

Stitch Quest: Interactive Learning Application for Sewing

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Abstract

This study designed, developed, and evaluated Stitch Quest: An Interactive Learning Application for Sewing, a technology-assisted instructional resource intended to support elementary learners in acquiring basic sewing knowledge and skills. The study was anchored in Constructivist Learning Theory, Cognitive Theory of Multimedia Learning, Self-Determination Theory, and Game-Based Learning Theory. A descriptive-developmental research design was employed, involving the systematic development and evaluation of the application using MIT App Inventor, TinyDB, multimedia resources, simulations, tutorials, interactive quizzes, level progression, scoring, feedback, and rewards. Fifty elementary teachers teaching Technology and Livelihood Education in public elementary schools in Tulunan East District were purposively selected as respondents. A five-point survey questionnaire assessed the application's content, usability, interactivity, and accessibility, while frequency count and mean were used for data analysis. Results showed that Stitch Quest was highly acceptable across all dimensions. Interactivity obtained the highest overall mean of 4.75, followed by content at 4.64, while usability and accessibility both obtained 4.59. Comparatively lower ratings for independent use, task efficiency, and navigation consistency indicated areas requiring further refinement. The study concluded that Stitch Quest provides relevant, organized, interactive, user-friendly, and accessible support for sewing instruction and recommended its use as a supplementary classroom and self-paced learning resource. Further improvements in quizzes, difficulty levels, navigation, platform compatibility, and future evaluation of learner performance and skill acquisition were recommended. The study primarily supports SDG 4: Quality Education through accessible and learner-centered technology-assisted instruction and SDG 9: Industry, Innovation and Infrastructure through educational technology innovation. Its sustainability impact is primarily educational, technological, and institutional, particularly through the development of a reusable digital resource that supports flexible instruction, continued access to learning materials, and technology integration in practical education.

Keywords: Accessibility, Game-Based Learning, Interactive Learning Application, Multimedia Learning, Sewing Education, Stitch Quest, Technology and Livelihood Education, Usability

1. Introduction

Advancements in educational technology have expanded opportunities for interactive, learner-centered instruction, particularly in skill-based education. Multimedia applications allow learners to engage with visual, auditory, and kinesthetic content, supporting comprehension and retention. This is especially relevant to sewing instruction, where learners must acquire procedural knowledge and practical skills. Mayer (2021) and Hodges et al. (2020) emphasized the importance of instructional approaches that support such learning, particularly when traditional teaching is constrained by limited instructional time, materials, and opportunities for repeated practice.

Interactive learning applications that combine three-dimensional images, videos, simulations, tutorials, and game-based assessments can provide engaging environments for learning technical procedures. These features can strengthen motivation, participation, and interaction with instructional content (Zainuddin, Chu, Shujahat, & Perera, 2020; Schindler et al., 2021). In response to these instructional needs, the study developed *Stitch Quest: An Interactive Learning Application for Sewing*, a digital learning resource designed to connect technology-assisted instruction with basic sewing knowledge and skills.

Sewing is a practical, skills-oriented area of instruction that requires learners to understand tools, materials, techniques, and sequential procedures. Conventional instruction commonly depends on teacher demonstrations and printed resources, which may provide limited opportunities for learners to repeatedly observe and practice sewing procedures. Multimedia-based instruction addresses this limitation by presenting skills through demonstrations, simulations, tutorials, and other interactive materials that learners can access and review according to their learning pace. Interactive and game-based learning environments further encourage active participation by providing tasks, challenges, feedback, and rewards. The integration of these features can increase learner engagement by making instructional activities more participatory and motivating (Zainuddin, Chu, Shujahat, & Perera, 2020). Younger learners may particularly benefit from such approaches because interactive and play-oriented learning experiences correspond with their learning characteristics (Tokac, Novak, & Thompson, 2022). The development of *Stitch Quest* responds to the need for an instructional resource that supports the teaching of basic sewing concepts through interactive digital experiences. Its features include multimedia content, simulations, tutorials, three-dimensional images, and game-based quizzes intended to provide learners with opportunities to observe, interact with, and review sewing-related content.

