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# FazBoard: An AI-Educational Hybrid Intelligent Teaching & Learning System

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*FazBoard, an avant-garde educational platform, seamlessly integrates artificial intelligence with contemporary educational methodologies to foster a dynamic, adaptive, and collaborative learning ecosystem. The platform's linchpin comprises two components: an agile digital canvas that simulates interactive teaching and learning spaces, and an AI Assistant, incarnated as a digital humanoid, available round-the-clock for responsive academic support. The digital canvas is designed to cultivate an immersive and versatile environment, emulating the interactions of traditional classrooms without the constraints of time or location. The AI Assistant excels in providing instantaneous responses to queries, aggregating valuable learning analytics, and streamlining administrative tasks - all of which contribute to curriculum refinement and enhanced pedagogical efficacy. Furthermore, FazBoard is aimed at bolstering student engagement by creating an inclusive learning milieu, through adaptive learning strategies that cater to the diverse educational needs of its users. This paper delves into the architecture, functionalities, and far-reaching applications of FazBoard, heralding it as a quintessential model of integrating AI into education, thereby shaping the trajectory of 21st-century educational practices.*

**Keywords:** *AI assistant, digital canvas, digital transformation, natural language processing, machine learning, instructional design, learning equity, connectedness*

## Introduction

With open Ai and so many bot platforms readily available, just about anyone can create a bot. However, to create a good one in education is all about the Bot Framework and the design with infused and aligned Functional Instructional Design/ Technical Instructional Design (FID/TID) to Content Instructional Design/Pedagogical Instructional Design (CID/PID) as shown in Figure 1. This makes good use of the transfer of learning to the bot since they are not born with the same inherently learning brain as humans. In this case any education bot is only as good as its Framework if built based on the alignment between the FID, TID, CID, and PID. This alignment and the human-AI hybrid system integration in an educational context for example, provides a great tool to adjust the content/curriculum in terms of substance, difficulty, or clarity levels (CID) or to the method and style of the delivery (PID), and that is the pedagogical strategy of ensuring the learning is taking place or in other words helping students assimilate the knowledge.

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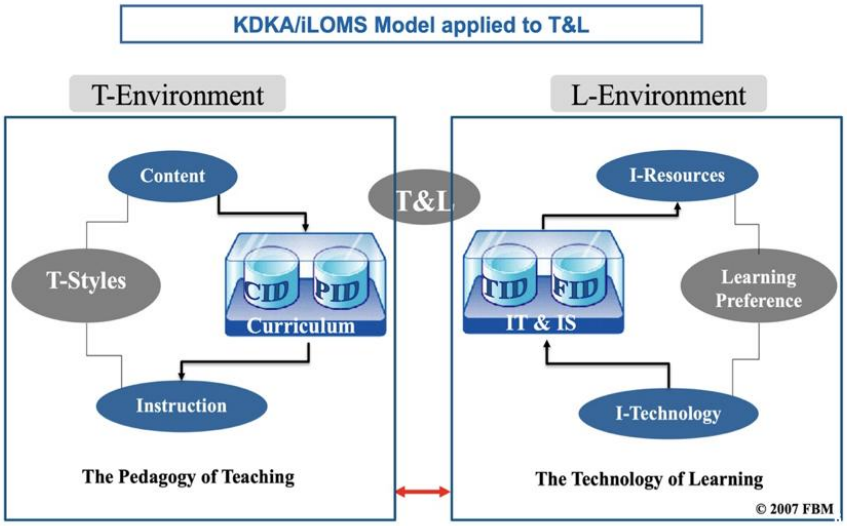
**Figure 1.** *KDKA/iLOMS Model Applied to T&L*




The advent of technology has dramatically transformed the educational landscape. Contemporary educational systems demand integration with advanced technologies to ensure responsiveness to the evolving needs of students and educators. Among the myriad of technological advancements, Artificial Intelligence (AI) emerges as a crucial instrument for reforming education, and FazBoard stands at the forefront of this evolution.

