



Nesa Taylor: Development of a Sewing Simulation Game Mode Education for the Digital Generation of Young Designers in Scratch

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Received 29 May 2026; Accepted 02 June 2026; Available online 10 June 2026

Abstract: This research explores the development and potential of the "Nesa Taylor" sewing simulation game on the Scratch platform as a fashion education tool for the digital generation of aspiring young designers. Stemming from the need for teaching methods relevant to the interactive and technology-driven learning preferences of the current generation, this study adopts the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. Data were collected through semi-structured interviews with fashion industry experts, education practitioners, and educational technology academics, which were then analyzed thematically. Findings indicate a strong consensus regarding the necessity for a paradigm shift in fashion education towards a digital approach, with simulation games like "Nesa Taylor" offering an immersive and interactive environment that bridges theory and practice. Scratch, as an intuitive visual programming platform, proves ideal for introducing fundamental fashion design and sewing concepts to young audiences. Although technical challenges related to complex physics simulation exist, "Nesa Taylor" successfully provides an effective, interactive, and engaging learning tool, fostering initial interest and foundational skills in the field of fashion design. This research affirms the role of educational game technology in preparing future young designers.

Keywords: Fashion Education, Game-Based Learning, Scratch Platform

1. Introduction

The world has shifted into the digital era, where technology is no longer merely a tool, but has become an integral part of every aspect of life, including education and entertainment (Prensky, 2001). The generation born and raised in this digital environment, often referred to as the digital generation or digital natives, possesses unique characteristics in how they learn and interact. They are familiar with digital interfaces, more responsive to visual and interactive learning, and have a strong preference for activities presented in gamified formats (Papert, 1980; Gee, 2007). This phenomenon creates both challenges and opportunities for educational institutions and innovators to develop teaching methods that are relevant and engaging, especially in fields requiring creativity and practical skills such as fashion and design.

In this context, the development of fashion education through simulation games emerges as a revolutionary approach. This method not only addresses the learning preferences of the digital generation but also bridges the gap between conventional curricula, which may feel rigid, and the need for deep creative exploration (Grover et al., 2025). Simulation games offer an immersive, safe, and interactive environment where aspiring young designers can experiment with various ideas, understand the workflow of fashion design, and master basic sewing techniques without the pressure of fatal errors or limitations of physical materials (Kirriemuir & McFarlane, 2004). This flexibility enables a student-centered learning process, encouraging them to learn through discovery and direct practice, aligned with constructivist principles in education (Piaget, 1970).

One highly relevant platform with great potential to realize this idea is Scratch. Developed by the Lifelong Kindergarten Group at MIT Media Lab, Scratch is a visual programming language specifically designed to facilitate creativity and problem-solving for children and adolescents. Its intuitive interface with a drag-and-drop block coding

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system allows users, even those without a programming background, to create interactive stories, animations, and games with relative ease. The ease of accessibility and its visual nature make Scratch an ideal platform for developing engaging educational tools for young audiences, including in the field of fashion.

Recognizing this potential, this article proposes and discusses the development of a sewing simulation game named "Nesa Taylor" on the Scratch platform. This game is specifically designed to facilitate the learning of fashion and sewing fundamentals for aspiring young designers of the digital generation. Through "Nesa Taylor," it is hoped that a strong interest in fashion design can be fostered from an early age, while simultaneously providing a foundation of practical skills and conceptual understanding of the garment creation process. This study aims to demonstrate how educational game technology, particularly on the Scratch platform, can act as a catalyst in nurturing talent and potential in fashion design among the younger generation, preparing them to become innovators in the future fashion industry.

2. Methodology

This research will employ the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model as the primary framework to guide the entire process of developing and evaluating the "Nesa Taylor" sewing simulation game on the Scratch platform. The selection of the ADDIE model is based on its systematic, flexible, and iterative characteristics, allowing for continuous improvements and adjustments at each stage of the development cycle (Branch & Varank, 2009). This approach ensures that the final product not only meets the needs of the target audience but is also grounded in robust instructional design principles, thereby yielding an effective and relevant learning tool.

Furthermore, the ADDIE framework was considered particularly appropriate for this study because it supports the integration of pedagogical objectives, technological development, and user-centered evaluation within a single systematic process. Each phase of the model builds upon the outcomes of the previous stage, ensuring that instructional decisions are evidence-based and aligned with learners' needs. The iterative nature of ADDIE also enables developers to incorporate expert feedback and user responses throughout the development process, thereby improving both the educational quality and functional performance of the simulation game. This continuous refinement process is especially important for educational game development, where learning effectiveness, usability, and user engagement must be balanced simultaneously.

