



CS3216 Final Project Report

TaleWeaver

Group 1

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Preliminaries

URL for live application: <https://www.taleweaver.net>

Link to GitHub repository: <https://github.com/taleweaverapp/taleweaver>

Description of Application

Our application, TaleWeaver, is a web application that offers parents with young children the ability to create customised illustrated stories for their child. In addition to setting various parameters such as what the story is about, what values it should impart, etc, parents can also personalise the story to their child. They do so by creating an avatar that resembles their child and using that as the main character in the story. TaleWeaver thus offers a convenient and time-efficient means for parents to provide personalised storytelling experiences, not only alleviating the frustration of repetitive and hard-to-find books but also fostering engagement through the child's inclusion as the main character. It stands out as a superior alternative to mindless screen time, encouraging children to explore imaginative worlds through personalised stories and illustrations while also enabling parents to instil moral values, ensuring that the time children spend with TaleWeaver is not just entertaining but also enriching.

Competitor Analysis

BedtimeStory.ai

Pros

1. Highly Customisable -
BedtimeStory offers extensive customisation options, ranging from story types, reader ages, to writing styles. They allow users to speed up the generation time, and offer users the option to skip the image generation step altogether to create the story faster. Additionally, they allow users to randomly generate a topic with the 'I'm feeling lucky' button, speeding up the generation process.

Create a new story

Every good story starts with a good idea

For example, "A boy that loves water balloons..."

I'm feeling lucky Generate story

Advanced settings

Language: English Story type: Bedtime Story: A classic. Reader age: Cr... Writing style: Normal typing s... Experience: 12 paragraphs (~600 words)

Story length: Story length

Fable: Moral lessons, talking animals.
Fairytale: Magic, enchanting creatures, happy endings.
Adventure: Exciting journeys, young heroes, challenges.
Educational: Informative, age-appropriate facts, engaging.
Mystery: Puzzles, clues, child detectives.
Science fiction: Futuristic, imaginative worlds, exploration.
Realistic fiction: Everyday life, relatable characters, emotions.

2. Large Collection -
BedtimeStory has a large collection of stories submitted by users, including stories in many other languages.

The screenshot shows the BedtimeStory.ai website interface. On the left, there's a sidebar with navigation links like 'Create', 'Discover', 'My library', 'My profile', and 'Settings'. Below these are buttons for 'Upgrade to PRO' and a user profile icon. The main area has two sections: 'Create' (with fields for title, story type, reader age, writing style, and experience level) and 'Browse' (showing a grid of story thumbnails and categories like Adventure, Bedtime Story, Educational, Fable, Fairytale, Mystery, Realistic fiction, and Science fiction). At the top right, there's a promotional banner for 'Earlybird 50% OFF'.

Displaying all of these allows parents to instantly choose a story.

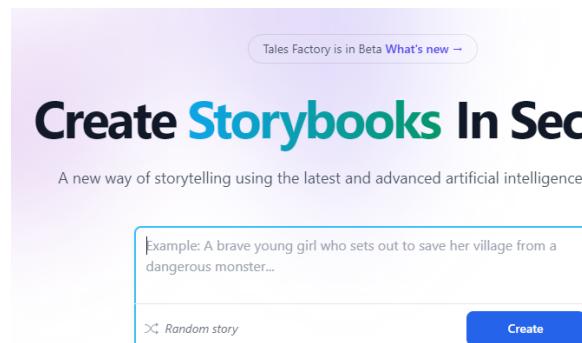
Cons

1. Lack of Safety - The largest concern with BedtimeStory is that there is completely no content restriction in the stories. From our testing, even the most morbid and child-unfriendly prompts were greeted with an extensive story that provided details that were completely age-inappropriate. For example, this quote was taken from a story (<https://bedtimestory.ai/joshenlim1/story/sbYTrli>) that was intended to be for 1-2 year olds: *"After a few minutes of exploring each other's bodies, the pair began to feel uncomfortable with what they had just done, ... Jack grabbed a nearby rock and hit Jill over the head with it multiple times ... Jill was lying motionless on the ground beside him—blood seeping out from her forehead onto the grass beneath her body—and he knew immediately that she was dead."*
2. Poor Content Quality - Though the free stories tend to be lengthy, the free versions only contain 1 image. The vocabulary of their stories seem to be targeted at teens or children of older age than what was specified.

