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“Scribbles”, An Android App (Cacographic) to Enhance Hand agility in Children With Poor Handwriting & Grammatical Mistakes

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ABSTRACT: In the modern world of communication, effective handwriting skills and grammatical accuracy remain crucial, yet many children encounter difficulties in mastering these fundamental abilities. "Scribbles" is an Android application, lovingly referred to as "Cacographic," developed to address these challenges by enhancing hand agility and rectifying grammatical mistakes in children with poor handwriting.

This innovative project focuses on creating an engaging and educational mobile app that helps children develop fine motor skills, hand agility, and linguistic accuracy. "Scribbles" combines the best of educational technology with the specific needs of children who struggle with handwriting and grammar.

The development journey commences with in-depth user research, engaging children, parents, and educators to better understand the unique obstacles faced by those with poor handwriting and grammatical challenges. "Scribbles" is designed as an all-encompassing solution, integrating gamification, user-friendly interface design, and age-appropriate content to captivate children while fostering their skill development.

The app boasts an array of features, including handwriting exercises, grammar correction exercises, interactive games, and progress tracking. By offering children a seamless and enjoyable learning experience, "Scribbles" aspires to make the path to better handwriting and grammatical proficiency a rewarding one. The app's multi-user support allows children to create individual profiles and monitor their progress over time.

Usability testing and iterative development are critical components of the project, ensuring that "Scribbles" is not just a concept but a practical tool for hand agility enhancement and grammar correction. User feedback and extensive testing are leveraged to refine the app and make it a reliable resource.

Upon completion, "Scribbles" will be submitted to the Google Play Store, ready to be accessed by children, parents, educators, and language enthusiasts. Marketing strategies will be deployed to reach the target audience and offer them a comprehensive tool that can significantly impact the lives of children with poor handwriting and grammatical mistakes.

With ongoing monitoring, updates, and collaboration with educational institutions, "Scribbles" aims to be more than just an app; it aims to be a transformational force in helping children overcome challenges related to handwriting and grammar, empowering them with the skills they need to communicate effectively in the modern world.

KEYWORDS: Digital tools, evolutionary prototyping, fine motor skill, HCI principles, handwriting difficulty, hand dexterity, Tablet PC, touch-based interfaces

I. INTRODUCTION

In the ever-evolving landscape of education and communication, the ability to write clearly and express thoughts accurately remains of paramount importance. Yet, there are children who face challenges with poor handwriting and grammatical mistakes that can hinder their academic progress and communication skills. Addressing these issues head-on is the "Scribbles" Android application, affectionately named "Cacographic."

"Scribbles" is designed to be a transformative educational tool, focused on enhancing hand agility and rectifying grammatical mistakes in children. It seeks to create a holistic learning environment that not only addresses these challenges but also makes the journey enjoyable and engaging. This introduction provides an overview of the

"Scribbles" app, detailing its purpose, development objectives, and the vital role it plays in supporting children facing these difficulties.

The Need for "Scribbles":

For many children, the development of clear and legible handwriting is a complex and often overlooked skill. Handwriting issues can lead to frustration, reduced self-confidence, and academic challenges. Additionally, grammatical errors can hinder effective communication, impacting both written and spoken language proficiency. In recognition of these challenges, "Scribbles" steps in as a solution that integrates technology, education, and creativity to assist children in honing their handwriting and language skills.

The Purpose of "Scribbles":

The primary purpose of "Scribbles" is to enhance hand agility in children with poor handwriting and to help them overcome grammatical mistakes. By creating an interactive, engaging, and educational platform, this app endeavors to provide children with an opportunity to refine their fine motor skills, develop legible handwriting, and attain grammatical accuracy in a captivating manner. "Scribbles" is designed not just as an app but as a holistic learning experience that empowers children to take control of their progress.

Key Features and Objectives:

"Scribbles" offers a range of features, including handwriting exercises, grammar correction exercises, interactive games, and progress tracking. These features are meticulously designed to provide a comprehensive learning journey that captures children's attention and fosters skill development. The app also supports multiple user profiles, allowing children to monitor their individual progress and improvement over time.

In the journey to develop "Scribbles," user research, usability testing, and iterative development have been key components. This approach ensures that the app is not just a concept but a practical and effective tool for enhancing hand agility and correcting grammatical errors.

Impact and Transformation:

Upon completion, "Scribbles" will be made available on the Google Play Store, accessible to children, parents, educators, and language enthusiasts. The app's impact goes beyond individual skill development; it aims to be a transformative force in helping children overcome challenges related to handwriting and grammar. By providing them with the skills needed to communicate effectively in the modern world, "Scribbles" seeks to empower children with confidence and competence.