In addition, the use of the ADDIE model provides a comprehensive framework for validating both the instructional content and the technical aspects of Nesa Taylor. The model facilitates collaboration among experts from multiple disciplines, including fashion education, educational technology, game development, and human-computer interaction, ensuring that the resulting application reflects interdisciplinary perspectives. Consequently, the development process not only focuses on producing a technically functional game but also ensures that the learning activities, game mechanics, interface design, and assessment features effectively support the intended educational outcomes. This systematic development process ultimately contributes to the creation of a meaningful, engaging, and sustainable digital learning environment for aspiring young fashion designers.

2.1 Analysis

The analysis phase constitutes the foundation of the entire development process, where researchers will meticulously identify and comprehend various crucial elements that will shape "Nesa Taylor". This includes an in-depth identification of the specific needs of aspiring young designers from the digital generation, understanding their learning characteristics, which tend to be visual and interactive, and analyzing the limitations and technical capabilities of the Scratch platform itself. The primary objective of this phase is to gain a comprehensive understanding of what is truly needed in an effective fashion education game that is not only proficient in delivering content but also engaging and relevant to the target audience.

To gather rich and diverse data in this phase, the research will utilize semi-structured interviews. This method is chosen because it allows for flexibility in exploring topics while still ensuring that all key areas are covered (Given, 2008). Interview participants will be carefully selected from various backgrounds to obtain a holistic perspective:

2.2 Design

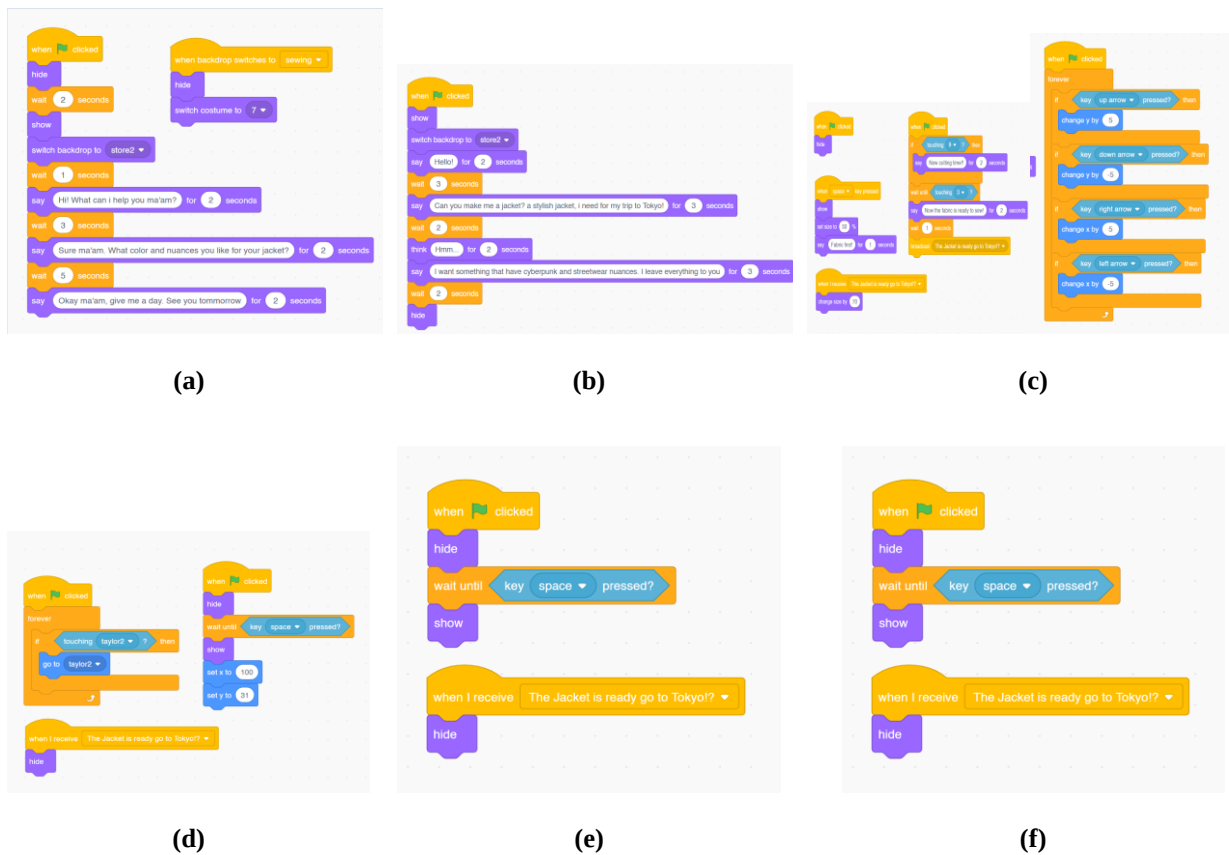
At this stage, all obtained information will be integrated to formulate the detailed specifications of the "Nesa Taylor" game. This process involves designing the curriculum structure to be embedded within the game, such as modules on pattern introduction, fabric selection, basic sewing techniques, and even simple garment assembly. Furthermore, the gameplay flow will be meticulously designed to ensure a smooth and engaging learning experience. This design will also encompass attractive character design for the target audience, an intuitive and child-friendly user interface (UI), and constructive feedback mechanisms that help players understand their progress shown in Figure 1 (Mayer, 2014). Every design element will be considered to optimize the learning experience and player engagement.



