Re-Imagining Data Collection and Analysis in Special Education

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***Abstract*—**History has demonstrated the most impactful technological advancements are often born from great tragedy. In the aftermath of the COVID-19 Pandemic, the relationship between technology, teachers, and students has had to adapt and evolve accordingly. Despite obvious advancements in technology, numerous shortcomings persist within the sector. The United States is currently facing a critical issue with teacher satisfaction and retention at historic lows, posing a potential tragedy with severe educational deficits. This study zeroes in on a specific area of concern, focusing on the Special education domain. It examines the interactions of Special Educators with the PowerSchool Individualized Education Programs (IEPs) interface, particularly the Present Level of Performance (PLOP) interface, which has faced considerable scrutiny. By analyzing feedback from over 50 Special Educators and conducting personal interviews with five, we propose evidence-based prototypes and solutions designed to navigate the evolving educational landscape. Our goal is to equip teachers, especially those in special education, with the resources they need to succeed.

1 INTRODUCTION

The decision to conduct exploratory research into the field of special education – a vulnerable population wrought with hindrances to effectiveness, is inspired by the observation that society seemingly places little worth on tasks with low monetary value. Tasks that yield significant financial gain and social value are highly pursued – and attract considerable attention and resources. For example, in 2020 the Food and Drug Administration (FDA) decided to fast track both Pfizer and Moderna's COVID-19 vaccinations despite safety concerns. This was

largely heralded as a major success for society, and it quickly became a campaign headline for politicians. For Pfizer's efforts, they were able to record over $100 billion dollars in revenue from 2021 to 2022 (Pfizer Investor Insights, 2023). On the other hand, industries such as alcoholic beverages, despite contributing to over 95,000 alcohol-related deaths in the U.S. in 2023, continue to thrive financially (NCDAS, 2023). Conversely, sectors like the U.S. education system, despite possessing a high social value, are often neglected. The famous American philosopher and writer Will Durant emphasized that "Education is the transmission of a civilization."(Smith, 2020, as cited in Durant, 1950) His publications illustrate the importance of education, and its direct impact on economic growth and a society's ability to prosper. Despite the high social value associated with education, the U.S. education system remains in crisis. A study conducted by Brown University in 2022 revealed there to be at least 36,000 teacher vacancies along with at least 163,000 positions held by under qualified teachers (Nguyen, Lam, & Bruno, 2022). This neglect, particularly pronounced in special education, demonstrates a conflict between the societal importance attributed to education and the resources allocated to it. This research aims to investigate the cause of this disparity, focusing specifically on challenges and needs of Special Educators. These educators are pivotal in the development of Individualized Education Programs (IEPs) for special needs students – a process requiring extensive documentation, data compilation, and analysis, specifically within the Present Level of Performance (PLOP) section of the IEP platform (see Figure 1).

The PLOP interface is necessary for tailoring education to individual needs. However, it demands considerable cognitive effort from teachers to write, save, edit, and manage IEPs effectively. To accomplish this, teachers must use the PowerSchool application. Figure 2 provides a visual representation of the hierarchical structure of the PLOP interface, located within the PowerSchool platform. Through analysis of PowerSchool's PLOP interface, we aim to understand what those challenges are, present technological options to shorten the Gulf of Execution for key tasks, and seek to improve educator efficacy.

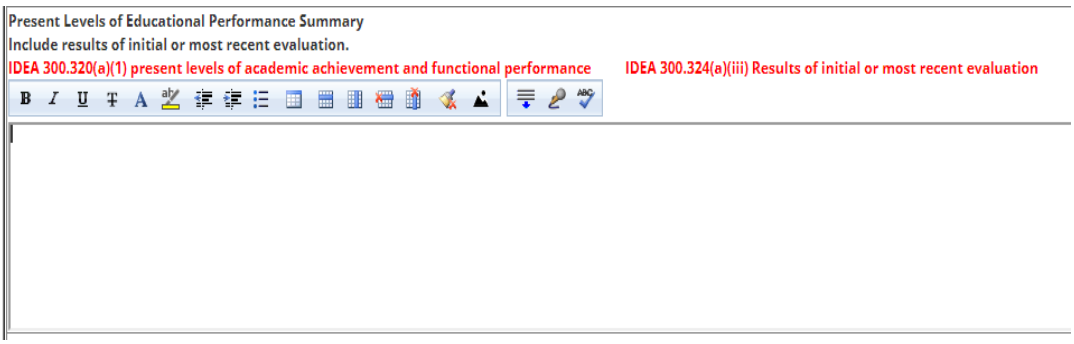

***Figure 1*—PowerSchool PLOP Interface**. Educators compile, analyze, and sort data gathered from multiple web platforms into the above interface.

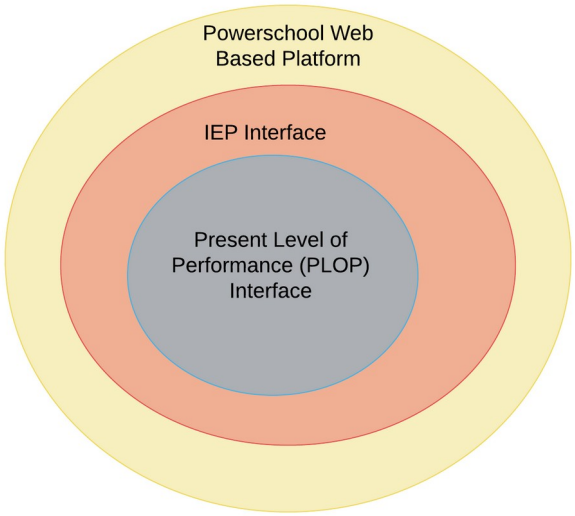

***Figure 2*—Hierarchical Depiction of PLOP Interface.** The PLOP interface exists within the PowerSchool 's IEP platform.

2 NEEDFINDING PLAN

The needfinding plan begins with desk research aimed at providing a comprehensive view of past and current policies relating to Special Educators within IEP production.

Then, the identification and analysis of our user base is established: Special Educators. This group is deemed most *at risk* due to their unique exposure and challenges to the IEP process. This demographic would likely benefit most from User Interface (UI) and User Experience (UX) improvements. Analysis will draw from surveys and existing literature.

In the next phase, online surveys are sent to Special Educators via Google Forms. Surveys are designed to uncover details and insights into users' unique experiences with the PLOP interface. Location and sample size is also considered. Targeted users will consist of teachers in Colorado, Ohio, and North Carolina. These schools represent areas of access for the researcher and serve to gain input across multiple socioeconomic demographics. Additionally, two in depth personal interviews with subject matter experts (SMEs), are conducted to gather needs and assess friction points.

Finally, a heuristic evaluation will be conducted to assess the usability of the interface. Three of Jakob Nielson's 10 usability heuristics are applied to assess usability of the interface (Moran & Gordon, 2024). The following heuristics were selected based on relevance to the PLOP interface: *user control and freedom, consistency and standards,* and *flexibility and efficiency of use*.

2.1 Needfinding Results

The needfinding plan closely resembled the planned methodology. A large majority of the surveys sent were responded to quickly, providing ample time to analyze the responses. A quick response time indicated a strong interest and concern among Special Educators regarding the topic. Despite enthusiasm amongst participants, the desired quantity of survey responses was slightly less than the goal of 50. This may be attributable to the scarcity of Special Educators. On average, there are three teachers per school. This made the process of locating the target audience more challenging than anticipated. The two personal interviews revealed extremely useful information, as I was able to ask follow up questions and tailor information based on the flow of the conversation. Our results analysis will examine survey results, interview responses, and analysis of the Heuristic Evaluation.

2.2 Survey Results

A total of 33 teachers from Colorado, North Carolina, and Ohio provided survey responses – uncovering critical insights and shortening knowledge gaps.

One such insight was uncovered in question 10 (See Appendix 13.1.10). When asked what educators found to be most difficult in collecting data for IEP production, 56% of educators agreed that managing multiple data sources/platforms is most difficult. Considering that over 45% of teachers

contribute to over 26 IEPs per year – frustrations with multiple data sources account for a large degree of issues within the PLOP interface.

Furthermore, while over 72% of educators acknowledged the existence of data collection programs with analysis tools (See Appendix 13.1.9), the data suggests a concentration of tool usage around four main programs: Woodcock-Johnson, Star Renaissance, Aims Web Plus, and CMAS (See Appendix 13.1.8). Two previously unknown insights can be gleaned from these metrics. First, teachers have access to data collection tools, but they experience significant cognitive stress while compiling and interpreting these data spread across several sites. Second, the vast majority of the data collection and assessment tools in use are concentrated amongst four tools – Woodcock-Johnson, Star Renaissance, Aims Web Plus, and CMAS.

