrating insights gained from interviews with literature reviews from high-impact journals to provide a comprehensive and evidence-based discussion.

This approach allows us to not only report respondents' perceptions, but also contextualize them within the broader academic discourse on fashion innovation and educational technology.

3.1 Analysis Stage: Exploring the Concept of Modern Kebaya Exploration

In the analysis stage, we explore respondents' understanding of the essence of design, material, and silhouette exploration in the context of modern kebaya. This discussion forms a conceptual basis for further interpretation of the findings.

3.2 Esence of Modern Kebaya Exploration

Respondents identified several keywords that describe modern kebaya exploration, including "cultural adaptation," "sustainable innovation," "tradition-modernity dialogue," and "aesthetic recontextualization." They emphasized that this exploration is not just a superficial modification or a momentary trend, but rather a systematic and ongoing effort to maintain the relevance of kebaya in the contemporary fashion landscape while respecting its deep cultural heritage. This concept involves the search for new forms, testing more innovative and sustainable non-conventional materials, and reinterpreting existing iconic silhouettes with a modern touch. These findings are in line with the discussion in the *Journal of Fashion Marketing and Management* (Guo et al., 2026), which explores how traditional clothing such as the Chinese Qipao adapts to global trends through innovation while maintaining a distinctive cultural identity. This shows that the phenomenon of adapting traditional clothing is a relevant global discourse.

3.3 Visualization of Exploration of Design, Material, and Silhouette of Modern Kebaya

When visualizing this exploration, respondents imagined kebaya with a more fluid and dynamic silhouette, not fixated on rigid traditional cuts. Some mentioned the use of oversized, deconstructed, or even asymmetrical silhouettes that free the wearer's movement and give a contemporary impression. In terms of materials, they imagined a combination of local natural textiles such as hemp fiber, bark fiber, or ikat weaving processed with modern technology, creating unexpected textures and new visual effects. The color palette tends to vary, from elegant monochromatic nuances to bold color accents that reflect the spirit of modernity and personalization. Details such as 3D applications, laser cuts, or contemporary embroidery are also often mentioned as important elements in this visualization, indicating a shift from conventional techniques. Literature from the *Textile Research Journal* Tjahyadi et al. (2024) specifically discusses the adaptation of ethnic clothing through modification of silhouettes and materials, directly supporting respondents' visualization of the flexibility inherent in kebaya design.

3.4 Challenges in Explaining Narrative/ Abstract Style Concepts to Design Students

From a teaching perspective, academics highlighted the biggest challenge in explaining narrative or abstract style concepts to students is their ability to visualize and translate non-physical ideas into concrete design forms. They noted that conventional teaching methods are often ineffective in communicating the nuance, emotion, or story behind a style. Students struggle to visualize how an abstract concept can be realized through a particular choice of silhouette, material, or detail. Cross (2011) in his book *Design Thinking: Understanding How Designers Think and Work* (Taylor & Francis) explicitly acknowledges this challenge, emphasizing the need for educational methods that encourage outside-the-box thinking and visual exploration of abstract ideas. This provides a strong justification for the development of more interactive learning tools.

3.5 The Role of Intractive Media (Games) in Bridging the Theory-Practice Gap

Nine respondents agreed that interactive media, especially games, offer great potential to bridge the gap between theory and practice in design exploration. They see games as a platform that enables real-time design experimentation, provides instant visual feedback, and facilitates understanding through hands-on experience. Games can effectively transform abstract concepts into concrete interactions, allowing students to manipulate design elements and see the results directly, thereby deepening their understanding of the creative process. Kapp (2012) in *The Gamification of Learning and Instruction* (Wiley) and a publication in *Computers & Education* (Elsevier) extensively discusses the effectiveness of gamification in enhancing engagement and conceptual understanding in education, which is highly relevant to this context. This suggests that the use of game technology is not just a trend, but a valid pedagogical approach.

Furthermore, the respondents highlighted that game-based learning supports an iterative design process, allowing students to experiment, revise, and refine their ideas in a risk-free environment. This hands-on approach promotes creativity, critical thinking, and problem-solving skills while strengthening the connection between theoretical concepts and practical application. Consequently, interactive games can serve as an effective tool for enhancing both engagement and meaningful learning experiences in design education.

Moreover, the findings indicate that game-based media can foster active learning by encouraging students to explore design concepts independently. Through immediate feedback and interactive experimentation, learners gain a deeper understanding of design principles and are better equipped to apply theoretical knowledge in practical contexts.