II.METHODOLOGY

Phase 1: Needs Assessment and User Research

Needs Assessment:

Conduct a comprehensive needs assessment to understand the specific challenges children face in handwriting and grammar in multiple languages, including English, Hindi, and Marathi.

User Research:

Engage with children, parents, and educators who represent the target audience to gather insights into the challenges they encounter with poor handwriting and grammatical errors in different languages.

Phase 2: Design and Content Development

- **UI and UX Design:**

Collaborate with UI/UX designers to create an intuitive, child-friendly interface that accommodates multiple languages. Develop user-friendly language switching options within the app.

- **Feature Planning:**

Identify and prioritize features that cater to the improvement of hand agility, handwriting, and grammatical accuracy in English, Hindi, and Marathi.

- **Content Creation:**

Work with linguists and language experts to develop exercises, content, and activities in all three languages, ensuring they align with language-specific grammatical challenges.

Phase 3: App Development

- Multi-Language Support:

Choose appropriate technologies and libraries that facilitate the integration of multiple languages.

Ensure seamless switching between languages within the app.

- Exercise and Game Development:

Create exercises and games for improving hand agility, handwriting, and grammar, tailored to the specific challenges of each language.

- Progress Tracking:

Integrate a progress tracking system that records the child's development in each language.

- Gamification Elements:

Include language-specific gamification features, rewards, and achievements to motivate children to continue learning and improving their skills in each language.

Phase 4: Testing and Iteration

- Usability Testing:

Conduct usability testing with children proficient in English, Hindi, and Marathi to ensure the app's effectiveness in addressing language-specific challenges.

- Bug Testing:

Rigorously test the app to identify and rectify technical issues and bugs related to language switching and grammar correction.

- Iterative Development:

Use feedback from users in each language group to make iterative improvements to the app's design, features, and exercises, adapting them to the linguistic nuances of English, Hindi, and Marathi.

Phase 5: Deployment and Localization

- App Store Submission:

Prepare the app for submission to the Google Play Store with support for multiple languages.

Ensure compliance with localization requirements for each language.

- Localization and Language Checks:

Collaborate with linguists and native speakers to perform language checks and ensure grammatical accuracy in English, Hindi, and Marathi.

Phase 6: Education and Training

- User Guides and Tutorials:

Create user guides and tutorials within the app for each language to assist children and parents in understanding language-specific exercises and activities.

- Educator Training:

Provide training materials for educators and language instructors to support the integration of the app into language and handwriting improvement programs.

Phase 7: Evaluation and Impact Assessment

- User Feedback and Evaluation:

Continuously collect user feedback in each language group to assess the effectiveness of the app in improving hand agility, handwriting, and grammar.

- Research and Impact Assessment:

Collaborate with educational institutions and linguistic experts to evaluate the app's impact on language proficiency and handwriting skills in English, Hindi, and Marathi.

By following this comprehensive methodology, "Scribbles" (Cacographic) can be developed as an effective tool for enhancing hand agility and correcting grammatical mistakes in multiple languages, addressing the specific linguistic and handwriting challenges faced by children.

III. MODELING AND ANALYSIS

Modeling:

1. Conceptual Model Development:

Create a conceptual model that outlines the core components and interactions within the app. This model should illustrate how language-specific exercises, grammar correction activities, and hand agility exercises are interconnected.

2. Language-Specific Conceptual Models:

Develop language-specific conceptual models for English, Hindi, and Marathi. These models should address the unique grammatical challenges of each language and the linguistic nuances that affect handwriting.

3. Flowcharts and User Path Modeling:

Create flowcharts and user path models to represent how children navigate through the app, switch between languages, and access different exercises. Ensure these models consider the user's progress tracking and feedback mechanisms.

4. Educational Model Enhancement:

Continuously refine the conceptual models based on feedback from educators and language experts. Adjust the models to better represent the flow of language-specific learning and how it improves hand agility and corrects grammatical mistakes.

Analysis:

1. Quantitative Data Collection:

Collect quantitative data on children's performance within the app. This data should include progress metrics related to hand agility, handwriting improvement, and grammatical accuracy for each language.

2. Language-Specific Data Analysis:

Analyze the quantitative data separately for each language, allowing for language-specific insights into the effectiveness of exercises and activities. Determine which areas of grammar correction and hand agility need further attention in each language.

3. Comparative Analysis:

Conduct a comparative analysis to assess the relative effectiveness of exercises and activities in English, Hindi, and Marathi. Determine which language groups show the most improvement and in which specific areas.

4. Qualitative Data Collection:

Gather qualitative data through user feedback, interviews, and surveys, focusing on language-specific challenges and improvements. Capture insights into children's experiences and their perceptions of handwriting and grammatical correction in their respective languages.

1. Thematic Analysis:

Perform thematic analysis of qualitative data to identify recurring patterns related to language-specific challenges, user engagement, and the app's effectiveness in improving hand agility and grammatical accuracy.