Game-based learning integrates elements such as points, levels, challenges, and rewards into instructional activities to strengthen motivation and participation. Research indicates that learners exposed to game-based instructional tools may demonstrate greater engagement and improved learning performance compared with learners who depend primarily on conventional instruction (Schindler et al., 2021). Game-based environments also provide opportunities for practice, immediate feedback, and interactive experiences that may strengthen both cognitive understanding and practical skill development (Zainuddin et al., 2020). Mobile-assisted learning further extends instruction beyond the conventional classroom by allowing learners to access educational materials through smartphones and tablets. Crompton and Burke (2020) explained that mobile learning provides flexibility, accessibility, and opportunities for learners to interact with instructional content at their own pace. Mobile applications can therefore function as supplementary learning resources that accommodate different learning approaches and provide convenient access to instructional materials. The effectiveness of mobile learning is strengthened when interactive and multimedia features are incorporated. Alrasheedi, Capretz, and Raza (2021) found that mobile learning environments can improve learner attitudes by providing accessible and interactive experiences. Crompton and Burke (2020) also emphasized their contribution to self-directed and personalized learning when multimedia resources such as videos, animations, and interactive activities are included. Interactive multimedia is particularly relevant to procedural learning because it combines text, images, animation, video, and simulation. Multimedia environments can support comprehension and retention by enabling learners to process information through visual and auditory channels (Mayer, 2021). For sewing instruction, these features provide visual representations of procedures that may be difficult to understand through verbal explanations or printed materials alone. Multimedia and immersive technologies can also make complex procedures easier to observe. Radianti, Majchrzak, Fromm, and Wohlgenannt (2020) reported that multimedia and immersive learning tools support understanding through realistic visual demonstrations. Similarly, Alamri (2021) found that interactive multimedia environments can improve motivation and learning performance by allowing learners to observe demonstrations and perform guided activities.

Within the national elementary education context, sewing is commonly introduced through Technology and Livelihood Education or other practical arts subjects to develop foundational life skills, fine motor coordination, creativity, patience, and problem-solving abilities. According to the Department of Education (DepEd Order #18, s. 2020), practical arts instruction in elementary education is intended to develop competencies that support everyday living and future skill development. Technology integration offers an alternative to instruction that relies heavily on direct demonstrations and printed materials. Cabero-Almenara, Barroso-Osuna, and Palacios-Rodríguez (2021) found that digital learning tools can strengthen procedural knowledge and learner participation in skill-based subjects. In Technology and Livelihood Education, Santos and De Guzman (2020) likewise reported that interactive instructional materials increased pupils' motivation and supported mastery of practical skills. At the broader level, technology has become increasingly important in technical and vocational learning environments because it expands access to instructional resources and provides additional opportunities for practical learning. UNESCO (2021) emphasized that technology-enhanced learning environments can contribute to the development of practical and technical competencies while increasing access to education. Digital simulations, instructional videos, and interactive modules further support learner-centered instruction by allowing students to interact with learning materials and practice skills through structured activities, as emphasized by Sangrà, Raffaghello, and Guitert (2021). The source chapter does not specify a particular local school or

community setting for the study. Consequently, its contextual foundation is primarily established through elementary TLE instruction at the national level and research on technology-assisted and vocational learning at the broader educational level.