2.3 Interview Results

Two individual interviews were conducted with subject matter experts (SMEs). Each SME has over 8 years of experience, and carries advanced degrees. To maintain anonymity, we refer to them as Ms. Smith and Ms. Johnson. The interview with Ms. Smith assisted in interpreting survey data of which I previously could not make sense. In question seven (See Appendix 13.1.9), teachers were asked how much time was spent on collecting, analyzing, and producing data for initial IEPs. Results showed the majority of teachers spent between 6-10 hours. This was on the lower end of the spectrum for my expectations. Ms. Smith clarified that this is not by choice but necessity. An overwhelming number of caseloads forces educators to settle for a "good enough" level of analysis. This insight reveals a systemic issue: educators are stretched too thin, impacting the quality of individualized education planning.

Ms. Johnson expressed similar feelings of frustration with the system. As a school administrator, Ms. Johnson is responsible for reviewing other educators' IEP comments. She expressed her frustration with common errors she must correct. She highlighted that the vast majority of the errors result from a teacher's lack of understanding how data compilation/interpretation drives the process. In the Present Level of Performance (PLOP) interface, educators must input data from several different sites. What the teacher enters in the PLOP interface determines how a kid will be handled and educated for the school year. Mistakes in locating or interpreting data could lead to serious legal ramifications.

2.4 Heuristic Evaluation Results

Utilizing Jakob Nielsen's usability heuristics, the PLOP interface was evaluated for *user control and freedom*, *consistency and standards*, and *flexibility and efficiency of use*, revealing key areas for improvement (Moran & Gordon, 2024).

User control and freedom: Educators frequently encountered issues determining if another user was editing the same document – resulting in being locked out. A recommendation for change is to adopt a collaborative editing system similar to Google Documents that displays real time modifications (See Appendix 13.2.1).

Consistency and Standards: The interface's singular text box for diverse data inputs such as progress monitoring and test results presents organization challenges. Introducing a hierarchical structure for data entry could guide educators through the process, improving usability (See Appendix 13.2.1).

Flexibility and Efficiency of Use: The current need for educators to manually gather data from various platforms is inefficient. Implementing an auto-import tool that directly brings in structured data could add efficiency to this process, ensuring crucial metrics are not overlooked (See Appendix 13.2.3).

3 BRAINSTORMING PLAN

Brainstorming is a powerful tool for generating ideas and solutions. My strategy for brainstorming will be carried out to maximize creative output, setting the stage for the refinement of solutions. I will use a chunking technique to conduct three individual Brainstorming sessions broken up by at least one hour breaks. Separating sessions into manageable time blocks will allow me to maintain focus while retaining information. After one iteration of needfinding, I have a good idea of the problem context. Prior to each session, I'll ensure I write down a generic problem statement I can easily reference in the event my attention becomes compromised.

Next, I'll confine myself to a quiet room for three twenty minute sessions, where I write down as many ideas of which I can think on paper. The first session will be a fact finding session, focusing on facts and givens. The second session will generate ideas and possible leads. The final session will focus on offering solutions, and deciding on a tentative implementation plan. At the conclusion of my brainstorming session, I will discuss results with my spouse. As a Licensed

Clinical Social Worker (LCSW) in the school system, she is well familiar with the problem statement, and can act as a voice of reason as we discuss ideas generated during the brainstorming process, and how it will aid in the creation of design alternatives.

3.1 Brainstorming Results

Results of brainstorming exercises were quite informative (See Appendix 13.3.1). During the first brainstorming session, I listed the facts and givens. This allowed me to refine my problem context into a clear statement:

How can a one man design team go through several iterations of the design life cycle to pinpoint the largest friction point within the PowerSchool Present Level of Performance (PLOP) interface – and through iteration, make design modifications that will improve special education teachers' ability to perform data collection and interpret key metrics given time constraints, resulting in a tangible improvement of teacher efficacy.

This statement captures the full scope of what needs to be accomplished throughout the design lifestyle.

With a clear understanding of the facts and a refined problem statement, the second brainstorming session focused on perspective solutions. To accomplish this goal, I created three user personas for my targeted users based on the evaluation of needfinding results. Although they were initially rough sketches, a complete model was created after brainstorming was complete (See Appendices 13.3.2 – 13.3.4). Through creation of personas, and focusing on the core issues, I came up with various solutions aimed at tackling the defined problem statement.

The final brainstorming session focused on the implementation of ideas and design alternatives. During this block of time, I honed my focus on three of the most relevant ideas, and how they might be implemented. Efforts of brainstorming produced three refined solutions. The first solution incorporates an auto import tool for data metrics collected on specific students. Initial interviews and surveys revealed that this crucial student data already exists (See Appendix 13.1.9). However, it can be difficult to locate for some educators. Results of the initial survey also concluded there to be four main data metrics that Special Educators use in the PLOP interface – Woodcock-Johnson, Star Renaissance, Aims Web Plus, and CMAS (See Appendix 13.1.8). Incorporating corresponding check boxes to import these data would ensure educators are

using quantitative data in their analyses, reducing the level of technical knowledge teachers need to locate and interpret key data points.

The second solution focused on tools such as headers to guide educators along the process as they create the present levels of performance within the interface. Survey question 11 (See Appendix 13.1.11) allowed teachers the opportunity to give improvement recommendations. A noticeable trend was that teachers seemed to consistently denote the need for assistance with generating ideas consisting of attainable, objective, and measurable goals that can be tweaked for different student academic, speech, and behavioral characteristics. There are specific topics in which teachers are mandated to address in the PLOP interface. Mandated data could be organized into headers, providing teachers with a guideline to follow as they create their entry.

The final solution modified the interface to allow multiple educators to log into the platform and observe their coworkers making changes in real time. This solution was aimed at addressing concerns brought up during SME interviews and reflections in survey data.

4 INITIAL PROTOTYPING

To best address the needs of a large demographic of Special Educators, I leveraged persona profiles created during the brainstorming process. This method reflects a user-centered approach taken during the initial prototyping process and ensures the design solutions closely align with the actual user needs.

4.1 Prototype 1: Auto Import

The Auto Import prototype is a low fidelity sketch prototype that's designed to streamline data integration directly into the PLOP interface via an auto import feature – simplifying the data entry process and reducing the manual entry burden. This functionality is aimed at enhancing efficiency and accuracy in IEP preparation and directly responds to educators' identified needs for a more efficient way to manage data from various sources. The prototype allows educators to import data from four main data sources identified as most utilized by Special Educators: *Woodcock-Johnson*, *Aims Web Plus*, *CMAS*, and *Star Renaissance* (See Figure 3).

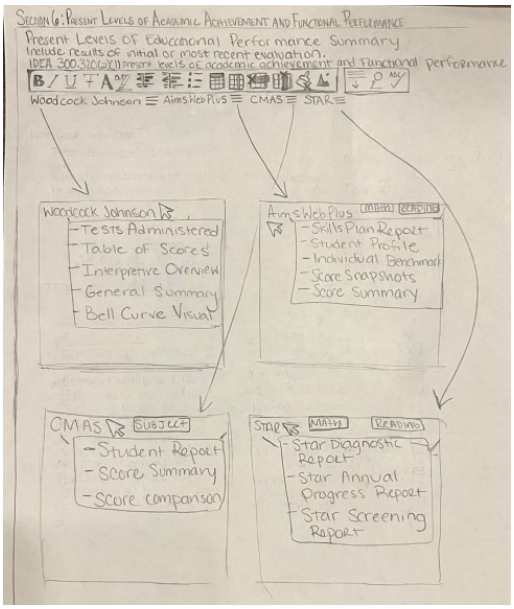

***Figure 3*—PowerSchool PLOP Auto Import Feature**. This prototype allows the user to import data from Woodcock-Johnson, Star Renaissance, Aims Web Plus, and CMAS

4.2 Prototype 2: Guided Headers

The Guided Headers prototype presents the user with predefined headers that prompt them to enter essential information. They serve as cues – ensuring the user doesn't forget to include crucial data. This functionality aims to reduce the cognitive load associated with organizing and remembering all necessary data points by offloading tasks from the user onto the interface. Instead of relying on the user to structure their document from scratch, the application provides an intuitive framework that allows the user to customize as needed.