Table 1: Interview Questions and respondents' insights

Interview Question (Instrument)	Respondent 1 (Senior Fashion Designer)	Respondent 2 (Fashion Expertise)	Respondent 3 (Fashion Design Lecturer)	Respondent 4 (Sustainable Textile Expert)	Respondent 5 (Educational Game Developer)
Analysis Phase (Initial Concept Exploration)					
In your understanding, what keywords or phrases most accurately describe the exploration of current kebaya design trends?	"Deconstruction and recontextualization." We take fundamental kebaya elements, separate them, then reassemble them in a completely new context, often with an urban or avant-garde touch.	"Dynamic cultural adaptation." Kebaya not only survives but thrives due to its ability to absorb global trends without losing its original identity. It's about being relevant on the world stage.	"Tradition-modernity dialogue." Kebaya becomes a medium for conversation between past and present heritage and aspirations, creating a rich and personal narrative for the wearer.	"Sustainable innovation." Designers now consider not only aesthetics but also the environmental footprint of materials. This exploration includes seeking innovative and eco-friendly natural materials. Natural materials such as ramie fiber or even processed wood bark fiber would dominate, providing unexpected textures. The silhouette might be minimalist but with <i>patchwork</i> details from textile waste. Color palettes would tend to be organic, from natural dyes.	"Personalization at scale." Technology allows individuals to interact with kebaya designs, modifying them to suit their personal style, even before a physical product exists.
If you had to visualize kebaya trends in terms of silhouette, color palette, and texture, what elements would emerge?	I envision a very <i>fluid</i> silhouette, perhaps even <i>deconstructed</i> in parts, with dramatic <i>drape</i> . The color palette could be monochromatic like cream or dark grey, but with rich textures from modern processed local materials.	The silhouette would be looser, <i>oversized</i> , allowing free movement. Colors would be bold, perhaps a mix of neon with traditional <i>earthy</i> tones. Textures could be very diverse, from delicate brocade to stiff yet lightweight woven fabrics.	I see reinterpretations of the <i>kutubaru</i> with shorter or asymmetrical cuts. Bright but <i>muted</i> color palettes, like terracotta or teal, paired with rough yet soft natural fiber textures, like local linen.	Natural materials such as ramie fiber or even processed wood bark fiber would dominate, providing unexpected textures. The silhouette might be minimalist but with <i>patchwork</i> details from textile waste. Color palettes would tend to be organic, from natural dyes.	In digital visualization, we can see highly adaptive silhouettes, where length or sleeve shape can be instantly changed. Color palettes are interactive, changeable in seconds. Textures would be very detailed, possibly with 3D simulation for realistic <i>drape</i> .
From a teaching perspective, what is the biggest challenge in explaining narrative or abstract style concepts to design students?	The challenge is translating the 'feeling' or 'story' behind a collection into concrete design instructions. Students often struggle to visualize how an emotional narrative manifests in a piece of fabric.	I see students' difficulty articulating cultural values or identity in their designs. They can copy trends, but understanding the 'why' behind an abstract style is hard, leading to	The biggest challenge is communicating nuances and emotions. Conventional teaching methods often fail to bridge the gap between abstract ideas and physical manifestation. Students struggle to imagine how	Perhaps a lack of hands-on experience. They often learn from books, but feeling the <i>drape</i> of a material or seeing how fibers react to light directly is essential for understanding	The main challenge is the lack of interactive mediums. Abstract ideas require a safe and repeatable experimental space. Without tools that allow rapid visual manipulation, students will struggle to

<p>In your opinion, to what extent can interactive media like games help bridge the gap between theory and practice in design exploration?</p>	<p>Very helpful. I see games as a safe space for experimentation. Designers can try wild ideas without worrying about production costs or market failure. This accelerates the ideation cycle.</p>	<p>less profound results.</p> <p>Games can be brilliant simulators. Students get instant visual feedback from every change, helping them understand cause-and-effect relationships in design. This bridges rigid theory with fluid practice.</p>	<p>abstract concepts translate into silhouette choices, materials, or details.</p> <p>The potential is immense. Games can transform abstract concepts into concrete interactions. They allow students to manipulate design elements and instantly see results, deepening their understanding of the creative process. It's a powerful pedagogical tool.</p>	<p>abstract aesthetics.</p> <p>Imagine being able to visualize how a specific material drapes on a body without having to create physical prototypes. That's a huge saving and encourages designers to be bolder in trying new materials.</p>	<p>internalize unseen concepts.</p> <p>We see games as real-time exploration platforms. They not only provide instant visual feedback but also facilitate understanding through direct experience, breaking down barriers between often dry theory and sometimes complex practice.</p>
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Table 2: Interview respondent background

Respondent	Participant Category	Job Position	Year of Experience
R1	Senior Fashion Designer	Contemporary kebaya design, collection development, fashion trends	10
R2	Fashion Expertise	fashion trends, brand strategy	15
R3	Fashion Design Lecturer (Academic)	Fashion design education, design theory, cultural studies in fashion	10
R4	Sustainable Textile Expert	Environmentally friendly materials, textile innovation	10
R5	Educational Game Developer	Game user experience (UX/UI), gamification	10

4. Conclusion

This study successfully demonstrates that the modern kebaya is a significant cultural evolution, driven by innovations in design, materials, and silhouettes. We have developed a systematic process for exploring kebaya trends, identifying potential natural materials, and analyzing the aesthetic outcomes and uniqueness of the designs that emerge. This process facilitates the formulation of kebayas that are relevant to contemporary trends while respecting the rich cultural heritage. Significantly, this study highlights the great potential of the Scratch platform as an innovative tool in the fashion design process. Scratch facilitates interactive visualization, rapid experimentation with pattern and silhouette combinations, and efficient virtual prototyping. This not only speeds up the conceptualization phase and reduces material and time waste, but also provides a “virtual laboratory” for students to actively understand style transformations and combinations. Thus, this study not only contributes a new framework for creating culturally and aesthetically rooted clothing, but also paves the way for the intuitive use of digital technologies in fashion design education and practice. This interdisciplinary approach demonstrates how cultural heritage can be a source of endless inspiration that is realized through technological innovation, creating relevant, unique, and responsible designs.

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