Talesfactory

Pros

1. Pricing - Their pricing model is quite reasonable, with users being able to generate 50 stories with just \$10 a month. Free credits are also given after an account is created, allowing for users to test out their product first before committing to it.
2. Safety - The stories generated seem to be safe.
3. Audio narration - They provide audio narration for each page.



Cons

1. Poor Content Quality - Images generated for each page of the story have little to no link to each other, often featuring different subjects and lack of details. Increasing the quality of pictures is hidden behind a paywall, preventing users from knowing how good the images can get. Also, the UI of the story is simplistic.
2. Poor Customisation - Users are only able to generate a story from a prompt. They are unable to customise the story to age, theme, vocabulary, and leave most of the hard work, creativity, to the users.

Childbook



Pros

1. Beautiful Artwork and Layout - Images in their demo are consistent throughout, and the art style remains similar with engaging, colourful content. The story itself is also displayed like a book, featuring pages that flip to simulate an actual book.
2. Character Customisation - Users are able to enter many characteristics about the character, personalising it to the child. They are able to key in ethnicity, age, hair length to make sure that the illustrations are consistent. Users can also select the story to be a rhyming story.

Cons

1. Paywall - Expensive, users are required to spend 1.5-2.5 SGD per story or 30 SGD a month for unlimited stories.
2. Limited Story Customisation - Users are required to key in the entire prompt of the story, unable to focus on educational features like learning vocabulary or choosing the values that the story should impart. Most of the creativity is left to the user. Users are entirely un-guided when coming up with stories, creating more friction for them.

TaleWeaver - our difference

1. Safety - Our application puts several measures through prompt engineering, profanity filters, to make sure that stories produced are of content that are age-appropriate and child-friendly.
2. Customisation - Our application highlights several customisation features that we have identified as important to our target users. We also boast an intuitive and effective UI for users to maximise their customisation options without compromising on time. Importantly, we let parents customise stories to their children using avatars. Avatars let children feel represented accurately in the story's illustrations.
3. Content Quality - Our application tailors stories with the right vocabulary and creates beautiful visuals that are more consistent than in our competitors' stories. Our visuals attracted a lot of positive reactions from our users so far, which we take as a good signal about the illustration quality.
4. Pricing model - All users get 3 free stories, letting every new user trial the application. These free stories are representative of the normal stories that TaleWeaver will generate (unlike in competitors like BedtimeStory), empowering parents to make a more informed choice. Our paid tiers cost about S\$1 per story (assuming complete usage) - this pricing model is justified to cover our API and storage costs.

Factors ranked from most important to least (1 = worst, 5 = best)	TaleWeaver	Childbook	Talesfactory	BedtimeStory.ai
Safety	5	?	3	1
Customization	5	4	1	5
Content	4	4	3	2
Pricing	3	2 (Not Free)	4 (10/mo)	4 (10/mo)
Seamlessness	3	?	4	5
Narration	No	Yes	Yes	No

TaleWeaver prioritises parents' actual needs: making stories safe, customising stories to specific goals or values, and ensuring children feel represented by the illustrations in their storybooks (via avatars). Our pricing model is admittedly more expensive to cover our current costs. We could possibly optimise how we use compute and storage to reduce costs, or operate at a loss if we have a strong reason to do so. Talesfactory and BedtimeStory are faster at generating stories, and currently provide a more seamless experience. However, our job queue system will scale better as sufficient traffic will lead to both those apps' blocking loading screen being a problem. Lastly, we de-prioritised narration since our priority is for parents and children to use TaleWeaver for bonding.

Milestones and Timeline Review

Through our regular reviews and sprint meetings, we were able to hit most of our milestones and follow our timeline quite closely. Part of our ability to do so was due to several key revisions of milestones that involved de-prioritising certain tasks in favour of others. While doing so, we always made sure that the change in priorities came from the refinement of our product direction, that in turn stemmed from user feedback and interviews. In the below subsections, we will briefly detail the key changes in milestones and whether or not we were able to stick to the proposed timeline.