2. Feedback Integration:

Incorporate feedback from users, educators, and language experts into the app's ongoing development. Adjust exercises, activities, and language-specific content based on this feedback.

3. Long-Term Retention Analysis:

Assess the long-term retention of language skills, hand agility, and grammatical improvements by periodically reevaluating children's performance over time.

4. Transferability Assessment:

Investigate whether the skills developed in the app (e.g., grammatical correction) transfer to other areas of a child's life, such as improved schoolwork or everyday communication.

5. Refinement of Language-Specific Models:

Utilize the results of the analysis to refine the language-specific conceptual models. Make adjustments to better represent the flow of learning, the unique linguistic challenges of each language, and the relationships between language proficiency and handwriting improvement.

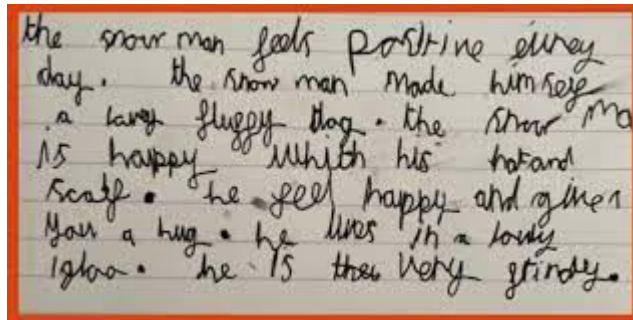


Figure 1. Offline Snapshot

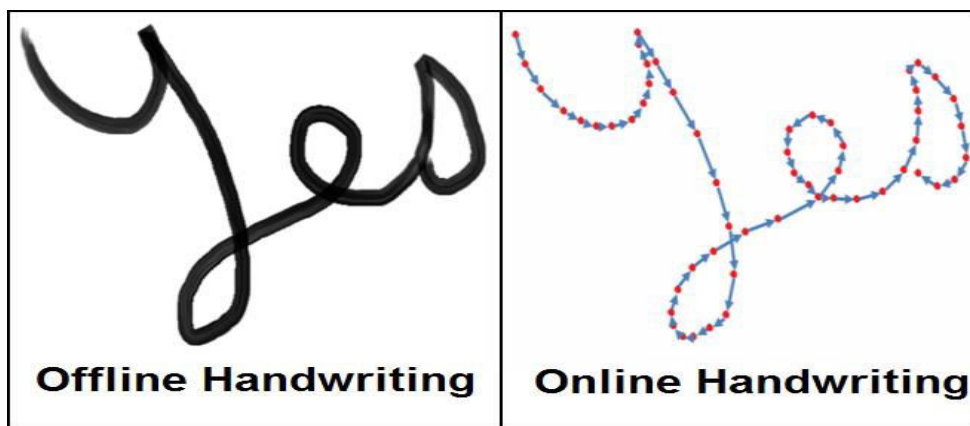


Figure 2. Comparative

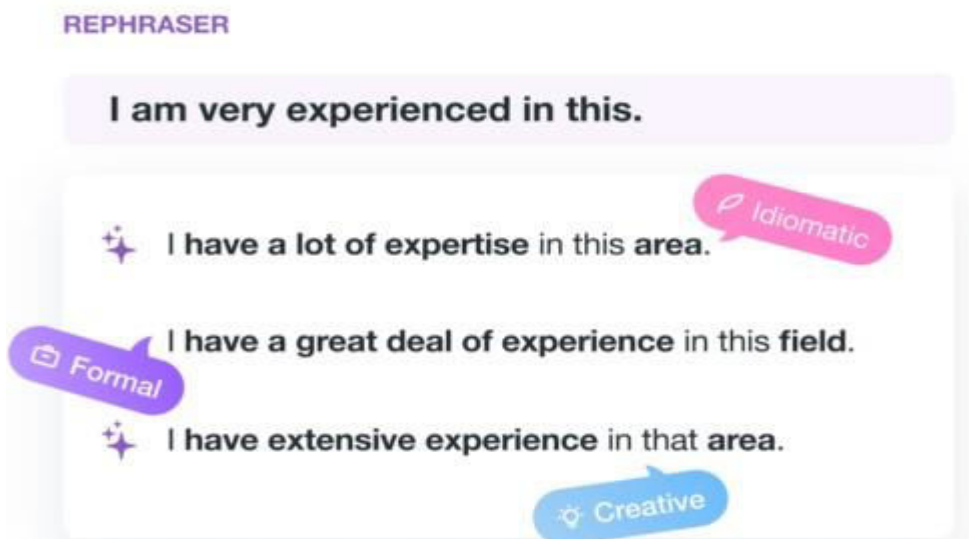


Figure 3. Grammatical Check

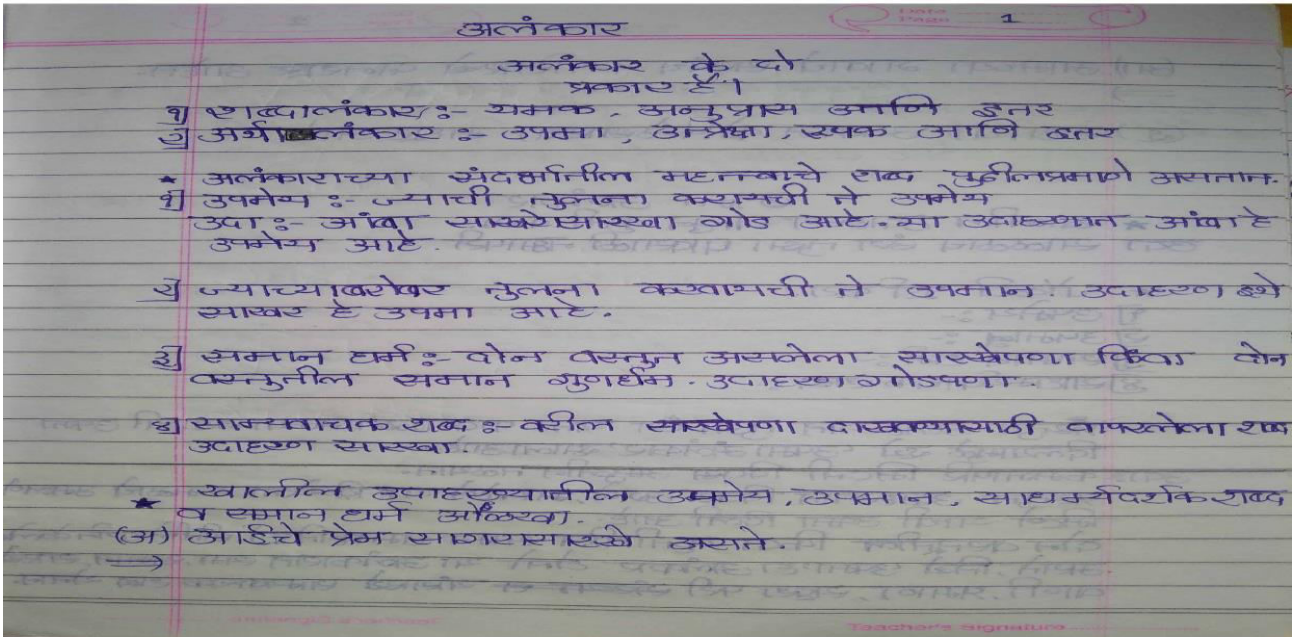


Figure 4. Other Languages Offline snapshot



Figure 5. Grammar Checker

IV. ANALYSIS

After the pretest, the children were asked to perform all six activities on a tablet computer one by one. The first activity, Finger Aerobics, is a game-oriented activity to develop pencil/pen grip in children. The second activity, Pattern Trace, was used to develop visualmotor integration. The third activity, Circle Trace-Basic, may help children to enhance curved movements and drawing skills. The fourth activity, Circle Trace-Advanced, helps children develop visual-spatial skills. The fifth activity, Hand-Dominance is used to identify the dominant hand and also to develop hand-eye coordination in children with writing difficulties. Finally, the Letter Trace activity was used to teach the letter size and shape (both uppercase and lowercase).

