TCU Computer Science

Instructional Equity Observing Tool
Vision

Version <1.2>

Revision History

Date	Version	Description	Author
22 September 2022	1.0	Initial Draft	Rory McCrory, Micah Collins, Sam Callan, Yilika Loufoua
30 September 2022	1.1	Editing with Client Input	Rory McCrory, Micah Collins, Sam Callan, Yilika Loufoua
20 October 2022	1.2	Finishing Sections with Client Business Decisions	Rory McCrory, Micah Collins, Sam Callan, Yilika Loufoua

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Vision

1. Introduction

The purpose of this document is to collect, analyze, and define the business requirements, i.e., high-level needs, desired ultimate business outcomes and features of the **Instructional Equity Observing Tool Vision**. It focuses on the capabilities needed by the stakeholders and the target users, and **why** these needs exist in the first place. The details of how the **Instructional Equity Observing Tool Vision** fulfills these needs are detailed in the use-case and supplementary specifications.

1.1 Background

Research in education over the last 25 years has shown improved outcomes for special education students when teachers use key elements of instructional equity in their classrooms. Instructional equity refers to the idea that *every* student learns the lesson *every* class day and can demonstrate evidence of their learning. It is not enough that every student has access to the lesson, but more important that the instructor makes sure every student is actively learning the material. Currently, observational studies done in classrooms to assess instructional equity are expensive, time-consuming and difficult to achieve inter-scorer reliability. However, institutions believe that "through systemically analyzing multiple sources of data, educators can make informed and knowledgeable school improvement decisions(*Counselors and Principals: Collaborating to Improve Instructional Equity*, 1.2:R1)."

1.2 References

R1: *Counselors and Principals: Collaborating to Improve Instructional Equity*, Journal of Organizational and Educational Leadership, v2 n1 Article 6 Sep 2016 (Ref. 1.1 Background)

R2: Armstrong, P. (2010). *Bloom's Taxonomy.* Vanderbilt University Center for Teaching. Retrieved [20 Oct 2022] from https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/.

R3: *Efficient Training of Language Models to Fill in the Middle*, OpenAI, arXiv:2207.14255v1 [cs.CL] 28 Jul 2022

R4: *Glossary*, Rory McCrory | Sam Callan | Micah Collins | Yilika Loufoua, (16 Oct 2022), (Ref 4.3 Deployment Considerations)

2. Business Requirements

2.1 Business Opportunity/Problem Statement

The problem of	Observational studies of Instructional Equity in Special Education being expensive, time-consuming, and difficult to achieve inter-scorer reliability.
affects	TCU Education Department and Special Education classrooms
the impact of which is	A lack of observational studies in K-12 schools to document instructional equity
a successful solution would be	Better education experience for students in Special Education

2.2 Business Objectives

[Summarize the important business benefits the product will provide in a quantitative and measurable way. Platitudes ("become recognized as a world-class <whatever>") and vaguely stated improvements ("provide a more rewarding customer experience") are neither helpful nor verifiable.]

BO-1: Reduce the time spent on analysis by over 99%

Current: 6 weeks
New: Minutes

BO-2: Provide concrete access for professors who need instructional equity analysis

2.3 Success Metrics

SM-1: Model accuracy of 75% or higher on speaker differentiation and the detection of questions.
SM-1: Model accuracy of 75% or higher on speaker differentiation and the timestamping of questions.
SM-1: Model accuracy of 75% or higher on speaker differentiation and the labeling of questions.

2.4 Vision Statement

For	Special Education Instructors
Who	who want to quantify teaching metrics based on recorded instruction audio

The Instructional Equity Observing Tool(product name)	is an AI-driven audio classification and statistics tool
That	analyzes audio/video recordings and creates data visualizations that represent instructional performance
Unlike	current methods of observing, documenting, and analyzing instructional equity
Our product	remains affordable, efficient, and automated.