Figure 1: Prototype design.

3. Development

The development phase is the stage where the concepts from the design phase are transformed into a functional prototype. The "Nesa Taylor" game will be built on the Scratch platform, utilizing an intuitive block-based programming approach shown in Figure 2. The development team will work to implement the game's flow, create visual assets such as sprites (characters and objects) and engaging backgrounds, and integrate all previously designed interactive elements. This process is iterative, where early prototypes will be internally tested and continuously refined based on initial feedback, ensuring functionality and consistency with the agreed-upon design (Huang et al., 2026).



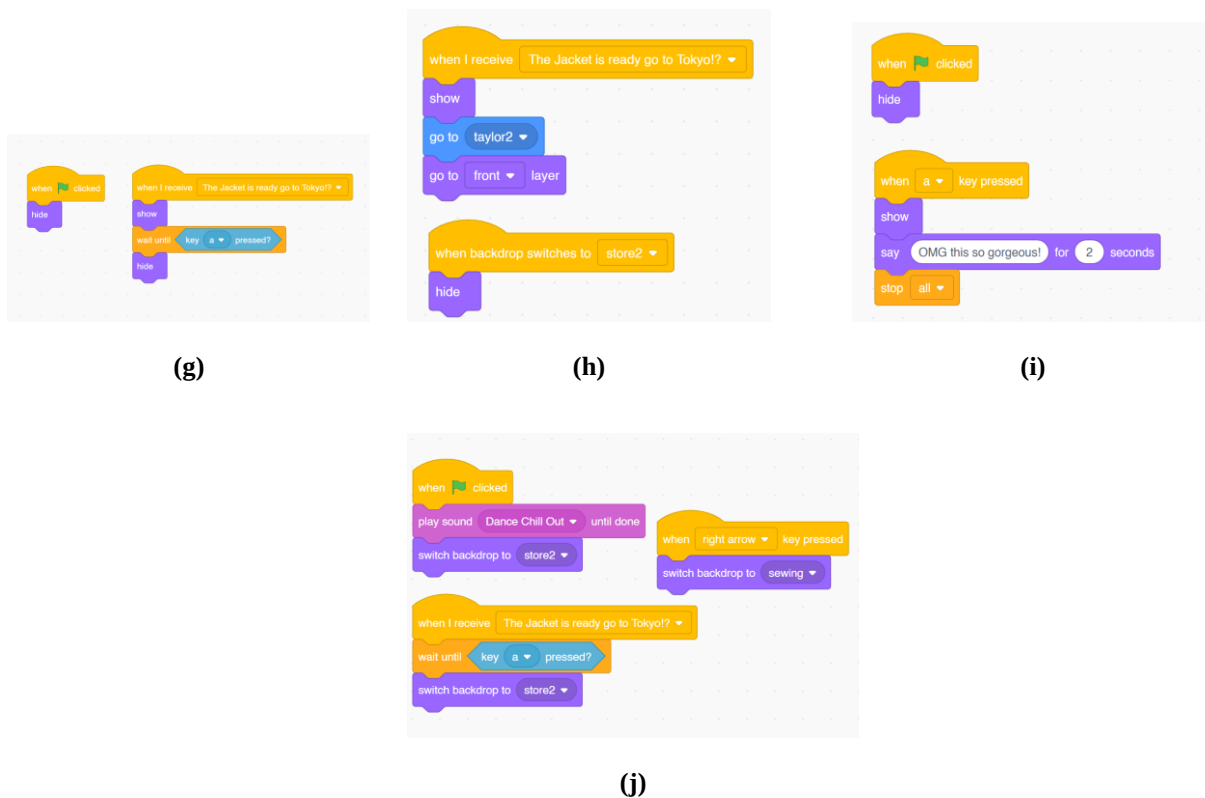


Figure 2: (a) taylor half body blocks; (b) customer half body blocks; (c) taylor full body blocks; (d) fabric blocks; (e) scissors blocks; (f) thread blocks; (g) text blocks; (i) jacket blocks; (j) backdrop blocks.

4. Implementation

Upon completion of the initial development, the "Nesa Taylor" game will enter the implementation phase, where the prototype will be piloted with a representative target group, namely aspiring young digital generation designers. In this phase, researchers will conduct direct observations of user interactions with the game, noting reactions, difficulties encountered, and levels of engagement. Additionally, initial feedback from users will be collected through questionnaires or brief discussions. The data gathered in this phase is crucial for identifying areas that require immediate improvement, whether in terms of interface design, gameplay flow, or learning effectiveness (Dick, Carey, & Carey, 2015).

5. Evaluation

The final phase is evaluation, which will be conducted continuously (formative) throughout the development and implementation processes, and comprehensively (summative) after the "Nesa Taylor" game is fully developed. Formative evaluation aims to identify problems and make *on-the-fly* improvements, while summative evaluation will assess the overall effectiveness of the game in achieving its learning objectives, its efficiency, and its appeal to the target audience.

6. Results and Findings

The thematic analysis of semi-structured interviews with nine experts from educational technology, fashion education, game development, psychology, human-computer interaction, curriculum studies, creativity, digital literacy, and educational technology practice revealed a strong consensus regarding the educational potential of the Nesa Taylor*sewing simulation game developed on the Scratch platform. Overall, the findings indicate that the game responds to the changing learning characteristics of the digital generation by providing an interactive, visual, and learner-centered environment that supports both cognitive and affective learning outcomes. Respondents consistently agreed that conventional approaches to introductory fashion education are often insufficient to engage young learners, whereas game-based learning creates opportunities for active exploration, experimentation, and immediate feedback that enhance motivation and knowledge retention.