The development of Stitch Quest is anchored in Constructivist Learning Theory, the Cognitive Theory of Multimedia Learning, Self-Determination Theory, and Game-Based Learning Theory. Piaget's Constructivist Learning Theory (1972) explains that learners actively construct knowledge through meaningful experiences and interactions. This perspective supports the use of interactive tutorials and simulations through which elementary learners can explore and understand basic sewing processes. The Cognitive Theory of Multimedia Learning proposed by Mayer (2009) holds that learning can be enhanced when information is appropriately presented through words and visuals. This provides a basis for incorporating three-dimensional images, video demonstrations, simulations, and visual tutorials into Stitch Quest. Self-Determination Theory developed by Deci and Ryan (2000) emphasizes autonomy and competence as important components of learner motivation. In the application, these principles are reflected through structured level progression, required scores, stars, and rewards that encourage learners to complete activities and demonstrate mastery. Game-Based Learning Theory articulated by Gee (2007) further supports the use of challenges, immediate feedback, and mastery-oriented progression to enhance engagement and skill acquisition. Together, these theories provide the foundation for developing a game-based and multimedia-rich application intended to support the learning of basic sewing concepts. Conceptually, the development of Stitch Quest follows an input-process-output structure. The inputs consist of ideas, books, references, materials, tools, and equipment used in developing the application. The process involves analyzing, planning, designing, developing, testing, revising, and evaluating the learning resource. The intended output is Stitch Quest: Interactive Learning Application for Sewing. Developmental research supports this systematic process of designing, producing, and evaluating educational products. Richey and Klein (2021) emphasized that developmental research combines product development and evaluation to improve educational practices. Evaluation by teachers and experts is also important in determining whether digital instructional resources meet instructional and curriculum requirements. Bond et al. (2020) emphasized the role of expert validation in ensuring that digital learning resources appropriately support learning objectives.

Although digital, mobile, multimedia, and game-based learning approaches have demonstrated potential for enhancing learner participation and procedural understanding, traditional sewing instruction may still be limited by instructional time, available materials, and opportunities for repeated demonstrations and practice. Existing literature supports technology integration in skill-based instruction but also establishes the need to develop and evaluate instructional resources designed for specific practical subjects such as basic sewing. Stitch Quest was therefore developed as an interactive learning application that combines multimedia presentation, simulations, tutorials, three-dimensional images, and game-based assessment within a single learning environment. The study specifically sought to design and develop the application and determine its acceptability in terms of content, usability, interactivity, and accessibility. The application covers basic sewing information, particularly tools, materials, and fundamental sewing techniques. Its game-based quizzes use levels, scores, stars, repetition of unsuccessful levels, and additional rewards as motivational features. However, the study is limited to the design, development, and acceptability evaluation of the application. It does not measure learners' academic achievement, actual sewing skill performance, or long-term learning outcomes and does not cover advanced sewing concepts.

The study is most directly aligned with SDG 4: Quality Education because it develops a technology-assisted instructional resource intended to support accessible, interactive, and learner-centered education. The application provides supplementary multimedia materials that can support the teaching and learning of practical sewing concepts while allowing learners to review instructional content at their own pace. The study also relates to SDG 9: Industry, Innovation and Infrastructure through the use and development of digital technology for educational innovation. Stitch Quest demonstrates the application of mobile, multimedia, simulation, and game-based technologies to a practical area of instruction, supporting the integration of innovative digital resources into teaching and learning. The study has an indirect connection with SDG 8: Decent Work and Economic Growth because sewing and practical arts instruction contribute to foundational competencies and future skill development. However, the present study does not directly examine employment, livelihood outcomes, or economic performance; its contribution is limited to supporting the instructional foundation for practical skill development.

The study primarily contributes to educational and technological sustainability by developing a reusable digital instructional resource that can supplement teacher demonstrations and provide learners with continued access to basic sewing instruction. Its multimedia and interactive features may support more flexible instructional delivery and help teachers maximize classroom time. The study also has relevance to institutional sustainability because its findings may provide curriculum specialists and school administrators with information concerning the integration of interactive and technology-based materials into skill-oriented subjects. The application may serve as a reference for developing or improving learner-centered digital instructional resources within Technology and Livelihood Education. From a broader multidisciplinary perspective, Stitch Quest connects education, technology,

practical arts, instructional design, and skill development. Its contribution to sustainability lies primarily in supporting continued access to instructional resources, innovative teaching practices, and the integration of digital learning tools into practical education. The study does not establish environmental or ecological sustainability outcomes; therefore, its sustainability relevance is appropriately confined to educational, technological, and institutional dimensions.