2.5 Business Risks

RI-1: Teachers might change teaching style to something less natural and therefore the new style may be harder for them to adapt and teach well with (Probability = 0.3; Impact = 6)

RI-2: Too few teachers might use the system, reducing the return on investment from the system development and the changes in teaching procedures (Probability = 0.5; Impact = 9)

RI-3: Teachers may be misled from a report and the facts that it is stating, thus changing teaching style in a way that would not be beneficial but perhaps negative (Probability = 0.3; Impact = 6)

2.6 Business Assumptions and Dependencies

AS-1: Teachers will be able to access browser application

AS-2: Teachers will be knowledgeable enough to upload files and download the report

AS-3: Teachers will be able to read and understand the analysis report

AS-4: Audio file quality will be sufficient for analysis

AS-5: Classroom instruction is orderly enough for speaker differentiation

AS-6: Files uploaded will be of appropriate size and file format

3. Stakeholder Profiles and User Descriptions

3.1 Stakeholder Profiles

Stakeholder	Major value or benefit from this product	Attitudes	Major features of interest	Constraints	End user or not?
Curby Alexander	Improve ability to do research on instructional equity in classrooms and analyze teacher practices more efficiently.	Very committed and responsive to messages.	Data reporting capabilities of product.	Non-prescriptive analytics (present data, not solutions)	Yes
Michael Faggella-Luby	Improve ability to do research on instructional equity in classrooms and analyze teacher practices more efficiently.	Teacher perspective, would be an end user.	promoting good-quality teaching through the product, 'trends' features. Time saved over manual procedures.	Video-file compatibility required, speaker differentiation within file requested.	Yes
Liran Ma	Integration of different Machine Learning models to find the optimal results in analysis	Positive, scientific interest	Algorithm structure/rigor	Focus on using an already-trained machine learning model.	Possibly
Teachers/instructional equity analysts	Allow for better analysis of teaching practices and understanding of impact on instructional equity and automation of previously manual tasks	NA	Entire software	None	Yes
Students	Benefit from improved teacher awareness and attention towards a balanced classroom	NA	NA	None	No

3.2 User Environment

Number of people involved in completing the task? Is this changing?

- *1 person to complete task. Only need one person to upload files and view the analysis. This should not change.*

How long is a task cycle? Amount of time spent in each activity? Is this changing?

- *Task cycle should be at least < 30 mins. Could change depending on model(s).*

Any unique environmental constraints: mobile, outdoors, in-flight, and so on?

- *No constraints except for internet access.*

Which system platforms are in use today? Future platforms?

- *None in use today. Future platform would be a web application for teachers to access to upload files and receive analysis*

What other applications are in use? Does your application need to integrate with them?

- *API's for speech to text, speaker differentiation, and text analysis.*

This is where extracts from the Business Model could be included to outline the task and roles involved, and so on.]

3.3 Alternatives and Competition

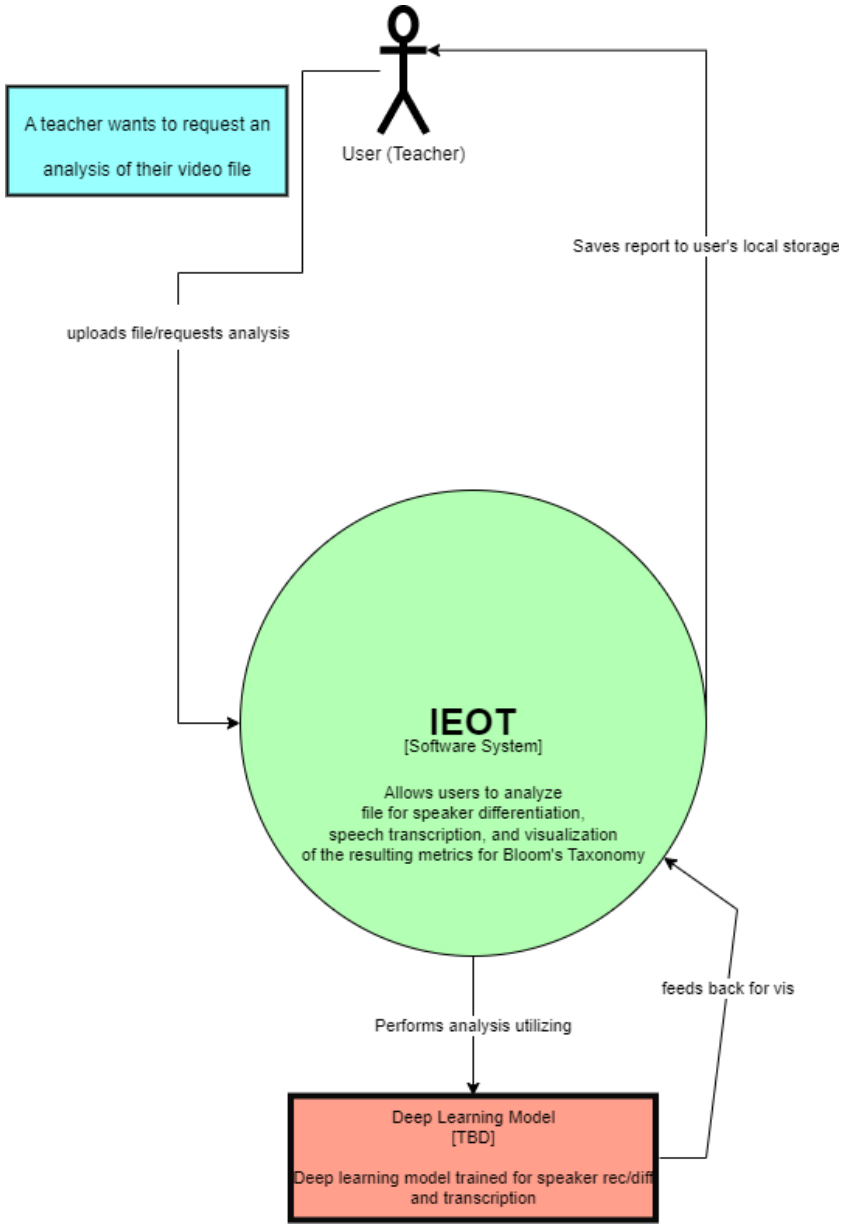
- Current alternative is manually analyzing information regarding teacher-student interaction in the classroom. This method is inefficient and also inconsistent.

