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Innovating Fashion Design Learning Through "Blossomara" Game on Scratch as an Educational Medium for Indonesian Tropical Flora

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Abstract: The fundamental shift in contemporary fashion design has transformed it into a multidisciplinary field, integrating cultural, ecological, and technological aspects. Global interest in sustainable, nature-inspired design is highly relevant given Indonesia's rich tropical biodiversity. However, a significant methodological gap exists in the digital learning and exploration of botanical ideas. While digital technology has been adopted, specific interactive tools for adapting local botanical details are still lacking. Other research rarely examines the potential of game-based learning platforms like Scratch for exploring endemic flora.This study aims to address this gap by using the "Bloosomara" game on Scratch as an educational medium. Specifically, this research seeks to develop a process for applying tropical flora ideas in gown design, identifying transformative stages from botanical observation to design visualization. It will also identify suitable techniques and silhouettes, and explore the structural and textural adaptation of botanical elements into garment construction. Finally, the aesthetic results and uniqueness derived from this flora-based design exploration will be analyzed. This approach is expected to contribute to the development of a more interactive fashion design learning methodology, relevant to Indonesia's natural richness.

Keywords: Fashion Design, Party Wear, Tropical Flora, Scratch, Respondents

1. Introduction

The contemporary fashion design paradigm has transformed from merely an aesthetic expression into a multidisciplinary domain that integrates cultural, ecological, and technological aspects (Nugraha, 2023). Current global trends show an increasing interest in sustainable and nature-inspired design, a shift highly relevant in Indonesia given its rich tropical biodiversity (Santini et al., 2023). Gowns with floral motifs and the use of natural materials are increasingly dominating fashion trends, reflecting consumer preferences shifting towards products that are not only authentic but also responsible (Putri, 2021). This phenomenon presents both challenges and opportunities for fashion designers to innovate, particularly in exploring Indonesian tropical flora as a design inspiration source whose potential remains optimally untapped (Kamarauddin, 2023).

Despite global enthusiasm for integrating nature into fashion design, a significant methodological gap is observed in the learning and digital exploration related to the utilization of botanical ideas (Indriana, 2024). In developed countries such as France and the United States, fashion design curricula have adopted digital technology for simulation and visualization. However, they have not specifically developed interactive tools focusing on adapting local botanical details into design elements. Similarly, research in Turkey, Germany, and Russia has highlighted the importance of cultural heritage and textile innovation (Sudita et al., 2023). Yet, they rarely examine the potential of
game-based learning platforms like Scratch as a medium for in-depth exploration by fashion design students, especially in the context of endemic flora (Hidayatulloh, 2024). This gap indicates the need for innovative approaches that bridge

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the richness of natural resources with the capabilities of educational technology to enrich the creative process in fashion design (Ridho et al., 2022). MIT's Scratch platform, with its intuitive visual programming interface, offers significant potential as an educational game development environment (Ali & Hasanah, 2024). Its ability to facilitate the creation of interactive prototypes allows for the exploration of complex design ideas, providing an effective means for students to visualize and interact with tropical flora-based design concepts dynamically (Muna & Prayoga, 2024).

This study aims to address this gap by utilizing the "Bloosomara" game on Scratch as an educational medium. Specifically, this study seeks to develop a process for applying tropical flora inspiration to gown design by identifying transformative stages from botanical observation to design visualization. Additionally, the research will identify techniques and silhouettes appropriate to flora forms, exploring the structural and textural adaptation of botanical elements into garment construction. Finally, the aesthetic results and uniqueness derived from this flora-based design exploration will be analyzed. Through this approach, this research hopes to contribute to the development of a more interactive fashion design learning methodology relevant to Indonesia's natural richness (Wildan et al., 2023).