2. Material and methods

2.1 Research Design

The study utilized a descriptive–developmental research design focused on designing, developing, and evaluating an interactive learning application for sewing intended for elementary pupils. The developmental component involved the systematic production and refinement of the application, while the descriptive component was used to determine its acceptability in terms of content, usability, interactivity, and accessibility based on teachers' evaluations. The development followed a sequential lifecycle beginning with requirements analysis, where learning objectives, quiz structures, reward mechanisms, level progression, and teacher validation were established. System design involved planning the interface and user workflow, including the home, menu, learning modules, quizzes, results, and reward functions. The application was developed using MIT App Inventor, while TinyDB served as local storage for learner progress, quiz scores, stars earned, completed modules, and unlocked levels. Functional testing verified quiz operations, scoring, level unlocking, reward conditions, and data storage. The application was then packaged as an APK file for installation on mobile devices and classroom tablets, followed by maintenance and updates to improve its content and functionality. The application was structured to allow students to access learning modules, complete quizzes, receive scores and stars, unlock succeeding levels, and receive reward notifications when prescribed conditions were met. Teachers served a supervisory role by monitoring progress and confirming reward eligibility. The system organized information on students, modules, quiz levels, questions, quiz results, and rewards to manage learning progress and performance. The project required a total cost of Php 18,000.00, consisting of Php 15,000.00 for programming and Php 3,000.00 for pilot testing. Development was completed over four weeks, with one week each allotted for planning, designing, and preparation; development and programming; testing and revision; and evaluation.

2.2 Locale of the Study

The study was conducted in public elementary schools in Tulunan East District that offer Technology and Livelihood Education (TLE). The locale was selected because these schools provide instruction in basic life skills, including sewing, and have elementary teachers with relevant instructional experience who could evaluate the developed application.

2.3 Respondents of the Study

The respondents consisted of fifty (50) elementary school teachers who teach TLE. They evaluated the developed application, while elementary pupils were considered the intended users but were not directly involved as respondents during the evaluation phase.

2.4 Sample and Sampling Procedure

Purposive sampling was employed in selecting the respondents. Elementary teachers with experience in teaching sewing, practical arts, or Technology and Livelihood Education were intentionally chosen because of their expertise and familiarity with the subject matter. This approach ensured that the application was assessed by respondents capable of providing informed and relevant evaluations.

2.5 Research Instrument

A survey questionnaire was used to assess the acceptability of Stitch Quest in terms of content, usability, interactivity, and accessibility. The questionnaire for content was adapted from multimedia learning principles by Mayer (2009), while usability was adopted from Post-Study System Usability Questionnaire (PSSUQ) by Lewis (1992). Interactivity was adopted from interactive learning frameworks by Moreno and Mayer (2007), and accessibility was directly adopted from accessibility standards based on ISO 9241-11 and Universal Design for Learning guidelines. The instrument used a five-point rating scale. Mean scores of 4.50-5.00 were interpreted as Highly Acceptable, 3.50-4.49 as Acceptable, 2.50-3.49 as Moderately Acceptable, 1.50-2.49 as Unacceptable, and 1.00-1.49 as Highly Unacceptable. These ratings represented the respondents' assessment of the application's ease of use and overall acceptability.

2.6 Data Gathering Procedure

Data gathering followed a systematic process. Certification was first sought from the Ethics committee to ensure compliance with ethical standards, followed by permission from the head of office or research coordinator and the concerned school administrators. The developed application and evaluation questionnaire were then presented to the selected elementary teachers. After evaluation, the accomplished questionnaires were collected, checked for completeness, and prepared for analysis.

2.7 Data Analysis Techniques

The data obtained from the evaluation questionnaires were analyzed using frequency count and mean. Frequency count was used to describe the number of responses, while the mean was used to determine the level of acceptability of Stitch Quest in terms of content, usability, interactivity, and accessibility. The results provided the basis for determining the acceptability of the application as an instructional support tool for elementary sewing instruction.

2.8 Ethical Considerations

The study included procedures intended to ensure compliance with ethical requirements. Certification was sought from the Ethics committee before data gathering, and permission was obtained from the head of office or research coordinator and school administrators before the application and evaluation questionnaire were administered to the selected teachers.

