
TCU Computer Science

**AI Instructional Effectiveness
Vision and Scope**

Version 2.0.0

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Revision History

Date	Version	Description	Author
9/26/2023	1.0.0	Initial Draft of Vision Document	Vision Team
3/25/2024	2.0.0	Final Draft of Vision Document	John Henry Mejia

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Vision

1. Introduction

The purpose of this document is to collect, analyze, and define the business requirements of our AI Instructional Effectiveness tool. It focuses specifically on the capabilities needed by both the stakeholders and target users, and the problems that cause these needs to arise. Instructors at all levels can benefit from quick, highly-available feedback, which in the past has required having an experienced peer sit in on class and take meticulous notes. The AI Instructional Effectiveness tool, called ClassifAI, aims to provide instructors with almost instantaneous, highly visualized feedback on any given class period, by leveraging the power of Artificial Intelligence to transcribe text from speech and then further classify that text into valuable data groups.

1.1 Background

Instructors do not often have the luxury of free time, so having a peer, especially one experienced enough to give valuable feedback, sit-in on class can be difficult to schedule. Instructors can benefit from class feedback instantly and greatly, restructuring their class periods to focus on what matters to them. An average class period in K-12 is 50 minutes long, and post-secondary education extends that metric further. Instructors simply do not have time to sit in on their peers' class periods often enough to facilitate radical changes in teaching styles or focus.

One metric important to this project is specifically Costa's level of Thinking, Introduced by Dr Arthur Costa in 1991. Being able to have this, summaries, and

1.2 References

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2. Business Requirements

2.1 Business Opportunity/Problem Statement

The problem of	gathering efficient, available feedback
affects	instructors at all levels of education,
the impact of which is	that instructors do not receive adequate feedback often enough.
a successful solution would be	one that allows instructors to view feedback on class periods as often as possible, and that data should provide meaningful, actionable insight.

2.2 Business Objectives

BO-1: Provide an alternative feedback source, rather than a peer instructor,

BO-2: Reduce average cost and time to report by 50% or more.

2.3 Success Metrics

SM-1: Adoption Rate- ClassifAI will have 50 regular users within the first year of its release.

SM-2: User Engagement - 70% of educators who upload teaching audio/video content to ClassifAI engage with the platform's analysis features (transcript review, metrics analysis, etc.) at least once a week within 3 months of initial release.

SM-3: Accuracy Improvement - ClassifAI achieves a minimum speech-to-text transcription accuracy rate of 90% within 6 months of initial release, as measured against a standardized benchmark dataset.

SM-4: Feature Utilization - Within six months of release, 60% of ClassifAI users have utilized advanced features such as customizable reports at least once.

SM-5: Platform Stability - ClassifAI achieves an uptime of 99% within the first year of release, ensuring uninterrupted access to the platform for users.

2.4 Vision Statement

For	instructors at all levels of education
Who	can benefit from immediate classroom feedback
The AI Instructional Effectiveness tool	is an AI-driven transcribing and question classifying tool
That	transcribes an audio file to text and classifies both instructor and student questions, then provides visual data, in an easy-to-use, free-to-use web based application.

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Unlike	having a peer transcribe the lecture, or a senior evaluate the class period,
Our product	requires no coordination with peers, and provides the ability to review each and every class period in detail with minimal effort.

2.5 Business Risks

RI-1: Marketplace Competition

Risk: Existing competitors may offer similar solutions or may develop them in response to ClassifAI's entry into the market, leading to increased competition.

Probability: Medium (0.7)

Impact: High (8)

Mitigation: Continuous market research to stay ahead of competitors, focusing on unique features and value propositions, and building strong customer relationships.

RI-2: User Acceptance

Risk: Educators may be resistant to adopting a new technology or may find the interface and functionality of ClassifAI challenging to use, leading to low user adoption rates.

Probability: High (0.8)

Impact: Medium (6)

Mitigation: Conducting thorough user testing and feedback sessions during the development phase, providing comprehensive training and support resources, and continuously iterating based on user feedback.

RI-3: Implementation Issues

Risk: Technical difficulties may arise during the implementation phase, leading to delays in the launch of ClassifAI or compromising its functionality.

Probability: Medium (0.6)

Impact: High (9)

Mitigation: Conducting rigorous testing and quality assurance throughout the development process, having contingency plans in place for potential technical challenges, and ensuring clear communication between development teams.

RI-4: Data Security and Privacy Concerns

Risk: Despite transitioning to local hosting for cost savings and data security, there may still be concerns among educators about the privacy and security of their teaching materials and data stored on ClassifAI's platform.

Probability: Medium (0.5)

Impact: High (8)

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Mitigation: Implementing robust security measures such as encryption, access controls, and regular security audits, ensuring compliance with relevant data protection regulations, and transparently communicating the security measures implemented to users.

RI-5: Market Timing

Risk: ClassifAI may enter the market at an inopportune time, such as during a period of economic downturn or when educators are not actively seeking new teaching tools, leading to slower adoption rates and lower revenue.

Probability: Low (0.3)

Impact: Medium (7)

Mitigation: Conducting thorough market research and trend analysis to identify optimal launch timing, offering flexible pricing plans to accommodate budget constraints, and diversifying target customer segments.