FazBoard, a pioneering educational platform, amalgamates an Infinite Digital Canvas with an Integrated AI Assistant to foster an adaptive and engaging learning ecosystem. The canvas serves as a dynamic space for educators and students to interact and collaborate, enriched with tools for content delivery and brainstorming. Meanwhile, the AI Assistant harnesses the power of Natural Language Processing (NLP) and Machine Learning (ML) algorithms to understand, process, and respond to human language, automate administrative tasks, and collect data for performance analytics.

This paper delves into the architecture and functionalities of FazBoard, examines its implementation through pilot studies, and evaluates its impact on the educational experience. Furthermore, this paper discusses the potential of AI integration in education, with FazBoard as an exemplary model to achieve the following:

1. Provide all students with 24/7 on-demand instant responses, especially to questions that are frequently asked by most students (like an FAQ).
2. Act as a first line of teaching/learning assistant to provide the on-demand 24/7 connection to the growing number of students taking online classes.
3. Automate the collection and analytics of frequently asked questions by students.
4. Capture most asked questions by students automatically where we can query and organize all questions to make general or class wide announcements with answers/directions/clarifications or adjust my CID or PID. In other words, to help adjust the content/curriculum in terms of substance, difficulty, or clarity

levels (CID) or to the method and style of the delivery and that is the pedagogical strategy of getting the learning to take place or basically helping students assimilate the knowledge.
5. Reduce response time and address belated responses to students, especially with large classes.
6. Integrate with all our teaching material in the class or other supplemental learning materials from other sources outside the CLMS.
7. Provide a fun and engaging personalized messaging experience for our students who as growing digital beings would rather text or chat with a conversational bot than pick up the phone to call, e-mail, or schedule office hour meetings.
8. Students are automatically transferred to live chat with the faculty when they are available if our FazBot cannot give them an answer or at any time they wish to message the faculty instead.
9. Students do not have to have access to any Ai or Bot platform to use our FazBot and can just use any device.

## Rationale and Literature Review

The evolving educational landscape, influenced by rapid technological advancements and global events like the COVID-19 pandemic, has emphasized the necessity of integrating Artificial Intelligence (AI) into educational systems. This integration offers transformative possibilities for advancing teaching methodologies, fostering innovative research, and leveraging technological tools. FazBoard represents a hybrid teaching and learning platform designed to bridge the gap between traditional and online education by facilitating seamless and meaningful interactions between students and educators. The disruption caused by the COVID-19 pandemic has highlighted the inadequacies of conventional educational systems and the urgent need for platforms like FazBoard that can ensure educational continuity and excellence in a rapidly changing world.

AI technologies, particularly chatbots, have become integral in modern education by delivering personalized learning experiences and real-time feedback, enhancing the overall teaching and learning process (Bengtsson & Wu 2023). Despite these benefits, existing educational chatbots face limitations, including the lack of flexibility compared to human-to-human interactions (Litman 2016). Addressing these challenges requires leveraging advanced Natural Language Processing (NLP) techniques and machine learning algorithms to facilitate more human-like responses and deeper engagement (Ogawa & Nakamura 2023). This is critical for designing chatbots that create immersive and dynamic educational experiences.

A significant limitation in current educational chatbots is their inability to assess students' emotional states accurately. Research underscores the importance of recognizing and responding to students' affective states, as emotions play a crucial role in the learning process (Abrahams & Regan 2023). An ideal chatbot should identify signs of frustration or confusion and adapt its responses to provide

encouragement or clarification. For example, advances in sentiment analysis and affective computing have shown promise in improving the chatbot's capability to engage empathetically with students (Forbes-Riley & Litman 2012).

Another area of improvement is the capacity of chatbots to provide sophisticated feedback on student writing. Traditional systems are limited to surface-level assessments, such as grammar and spelling checks, and fail to address deeper aspects like coherence and organization (Rahimi et al. 2015). Recent studies have explored the use of machine learning models to analyze student essays more holistically, identifying thesis and conclusion statements and offering constructive feedback to improve writing quality (Falakmasir et al. 2014).

Additionally, the integration of learning analytics has emerged as a pivotal tool for enhancing educational outcomes (Ahmad & Chang 2022). By analyzing vast amounts of data generated during the learning process, these tools offer valuable insights into student behavior and performance. When integrated with educational chatbots, learning analytics can enable more personalized and adaptive learning experiences tailored to individual student needs (Wambui & Kirui 2022). For instance, AI systems can use real-time analytics to identify learning gaps and provide targeted interventions, improving both engagement and retention.