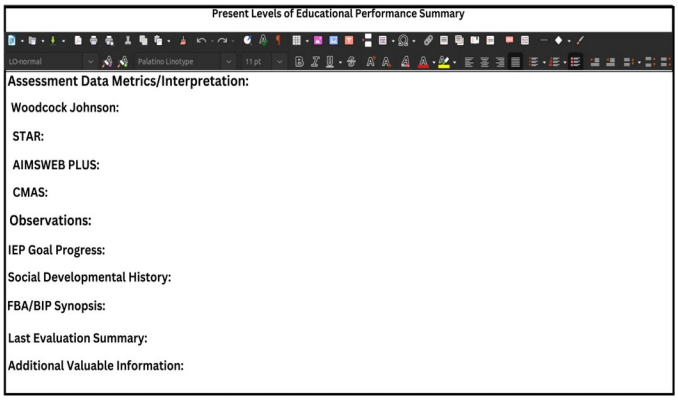

***Figure 4*—PowerSchool PLOP Guided Outline** This prototype provides the user with a guided outline as they input information.

4.3 Prototype 3: Interactive Design

The Interactive design offers users the capability to see if another user is currently editing the same screen in real time – reducing the amount of errors attributed to overwriting coworker data. The active editor shown in Figure 5 serves as an affordance by providing the user with a visual cue about who is editing the shared document. By knowing when another user is editing in the same screen, teachers may share thoughts and collaborate in real time.

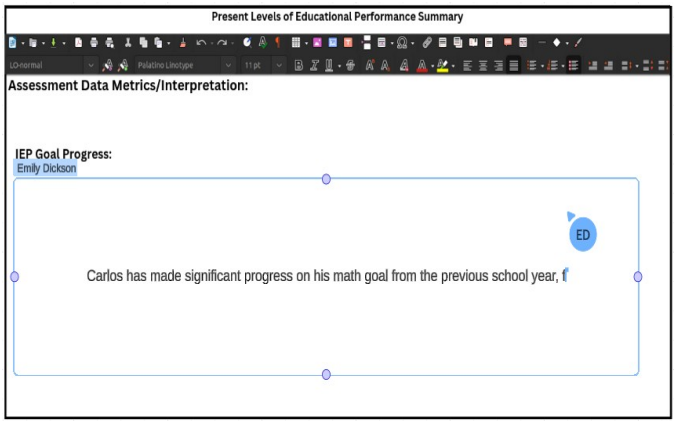

***Figure 5*—PowerSchool PLOP Active Edit.** This prototype allows the user to view edits by coworkers in real time.

5 EVALUATION PLANNING

Prototypes will be evaluated from a quantitative perspective from results gleaned from surveys sent out to Special Educators via Google Forms. The targeted sample size is of a similar demographic as established during the needfinding process – teachers in Colorado, Ohio, and North Carolina. This demographic is accessible through professional and personal relationships.

Prototypes will be evaluated from a qualitative perspective through two personal interviews with the same two subject matter experts (SMEs) interviewed in section 2.3 to gather needs and assess friction points.

5.1 Quantitative Planning

To assess the effectiveness of the three prototypes, we will deploy a survey via Google Forms, targeting Special Educators as outlined in (See Appendices 13.4.1 – 13.4.4). The survey displays each of the three prototypes followed by questions tailored to evaluate how each design could enhance their ability to perform

specific tasks. Questions are individualized based on each interface. Tailoring the questions in such a manor allows us to receive relevant feedback regardless of the level of precision presented in each prototype.

Prototype 1: Auto Import: The survey uses targeted language to assess the degree to which the Auto import tool is able to offload the task of managing multiple data sources. We will avoid questions on visual design elements like font size or button dimensions, focusing instead on the prototype's functional capability to offload tasks.

Prototype 2: Guided Headers: In this section of the survey, we also use targeted language to assess the degree to which guided headers assist in providing structure and guidance, and assist in offloading tasks from the user to the interface. We want to evaluate the level of intuitiveness of the headers, and ensure that one modality – offloading tasks on the interface, is not competing with another modality - emphasizing essential content while minimizing clutter.

Prototype 3: Interactive Design: The survey uses targeted language to evaluate the degree to which this prototype uses affordances to indicate to the user that other coworkers are collaborating in real time.

Prototype Comparison: Educators will be asked to rank the designs in terms of usefulness and intuitiveness. This comparison will provide insights to help assess which designs are perceived as beneficial, and examine differences between user preferences.

5.2 Qualitative Planning

The qualitative evaluation will be conducted through personal interviews with the two subject matter experts (SMEs) previously engaged in the project. This phase aims to delve deeper into the usability and effectiveness of the prototypes, paralleling the key data points addressed in the quantitative survey. However, the personal interview will afford the opportunity to expound upon data received in the quantitative evaluation. As I navigate the research and uncover insights, I will highlight key themes, patterns, and takeaways.

6 EVALUATION RESULTS

This project is uniquely personal for many Special Educators. Therefore, the re-engagement of the same demographic represents the participatory design

strategy implemented during the needfinding process. The educators involved have had early, consistent, and active involvement throughout the process. Results of the second survey were quite insightful. I received 16 responses during this phase. Important conclusions may be gleaned from the data within the responses (See Appendices 13.5.1 – 13.5.4).

6.1 Quantitative results

Prototype 1: Auto Import: Results of the executed evaluation plan demonstrated the effectiveness of the import feature's ability to offload tasks from the user to the interface. On a scale from 1 to 5, users gave high scores to the effectiveness of the auto import functionality. The graph represented in figure 6 represents the positive interpretation of the auto import feature and shows strong promises for usability and effectiveness.

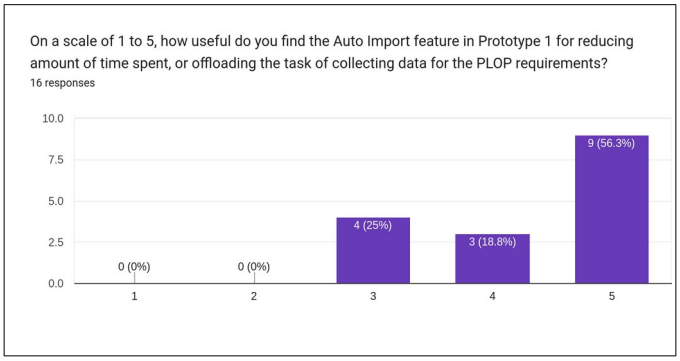

Figure 6—Prototype 1. *Survey results display the effect Prototype 1 had on offloading tasks.*

Prototype 2: Guided Headers: Survey results revealed that most educators polled felt the inclusion of guided headers would be either extremely helpful or moderately helpful – with a combined polling of 62.5% concurring. This is consistent with our initial survey results where many teachers specifically requested the feature. This consistency between needs expressed in the early stages of research and the positive reception of the prototype validates our user-centered design approach.

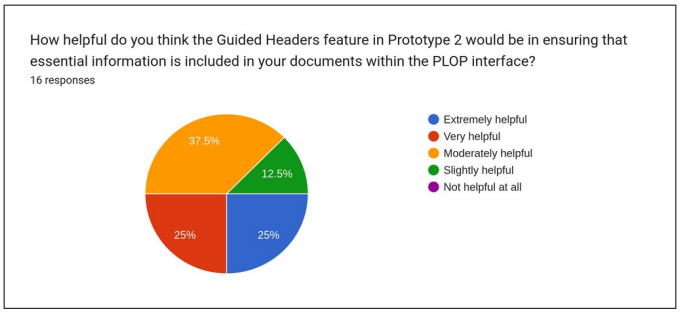

Figure 7—Prototype 2. *Survey results display the effect of Prototype 1 had on offloading tasks.*

Prototype 3: Interactive Design: This prototype evaluated the degree to which the interface offered appropriate affordances to indicate the interactive design to users. An overwhelmingly positive response was received – resulting in 100% of educators polled agreeing that the indicator effectively provided visual cues about who was editing the shared document. These results demonstrate positive potential for the creation of a collaborative PLOP environment.

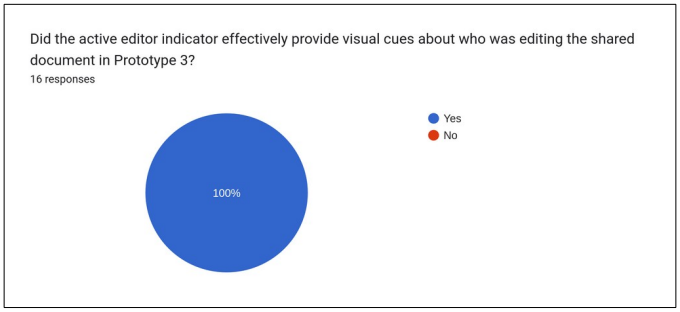

Figure 8—Prototype 3. *Survey results display the effectiveness of interactive affordances.*

Prototype Comparison: Educators were asked to rank the prototypes in terms of usefulness and intuitiveness. Results show that while educators find prototype 1 more intuitive, they find prototype 2 to be more useful. The results shown in figure 9 display interesting results, and shows a divergence from what users find intuitive and useful. The educators' rankings highlight the importance of balancing intuitiveness and usefulness in further iterations in the design lifecycle. Undoubtedly, an intuitive design is essential. However, the overall usefulness of a feature, and its ability to meet specific educators' needs—plays a large role in its value. These findings will play an important role moving forward. Consideration to effectively balance the two metrics will likely determine the degree of benefit the final prototype will provide to educators.