Proposal to Progress Report 1

Our initial plan for this period was to focus on the following: refining prompt engineering and story generation, setting design system and branding via user interviews, several UX fixes, and an iPad app.

During our proposal meeting and through our user interviews, we realised that there was not much value-add to developing an iPad app, and thus we decided to drop the pursuit of the iPad app in favour of development of our key product. Hence, our efforts shifted more to increasing image quality, which users expressed strong dissatisfaction with during our first round of user testing. We also increased the priority of reducing waiting times as suggested by our users.

We were able to meet most of our milestones, with the sole exception being some UX fixes that we were unable to implement in time, in particular the responsive layout for the story for users viewing on mobile devices.

Other than the above, we achieved a dramatic improvement in both text and image prompt engineering, facilitated by a shift to Stable Diffusion API (after rigorous testing of other LLM providers). We also made several improvements to our UI that was backed by our branding and design system, as well as reduced waiting time by displaying the initial text and cover image first for children and parents to read, while continuing to generate the remainder of the images. In addition, we added in a small game to keep children entertained while the text and cover image was being generated.

Overall, this period was quite successful for us. Even though we did not manage to hit all our milestones, we felt that the focus on refining the direction of our product was very important as it set a solid groundwork for future work.

Progress Report 1 to Progress Report 2

Our initial plan for this period was to continue working on prompt testing to iron out bugs, add in a new avatar customisation feature, integrate a payment system, and work on various enhancements such as a “like” feature and tracking of generation count and reason for generation failures. For marketing and user research, we planned to conduct more user interviews, continue updating our design system and branding, as well as begin publicity and outreach.

After conducting user interviews, we realised that the game we had implemented previously was not enough to solve the issue of waiting times. Hence, we brainstormed to come up with a 2-pronged approach to resolve this issue, and increased its priority. The approach was to allow users to generate multiple stories at a time, removing the “bottleneck” of waiting for a story to be generated before they can generate another one. Users could also navigate away from the “Create” page while a story is being generated. Once generated, the story will automatically be added to their libraries. Thus, this allows users to explore other stories with their child while the generation is ongoing.

To accommodate the above change in priority, we decided to de-prioritise issues of lesser importance, such as refining the landing page and sorting features for the public gallery. This change allowed us to focus our efforts on features that would more directly impact our users.

We were able to achieve the milestone set out for this period. In particular, we were able to implement the 2 key features of avatar creation and the job queue system, as well as further optimise our prompts to increase consistency and achieve greater customizability. We were also able to integrate new sign-in methods and a payment system, and could now keep track of generations and their statuses, as well as “likes” that a story received. On the marketing end, we also created social media pages and began to slowly release content to showcase our features.

Progress Report 2 to Present

Our initial plan for this period was to continue working on prompt fixes that had come up through our logging of generation failures, finalise payment system integration, and add in notifications for the job queue system. In addition, we aimed to tidy up the front end and landing page, as well as resolve any bugs or edge cases that might come up. On the marketing and user research side, we planned to focus on publicity and outreach, conducting user interviews where necessary.

While we did not conduct formal user interviews in the end, we did a few informal surveys that helped to inform some of the front end changes that we made, such as buttons and flows for avatar creation. We decided not to conduct user interviews at this stage because we had not introduced many significant changes, and felt that our efforts would be better focused on making a more polished product. In addition, we knew that we would also be able to get user feedback during StePS.

We did not make other changes to our timeline, and were able to complete the tasks as set out above, as well as some other enhancements such as the ability to sort the stories in the public gallery. However, we were not able to fix some of the prompt issues that we had, and this problem surfaced during StePS itself. The key problem was that the image prompts for Stable Diffusion were being flagged by the LLM’s API because they contained certain keywords, for example “young child”. While we had a few ideas of how to get around this issue, we were unable to implement and test them in time.

In terms of marketing and user research, we released a series of posts to further increase our publicity and outreach. While we were able to achieve a decent number of post

impressions, we felt that we could have done more on this end, for instance by posting to Facebook groups that catered to young parents. We plan to carry this plan out in the future.