3. Results and Discussion

3.1 Design and Development of Stitch Quest

3.1.1 Application Design and Learning Structure

Stitch Quest was designed around learning objectives covering basic sewing concepts, tools, materials, and fundamental techniques. Instructional content was organized into progressive learning modules supported by images, video demonstrations, and simulations. The application incorporated user registration, a dashboard for tracking learning progress, four learning modules, interactive quizzes, level progression, immediate feedback, star-based scoring, and rewards. Learners could access lessons, record module completion, answer five-question quizzes, view their scores, and unlock succeeding levels after achieving the required performance. Teachers served as facilitators who monitored progress and validated rewards. The multimedia structure supported organized and engaging presentation of sewing lessons, consistent with evidence that multimedia-integrated instruction improves learners' understanding and retention (Mayer, 2021). The use of star ratings, progression, feedback, and rewards was also intended to sustain participation and reinforce positive learning behavior, as incentive systems such as rewards, points, and feedback are essential in promoting motivation and engagement in learning environments (Lomos et al., 2023).

3.1.2 Application Development and System Functionality

The application was developed using MIT App Inventor for block-based programming, TinyDB for local data storage, and multimedia resources for instructional delivery. Its system structure organized student information, modules, quiz levels, questions, results, and rewards while supporting functions such as module access, quiz completion, score computation, star assignment, level unlocking, and reward activation. TinyDB stored learner progress, quiz results, earned stars, and unlocked levels, while continuous testing and refinement were performed to ensure that the application functions operated accurately and consistently. The integration of mobile technologies and multimedia resources supported the development of an accessible and engaging learning environment (Helen Crompton et al., 2021). According to Thomas Connolly and Begg (2022), effective database design through data modeling techniques such as Entity Relationship Diagrams (ERDs) supports data integrity, consistency, and efficient information management. According to Pressman and Maxim (2020), sequential flow diagrams are essential in guiding the structured step-by-step logic of system development by clearly defining the order of processes and decision points. According to Juho Hamari et al. (2022), gamification elements such as progression mechanics and reward systems contribute to learner motivation and reinforce desired behaviors. According to Ian Sommerville (2020), effective software systems also depend on reliable data storage and continuous testing to maintain functionality, accuracy, and user satisfaction.

3.2 Acceptability of Stitch Quest

3.2.1 Content

The content of Stitch Quest obtained an overall mean of 4.64 and was rated "Highly Acceptable." The highest-rated indicator was the accuracy and relevance of sewing information, with a mean of 4.74. The appropriateness of lesson difficulty, use of visuals and multimedia, and suitability of the content for sewing instruction each obtained a mean of 4.68. The clarity of the learning objectives received the lowest mean of 4.50 but remained within the "Highly Acceptable" category. These results indicate that respondents generally regarded the application's instructional content as accurate, relevant, appropriately structured, and suitable for sewing education. The high content rating reflects the importance of accurate and relevant instructional information in supporting satisfaction, engagement, and learning effectiveness (Alterkait & Alduaij, 2024; Utami et al., 2024). According to Mayer (2023), accurate, learner-centered, and well-structured multimedia instructional resources successfully support the development of both knowledge and skills, guaranteeing excellent instructional quality and learner acceptability. Clark (2023), also emphasized that learners' comprehension and attentiveness can be further improved by adjusting learning objectives for more accuracy and emphasis, even in cases when they are generally clear.

3.2.2 Usability

Stitch Quest obtained an overall usability mean of 4.59, interpreted as “Highly Acceptable.” Ease of use and the proper functioning of application features received the highest means of 4.72. Navigation, screen information, responsiveness, layout, error messages, and overall usability were also rated highly. However, efficiency in completing tasks obtained a mean of 4.47, while comfort in using the application without assistance received 4.42; both were rated “Acceptable.” These results indicate that the application was generally easy to use, although some users may require minor assistance or greater familiarity with the interface. The findings indicate that the application provides generally efficient and satisfactory user interaction. As emphasized by Nielsen (2020), highly usable systems enable users to interact efficiently and effectively with minimal difficulty, contributing to greater user satisfaction and system acceptability. The high ratings for ease of use and functional reliability are consistent with the principle that usability is strongly influenced by reliable system performance and ease of interaction (Nielsen, 2020). Garrett’s (2021) study emphasizes that first-time users may still require improved onboarding and greater interface familiarity, which corresponds with the comparatively lower ratings for task efficiency and independent use.