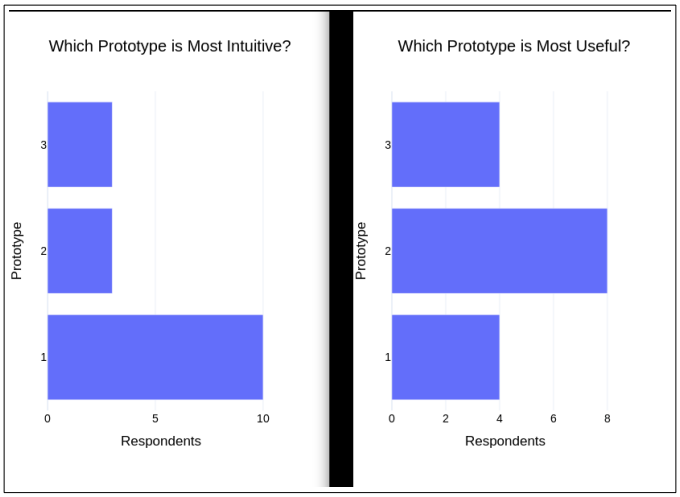

Figure 9—Prototype Comparison. *Survey results display the three prototypes ranking of intuition and usefulness.*

6.2 Qualitative results

Two personal interviews were conducted with the same subject matter experts (SMEs) that were interviewed during the needfinding process. As previously mentioned, each SME has significant experience in special education.

6.3 Personal Interview: Ms. Smith

Ms. Smith's feedback on Prototype 1 (Auto Import) and Prototype 2 (Guided Headers) highlighted a critical need for customization to meet the needs of the diverse special education community.

Prototype 1: Auto Import: Quantitative results showed a significant number of teachers mentioned they would prefer to choose which assessment tools were used for data import and how some, if not all, of these data sources wouldn't be relevant for them. Ms. Smith validated this, noting the importance of allowing schools to select relevant tools based on availability and funding. The option to customize the selection would align the feature more closely with the different needs of schools and districts.

Prototype 2: Guided Headers: Like the Auto Import prototype, educators expressed a preference for customizable headers in the Guided Headers prototype. Ms. Smith emphasized the ambiguity in federal expectations for IEP creation, leading to varied requirements at the school or district level. A solution, such as a dropdown menu of headers that educators can choose from, would offer the flexibility needed to accommodate these differing requirements effectively.

6.4 Personal Interview: Ms. Johnson

Ms. Johnson provided new insights into the utility of Prototypes 2 (Guided Headers) and 3 (Interactive Design), emphasizing their impact on improving IEP team collaboration. She highlighted that these prototypes would be an immense improvement in terms of data compilation and analysis. She mentioned the Interactive design tool will play a significant role in preventing data loss or editing conflicts among team members.

My initial assumption was that the auto import tool would provide the greatest amount of utility. However, Ms. Johnson validated survey results in figure 9 by noting its primary benefit would be tailored directly to special education teachers, who manage academic data. Given that IEP teams often include up to 7 or 8 professionals, with only the special education teacher handling academic data, the broader team benefits more from the organization and collaboration facilitated by Prototypes 2 and 3. Ms. Johnson's perspective underlines the importance of considering the diverse roles within IEP teams when evaluating the prototypes' overall benefit added.

7 SECOND ITERATION PLANNING

7.1 New Insights

After the first iteration of the design life cycle, I re-examined the problem context and reflected on user needs. After thorough analysis, it became apparent that the most effective design would combine elements of all three prototypes. Both quantitative and qualitative feedback revealed that although each prototype effectively addressed specific concerns, they individually overlooked other key aspects of the user experience.

7.2 Design Shortfalls

Prototype 1: Auto Import: This prototype addressed the issue of finding, locating, and including required data from the three main data collection sources. However, this prototype ignored the interactive editing requirement. Additionally, feedback suggested that the guided headers feature included in prototype 2 was more beneficial than the auto import function.

Prototype 2: Guided Headers: The structured template in this prototype provided an extremely useful template educators could follow while entering data into the PLOP interface. However, quantitative and qualitative feedback suggested that for some teachers, particular header input was not required, while others felt the headers added clutter to the screen – adding confusion for teachers who did not wish to use headers to begin with.

Prototype 3: Interactive Design: The interactive edit feature was widely appreciated and is a crucial addition that was specifically requested by multiple educators. However, this prototype ignored the stakeholder requirements for the import of data, and the use of headers – which were also critical requirements.

7.3 Re-imagined Design

After re-examining shortfalls of the three prototypes, no one single design emerged as a clear winner. Therefore, an implementation of all three designs is required to provide solutions for all major stakeholder requirements.

Integrated Auto Import Functionality: The final design would incorporate the auto import functionality from Prototype 1 – allowing users to import essential data from various sites. This feature will be designed to be both intuitive and responsive, while meeting critical stakeholder needs for data inclusion.

Optional Guided Headers: Reflecting on feedback from Prototype 2, the header functionality will be made to be an optional feature, activated via a checkbox based on user preference. This approach allows educators to personalize their own experience, using the headers when needed without cluttering the interface. Reflections from the prototype comparison survey revealed the need to balance task offloading with the need to minimize clutter – and ensure these modalities complement rather than compete.

Interactive Editing: Finally, the design will incorporate the interactive edit feature from prototype 3. The incorporation of this element will be designed to be a seamless integration with the interface – allowing the user to view when another user is currently editing.

8 FINAL PROTOTYPE

The final prototype is developed using Java, FXML, and CSS programming languages, with JavaFX as the chosen framework. This allows for the creation of an interactive simulation with a responsive graphical user interface (GUI) complete with realistic inputs and outputs.

Privacy Rights Limitations: In order to adhere to privacy laws, the prototype simulates educational data. Therefore, all data displayed within the prototype is made to simulate data a user would see when pulled from various data collection sites, without using actual child data. This ensures compliance with privacy regulations while providing a realistic user experience.

Data Import Constraints: The auto-import functionality involves data from specific collection sources. I acknowledge the need for formal agreements and robust data security considerations. Therefore, the prototype focuses on the interface's look and feel, providing an interactive experience that demonstrates functionalities without backend integration (Houde & Hill, 1997, p. 374).

8.1 Initial PLOP Interface Screen

The initial PLOP interface screen reflects all essential features identified through user feedback. The interface adopts an intentionally minimalistic design, with significant changes. Feedback from both qualitative and quantitative evaluation revealed the effectiveness of three critical user requirements – which are incorporated and displayed in the final prototype in figures 10 - 13:

- An auto import tool for most commonly used data collection sites
- Guided header template educators could follow while writing analyses
- An interactive cursor denoting multiple users

Additionally, a mapping technique is used to make the toolbar easier to understand the intended use of the object. Microsoft Word is the most widely used composition interface in the world with over 345 million active subscribers to Microsoft 365 (Microsoft 365 Suite Revenue and Growth Statistics, 2024). Because of this popularity, users are likely familiar with the location of key objects in the toolbar. The positioning of essential buttons mapped to similar locations as Word reduces user cognitive load, and likelihood of errors.

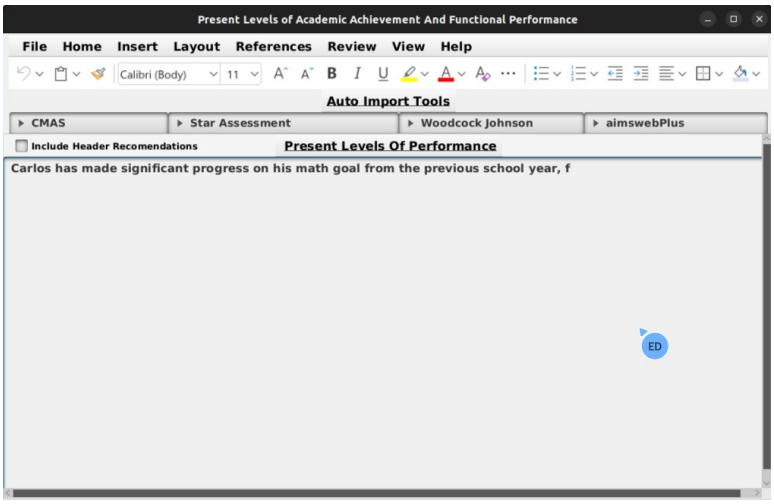

Figure 10—Final Prototype. *Initial screen of the Final PLOP interface incorporating critical user requirements.*

8.2 Optional Headers and Auto Import Tools

Feedback from Ms. Smith and quantitative survey results emphasized the need for customizable features within the PLOP interface, particularly concerning headers and data import tools. In response, the final prototype has been designed to empower educators with flexibility and control over *Customizable Headers*. Recognizing diverse uses and preferences of educators, the final prototype includes an option to enable or disable headers via a checkbox.