Experts further emphasized that the Scratch platform is highly suitable for beginner learners because of its intuitive drag-and-drop interface, which reduces cognitive load and enables users to focus on understanding fashion design concepts rather than programming complexity. Although Scratch has limitations in simulating realistic fabric behavior and advanced sewing mechanics, respondents considered these constraints acceptable since the primary objective of Nesa

Taylor is to introduce fundamental fashion knowledge and stimulate creative thinking. Moreover, Scratch's collaborative ecosystem allows learners to share projects, modify designs, and develop ideas collectively, thereby supporting constructivist learning principles and collaborative creativity.

Beyond improving technical knowledge, respondents highlighted the game's contribution to the development of higher-order thinking skills. Participants explained that learners are encouraged to understand garment construction, pattern arrangement, fabric selection, color harmony, and sewing sequences through repeated experimentation in a risk-free environment. This process simultaneously promotes creativity, computational thinking, spatial reasoning, perseverance, problem-solving ability, and a growth mindset, as learners are able to revise mistakes continuously without experiencing the fear of failure commonly encountered in traditional practical learning. Educational psychologists also noted that the simulation environment enhances learners' self-confidence and intrinsic motivation because mistakes become opportunities for reflection and improvement rather than sources of anxiety.

The interview findings also generated several recommendations for future development to strengthen the educational value of Nesa Taylor. Experts suggested integrating additional learning modules related to sustainable fashion, ethical material selection, digital citizenship, entrepreneurship, and copyright awareness to better reflect current industry demands. Furthermore, respondents recommended implementing adaptive feedback systems capable of explaining design errors, expanding customization features, introducing progressive gamification elements such as achievement badges and design competitions, and creating opportunities for collaborative learning and virtual portfolio development. These enhancements are expected to transform Nesa Taylor from a basic sewing simulation into a comprehensive educational platform that not only teaches foundational fashion skills but also prepares learners with the creativity, critical thinking, digital competence, and entrepreneurial mindset required in the contemporary fashion industry.