1.1 Fashion Design

Fashion design is a type of design that involves creating clothing, accessories, and fashion trends that align with user style and needs. In the modern era, fashion design is increasingly integrated with technology and sustainability principles. For example, the application of computer-aided design (CAD) software and virtual reality (VR) technology is now an integral part of fashion design education curricula, preparing designers to face industry digitalization (Ahmad, 2025). Furthermore, this field also serves as a powerful medium for reflecting social and environmental issues. Designers can voice important messages and raise public awareness through the exploration of alternative materials, ethical production techniques, and strong design narratives (Fauzan et al., 2023). The core of fashion design lies in innovation and creativity the designer's ability to interpret and transform diverse inspirations into original visual forms, thereby creating works that are relevant and stand out in a competitive global market (Kim, 2024).

1.2 Tropical Flora

Tropical flora refers to the abundant plant life thriving in equatorial regions, characterized by vibrant shapes, textures, and colors due to warm and humid climates. In Indonesia, endemic flora such as Corpse Flower (*Amorphophallus titanum*)**,** Papuan Black Orchid (*Coelogyne pandurata*)**,** and Rafflesia arnoldii are prime examples of highly valuable natural assets, both ecologically and aesthetically. They serve as boundless sources of inspiration for various creative fields. This rich biodiversity in tropical areas, especially endemic flora, offers a broad spectrum for design inspiration in fashion, art, and architecture, as the unique forms, complex patterns, and bright color palettes of tropical plants can be translated into motifs, silhouettes, and textural details in fashion collections (Zuhir et al., 2022).

However, many endemic tropical flora species face serious threats of extinction due to deforestation and climate change. This underscores that conservation efforts are not only crucial for maintaining ecological balance but also for preserving unique inspirational potential for the creative industry and education (Halawa & Zakiyah, 2025). Therefore, designers often adopt the principle of biomimicry imitating natural forms and functions to create design innovations. Tropical flora, with its adaptive structures and aesthetics, provides a rich model for the development of textiles, dynamic silhouettes, and complex patterns in fashion (Budholiya et al., 2023).

1.3 Scracth

Scratch is a visual programming platform developed by MIT Media Lab, designed to introduce coding concepts to individuals of all ages, especially beginners. As an intuitive educational game development environment, Scratch allows users to create interactive stories, animations, and games by dragging and dropping code blocks, without needing complex syntax writing. Its advantages in enhancing computational skills and creativity are widely recognized; studies show that using Scratch can significantly improve computational thinking, problem-solving, and creative expression in learners (Rahmadika et al., 2021). With its accessible interface and active global community, Scratch facilitates experimentation and innovation, providing a safe platform for users to test and develop complex ideas in a fun learning context (Resnick, 2017).

1.4 Party Wear

Party wear refers to a category of clothing specifically designed for formal or semi-formal events. It emphasizes luxury and elegance through the use of opulent materials like silk, brocade, or lace, and intricate details such as sequins and embroidery. These gowns often feature dramatic silhouettes that not only cover the body but also serve as an expression of identity and a part of social rituals, with designs focused on creating a strong, memorable impression (Putri, 2021).

The party wear industry continually innovates in material selection, seeking fabrics that are not only visually appealing but also possess desirable drape characteristics and the ability to maintain complex shapes, often blending tradition with modern technology (Gadi et al., 2025). Furthermore, party wear designs frequently draw inspiration from local cultural elements or surrounding nature. The incorporation of floral motifs, traditional patterns, or the adaptation of

natural forms into silhouettes and embellishments can result in unique and meaningful collections, reflecting a rich heritage and environment (Pandanwangi et al., 2021).

2. Methodology

This research adapts the ADDIE (Analysis, Design, Development, Implementation, Evaluation) framework as a methodological guide to develop and evaluate the "Blossomara" game on Scratch as an educational medium for tropical flora in fashion design learning. This instructional development approach is integrated with qualitative research methodology to gain a comprehensive understanding of the game's effectiveness and potential. The adaptation process of the ADDIE framework is illustrated in detail in Fig. 1.