*The Imperative for AI Integration in Education*

The COVID-19 pandemic underscored the need for resilient and adaptive online educational systems, revealing the limitations of traditional tools like video conferencing in fostering engagement and collaboration (Daniel 2020). Platforms such as FazBoard address these gaps by leveraging AI-driven features to bridge the divide between the convenience of digital platforms and the interactive essence of traditional classrooms. FazBoard's integration of tools like Natural Language Processing (NLP) and real-time analytics fosters active participation, personalized learning, and on-demand support, making it a transformative solution for addressing the challenges of both traditional and online educational systems (Abrahams & Regan 2023, Ogawa & Nakamura 2023).

However, the success of AI in education requires addressing critical ethical and societal considerations, including privacy and data security concerns, which are especially pressing when dealing with sensitive student data (Ferreira & Hong 2024). Equitably designed systems like FazBoard advocate for fairness, transparency, and inclusivity to ensure that AI-driven education benefits all learners, particularly marginalized groups (Bengtsson & Wu 2023). By tailoring educational experiences to diverse learning needs, FazBoard not only enhances learning outcomes but also promotes inclusivity, offering a student-centered, responsive model that exemplifies ethical AI innovation in education.

*Improving Student-Teacher Interaction*

Meaningful interaction between students and educators is vital for effective education, with research highlighting the superior outcomes achieved through personalized human tutoring. Diane Litman (2016) emphasized the importance of

natural language dialogues in fostering deeper understanding and engagement. FazBoard addresses this need by integrating an AI-powered teaching assistant (TA) capable of engaging in real-time, natural language dialogues. Using advanced Natural Language Processing (NLP), the system personalizes responses to students, creating an intuitive and conversational learning environment that bridges the gap between traditional human interaction and digital education (Ogawa & Nakamura 2023).

FazBoard's AI assistant also incorporates adaptive learning capabilities, dynamically evolving to meet individual student needs and learning preferences. By automating routine tasks, it allows educators to focus on complex instructional activities while maintaining high-quality engagement. Recent advancements in conversational AI technologies further enhance this dual approach, combining the strengths of human-centric teaching with the scalability and flexibility of AI. This ensures personalized, immediate, and meaningful academic support for every student, redefining the future of student-teacher interaction (Abrahams & Regan, 2023, Bengtsson & Wu 2023).

*Streamlining Knowledge Management*

Effective knowledge management is a cornerstone of educational success, facilitating the seamless organization, retrieval, and application of information to enhance learning outcomes. Toshio Okamoto and Mizue Kayama emphasized that knowledge management involves a systematic process of finding, selecting, organizing, and presenting information to optimize learners' comprehension and achievement of educational objectives (Okamoto & Kayama 2015). In alignment with these principles, FazBoard serves as an integrated platform that streamlines knowledge management by providing educators and students with tools to effortlessly share, organize, and access critical information. Building on recent advancements, FazBoard incorporates AI-driven features to further enhance the efficiency of knowledge management systems. By leveraging learning analytics and adaptive learning technologies, FazBoard personalizes the organization of educational content, aligning it with individual learning paths and preferences (Abrahams & Regan 2023). This not only improves information accessibility but also enables real-time feedback and dynamic adjustments to course materials based on student performance and engagement data (Ahmad & Chang 2022).

*Transformative Potential of AI in Higher Education*

Artificial Intelligence (AI) is reshaping higher education, offering transformative opportunities to integrate innovative technologies into the core design of institutions. Sedigheh Shakib Kotamjani emphasizes that AI's transformative potential lies not merely in adopting new technologies but in fundamentally reimagining teaching approaches to equip students for a competitive and rapidly evolving global landscape (Kotamjani 2020). FazBoard exemplifies this shift by placing students at the heart of the learning process through its AI-driven facilitation tools. By fostering engagement and active participation, FazBoard creates an adaptive environment where students collaborate, explore, and grow. Moreover, AI enhances instructional methodologies

by analyzing student performance data, providing actionable insights to address individual learning needs, and enabling automated grading systems that deliver constructive and timely feedback (Abrahams & Regan 2023).