Overall, we were able to meet all our milestones for this period, although some efforts were more successful than others. The gaps that we have identified above will be very useful in further improving our product post-CS3216.

Individual Contribution and Roles

Joshen Lim

- Product management, delegation of work and prioritisation of tasks
- Implementation of branding and ensuring consistency throughout website
- Mobile-responsive development for stories, landing page, and 'Create Story' pages
- Create Avatar feature, Stripe payment integration, migration to SDXL API, credits and subscription logic and display
- STePS video

Jivesh Mohan

- Routing of individual stories to unique URLs, only displaying public stories to users
- Integration of Authentication, Google Auth, email client setup
- Implementation of notification UI for successful/failed story generation
- Improve UX of 'Create Story' page

Neo Wei Qing

- Spearheaded triaging of deployment options, and handling of deployment versions
- Developed the Likes feature, sorting of results, integration of avatar descriptors into story
- Implemented logging of story generation details (total count, success, failures) for better
- Improved visual display of user's subscription details, and provide better UX options when users run out of credits

Quan Teng Foong

- Improved Random Story feature to be independent of GPT API calls
- Spearheaded Job Queue backend logic to allow background generation of stories
- Developed display for failed generations and allow user to recreate using saved customisation options
- Integrated Tanstack React Query to cache fetched stories, significantly reducing egress amounts
- Parallelised generation of images

Justin Lim

- Creation and execution of branding identity and assets
- UI prototyping and research
- UX research and reporting
- Marketing Strategy
- STEPS marketing collaterals (standee, posters, namecards, stickers)

Components

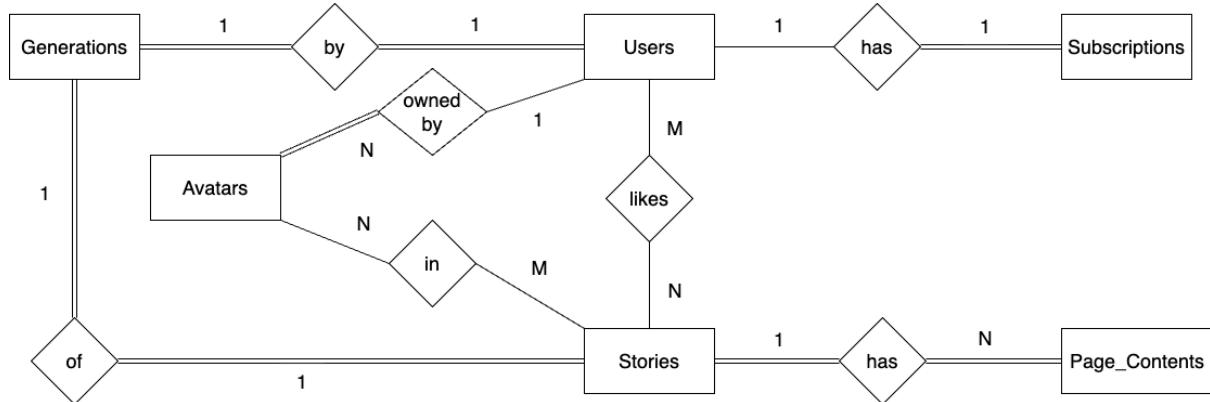
COLOURS

Color Name	Description	Hex Code
BRAND 1	This is the first main color of TaleWeaver	#40211F
BRAND 2	This is the second main color of TaleWeaver	#EE601A
FEEDBACK 1	This is the second main color of TaleWeaver	#228834
FEEDBACK 2	This is the second main color of TaleWeaver	#E3451C
2ND 1	This is the first main color of TaleWeaver	#40211F
2ND 3	This is the second main color of TaleWeaver	#EE601A
2ND 4	This is the second main color of TaleWeaver	#EE601A
NEUTRAL 1	Darker neutral tone for TaleWeaver	#404040
NEUTRAL 2	Lighter neutral tone for TaleWeaver	#EBEBEB
NEUTRAL 3	Lighter neutral tone for TaleWeaver	#EBEBEB