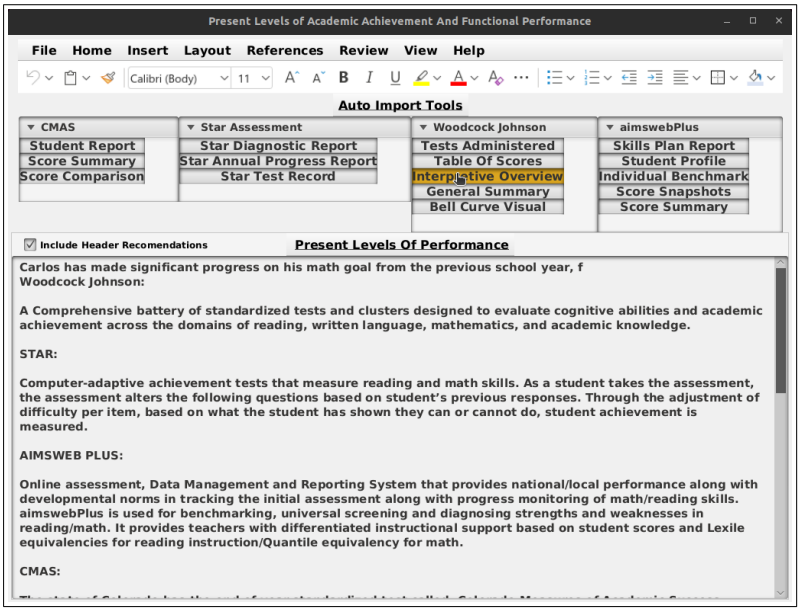

Figure 11—Final Prototype. *Final PLOP interface displaying auto import and header incorporation options.*

8.3 Auto Import Feature

Feedback from the evaluation phase highlighted the distinct value of the Auto Import feature, especially for case managers and school psychologists (See Appendix 13.5.1). The auto import tool in figure 12 incorporates a *selective data import feature* – allowing users to select from any of the four data collection sites identified as most commonly used and import them into the interface – while simultaneously inputting data in a side-by-side comparison. The *multiple source import feature* allows users to import from as many sources as necessary. The interface organizes the data in a stacked hierarchical structure. Finally, the *customizable header for imported data feature* allows users to import custom headers for each data source selected. This provides a personalized experience, while promoting an effective data organization structure. Users can choose to import from multiple sources.

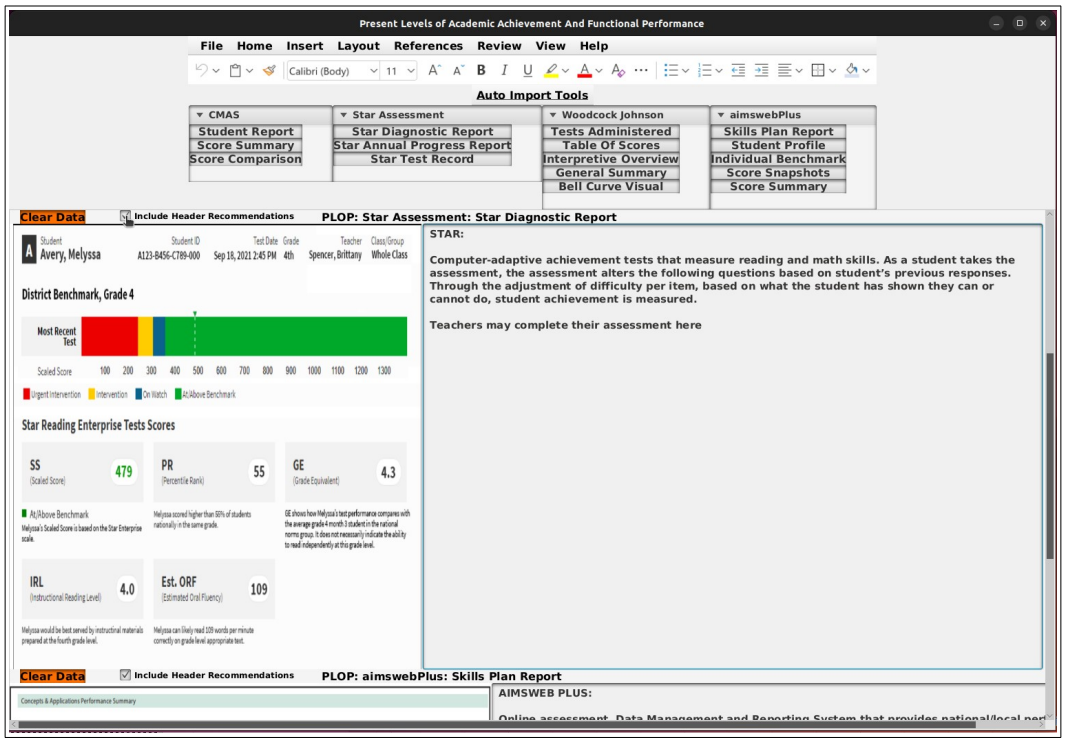

Figure 12—Final Prototype. *Final PLOP interface displaying auto import and header incorporation options.*

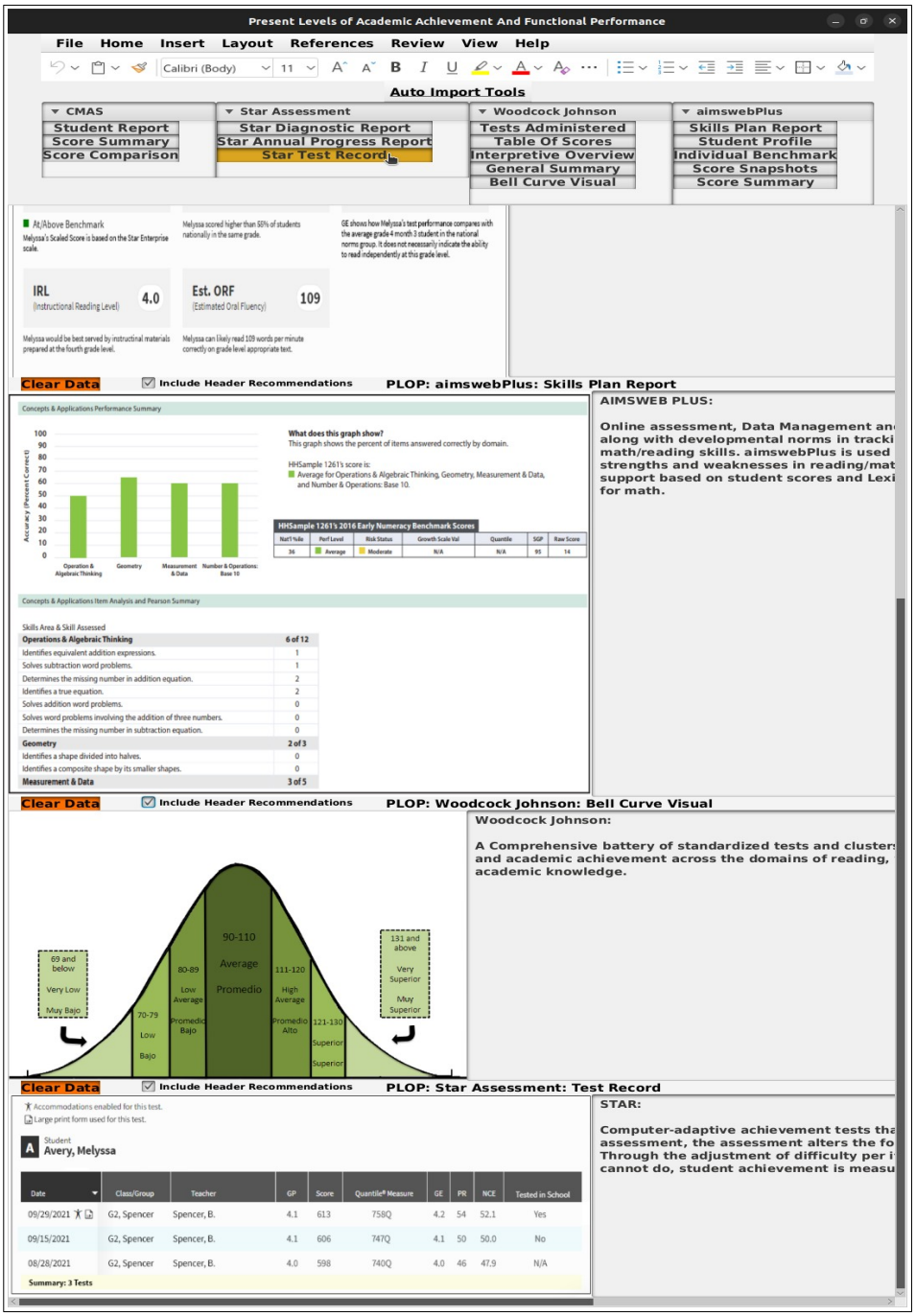

Figure 13—Final Prototype. *Final PLOP interface displaying auto import and header incorporation options.*