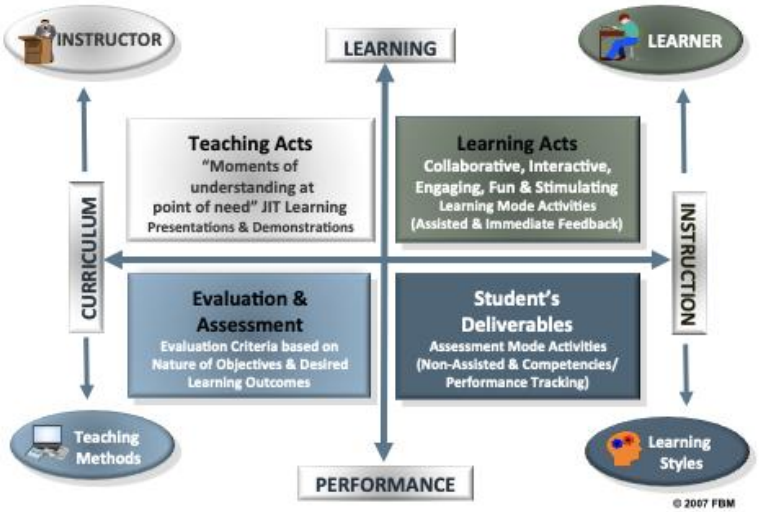
While the promise of AI in education is significant, its implementation is not without challenges. Technologies such as chatbots and adaptive learning systems have shown potential for personalizing education and facilitating real-time interactions. Advances in Natural Language Processing (NLP) and machine learning further enable these systems to mimic human-like interactions, offering a more relatable and effective learning experience (Ogawa & Nakamura 2023). However, the successful deployment of these technologies must address critical ethical and societal concerns. Issues such as data privacy, algorithmic bias, and the potential for unequal access to AI-driven tools pose challenges that require immediate and sustained attention (Ferreira & Hong 2024). Only by addressing these considerations can AI truly realize its promise of democratizing education and fostering equitable learning opportunities.

FazBoard synthesizes the strengths of existing online platforms and transcends their limitations, offering a new paradigm in digital education. Through the integration of an AI assistant and an immersive digital canvas, FazBoard bridges the divide between traditional teaching and modern technological capabilities. By promoting collaboration, adaptability, and inclusivity, it empowers students to navigate the complexities of contemporary education. Especially in the aftermath of the COVID-19 pandemic, which disrupted traditional educational systems, FazBoard provides a robust, scalable, and student-centered approach to online learning. It not only ensures continuity in education but also enhances productivity and focus, positioning itself as a cornerstone of future-ready educational innovation.

## FazBoard Applied in Teaching and Learning

As shown in Figure 2, the Knowledge Departed & Knowledge Assimilated (KDKA) Instructional Design (ID) model was employed to develop and evaluate the integration of an infinite digital canvas aimed at emulating the pedagogical spaces of the instructor, individual learner, and collaborative learning groups. The overarching design sought to capitalize on the merits of active learning strategies in tandem with the KDKA model's approaches, which concentrate on knowledge dissemination from the instructor and knowledge assimilation by the learners. This model emphasizes the interdependency between these two aspects throughout the curriculum design, development, and implementation phases, including e-learning content. It is predicated on the understanding that while every teaching activity encompasses a learning component, the converse is not necessarily true. Consequently, the focus shifts toward fostering learning as opposed to merely teaching, and engaging students through active learning via FazBoard.

