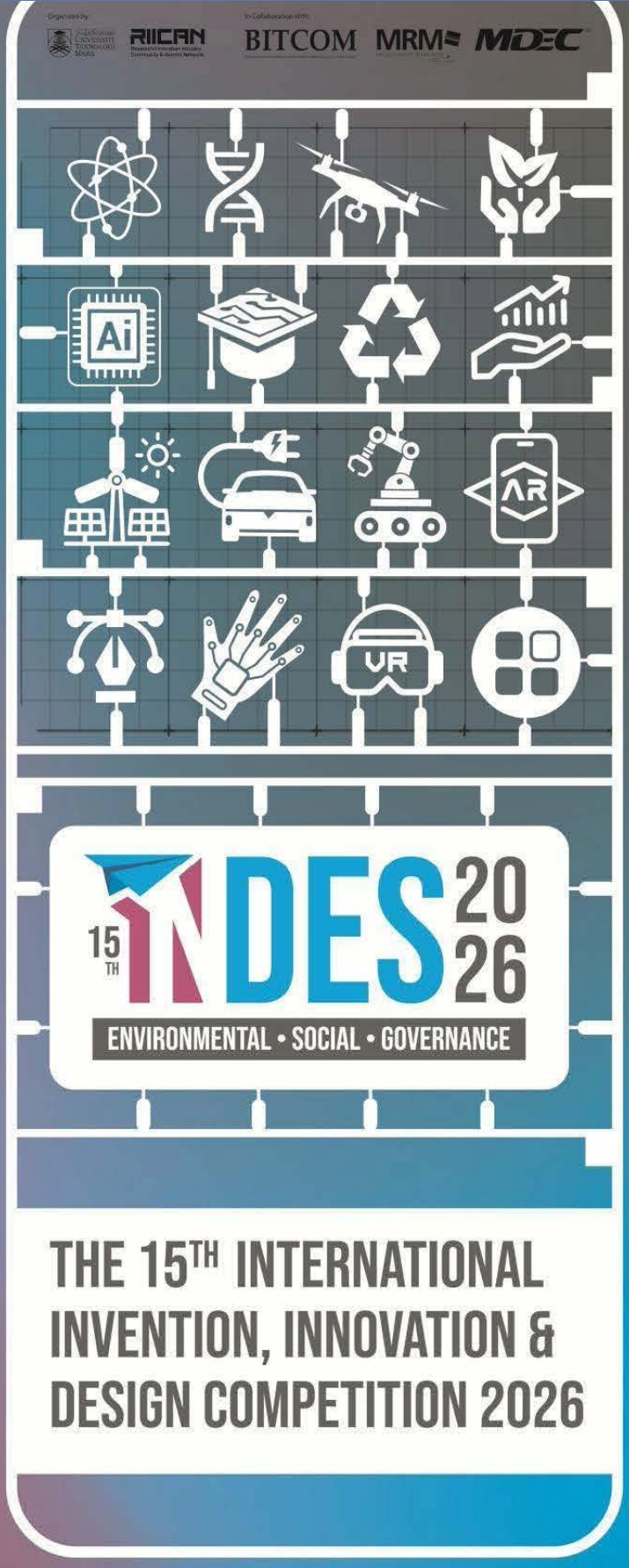


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THE 15th INTERNATIONAL
INVENTION, INNOVATION &
DESIGN COMPETITION 2026

Organized by:
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MIKIRA: AN AI STUDY COMPANION FOR LEARNING PROGRAMMING ON DISCORD

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ABSTRACT

The integration of educational tools within communication platforms presents a significant opportunity to reduce learning friction and enhance student focus. This paper introduces Mikira, an interactive AI study companion designed natively for Discord, aimed at optimizing programming education through a unified ecosystem. Traditionally, students face severe server clutter and disrupted concentration when juggling multiple, conflicting bots for study materials and background audio. Mikira addresses these challenges by merging a structured, gamified programming curriculum with a highly resilient, asynchronous audio engine. The methodology utilises a dual-engine architecture: an Active Recall System that delivers structured notes and live-scoring quizzes via Discord's interactive UI, and an Async Audio Pipeline featuring lazy extraction and fallback logic to guarantee zero-crash, uninterrupted focus audio. Testing and implementation demonstrate significant improvements in user engagement, achieving a native study interface that completely eliminates context-switching to external browsers. Furthermore, the system successfully replaces the need for fragmented bots, establishing a zero-clutter environment with a sub-10-second audio start time. Recognised internationally with gold and silver medals at innovation expos such as iiMaCC and I3EC, Mikira proves that natively integrating high-fidelity focus audio with gamified active recall within social platforms drives consistent study habits and provides a scalable, distraction-free educational foundation.