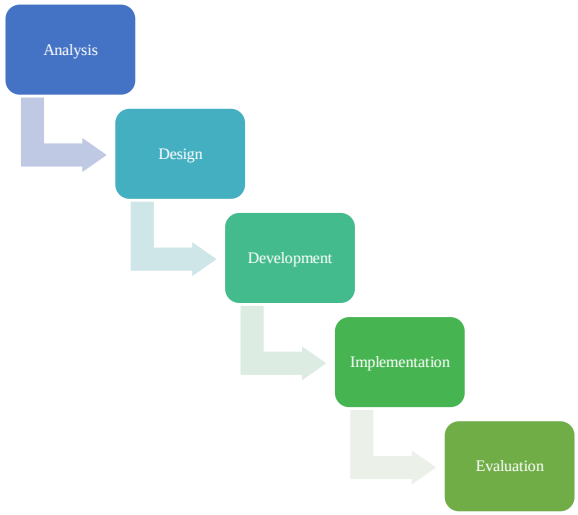

Fig. 1 - The ADDIE Framework.

The ADDIE framework is a systematic instructional and learning media development framework. It consists of five main phases. The first phase, Analysis, identifies needs, problems, learner characteristics, and learning objectives. The second phase, Design, involves planning the game's structure, narrative flow, visual elements, and interactivity relevant to the tropical flora theme. Next, the Development phase technically prototypes the game in Scratch based on the design outcomes. After that, the Implementation phase tests the product directly with users. The final phase, Evaluation**,** assesses the game's effectiveness and success as a learning medium using interview data**.**

2.1 Analysis Phase

The Analysis phase involves identifying the needs and characteristics of the target audience, along with analyzing relevant content. Current fashion design curricula are reviewed, and popular gown design trends in Indonesia, especially those inspired by flora, are examined. This analysis forms the basis for designing educational elements within the "Blossomara" game, ensuring the relevance of Indonesian tropical flora content to fashion design learning needs.

2.2 Design Phase

In the Design phase, the basic concept for the "Blossomara" game was developed. This included the game's flow, user interface, and integrated educational elements. The design focused on providing an interactive dress-up experience while also presenting information about tropical flora. Decisions were made on how tropical flora would inspire gown designs, and suitable techniques and silhouettes based on flower shapes were identified. This phase also involved creating the initial game prototype on the Scratch platform. The concept for applying floral inspiration to the gowns used in the "Blossomara" game can be seen in Table 1.

Table 1 - Application of floral inspiration in party dresss design.

Name of Flower	Flower Shape	Application in Party Dress Design
Anggrek Hitam Papua (*Coelogyne pandurata*)		
Kabut (*Amorphophallus titanum*)		
Rafflesia arnoldii		

This section, referenced as Table 1, illustrates the application of floral form inspiration in party dress design, drawing from three rare tropical flora species**,** *Coelogyne pandurata* (Papuan Black Orchid), *Amorphophallus titanum* (Corpse Flower), and *Rafflesia arnoldii***.** Each flower is presented with its original visual form alongside its interpretation in a fashion design.Specifically, the Papuan Black Orchid inspires a black party gown featuring a central floral accent, embodying distinctive elegance and luxury. The Kibut is translated into a long-silhouetted gown with dramatic collar accents, mimicking the striking petal structure of the original flower. *Rafflesia arnoldii*, characterized by its round shape and large, textured petals, is interpreted into a vibrant red party dress with a bold silhouette and details resembling its original floral structure. These three designs demonstrate how the visual characteristics of tropical flora can be creatively adapted into modern fashion pieces of high artistic value**.**

Beyond their aesthetic qualities, these design transformations demonstrate the role of biomimicry as a creative strategy in fashion design. Rather than directly replicating the flowers, the design process emphasizes abstraction and reinterpretation of their essential visual elements, including silhouette, petal arrangement, texture, color composition, and structural balance. This approach allows designers to preserve the unique identity of each rare tropical species while producing contemporary party dresses that meet both artistic and functional requirements. Consequently, the resulting garments not only serve as fashion products but also as visual representations that promote appreciation of Indonesia's rich botanical diversity through innovative design.