**Figure 2.** *The Knowledge Departed & Knowledge Assimilated (KDKA) Instructional Design (ID) Model*




## Results

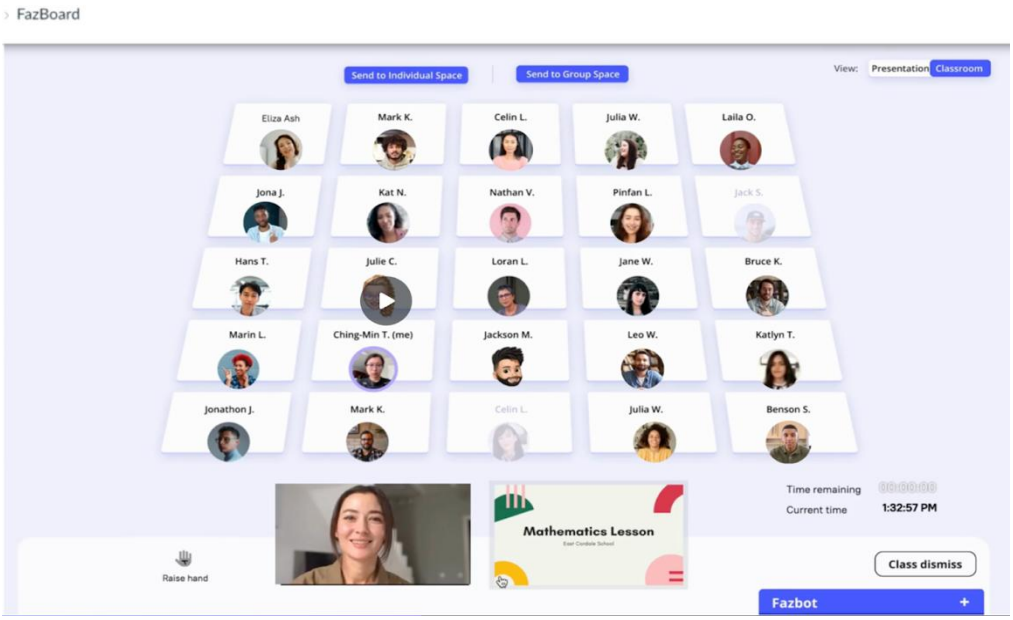
Leveraging the KDKA model, coupled with the digital functionalities afforded by the Learning Management System (LMS) Canvas, emphasis was placed on incorporating active learning pedagogy. This involved a multifaceted approach that encompassed the analysis of learners' backgrounds, identification of content knowledge types, construction of intended learning outcomes, design of interactive teaching and learning activities, and development of relevant assessments aligned with students' deliverables. Furthermore, an AI Teaching Assistant (TA) prototype was integrated to bolster active learning by offering around-the-clock instant responses, thus mitigating the disconnect and delayed replies that often characterize student inquiries.

The three simulated spaces – the teacher's space, the group learning space, and the individual learner's space – each utilized specially-designed KDKA templates:

### *Teacher's Space*

Depicted in Figure 3, this space grants the instructor a comprehensive view of the active participants, complete with video and audio. It also facilitates easy access to and interaction with an AI assistant, as well as a repository of preloaded teaching and learning activities or lesson presentations that can be shared on the class board. Moreover, the instructor can seamlessly share applications, browser sessions, screens, documents, whiteboards, and selected windows with either individual students, the entire class, or collaborative groups. Additionally, content from the individual or group learning spaces can be projected on the class board.