4. Scope and Limitations

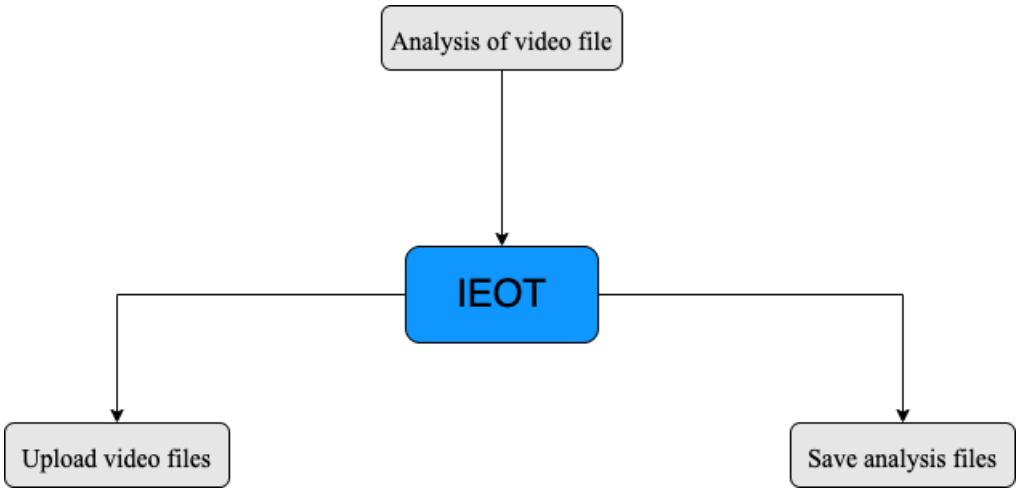
[This section provides a high-level view of the product capabilities, interfaces to other applications, and system configurations.]

4.1 Product Perspective

C4 Context Diagram:



4.2 Major Features / Scope



FE-1: Upload video files to be analyzed by model and to receive analysis of files.

FE-2: Perform analysis on uploaded file

FE-3: Save analysis files to user's local disk

4.3 Deployment Considerations

- Web Application available for all permitted users to access (*Glossary, Business Rules, BR-3*)
- No hosted database for users to access, file saving will be directed to user's system

5. Other Product Requirements

[At a high level, list applicable standards, legal, hardware, or platform requirements; performance requirements; and environmental requirements.

Define the quality ranges for performance, robustness, fault tolerance, usability, and similar characteristics that are not captured in the Feature Set.

Note any design constraints, external constraints, or other dependencies.

Define any specific documentation requirements, including user manuals, online help, installation, labeling, and packaging requirements.

Define the priority of these other product requirements. Include, if useful, attributes such as stability, benefit, effort, and risk.]

- To be determined.