The transformation process also highlights the importance of visual exploration in developing original fashion concepts. Through the analysis of each flower's morphology, designers identify dominant characteristics that can be translated into garment components such as silhouette, neckline, sleeve construction, decorative details, and surface embellishments. This systematic interpretation ensures that the resulting party dresses retain a recognizable connection to their natural inspiration while presenting innovative and contemporary fashion expressions.

2.3 Development Phase

The Development phase involved the actual creation of the "Blossomara" game in Scratch, based on the established design. The dress-up functionality was programmed, visual assets for gowns and flora were implemented, and educational narratives about each flower were integrated.

(a) (b) (c) (d) (e) (f) (g) (h)

Fig 2 - (a) Game opening; (b) flower selection; (c) feedback by each flower; (d) flower information; (e) fitting room; (f) dress-up; (g) indoor show time; (h) outdoor show time.

Figure 2 illustrates the complete user journey within the educational game, guiding learners through a structured sequence of activities from exploration to design presentation. Beginning with flower selection, students receive contextual information and feedback that supports their understanding of the distinctive characteristics of each tropical flower before entering the creative design stages. The fitting room and dress-up features enable learners to experiment with different fashion elements, while the indoor and outdoor fashion show scenes provide opportunities to evaluate the final designs in realistic presentation settings. This sequential workflow encourages active exploration, iterative learning, and creative decision-making throughout the design process.

The interface progression shown in Figure 2 was designed to mirror the stages of the fashion design process, beginning with inspiration, followed by concept development, experimentation, and final presentation. Each stage builds upon the previous one, enabling students to gradually transform botanical observations into fashion designs through an organized and intuitive workflow. Such a sequence helps learners understand that fashion design is an iterative process requiring continuous exploration and refinement rather than a single-step activity.

Figure 2 illustrates the interactive flow of the "Blossomara" game. The journey begins with the (a) Game Opening screen, leading to (b) Flower Selection where players choose one of three tropical flowers. After selection, a (c) Feedback by Each Flower motivational response appears, guiding players into the (d) Flower Information stage, which presents educational details. Next, in the (e) Fitting Room, players prepare their character for the (f) Dress-Up session, where a flower-themed gown is applied. The final result is showcased in two modes, (g) Indoor Show Time and (h) Outdoor Show Time, displaying the gown visualization in different settings. This systematic flow is consistently applied across all three gown designs, ensuring a uniform interactive progression for each flower from start to finish.

Fig. 3 - (a) Coding for start, (b) coding to move to the flower selection page, (c) coding to move to the fitting room, (d) coding for the figure, (e) coding for automatic dress application, (f) coding to move to the indoor show, (g) coding to move to the outdoor show, and (h) coding to return to the flower selection page.

Figure 3 illustrates the main coding flow for the "Blossomara" game developed using the Scratch platform. (a) focuses on setting the initial game display and starting the game when the "Start" button is pressed. (b) manages the transition to the flower selection page, allowing players to choose one of three available tropical flowers. Following this, (c) programs the movement to the fitting room after a flower is selected. In (d), the coding controls the display of the character or figure that will wear the gown. (e) handles the automatic application of the gown based on the player's flower choice. Meanwhile, (f) and (g) respectively manage the transition to the indoor and outdoor fashion show sessions, displaying the final results of the dress-up process. Lastly, (h) allows players to return to the flower selection page, enabling further exploration with different design choices. This sequence of coding forms a consistent interactive system flow that supports an educational and enjoyable user experience.

2.4 Implementation Phase

The Implementation phase focuses on deploying the "Blossomara" game with selected participants. Participants directly interacted with the game, utilized its dress-up feature, and accessed the educational flora information. Their interactions were observed, and data regarding their experience using the game as a design learning tool was collected.