TaleWeaver UI Screens

Application Design

Database ER Diagram



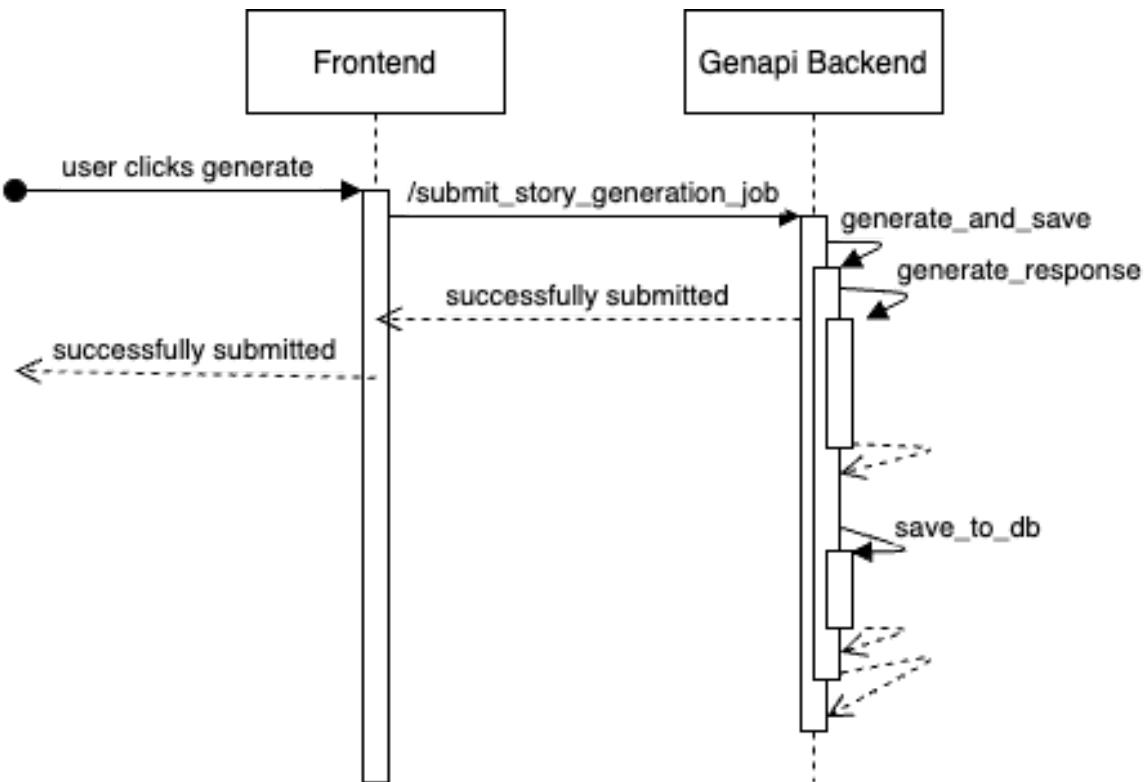
Schema

Table	Columns	Table	Columns
avatars	<ul style="list-style-type: none"> • avatarid • ownerid • name • hair_color • ethnicity • hairstyle • age • gender • clothing_color • created_at • image 	generations	<ul style="list-style-type: none"> • id • user_id • result • prompt • name • reason • created_at • story_id
contents	<ul style="list-style-type: none"> • page_id • page_text • image_prompt • subj_desc • image_url 	users	<ul style="list-style-type: none"> • user_id • created_at • email • gen_success • gen_failure • subscription_type • credits
avatars_in_stories	<ul style="list-style-type: none"> • avatarid • storyid 	pages	<ul style="list-style-type: none"> • page_id • story_id • page_number
subscriptions	<ul style="list-style-type: none"> • id • user_id • metadata • status • price_id • quantity 	stories	<ul style="list-style-type: none"> • story_id • age • moral • title • is_public • user_id

	<ul style="list-style-type: none"> cancel_at_period_end created_at cancel_at canceled_at current_period_start current_period_end created ended_at trial_start trial_end subscription_id 		<ul style="list-style-type: none"> genre coverurl score isdonegenerating storyprompt numpages contentflagged generationfailed charactername artstyle
customers	<ul style="list-style-type: none"> userid stripe_customer_id created_at 	likes	<ul style="list-style-type: none"> id userid storyid

Interesting Design Choices

Background Story Generation



Background story generation allows the user to submit a story to be generated, while continuing to use other functions of our app without waiting for the task to complete. As shown in the sequence diagram, a POST request to `/submit_story_generation_job` will trigger the creation of a separate thread, and immediately return a success message, indicating that the story has been submitted for generation. The new thread handles the work of generating text and images, then storing them in the database.