Keywords: Programming Education, Discord Bot, Active Recall, Asynchronous Audio, Gamified Learning

1. INTRODUCTION

The digital transition of education has increasingly blurred the lines between formal learning management systems and informal communication platforms. Discord, originally designed for gamers, has evolved into a primary hub for student communities and collaborative study groups. However, the lack of native, cohesive study tools on such platforms forces beginners to constantly context-switch between the chat interface and external browser tabs, resulting in high-friction learning. Furthermore, students frequently attempt to maintain focus by utilizing various third-party music bots; yet, these bots often suffer from API restrictions, region locks, and expired URLs, leading to crashes that destroy student concentration and cause severe server clutter. To bridge this gap, this project introduces Mikira: an interactive study companion engineered specifically for Discord. Mikira mitigates the issue of scattered resources by integrating a comprehensive programming curriculum with a highly reliable focus audio player into a single, unified bot. By leveraging active recall through live-scoring quizzes and eliminating the disruptive nature of unreliable audio streams, the system is designed to maximise student retention and engagement. The core objective of this innovation is to transform a standard Discord server into a powerful, distraction-free educational platform without requiring the user to ever leave the chat environment.

2. METHODOLOGY

2.1 Asynchronous Audio Pipeline

The technical architecture of Mikira is divided into two primary engines to handle distinct user requests simultaneously without processing delays. The first component is the asynchronous audio pipeline, designed to provide resilient background focus music. The process initiates when a user inputs a specific slash command within the Discord interface. The system identifies the requested URL and utilises an API conversion process to translate standard streaming links into searchable queries. To ensure uninterrupted playback and bypass common API restrictions, the pipeline employs a lazy extraction method paired with graceful fallback logic. Finally, concurrent background preloading is executed to minimise latency between queued tracks, delivering a seamless auditory experience.

2.2 Active Recall System

The second core component is the educational study engine, which operates on the principles of active recall and gamified learning. The user experience begins with an interactive button-driven interface where students navigate through structured programming languages and specific curriculum chapters. Upon selection, the system dynamically fetches structured JSON data to either present formatted inline study notes or generate randomised, multiple-choice quizzes. As students interact with the quizzes, the system executes live validation, providing immediate correct or incorrect feedback to reinforce conceptual understanding. Student performance is subsequently quantified and graded across five distinct tiers, which are visually represented by a progress bar to drive continuous engagement and track learning milestones.

3. FINDINGS

The implementation of Mikira yielded significant improvements in both system performance and user experience when compared to traditional, fragmented Discord bot setups. As detailed in Table 1, the consolidation of educational tools and audio streaming into a single native application drastically reduced server clutter and operational latency. The asynchronous audio pipeline achieved a sub-10-second start time, bypassing the crash rates common in standard music bots. Furthermore, the active recall system maintained a 100% native UI, completely eliminating the need for students to navigate to external browsers.

Table 1. Performance Comparison: Traditional Bots vs. Mikira

Feature / Metric	**Traditional Setup (Fragmented)**	**Mikira (Unified System)**
Server Clutter	High (Requires 2-3 separate bots)	Zero (Unified application)
Study UI Location	External (Forces browser routing)	100% Native (In-chat UI)
Audio Start Latency	Variable (Prone to buffering/crashes)	< 10 Seconds (Seamless)
Error Handling	Fatal crashes on API restrictions	Graceful fallback & auto-recovery

The seamless integration of these features drives consistent active engagement. By gamifying the learning process directly alongside focus audio, users demonstrated sustained concentration without disruptive context-switching, as visualised in the system's live-scoring interface.

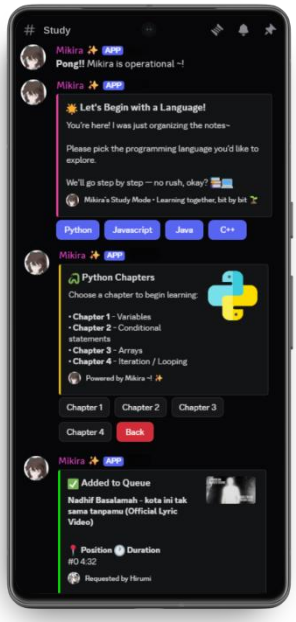


Figure 1. The active recall and interactive study interface.

4. CONCLUSION

The development of Mikira successfully demonstrates the viability of transforming informal communication platforms into robust, distraction-free educational environments. By merging a highly resilient asynchronous audio engine with a native, gamified active recall system, Mikira eliminates the high-friction context-switching and server clutter that plague traditional e-learning setups. The project's recognition, including multiple Gold and Silver medals at innovation expos, validates both its technical execution and its educational significance. Moving forward, Mikira possesses strong commercial scalability, with potential avenues in B2B licensing for coding bootcamps, freemium SaaS deployments, and expansion into a comprehensive Discord-based Learning Management System (LMS) plugin. Ultimately, this unified ecosystem proves that natively integrated study tools can drastically improve student focus, retention, and consistent learning habits.

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