2.5 Evaluation Phase

The Evaluation phase is the final stage of the ADDIE framework. It's designed to assess the "Blossomara" game's effectiveness and success as a learning tool. In this study, the primary goal of the evaluation is to determine if the game achieved its intended learning objectives related to tropical flora education in fashion design.

The evaluation process involves collecting data through interviews. These interviews are systematically structured to gather qualitative insights into participants' experiences, perceptions, and learning outcomes after interacting with the game.

3. Results and Findings

This section presents the primary findings and an in-depth discussion regarding the utilization of the Scratch-based game "Blossomara" as an educational tool in fashion design. These findings were derived from the analysis of interview data collected from fashion industry experts, practitioners, and academics, and are discussed in relation to the established research objectives.

The "Blossomara" game effectively develops and facilitates the application of tropical flora ideas in gown design through structured, transformative stages. Academics specifically highlighted the game's capability to help students visualize and manipulate abstract botanical elements—such as specific details from the Corpse Flower (*Amorphophallus titanum*)**,** Papuan Black Orchid (*Coelogyne pandurata*)**,** and Rafflesia arnoldii into concrete design components. They observed that the game's iterative process allows for rapid experimentation with flora shapes, colors, and textures. Traditionally, this process would require significant time and resources in manual sketching or physical prototyping. For instance, one academic stated, "This game allows students to 'play' with flower petals or leaf structures [of these flora], change their size, rotate them, and see their effect on the gown silhouette in real-time; this accelerates their conceptual understanding." These findings are consistent with literature indicating that game-based learning environments enhance cognitive and visualization abilities in creative disciplines (Razak et al., 2023). The game's ability to provide instant feedback is also crucial in reinforcing students' understanding of each botanical element's influence on the overall design (Penggabean et al., 2024).

Table 2 – Brief Background of Respondents.

Respondent ID	Gender	Profession	Brief Backgroun
R1	Male	Industrial Expert – Art Director & Visual Conceptor	This describes an individual with over 15 years of experience in the creative industry. Their expertise lies particularly in visual concept development and branding for major campaigns**.** They frequently collaborate with fashion designers to create strong visual narratives**.**
R2	Male	Academic – Senior Lecturer & Head of Fashion Design Study Program	This describes an academic focused on design theory and teaching methodologies. They possess expertise in guiding students from abstract concepts to design realization.
R3	Female	Practitioner – Final Year Fashion Design Student	This describes a student currently working on a final project focused on exploring innovative materials and silhouettes**.** They possess a strong interest in sustainable design and nature-inspired themes**.**
R4	Male	Industry Expert – Professional Fashion Designer & Brand Owner	This describes an independent fashion designer known for bold and artistic collections**.** This individual frequently explores non-conventional themes and utilizes couture techniques**.**
R5	Female	Academic – Lecturer of Design Theory & History	This describes an individual who teaches courses related to cultural analysis in design and semiotics**.** They are particularly interested in how narratives and symbolism can be realized in design works**.**
R6	Male	Practitioner – Visual Communication Design Student	This describes an individual with a background in graphic design and illustration, possessing a **s**trong understanding of how visual elements can be combined to create cohesive messages**.**

Continued

R7	Female	Industry Expert – Textile & Pattern Designer	This describes a specialist in developing patterns and textures for fabric. Their work is often inspired by micro-details from flora and fauna, which they translate into rich textile designs..
R8	Male	Academic – Academic & Interactive Media Researcher	This describes a professor focused on technological innovation in education, specifically the use of interactive media and gamification to enhance the learning experience.
R9	Female	Practitioner – Second-Year Fashion Design Student	This describes a student who is currently in the early stages of exploring their personal design style. They are enthusiastic about trying various creative approaches and new media in their learning process.