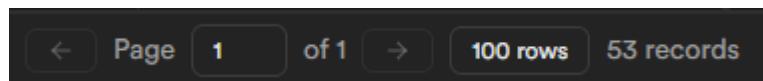
Notification System

The main pain point of the notification system is the fact that the /submit_story_generation_job has already returned a response and is no longer able to address the user's device to send a "job done" message. The solution we opted for was to store an "isdonegenerating" flag in the story table of the database, which would be flipped to true when the background thread has finished generating the story.

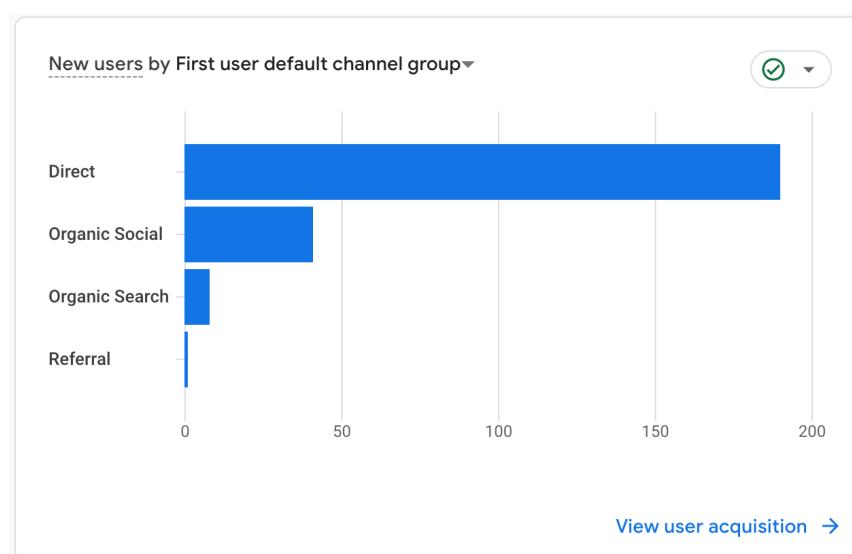
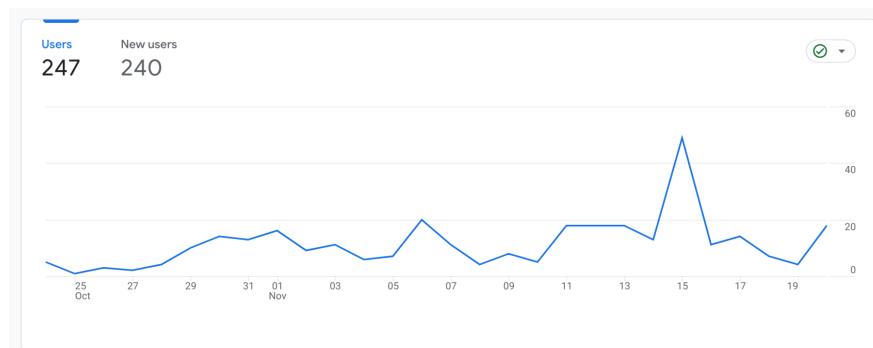
For the user to receive notifications about the completion of the generation task, we used Supabase Realtime, which uses web sockets to connect the frontend directly to Supabase. This was used to implement the observer pattern. Whenever the story table in the database is updated, a message is broadcasted to all subscribers and the frontend checks if the user's story is done generating, then shows a notification if appropriate.

User Report

53 registered users (Supabase):



247 unique website visitors



Insights Gained

Throughout our development of TaleWeaver, several key insights have emerged, shaping our approach towards a user-centric design, flexible product direction that takes into account user feedback and our vision for the product, and challenges inherent in marketing.