9 VIDEO PROTOTYPE

Video demonstration of final prototype available at the following link:

https://drive.google.com/file/d/1lz8ODJZwZxPXuWOUOUyOiip7g5XIg4Mn/view?usp=sharing

10 FINAL EVALUATION PLANNING

10.1 Qualitative Evaluation Planning

Final evaluation planning will involve personal interviews with five Special Educators that represent different use case scenarios of the PLOP interface. By leveraging personal networks, I will engage with subject matter experts across a range of educational settings, including two middle schools and one high school in Colorado Springs, Colorado. Interviews will be conducted on-site to facilitate a more immersive and interactive feedback process. The interview intentionally features two educators who have been involved throughout the entirety of the design life cycle (Ms. Smith and Ms. Johnson), while three educators interviewed have not seen the application before. Due to the small sample size of users interviewed, I will focus on qualitative analysis to identify themes and patterns within the feedback. Participants are informed on the fact that the final prototype is a "Look and Feel" prototype, with certain technical and functional limitations. They will be asked to primarily assess specific qualities of the prototype. This will contribute to a more comprehensive evaluation.

10.2 Quantitative Evaluation Planning

The final prototype evaluation will focus on three quantitative metrics for analysis. Prior to the interview, the users are informed they will be ranking each metric on a scale of 1 to 5 based on the following criteria:

- Intuitiveness: A score of 4 or higher would indicate the user found the interface to be highly intuitive. A score of 2 or below would denote the user found the interface to be highly non-intuitive.

- Value added: A score of 3 or higher would denote the user considers the interface to provide a high degree of value to their daily routine; whereas, a score of 1 or below would denote the user did not find the interface to provide value.
- Simplicity: A score of 4 or higher would denote the user found the interface to be simple, sleek, and easy to use. A score of 2 or below would denote the user found the interface to be complex and cumbersome.

Next, I will calculate the mean ranking and standard deviation for each metric. I will then interpret statistical significance based on these results. Finally, I will summarize descriptive statistics gleaned from the results of the data.

11 FINAL EVALUATION RESULTS

The evaluation plan, comprising personal interviews with special education subject matter experts across schools in Colorado Springs, Colorado, was successfully completed. Results of qualitative analyses are reflected as major themes and patterns – and displayed as bullet points under each interview below. It is important to acknowledge shortcomings with such a small sample size. Traditionally, a small sample size may lead to more drastic variance, or more pronounced results. However, because the sample size is made up of subject matter experts, the risk of high variance is reduced. Additionally, a reliance on qualitative data may produce social desirability bias in user response. To mitigate, I stressed the importance of unbiased results, and offered no emotional responses to positive or negative feedback. Educator names are fabricated for anonymity. Notes are reflected in (Appendices 13.2.1 – 13.2.3).

11.1 Interview 1: Ms. Donovan – Special Education Teacher

- Significant reduction in time spent searching various data collection sites
- Header templates for each import greatly increases awareness and comprehension of previously hard to understand data
- There may be a learning curve for non-tech savvy teachers

Table 1—Ms. Donavan's ratings compared to group consensus.

Metric Examined	Ms. Donovan Rating	Combined Mean	Standard Deviation
Value Added	*5*	*4.8*	*0.45*
Intuitiveness	*4*	*4.2*	*0.84*
Simplicity	*3*	*3.8*	*0.84*

Ms. Donovan's rating of 5 for value-added, with a standard deviation of .45 closely aligns with the collective group's high consensus of the interface's ability to add value. This metric is within statistical significance for providing a high degree of value to their daily routine. Her rating of 3, with standard deviation of 3.8 indicates her slightly more critical view of the interface.

11.2 Interview 2: Ms. Shulman – School Psychologist

- Headers save time – Ms. Shulman spends significant time correcting poor entries and explaining to coworkers what headers provide
- Ability to choose header inclusion or exclusion via simple checkbox is intuitive, and significantly de-clutters the interface
- Interactive design provides affordances, suggesting when another teacher is working

Table 2— Ms. Shulman's ratings compared to group consensus.

Metric Examined	Ms. Shulman Rating	Group Mean	Group Standard Deviation
Value Added	*5*	*4.8*	*0.45*
Intuitiveness	*5*	*4.2*	*0.84*
Simplicity	*4*	*3.8*	*0.84*

Similar to Ms. Donovan's assessment, Ms. Shulman shares the opinion that the final PLOP prototype produces value added. This metric is also within previously defined statistical significance for providing a high degree of value to her daily routine. Her rating of 5 represents statistical significance for

intuitiveness is higher than the group's average, indicating her high valuation for this metric.

11.3 Interview 3: Mr. Russell – Special Education Teacher

- Steeper learning curve exists for non-tech savvy educators
- Improved user feedback would shorten the Gulf of Evaluation for tasks

Table 3—Mr. Russell's ratings compared to group consensus .

Metric Examined	Mr. Russell Rating	Group Mean	Group Standard Deviation
Value Added	*4*	*4.8*	*0.45*
Intuitiveness	*3*	*4.2*	*0.84*
Simplicity	*3*	*3.8*	*0.84*

Although not statistically significant by previously defined standards, Mr. Russell possessed significantly more critical views of the interface, with all three ratings lower than the group consensus. Further testing may be beneficial to determine if his perception is reflective of higher expectations.

11.4 Interview 4: Ms. Smith – Special Education Teacher

- Color-coded items such as the clear button provide effective affordances to suggest what it accomplishes
- Familiar toolbar mapping patterns to Microsoft Word are intuitive
- Auto import tool is extremely powerful and will significantly improve quality of analysis conducted

Table 4— Ms Smith's ratings compared to group consensus

Metric Examined	Ms. Smith Rating	Group Mean	Group Standard Deviation
Value Added	*5*	*4.8*	*0.45*

Intuitiveness	*5*	*4.2*	*0.84*
Simplicity	*4*	*3.8*	*0.84*

Ms. Smith possesses higher opinions than the group's consensus for each metric. Additionally, all three values are statistically significant, indicating her high valuation for the interface. Since a participatory design process was adopted, Ms. Smith was consulted several times throughout the design lifecycle. This could have led to confirmation bias with her responses.

11.5 Interview 5: Ms. Johnson – Special Education Teacher

- Data import tool will save Ms. Johnson many hours of work by offloading tasks she previously had to do herself – reducing cognitive load and placing more on the interface.

Table 5— Ms Johnson's ratings compared to group consensus

Metric Examined	Ms. Johnson Rating	Combined Mean	Standard Deviation
Value Added	*5*	*4.8*	*0.45*
Intuitiveness	*4*	*4.2*	*0.84*
Simplicity	*5*	*3.8*	*0.84*

Similar to Ms. Smith, Ms. Johnson also possesses higher opinions than the group's consensus for each metric. This demonstrates a highly positive experience with the interface. She greatly appreciated the interface's ability to offload tasks, and the simplicity of the interface.