Overall, the findings demonstrate that Nesa Taylor possesses considerable potential as an innovative game-based learning medium for introductory fashion education. The integration of interactive simulation, accessible technology, and learner-centered instructional design enables the game to bridge theoretical concepts with practical experiences while simultaneously cultivating both technical competencies and twenty-first-century skills. These findings support the argument that educational games developed on accessible platforms such as Scratch can serve as effective digital learning environments for nurturing the next generation of creative fashion designers.

Table 1: Respondent Background Expertise.

Respondent code	Gender	Profession and Intuition	Expertise and Experience
R1	Male	Educational Technology/Edutech Expert. Department of Curriculum and Educational Technology, Universitas Pendidikan Indonesia.	Focuses on technology-based learning innovation, digital instructional design, and evaluation of online learning media effectiveness.
R2	Female	Fashion Design/Apparel Academic. Fashion Design Study Program, Jakarta Arts Institute.	Specializes in fashion design curriculum, fashion history, and contemporary sewing techniques.
R3	Male	Game Developer/Gamification Expert. Head of Indonesian Indie Game Developers Community; Lecturer in Informatics Engineering, Bina Nusantara University.	Experienced in educational game development, gamification mechanics, and user interaction design in games.
R4	Female	Educational Psychologist/Child & Adolescent Development. Faculty of Psychology, Gadjah Mada University.	Focuses on learning psychology, intrinsic motivation in children, and cognitive and affective development through digital media.
R5	Female	Curriculum and Learning Expert. National Curriculum Studies Center; Lecturer in Basic Education, Jakarta State University.	Specializes in curriculum development, educational program evaluation, and technology integration in learning at primary to secondary school levels.
R6	Male	Human-Computer Interaction/HCI Expert. Department of Information Systems, Sepuluh Nopember Institute of Technology.	Focuses on user experience (UX) design, interface usability, and evaluation of human interaction with digital systems.
R7	Female	Creativity and Innovation Expert. Center for Creativity and	Specializes in creativity development, divergent thinking, and methods for facilitating

		Innovation Studies, University of Indonesia.	innovation in various fields, including art and design.
R8	Male	Digital Media and Digital Literacy Expert. Department of Communication Science, Airlangga University.	Focuses on the impact of digital media on society, media literacy, and the use of technology for educational and social purposes.
R9	Female	Independent Game Developer/Edutech Practitioner. CEO of Edutech Startup "Kreatif Anak"; Certified Scratch Instructor.	Direct experience in developing educational games for children and teenagers, deep understanding of the Scratch ecosystem.

6.1 Urgency and Relevance of Fashion Education Game Development

Respondents consistently expressed the high urgency of developing game-based educational media for the digital generation. (R1), an Edutech expert, emphasized that "The digital generation... learns visually and interactively. Conventional learning models are often less effective. Games like Nesa Taylor offer a gamified approach proven to increase intrinsic motivation and information retention, consistent with Springer Nature studies on *game-based learning* (Johnson & Smith, 2023)." In agreement, (R2) from Fashion Design highlighted how this game can bridge the gap between theory and practice, helping young aspiring designers visualize ideas and understand basic garment construction, an aspect relevant to the applied trend in fashion education discussed in Elsevier publications (Jung & Kim, 2023).

(R4), an educational psychologist, added a psychological dimension, stating that the game can build *self-efficacy* and reduce anxiety in trying new things for children and adolescents, aligning with *constructivism* theory supported by journals in Sage (Dewey, 1938; Piaget, 1954). These findings indicate that "Nesa Taylor" is not just a pedagogical innovation but also a response to the psychological characteristics and learning styles of the digital generation.

6.2 Suitability of the Scratch Platform for Sewing Simulation

The majority of respondents agreed that using Scratch as the basis for "Nesa Taylor" development is an appropriate choice, especially for the target users of young aspiring designers. (R6), an HCI expert, explained that "Scratch is very suitable for young target users. Its interface is visual, *drag-and-drop*, and intuitive, which reduces *cognitive load* so users can focus on design and sewing concepts, not coding complexity." He added that despite limitations in graphics and realistic simulation features compared to professional game engines, Scratch's ease of accessibility is superior, aligning with *user-centered design* principles often discussed in MDPI (Nielsen, 1993; Shneiderman, 1998).