3.2.3 Interactivity

Interactivity received the highest evaluation among the four criteria, with an overall mean of 4.75 and a “Highly Acceptable” rating. The application’s ability to provide an engaging learning experience received the highest mean of 4.82, followed by the quizzes that made sewing instruction more engaging at 4.80. Effective interaction between lessons and quizzes received 4.78, while interactive features, scoring, level unlocking, feedback, and rewards were also highly rated. Learning by doing obtained the lowest mean of 4.70 but remained “Highly Acceptable.” The findings show that the application’s interactive components supported active engagement and sustained learner interest. Mayer (2023) supports this by highlighting how well-designed interactive multimedia learning environments encourage engagement, active cognitive processing, and meaningful learning. The integration of quizzes, level progression, and rewards is also consistent with findings that quiz-based learning activities enhance motivation and retention in digital learning environments (Wang & Tahir, 2020). Moreover, the application’s emphasis on active participation reflects Kolb (2015), experiential learning theory, where knowledge is created from firsthand experience and self-reflection, increasing the significance and effectiveness of learning.

3.2.4 Accessibility

The accessibility of Stitch Quest obtained an overall mean of 4.59 and was rated “Highly Acceptable.” Ease of access through mobile devices received the highest mean of 4.78. Clearly labeled buttons and icons obtained 4.68, while the visibility of text, images, and videos and accessibility to intended users both received 4.64. Other indicators relating to instructions, different learning speeds, reduced confusion, and limited technical skill requirements were also highly rated. Navigation consistency received the lowest mean of 4.46 and was rated “Acceptable,” indicating a minor area for improvement. The findings indicate that Stitch Quest generally minimizes barriers to access and supports convenient use through mobile devices. This is supported by Burgstahler (2020), who emphasized that accessibility in educational technology is strengthened when systems are device-compatible and readily available across platforms. The application’s interface clarity is also consistent with usability and accessibility design standards (ISO 9241-112, 2017). Although navigation received a comparatively lower rating, improving its consistency could further enhance accessibility and provide a smoother user experience (Nielsen, 2020).

3.3 Overall Acceptability of Stitch Quest

Across the evaluated dimensions, Stitch Quest was consistently rated “Highly Acceptable.” Interactivity received the highest overall mean of 4.75, followed by content at 4.64, while usability and accessibility each obtained 4.59. The results indicate that the application was positively evaluated in terms of its instructional content, ease of use, interactive learning features, and accessibility. The comparatively lower ratings for independent use, task efficiency, and navigation consistency identify specific aspects of the application that may benefit from further refinement.

4. Conclusion & Recommendations

Stitch Quest: An Interactive Learning Application for Sewing was successfully designed and developed using MIT App Inventor, TinyDB, and multimedia resources to provide structured learning modules, interactive quizzes, star-based scoring, level progression, feedback, and rewards. The application was found to be highly acceptable in terms of content, usability, interactivity, and accessibility, indicating that its instructional content was relevant and organized, its features supported learner engagement and motivation, and its interface was generally user-friendly and accessible through mobile devices.

Stitch Quest is recommended as a supplementary classroom and self-paced learning resource for sewing education and as a technology-based instructional tool for skills subjects. The application may be further improved by increasing quiz questions to 10–15 items, providing level-difficulty options, incorporating question randomization

and time limits, enhancing navigation consistency, and optimizing performance across Android, iOS, Windows, macOS, and Linux. Further studies are also recommended to determine its effectiveness in improving learners' academic performance and skill acquisition.

5. Compliance with ethical standards

The study incorporated ethical procedures before data collection, including seeking certification from the Ethics committee and obtaining permission from the appropriate institutional and school authorities prior to administering the application and evaluation questionnaire to the selected teachers.

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