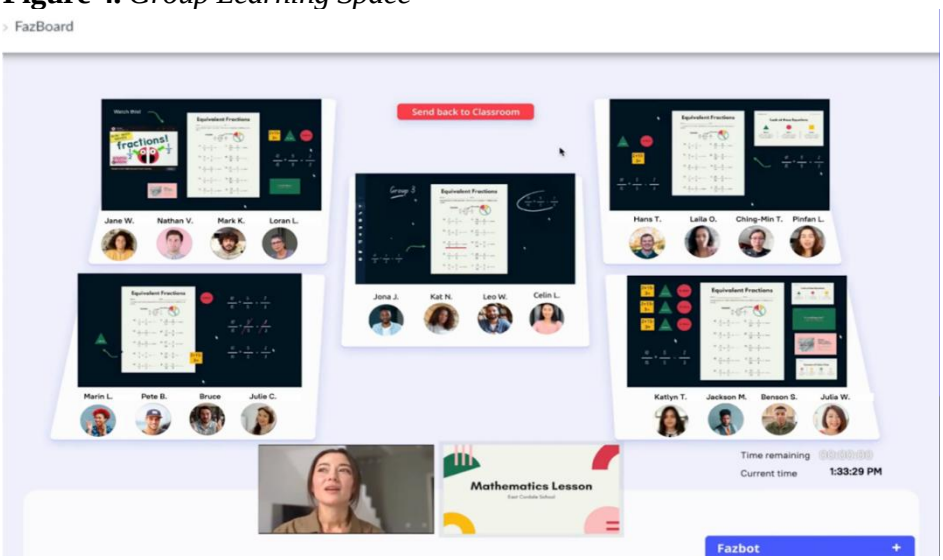
**Figure 3.** *Teacher's Space*




*Group Learning Space (Always Visible to Teacher)*

This collaborative environment captured in Figure 4, allows each team member to simultaneously share applications, browser sessions, screens, documents, whiteboards, and selected windows within their individual space or the shared team space. All team members can actively contribute, collaborate, and work synchronously, either within the shared space or their individual spaces. Teams can present to the entire class, and instructors can showcase content from any team's space on the class board. An AI Assistant is readily accessible to answer course-related questions, facilitate communication with the instructor, or engage in conversation.

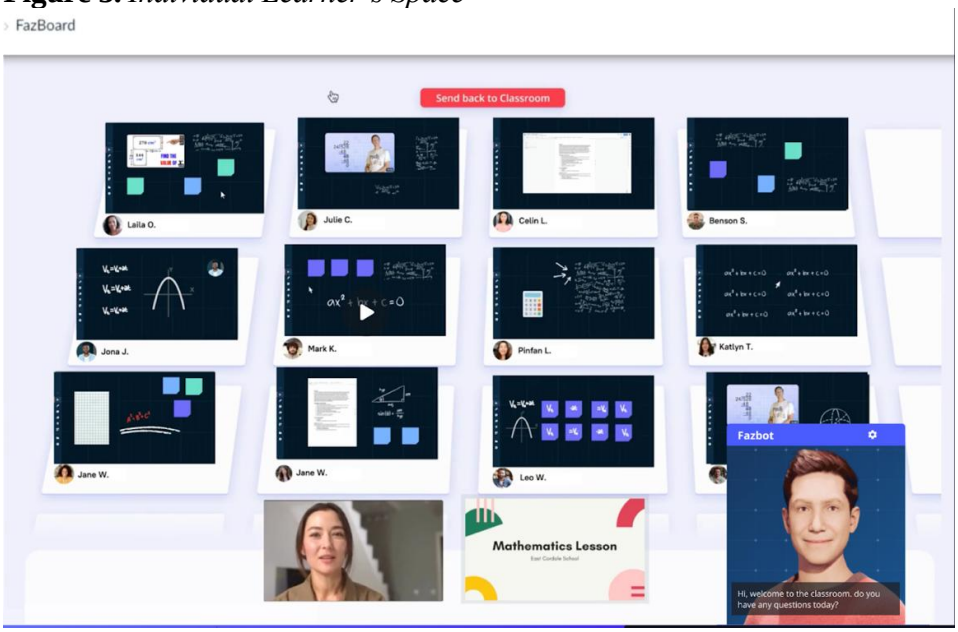
**Figure 4.** *Group Learning Space*



*Individual Learner's Space (Always Visible to Teacher)*

As shown in Figure 5, the individual learner's space permits real-time sharing of applications, browser sessions, screens, documents, whiteboards, and selected windows by both the instructor and students. The instructor can enter any student's space to provide assistance or collaborate in real time. Students can present to the entire class, and content from an individual learner's space can be displayed on the class board. Each learner has access to the AI Assistant for course inquiries, instructor communication, or engagement in dialogue.

**Figure 5.** *Individual Learner's Space*




*Pilot Implementation*

The pilot implementation involved three classes, and a survey of 17 students yielded the following benefits:

- **Comfort and Immediacy:** The platform alleviated students' anxiety and apprehension, enabling them to seek immediate responses in a comfortable and anonymous setting.
- **Data Quality from Interactions:** FazBoard's AI, unlike human instructors, can maintain a comprehensive record of all questions, challenges, and interactions, thereby facilitating data-driven analysis and targeted interventions for improving learning outcomes.