The table 2 includes nine individuals (R1–R9) comprising industry experts, academics, and practitioners, with diverse backgrounds. This diversity aims to provide a broad perspective on tropical flora-based design and the use of interactive media in fashion education. R1 is an art director and visual conceptor with over 15 years of experience in the creative industry. R2 is a senior academic and head of a fashion design study program, specializing in design theory and teaching methodologies, particularly in guiding students from concept to design realization. R3 is a final-year fashion design student working on a final project exploring materials and silhouettes, with a strong interest in sustainable design and nature-inspired themes. R4 is a professional fashion designer and brand owner known for bold and artistic collections, especially those exploring non-conventional themes. R5 is a lecturer of design theory and history, interested in the relationship between culture, symbolism, and design works. R6 is a visual communication design student with a strong background in illustration and graphic design, and a deep understanding of visual structure. R7 is a textile and pattern designer often inspired by micro-details of flora and fauna, which they develop into fabric textures and patterns. R8 is a professor and interactive media researcher, focused on using technology and gamification to enhance learning experiences. Finally, R9 is a second-year fashion design student in the early stages of exploring their personal style and open to various creative approaches in their learning process. This diverse profile provides a strong foundation for a comprehensive thematic analysis.

Table 3 – Interview results.

Respondent ID	Interview Questions	Interview Responses	Initial Codes / Keywords	Initial Interpretation / Thematic Connections
R1 (Male)	"In your understanding, what keywords or phrases most accurately describe the essence of a style inspired by tropical flora?"	"For me, it's about wild expression, hidden mystery, and unconventional luxury. There's an element of drama in it."	Wild expression, Mystery, Unconventional luxury, Drama	Emphasizing the unique, dramatic, and unparalleled natural opulence of tropical flora.
R2 (Male)	How would you visualize the silhouettes, color palettes, and textures of tropical flora, specifically the Kibut, Papuan black orchid, and Rafflesia arnoldii?	"Massive, architectural, organic silhouettes dominate, with a palette of black, deep purple, and moss green, accented by vivid crimson. Textures span rough/wrinkled to smooth/transparent."	Architectural silhouettes, dark-accented palette, contrasting textures.	Presenting tangible visual representations of botanical elements in design, with a focus on structure and contrast.
R3 (Female)	"From a teaching perspective, what's the biggest challenge in explaining narrative or abstract style concepts to design students?"	"Students often struggle to transform narrative or emotion into visual form. They tend to get stuck on literal replication of objects. Making them think abstractly is the challenge."	Narrative transformation, Literal replication, Abstract thinking	Identifying obstacles in translating narrative concepts into applicable designs and the need for abstraction.
R4 (Male)	"To what extent do you think interactive media like games can help bridge the gap between theory and	"Games allow for rapid, consequence-free experimentation and instant visualization. This is excellent for the trial-and-error process	Rapid experimentation, Instant visualization, Trial-	Highlighting games' ability to facilitate practical learning through exploration and

Continued

	practice in design exploration?"	and directly understanding the impact of design choices**."**	and-error, Impact of choices	immediate feedback.
R5 (Female)	"In your understanding, what keywords or phrases most accurately describe the essence of a style inspired by tropical flora**?"**	Its essence is dark grandeur, mysterious beauty, and unexpected vitality**.** There's a sense of powerful primitivism**."**	Dark grandeur, mysterious, vitality, primitivism	Emphasizing the philosophical depth and primal energy inherent in tropical flora.
R6 (Male)	How would you visualize the silhouettes, color palettes, and textures of tropical flora**,** specifically the Kabut**,** Papuan black orchid, and Rafflesia arnoldii**?**	"The silhouettes would definitely be large and curving, with deliberate asymmetry. The colors would be deep black, dark purple, blood red, with hints of sulfur yellow. The textures could be slimy, wrinkled, or like thick leather."	Large/curving silhouettes, Asymmetry, Dark/mottled palette, Organic/extreme textures.	Showcasing bold and exploratory concrete visualizations of specific floral visual elements.
R7 (Female)	From a teaching perspective, what's the biggest challenge in explaining narrative or abstract style concepts to design students?	"The challenge is guiding them out of their comfort zone of existing visual references. How to make them innovate from narratives that haven't been visualized before."	Narrative innovation, Stepping out of comfort zones, New visualization	Identifying obstacles in fostering creativity and innovation based on abstract concepts.
R8 (Male)	To what extent do you think interactive media like games can help bridge the gap between theory and practice in design exploration?	"Very much so. Games create an immersive learning environment where theory can be immediately tested**.** This builds an intuitive understanding and empirical experience not gained from lectures."	Immersive, theory testing, intuitive understanding, empirical experience	Highlighting games' ability to create a deep and practical learning environment for design theory.
R9 (Female)	In your understanding, what keywords or phrases most accurately describe the essence of a style inspired by tropical flora**?**	"I think it's about striking uniqueness**,** natural power**,** and eccentric allure**.** It's very bold and unusual."	Uniqueness, natural power, eccentric, bold	Emphasizing the strong, unique, and bold character of a style inspired by tropical flora.