2.6 Business Assumptions and Dependencies

Assumptions

AS-1: Adequate Hardware Availability: ClassifAI assumes that educators have access to devices (computers, microphones, cameras) with sufficient specifications to run the software, record quality audio/video of classroom interactions, and process the data within reasonable timeframes.

Impact if untrue: Performance bottlenecks for users with older devices or inadequate internet, which may hinder adoption.

AS-2: Model Reliability: ClassifAI assumes that the fine-tuned LLaMA model and WhisperX model will consistently achieve acceptable levels of accuracy in question categorization and transcription, respectively.

Impact if untrue: Inaccurate results could lead to misleading analysis, potentially undermining the value proposition of the tool.

AS-3: Clear Audio/Video Recordings: For optimal performance, ClassifAI assumes that the uploaded audio/video recordings will be clear and have minimal background noise.

Impact if untrue: Poor quality recordings might impair the transcription process, and subsequent analysis.

AS-4: Teacher Participation: ClassifAI assumes that the teachers actively choose to use the platform, record and upload classroom sessions, and are willing to engage with the provided analysis.

Impact if untrue: Low teacher adoption could significantly limit the project's impact and real-world data collection for further model improvements.

AS-5: Educator Understanding of Costa's Model: ClassifAI assumes that teachers seeking analysis based on Costa's Levels of Thinking have a working knowledge of the model's concepts.

Impact if untrue: Insufficient understanding of Costa's model could lead to misinterpretation of the analysis provided.

Dependencies

DE-1: Continued Model Availability and Support: ClassifAI depends on the continued availability, maintenance, and support of the OpenAI WhisperX model and the fine-tuned LLaMA model.

Impact if broken: Changes, discontinuation, or significant accuracy degradation in dependent models could severely impact the core functionalities of ClassifAI.

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DE-2: Secure Data Storage & Handling: ClassifAI's local hosting approach depends on the TCU's IT infrastructure to provide robust security for the stored audio/video and analysis results to ensure data privacy and compliance with applicable regulations.

Impact if untrue: Data breaches or security vulnerabilities could jeopardize user privacy and diminish the platform's trustworthiness.

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3. Stakeholder Profiles and User Descriptions

3.1 Stakeholder Profiles

Stakeholder	Major value or benefit from this product	Major features of interest	Constraints	End user or not?
Educators and Teachers	Cost savings for analysis. Streamlined process of transcription and categorization.	Cost and employee time savings must exceed development and usage costs	None identified	Yes

3.2 User Environment

The target users of ClassifAI are primarily educators seeking to improve the quality of their teaching through efficient analysis of their interactions with students. ClassifAI is designed for individual use. Task cycles within the application revolve around uploading an audio/video recording of a teaching session, processing, and reviewing the results. Time spent on each activity will vary depending on the length of the recording. While designed for desktop use, the web-based nature of ClassifAI means educators could potentially access the platform from a variety of devices with internet connectivity. ClassifAI is envisioned as a standalone application but could integrate with existing learning management systems (LMS) in the future to provide even greater streamlining of the teacher's workflow.

3.3 Alternatives and Competition

Stakeholders seeking solutions for teacher-student interaction analysis face several alternatives to ClassifAI. One option is to continue with the status quo of manual review. However, this is time-intensive, provides limited insights, and may not be feasible for scaling feedback efforts. Another alternative is purchasing competitor products. While some commercial solutions offer transcription and basic analysis functions, they are frequently cloud-based, which can raise data privacy concerns and become cost-prohibitive. Additionally, competitor products might lack the fine-grained question categorization and focus on teaching improvement that ClassifAI provides. Finally, stakeholders could build a custom solution in-house. This offers maximum control, but it requires a significant investment of development time, resources, and ongoing maintenance.

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4. Scope and Limitations

4.1 Major Features / Scope

Here is a list of some major features. Please look at the Use case document diagram

FE-1: Secure File and YouTube Upload: Teachers effortlessly upload audio and video recordings of their lessons from local storage or directly from YouTube for analysis.

FE-2: Speech Recognition: ClassifAI will generate highly accurate transcripts of classroom interactions.

FE-3: Automated Question Classification: Questions are automatically categorized based on Costa's Three Levels of Thinking, providing deeper insights into cognitive engagement.

FE-4: In-Depth Analysis and Visualization: ClassifAI generates comprehensive analysis, including speaker diarization (identifying who is speaking), and visualizes key metrics with clear graphs and charts.

FE-5: User-Friendly Web Interface: An intuitive web interface makes navigation and understanding the results a seamless experience for educators.

FE-6: Flexible Export Options: Analyzed transcripts and reports are easily exported in various formats (e.g., PDF, CSV) for further review or sharing.

4.2 Deployment Considerations

Deployment information is included in [developer documentation](#). Users will be around the world. However, infrastructure should not be needed to change, unless we end up having more than a few dozen regular users.

5. Other Product Requirements

Platform requirements-

Currently we are deployed on a GPU server with 2x4090 graphics cards. This should be more than sufficient. You can deploy this system with the aforementioned steps above in the developer documentation on anything with a large enough GPU.

Alternatively, you can either 1. switch the categorization model to one that requires less VRAM like Gemma-2B or 2. switch to use a costly API model (ie. chatgpt). Doing this can reduce the VRAM required significantly and allow it to run on most computers with a dedicated GPU.

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