Iterative Feedback Loops and User Suggestions: Regular user interviews and feedback sessions have been pivotal in refining TaleWeaver. User feedback played a crucial role in shaping features like the 2-pronged approach to waiting times. Allowing users to generate multiple stories simultaneously and navigate away from the creation page addresses a pain point and enhances the overall user experience. In addition, early realisation about the limited value of an iPad app, prompted by our proposal meeting and user input, led to a strategic shift towards improving image quality and reducing waiting times, which were key points of user dissatisfaction early on. This also ties in to the following point:

Responsive Development and Strategic De-prioritisation: Adjusting our priorities based on user feedback ensured that we tackled pressing issues first, such as dissatisfaction with image quality and prolonged waiting times. Our iterative approach allowed us to stay agile, addressing user concerns promptly and creating a more user-friendly experience. This strategic de-prioritisation aligned with our commitment to delivering features that would have a direct and positive impact on user experience. Furthermore, we realised that we had to consider, amongst ourselves, the direction that we wanted TaleWeaver to head towards and whether we wanted to encourage parent-child interaction through TaleWeaver.

Humanising Technology: A key aspect of TaleWeaver that we continually returned to was our goal of having our product be a companion in fostering parent-child connections and enriching family narratives. Having this goal in mind and constantly reminding ourselves that our technology is to serve human needs enables us to have a unified vision and product design.

Implement Then Reiterate: When implementing features, it is important to ensure that a solution is working first, and then try improving or optimising it. Many of our features involved a specific goal, implementing a working solution, then refining it based on user feedback or based on discovery of a better alternative. This sped up our workflow and allowed us to reach our weekly sprint goals more effectively.

Continuous Publicity and Social Media Impact: Recognising the potential of increased publicity through targeted posts, we identified areas for improvement. Future marketing efforts will involve targeted posts in relevant online communities, ensuring a more strategic approach to reaching our target audience. In addition, we should also explore additional avenues for engagement, such as collaborating with parenting influencers or organisations, which would enhance our visibility.

Future Plan and Strategies

Based on our insights gained, our future plan and strategies will be focused on obtaining more financial support, social media and marketing outreach, as well as formal partnerships with related organisations. This will contribute towards our overall goal of increasing the visibility and implementation of TaleWeaver in public markets.

UI Implementation: We plan to further iterate on the story generation experience, user page flow and avatar creation based on our user testing results. This will be accompanied by gradual addition of more branding and asset elements to the current application to improve the UI experience for our target audience.

Grant Application: We plan to apply for several entrepreneurship based grants to obtain funding and higher visibility for TaleWeaver. Grants we are looking at include the NUS Venture Initiation Programme and the Philip Yeo Initiative.

UX Research and Testing: Based on our marketing plan, we aim to further access social media groups of our target audience, as well as reach out to other contacts for iterative user testing of our application. Other contacts include preschools, faculty members and LinkedIn contacts that are interested in the application.

Social Media Management: Social media outreach will play a significant part in increasing our reach to our target audience, of which we will focus on creating content for Facebook Groups and Instagram. This will consist of mini marketing campaign and further

As of now, this would be the rough marketing timeline for the next 3 months:

Dec 2023	<ul style="list-style-type: none">• Holiday Marketing Campaign• User Testing Requests and Gathering
Jan 2024	<ul style="list-style-type: none">• Marketing Campaign (Promo Codes, Free Tokens)• User Testing Requests and Gathering
Feb 2024	<ul style="list-style-type: none">• Marketing Campaign (Promo Codes, Free Tokens)• User Testing Requests and Gathering

Maintenance of Site: We will continue to chip in to maintain our website, and update features or fix bugs where necessary.

Future Partnerships: In terms of future partnerships, we see potential in reaching out to public schools, libraries and private tuition centres to develop arrangements for the usage and implementation of TaleWeaver in e-learning based settings for younger children. We plan to reach out to the National Library Board to further understand the opportunity landscape for implementation of TaleWeaver in structured and free learning environments.