Essentially, respondents in Table 3 described tropical style as wild, mysterious, eccentric, and dramatic (R1, R5, R9). They visualized tropical flora like the corpse flower, Papuan black orchid, and Rafflesia arnoldii as large, asymmetrical silhouettes with dark palettes and extreme, contrasting organic textures (R2, R6). Pedagogical challenges (R3, R7) included students' difficulty translating abstract ideas into visual designs and their tendency toward literal thinking. Regarding interactive media, R4 and R8 highlighted the significant potential of games for risk-free, immersive exploration that builds an intuitive understanding of design. Overall, Table 3 connects conceptual perceptions, design visualization, learning approaches, and interactive technology in tropical flora-based design education.

These findings indicate that tropical flora serves not only as a source of visual inspiration but also as a catalyst for higher-order creative thinking in fashion design education. The respondents emphasized that successful design development depends on students' ability to interpret natural forms through abstraction rather than direct imitation. Consequently, learning strategies should encourage observation, critical analysis, and iterative experimentation to help students transform complex botanical characteristics into original fashion concepts while maintaining aesthetic coherence. Taken together, the responses demonstrate that tropical flora-inspired fashion design involves more than aesthetic appreciation; it requires cognitive processes of observation, interpretation, and creative transformation. Respondents consistently emphasized that students should identify the distinctive morphological characteristics of each flower and reinterpret them into wearable forms rather than reproducing them literally. This finding underscores the importance of instructional approaches that balance conceptual analysis with practical design exploration.

Table 4 – Evaluation.

Respondent ID	Interview Questions	Interview Responses	Keywords	Initial Interpretation / Thematic Connections
R1 (Male)	After interacting with this game prototype, to what extent do you feel it successfully captures and represents the essence of tropical flora in the fashion gowns we discussed earlier?	"It's very good at capturing the essence of the corpse flower's colors and forms, with a luxurious dark nuance. However, the texture details for the Rafflesia could be more realistic."	Essence of color, luxurious darkness, texture realism	The game successfully represents the visual essence of flora, with room for improvement in the realism of texture details.
R2 (Male)	"How much potential does this game have as a learning medium for style transformation and combination?"	"This game is very effective for accelerating the understanding of transformation concepts visually and instantly."	Pedagogical potential, instant impact, transformation concepts	The effectiveness of games in understanding style transformation is demonstrated through rapid visual feedback.
R3 (Female)	Which aspects or features of this game do you find most effective? Which aspects require further improvement?	"The ease of the UI and the variety of base gowns are very effective. I could try things out quickly. Improvements? Perhaps a feature for more detailed motif or ornament customization specific to each flower."	User-friendly ui, variety of gowns, motif customization	Identifying the game's main strengths in ease of use and basic variety, along with areas for detailed feature development.
R4 (Male)	Do you see the potential for using a tool like this as an early conceptual prototyping medium in the professional design process? Why?	"Absolutely. It saves brainstorming time and can be a quick conceptual visualization for clients. For initial presentations, it's far more effective than regular sketches."	Rapid prototyping, brainstorming, client visualization	Games have potential as an efficient early prototyping tool for concept presentations and saving time in the industry.
R5 (Female)	After interacting with this game prototype, to what extent do you feel it successfully captures and represents the essence of tropical flora in the fashion gowns we discussed earlier?	"The game successfully visualizes the dark and mysterious 'aura' of the corpse flower. However, for the black orchid, there could perhaps be more variation in shimmer or transparency effects."	Dark, transparency	Successful atmosphere representation, with suggestions for improving specific material details.
R6 (M)	How do you assess the potential of this game as a learning tool for students to understand the process of style transformation and combination?	"This game makes the transformation process feel fun and not intimidating. I can tinker with elements and see the results instantly. It's very practical for learning."	Fun process, practical	The game is considered highly effective in making the learning process of style transformation and combination more engaging and practical.
R7 (Female)	Which aspects or features of this game do you find most effective? Which aspects require further improvement?	"The color and texture combination features are very effective; that's the core of design. What needs improvement? Perhaps options for background environments or presentation scenarios for the gowns."	texture combination, Presentation background	The game's strength lies in its visual combination tools, with suggestions for developing its design presentation context.