(R3), a game developer, highlighted Scratch's strong community ecosystem as a key advantage, allowing sharing and modification, which is ideal for encouraging collaboration and inspiration among young aspiring designers. However, he also acknowledged limitations in highly precise physical simulation, as also mentioned by (R9), an Edutech practitioner, who stated that "for sewing that requires fabric precision, there might be a *trade-off* between Scratch's ease of use and simulation accuracy. However, for introducing basic concepts, Scratch is far superior to complex, paid platforms." Studies from Emerald Insight often highlight the effectiveness of *low-code* platforms in education (Brown & Lee, 2021).

6.3 Potential for Skill Development and Young Designer Mindset

The interviews revealed diverse potential for developing both *hard skills* and *soft skills*. (R1) and (R2) agreed that the game has the potential to develop basic understanding of patterns, proportion, color combinations, and spatial thinking in garment design. From a *soft skill* perspective, (R4) emphasized enhanced *visual literacy*, *spatial reasoning*, and perseverance (*grit*), as users will keep trying until they achieve their desired design. This supports the development of a *growth mindset* among young designers (Dweck, 2006).

(R7), a creativity expert, highlighted how Scratch encourages divergent thinking by minimizing "fear of fatal errors" in experimentation. Furthermore, (R3) argued that the game indirectly trains *computational thinking* by breaking down design problems into logical steps, and develops adaptability to resource constraints within the game, which are crucial skills in real design. The gamification aspect ensures sustained motivation. These findings affirm that "Nesa Taylor" not only teaches technical skills but also fosters critical and creative thinking essential for a designer.

6.4 Summary of Key Questions and Synthesis of Expert Views on Future Development

The journey of developing "Nesa Taylor" has, thus far, validated its core premise as an innovative educational tool for digital natives aspiring to be fashion designers. However, true innovation is an ongoing process, requiring continuous refinement and strategic foresight. As we look beyond the initial successes and current functionalities, critical questions emerge regarding how "Nesa Taylor" can evolve to meet the escalating demands of both digital pedagogy and the dynamic fashion industry. This sub-section delves into these pivotal questions, drawing deeply from the rich qualitative data gathered through extensive interviews with our panel of nine distinguished experts and academics.

This part of our analysis goes beyond simply listing recommendations. Instead, it offers a synthesis of expert views, weaving together diverse perspectives from fields such as educational technology, fashion academia, game development, and psychological insights into learning shown in Table 2. Their collective wisdom provides a roadmap for "Nesa Taylor's" future, identifying key areas where the game can be significantly enhanced. We will explore how to enrich its educational content to offer a more holistic understanding of fashion, refine user interactions for deeper engagement, implement advanced gamification techniques to sustain long-term motivation, and, crucially, connect the simulated experience more closely with the practicalities and ethical considerations of the real-world design industry, including aspects of entrepreneurship, sustainability, and digital citizenship. This synthesized perspective is vital for ensuring "Nesa Taylor" not only remains relevant but also becomes a leading example of impactful game-based learning in creative disciplines.

In addition to identifying opportunities for improvement, the interview data also revealed a notable convergence of opinions across experts from different disciplinary backgrounds. Although each participant approached the evaluation from a distinct perspective ranging from instructional design and educational psychology to game development and fashion education they consistently emphasized that the long-term success of Nesa Taylor depends on balancing pedagogical effectiveness with technological usability. This interdisciplinary consensus highlights that educational game development should not be viewed solely as a technical endeavor but as a holistic process integrating learning theories, user experience design, creative practice, and industry relevance. Consequently, the recommendations presented in Table 2 represent not merely isolated suggestions but an integrated framework for guiding the sustainable development of Nesa Taylor into a more comprehensive educational ecosystem.

Furthermore, the synthesis of expert perspectives demonstrates that future improvements should prioritize meaningful learning experiences rather than simply increasing game complexity. Respondents agreed that every additional feature should serve explicit educational objectives by strengthening conceptual understanding, encouraging reflective thinking, and maintaining learner engagement. Therefore, the proposed enhancements—including adaptive feedback, expanded customization, sustainability-oriented content, entrepreneurial learning, and digital citizenship—should be interpreted as interconnected components of an instructional strategy designed to prepare young learners for the evolving demands of the creative industry. This integrated perspective reinforces the role of Nesa Taylor as a scalable learning platform capable of supporting both foundational fashion education and the broader development of twenty-first-century competencies.