FazBoard's project was acknowledged as an exemplary innovation by Educause and featured in the 2022 EDUCAUSE Horizon Report | Teaching and Learning Edition. This report surveys critical trends, technologies, and practices that are poised to shape the future of education and contemplates various future scenarios

and implications. FazBoard's inclusion in this report as part of EDUCAUSE's Showcase Series underscores its significance in addressing the pressing issues facing higher education.

## The Distinctiveness of FazBoard

FazBoard's distinguishing feature is its capacity to immerse students within a simulated teaching and learning environment, suitable for synchronous, asynchronous, or hybrid modalities, augmented with an AI Assistant. By utilizing AI technology and the democratization of Cognitive Computing, including Machine and Deep Learning (ML/DL) and Natural Language Processing (NLP/NLG/NLU), FazBoard bridges the growing divide between learners' readiness and adaptability to innovative technologies, devices, and applications, and the integration of these technologies within instructional practices.

Modern students tend to prioritize achieving desired grades over acquiring a deep understanding of the material, a tendency influenced by education systems that emphasize grades. This has led to a reliance on memorization rather than comprehension. FazBoard, however, guides students through the problem-solving process without directly providing answers, thus placing emphasis on learning rather than memorization.

The adversities faced in teaching and learning have been exacerbated in the wake of COVID-19. The efficacy of technology-assisted instruction, especially in virtual settings, depends not only on the robustness of the Learning Course Management System (LCMS) or virtual meeting tools like Zoom, but significantly on the pedagogical design of the content in terms of rigor, depth, presentation, and style.

Under this perspective, mere Instructional Design sophistication and LCMS are insufficient indicators of educational success in the genuine transfer of information and knowledge between students and educators. Furthermore, contemporary learners, who are growing up in the digital age, do not assimilate information in traditional ways. This divergence is aggravated by the disparity between learners' embrace of technology and educators' adoption of technological instructional methods. FazBoard addresses this challenge through a design that caters to the evolving learning preferences relative to traditional teaching methods.

The system includes an AI Assistant capable of personalized, adaptive instruction based on instructional resources and students' learning preferences. Furthermore, it incorporates the power of automation in teaching and learning, along with cognitive process automation to perform complex actions autonomously, such as identifying missing assignments, attendance, and other key performance indicators. This facilitates faculty tasks, such as the Student Engagement Roster, while also sending periodic reminders to students.

## Conclusion and Next Steps

FazBoard's innovation lies in its focus on learning through the combination of an infinite digital board and Artificial Intelligence. It recognizes that the terms “equality” and “equity” in education are differentiated by the letters "A&L," which stand for “All Learn.” All students have the ability to learn, albeit through different means and under varying conditions. FazBoard seeks to realign teaching and learning activities with classroom diversity and ensure equitable access and learning outcomes through Adaptive and Active Learning. Moreover, it tackles the challenge of delayed responses to students’ inquiries by providing 24/7 on-demand instant responses through an engaging AI Teaching Assistant.

The next phase of the FazBoard project will expand its focus on AI Assistant (FazBot) learning, including:

- Intelligent Tutoring & Mentoring/Coaching: Enabling FazBot to reach out to a broader spectrum of knowledge sources and adapt to the individual learner's needs.
- Adaptive Learning Model: Personalizing and adapting instructions based on resources and students’ learning preferences.
- Open Learner Modeling: Allowing students to evaluate their knowledge and reflect on their learning.
- RPA Integration: Integrating automation from cognitive RPA and I4PA to perform complex actions autonomously.
- Sounds More Human: Advancements in speech-to-text, text-to-speech, NLP, and Machine Learning will enable FazBot to conduct more sophisticated conversations.
- Looks More Human: As AI-powered video services and media presentation improve, FazBot may interface with humans in a more human-like manner.

Future scopes of FazBoard will also include more personalized learning and customized teaching through Machine and Deep Learning with NLP. This aims to provide individualized attention accommodating diverse learning preferences and abilities, embodying the essence of inclusivity in education. Additionally, new collaborations between human educators and FazBot will be explored to create more powerful learning environments and achieve stronger learning outcomes.

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