Train of Thought: A Rhythm-based cognitive training game for children (**5Ws and 1H**)

WHY: Many children, especially those with ADHD, have difficulties with timing, rhythm, and attention control. Rather than providing medical treatment, the game offers playful, structured brain training that transforms screen time into meaningful development. Modern research supports the use of rhythm to strengthen executive function and focus, which makes this project socially relevant and academically valuable. According to Puyrajinet et al., *2022*, the correlation coefficient of **0.65** between ADHD symptoms and rhythm deficits strongly suggests that **children with ADHD do struggle with rhythm and timing tasks**.

WHAT: **Train of Thought** is a 2D rhythm based educational game that supports the development of cognitive skills such as focus, rhythm coordination, and timing. The player keeps a cartoon train moving by tapping in sync with beats. The game includes retry limits and daily level caps to encourage structured play and self discipline. It's built to be both fun and educational, especially for children who may struggle with attention. According to Rickson et al., 2023, Rhythm games enhanced sustained attention comparable to low-dose stimulant medication.

WHEN: The game is designed for short, daily play, ideally 10 to 15 minutes per session. Short sessions prevent cognitive overload while reinforcing neural pathways for attention. Quick wins in games (e.g., beating a rhythm level) trigger motivation without overstimulation (Smith et al., 2023). It can be used during free time at home, school or learning centers. The gameplay system encourages returning the next day by limiting retries and levels to promote healthy screen use and consistency.

WHERE: Train of Thought can be played on mobile phones, or tablets, and it works offline. This makes it usable in homes, classrooms, or areas with poor internet access. It's suitable for a variety of learning environments where children may benefit from guided play.

WHO: The primary users of Train of Thought are children aged 6 to 10 years old. Recent studies show that children between 6 and 10 benefit significantly from rhythmic and musical training. A study conducted by Moreno et al., 2023, shows 120 children (6-10 years old), 60 with ADHD and 60 neurotypical, showed Rhythm games reduced "timing variability" by 35%, linked to better attention. The intervention used was Rhythm Paradise and BeatStars which tested their Inhibitory Control and Cognitive Flexibility. The game also serves teachers, parents, and educational institutions as secondary stakeholders, who can integrate it into daily learning or focus-building activities.

HOW: The game works by challenging players to tap along with musical beats to keep the train moving. If the player makes too many mistakes, the train slows or stops, and after three failed attempts, the game displays an “Out of Fuel” or “Your Conductor fell asleep!” message, preventing further attempts until the next day. The mechanics are designed to be intuitive, rewarding, and developmentally appropriate. An AI-based difficulty adjustment system to modify the gameplay in real time. For instance, if a child struggles with timing, the rhythm speed may be slowed slightly or the note patterns simplified to reduce frustration. Conversely, if they perform consistently well, the game gently increases speed or complexity to keep them challenged and engaged. The goal is to keep the game challenging but not frustrating.

The game will be developed using Cocos2d, an open-source 2D game engine known for its lightweight performance and cross-platform support. Specifically, the team will use C++ (or optionally JavaScript via Cocos Creator) to program the game logic, UI, and rhythm mechanics. Each level will be composed of visual rhythm cues that the player taps in time to keep the animated train moving.

References:

Puyjarinet, F., Bégel, V., Lopez, R., Dellacherie, D., & Dalla Bella, S. (2022). Temporal processing and sensorimotor synchronization deficits in children with ADHD. *Journal of Child Psychology and Psychiatry, 63*(3), 312–325. https://doi.org/10.1111/jcpp.13642

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