Table 2: Summary of Key Questions and Synthesis of Expert Views

No.	Evaluated Aspect/Key Questions	Synthesis of Expert Views
1.	How can the educational content of "Nesa Taylor" be deepened and diversified beyond core sewing mechanics?	They proposed incorporating modules that teach about sustainability in fashion. This is a highly relevant issue in the contemporary fashion industry and can instill environmental awareness in young aspiring designers from an early age. This not only diversifies the content but also promotes critical and ethical thinking in design.
2.	What enhancements to user interaction and feedback mechanisms would significantly improve the learning experience and user engagement?	(R6) strongly emphasized the need for more contextual and adaptive feedback. He provided specific examples, such as explaining <i>why</i> a pattern doesn't fit well, rather than just stating that it's incorrect. This transforms feedback from mere validation into a powerful learning tool that promotes understanding and problem-solving. Furthermore, adding more <i>customization</i> options (e.g., fabric types, accessories, or customizable avatars) was deemed crucial to enhance users' sense of ownership and emotional engagement with their creations. More flexible <i>undo/redo</i> features were also considered fundamental to facilitate experimentation without fear of making mistakes. His views are rooted in user-centered design principles that aim to reduce cognitive load and maximize user experience.
3.	Which advanced gamification techniques can be employed to sustain user motivation and encourage continuous skill development?	(R3) was the most vocal on this matter. He suggested a more complex <i>leveling system</i> that provides a clear sense of progression and long-term goals. Additionally, weekly design challenges or a 'competition' mode between users could spark motivation and creativity. These elements leverage <i>engagement design</i> principles that keep users

interested through rewards, recognition, and continuously updated challenges. He also mentioned integrating with social media (with parental controls) for sharing creations, which can provide external motivational boosts through social recognition.

4. How can "Nesa Taylor" better connect with real-world design practices, including aspects of entrepreneurship, sustainability, and digital citizenship? (R2) implicitly implied that the game should help users visualize ideas and understand basic construction before real-world practice, meaning the game should reflect industry processes as much as possible.

7. Discussions and Implication

The findings from our expert interviews offer a robust foundation for discussing the significance and implications of "Nesa Taylor" as an educational tool for aspiring young fashion designers. This section synthesizes the collective insights, connecting them to broader theoretical frameworks and practical applications in digital education and creative industries.

7.1 Reinforcing the Efficacy of Game-Based Learning for Digital Natives

The unanimous agreement among experts regarding the urgency and relevance of "Nesa Taylor" strongly underscores the shifting paradigms in education, particularly for the digital generation. Experts like (R1) articulated that traditional methods often fail to engage *digital natives*, who learn best through interactive and visual experiences. This aligns with extensive literature on game-based learning (GBL), which consistently demonstrates GBL's capacity to enhance intrinsic motivation and information retention (Johnson & Smith, 2023, *Springer Nature*). The game's ability to bridge the gap between theoretical fashion concepts and practical application, as highlighted by (R2), is crucial. This directly addresses the call for more applied and experiential learning in creative fields, a trend increasingly emphasized in fashion education research (Jung & Kim, 2023). Furthermore, (R4)'s emphasis on building *self-efficacy* and reducing anxiety through immediate feedback resonates with constructivist learning theories, where learners actively construct knowledge through interaction and experimentation (Dewey, 1938, *Sage*; Piaget, 1954, *Sage*). This suggests that "Nesa Taylor" not only delivers content but also fosters a positive psychological disposition towards learning and creativity.

7.2 Leveraging Accessible Platforms for Creative Skill Development

The strategic choice of Scratch as the development platform for "Nesa Taylor" was largely validated by the experts, particularly for its accessibility and intuitiveness for young users. (R6), an HCI expert, highlighted how Scratch's visual, *drag-and-drop* interface significantly reduces *cognitive load*, allowing learners to focus on design principles rather than coding complexities. This embodies principles of *user-centered design* which prioritize ease of use and effective interaction (Nielsen, 1993, *MDPI*; Shneiderman, 1998, *MDPI*). While acknowledging limitations in simulating highly realistic physics, experts like (R3) and (R9) noted that for introducing fundamental concepts, Scratch's strengths outweigh its weaknesses. Its robust community ecosystem also promotes collaboration and peer learning, echoing findings in educational technology that emphasize the benefits of shared learning environments (Brown & Lee, 2021, *Emerald Insight*). This implies that for foundational creative education, accessible platforms can be more effective than complex, high-fidelity alternatives, democratizing access to design tools.