Continued

R8 (Male)	Do you see the potential for using a tool like this as an early conceptual prototyping medium in the professional design process? Why?	"Absolutely. This is a bridge between pure ideas and initial execution**.** It can be used for internal concept validation, even for exploratory research before mass production**."**	Concept validation, exploratory research, pre-production	Games have significant potential as a pre-design tool for idea validation and conceptual research in the professional realm.
R9 (Female)	"To what extent does this game successfully represent the essence of tropical flora in gown design?"	"For the corpse flower, the stiff silhouette and dark colors are a perfect fit. The Rafflesia still needs more variety in bloom shapes or spots in the texture."	Stiff silhouette, bloom shape	The representation of the corpse flower's silhouette is successful; however, the Rafflesia requires more specific detail.

Table 4 presents the thematic analysis results from the prototype evaluation phase of the educational game designed to convey the essence of tropical flora within the context of fashion design. Interviews were conducted with 9 respondents. In general, most respondents stated that the game successfully captured the essence of tropical flora, particularly in its use of dark color tones, distinctive silhouettes, and mysterious atmosphere. However, suggestions were made to enhance the game, such as adding more texture variations or specific visual effects to deepen the experience (R1, R5, R9).

From a learning perspective, the game was considered highly effective in facilitating the understanding of style transformation, with quick response and instant visualization accelerating the learning process (R2, R6). The ease of the user interface and the ability for visual exploration were also seen as major strengths (R3, R7). In addition, the game's potential as a conceptual prototyping tool in the professional design industry was acknowledged by experienced respondents (R4, R8), particularly due to its practicality for brainstorming, concept validation, and pre-production exploration. Overall, the game was positively evaluated as an interactive medium that is not only educational but also applicable in professional contexts, while still open to feature refinement.

4. Conclusion

Based on the interview analysis, it can be concluded that tropical flora offers a rich source of fashion design inspiration through its unique visual and narrative characteristics. Associations with elements such as vibrancy, organic forms, and exoticism reveal great potential for bold and meaningful style exploration. The challenge of conveying abstract design concepts to students can be significantly addressed through interactive media. The game, designed as a teaching aid and prototyping tool, has proven to be highly effective. Its features direct experimentation and instant visualization enable students and professionals to understand the process of style transformation and combination more efficiently, reducing costs and accelerating iteration. This game not only enriches the teaching and learning process but also holds strong potential as an idea validation tool in professional design workflows, facilitating concept communication and enhancing collaboration. In short, interactive game technology represents the future of innovative fashion design education and practice**.**

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Conflict of Interest

The authors declare no conflicts of interest.

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