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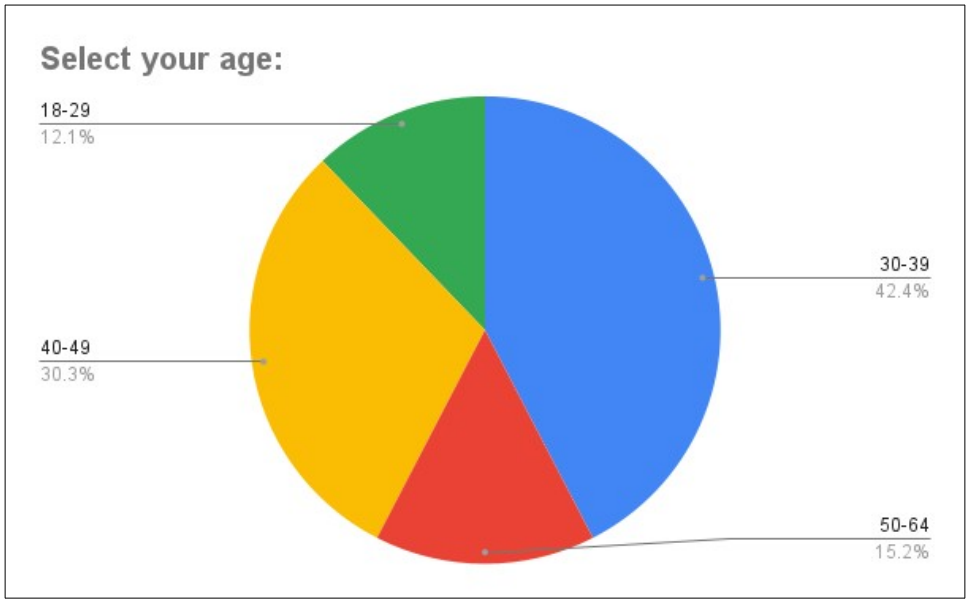
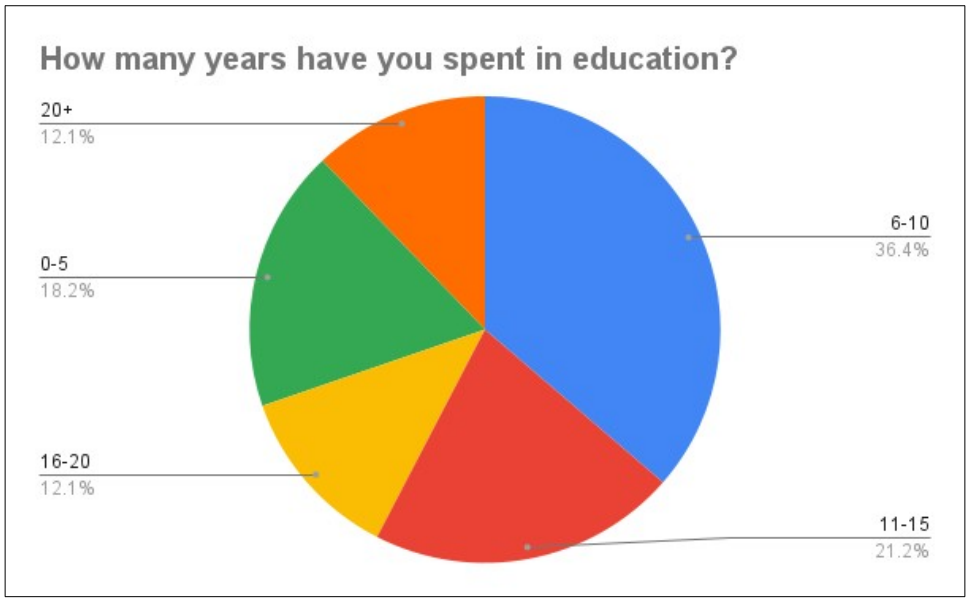
13 APPENDICES

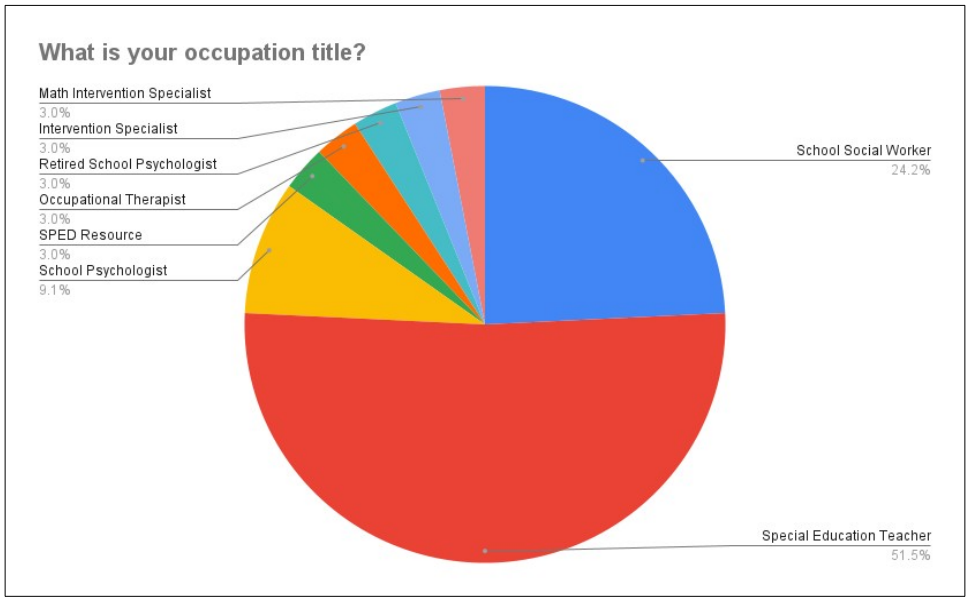
13.1 Raw Survey Data



Appendix 13.1.1—Question 1



Appendix 13.1.2—Question 1



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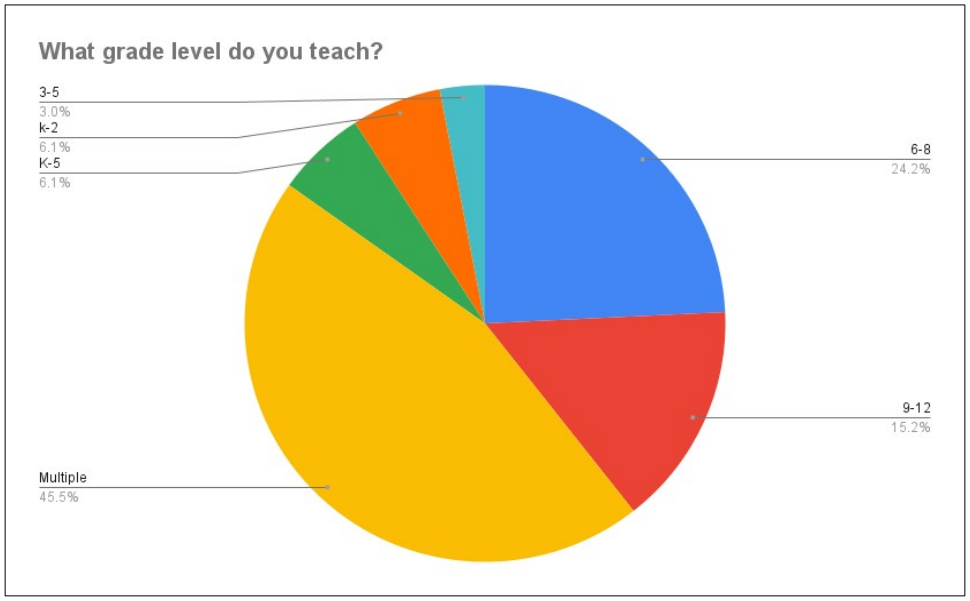
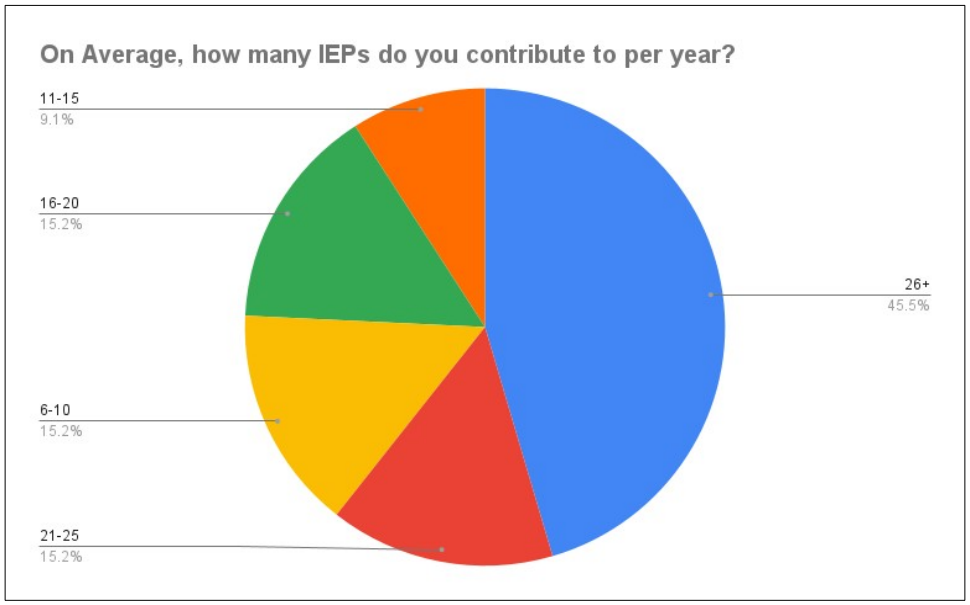