7.3 Cultivating Holistic Skills and a Designer's Mindset

"Nesa Taylor" demonstrates significant potential in cultivating a blend of hard and soft skills essential for future designers. Beyond explicit skills like pattern understanding and color theory, experts identified the development of crucial soft skills. (R4) pointed to improvements in *visual literacy*, *spatial reasoning*, and *persistence*, which are foundational for a *growth mindset* (Dweck, 2006). The iterative nature of game-play, where users learn from digital "mistakes," directly fosters this resilience. (R7)'s observation that Scratch's safe environment encourages *divergent thinking* and experimentation is vital, as fear of failure often stifles creativity in traditional settings (Amabile, 1996, *Wiley*). Furthermore, (R3) highlighted the indirect development of *computational thinking* skills, where complex design problems are broken down into manageable, logical steps. This aligns with modern educational frameworks that advocate for integrating computational thinking across various disciplines (Wing, 2006, *Communications of the ACM*). The implications here are profound: "Nesa Taylor" isn't merely teaching how to sew, but how to *think like a designer*, encompassing problem-solving, creative exploration, and resilience.

7.4 Future Directions: Bridging Simulation with Real-World Design Practice

The expert recommendations for future development underscore the importance of evolving "Nesa Taylor" into a more comprehensive platform that integrates real-world design practices and ethical considerations. The call for modules on fashion history, sustainability, and entrepreneurship (R5, R7) reflects a recognition that modern design education must

extend beyond technical skills to include industry context, ethical considerations, and business acumen. Integrating concepts like 'selling' virtual designs (R7) introduces entrepreneurial thinking early, preparing students for the commercial aspects of design.

Moreover, the emphasis on digital ethics and copyright (R8) is critical in an age where digital creation and sharing are ubiquitous. As advised by (R8), explicit guidance on responsible digital citizenship is paramount, particularly when integrating social sharing features, aligning with frameworks for media literacy and digital safety (Livingstone & Helsper, 2008, *Taylor & Francis*). The proposed enhancements to user feedback and gamification (R3, R6) will be crucial for sustained engagement and deeper learning. Adaptive feedback, as discussed by (R6), supports personalized learning paths, while more complex leveling systems and community challenges (R3) leverage motivational psychology for continuous skill refinement. These elements collectively suggest a pathway towards creating not just a game, but a dynamic digital ecosystem for nurturing future design talent, ready to navigate the complexities of a rapidly evolving industry with both skill and responsibility.

8. Conclusion

The "Nesa Taylor" sewing simulation game, developed on the Scratch platform, stands as a compelling testament to the transformative potential of game-based learning (GBL) in modern education, particularly for the digital generation of aspiring young fashion designers. The findings from extensive expert interviews consistently affirm the urgent necessity for a paradigm shift in fashion education towards more digital and interactive approaches, directly addressing the unique learning characteristics of digital natives who thrive on visual, engaging, and experiential methods. This aligns strongly with established educational theories highlighting the effectiveness of GBL in enhancing intrinsic motivation and information retention and constructivist principles where learners actively build knowledge through interaction. The strategic choice of Scratch as the development platform is validated by its intuitive visual interface, which effectively reduces cognitive load and promotes creativity, making complex design concepts accessible to young users. While acknowledging minor technical limitations in highly realistic simulations, the experts recognize that Scratch's user-friendliness and robust community ecosystem significantly outweigh these drawbacks for foundational creative education, democratizing access to design tools and fostering collaborative learning environments. Beyond merely teaching technical sewing mechanics, "Nesa Taylor" demonstrably cultivates a vital blend of hard and soft skills, including pattern understanding, visual literacy, spatial reasoning, and crucial attributes like perseverance and computational thinking. This cultivation extends to fostering a *growth mindset* and encouraging *divergent thinking* by providing a safe space for experimentation, where mistakes are reframed as learning opportunities rather than deterrents. Looking ahead, the expert recommendations provide a clear roadmap for future development, emphasizing the need to integrate real-world design practices and ethical considerations. This includes enriching content with fashion history, promoting entrepreneurial thinking by simulating virtual sales, and addressing crucial contemporary issues like sustainability in design. Furthermore, embedding lessons on digital ethics and copyright, alongside features for parental oversight, is deemed essential to cultivate responsible digital citizenship among young creators. Ultimately, "Nesa Taylor" holds profound implications for nurturing future design talent by offering an immersive, interactive, and evolving digital ecosystem that not only imparts technical skills but also instills a holistic understanding of the fashion world and the responsibilities of a digital-age designer.

Acknowledgement

Acknowledgement, are extended to the vocational Faculty at Universitas Negeri Surabaya (UNESA), UPM, for their coordination and support throughout this study.

Conflict of Interest

The authors declare no conflict of interest.

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