V. RESULTS

This paper describes the design, development, and efficacy evaluation of the application Scribbles for enhancing hand dexterity in children with poor handwriting. It is an Android application that uses the touchscreen technology. We followed various user interface guidelines to develop this application. The application mainly focuses on developing fine motor and visual-motor integration skills to improve hand dexterity. It comprises six activities to improve hand-eye coordination, strengthen hand muscles and pencil grip, and improve visual-spatial organization. The activities provided by the app may help students modulate the vertical and horizontal oscillations of the writing tool to produce better handwriting. The main advantage of the app is that it provides audible feedback and visual cues when haptic interactions in the activities go wrong, so that the child can immediately correct his/her movements.

V.CONCLUSION AND FUTURE WORK

In this digital era, the support of technological tools is complementary to the existing remediation methods for children with learning difficulties. It supports parents, special educators, and occupational therapists in assisting children with learning difficulties in classroom premises and in-home practice. In the future, we need further training sessions with children having poor handwriting skills to make more observations and strong conclusions on the efficacy of the software application. Based on the results, we can modify our app further to make it robust. This evolutionary process may require several rounds of evaluation and improvisation until a full-fledged app is obtained. Another future direction is to integrate a machine learning component into this learning environment, so that occupational therapists or doctors can easily detect deficits in the writing skills of a child.

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