Appendix 13.1.4—Question 4



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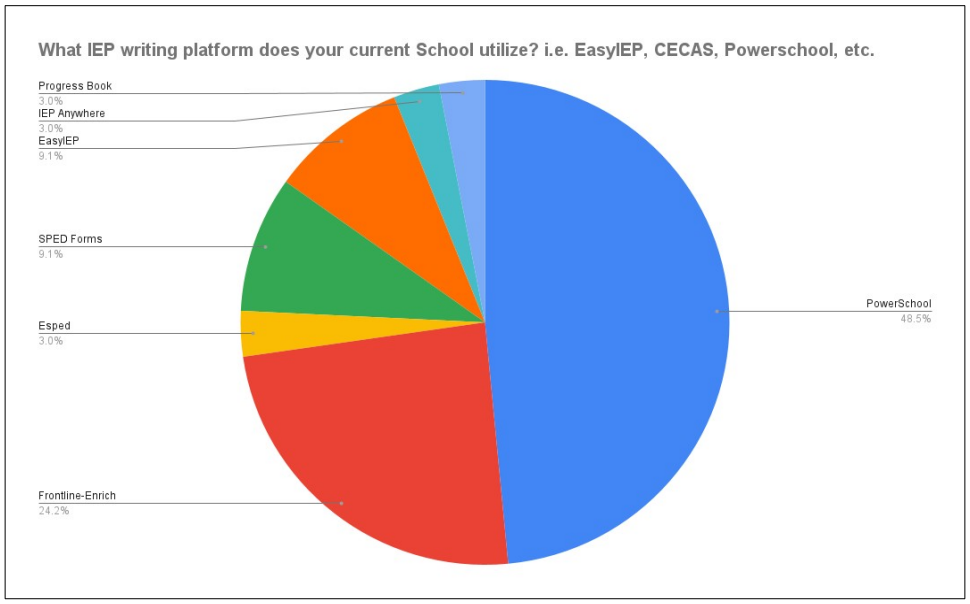
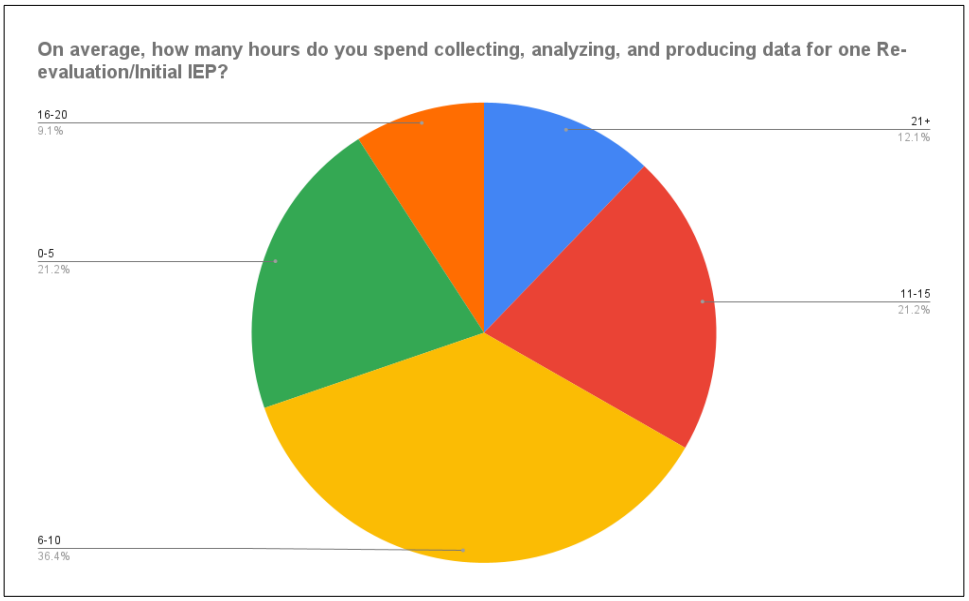
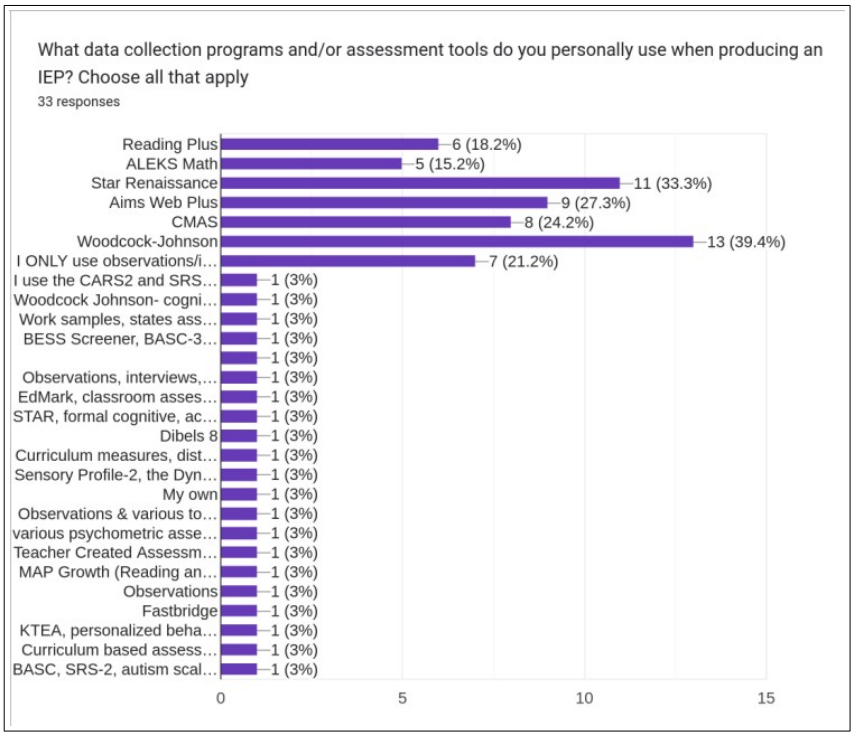


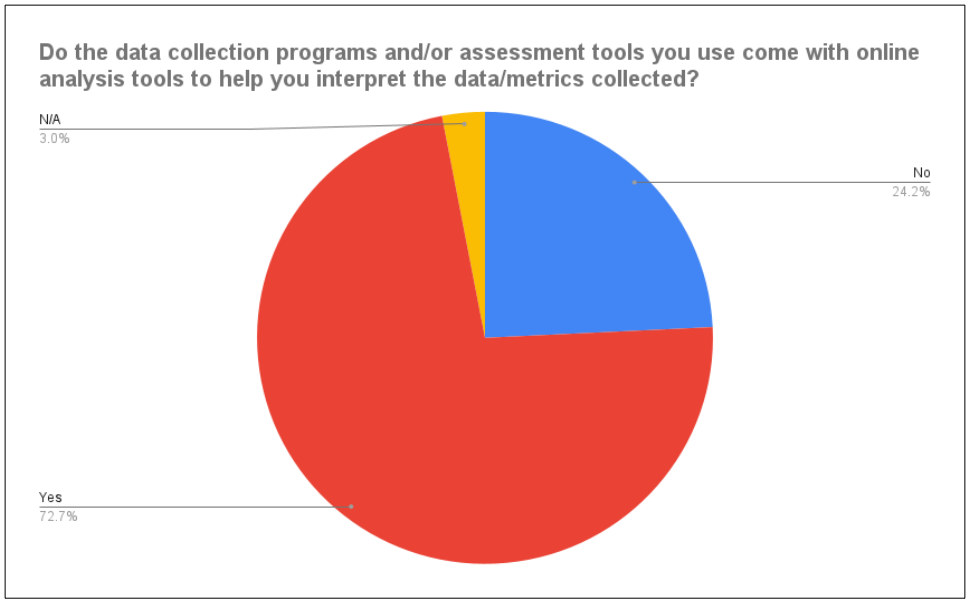
Appendix 13.1.6—Question 6



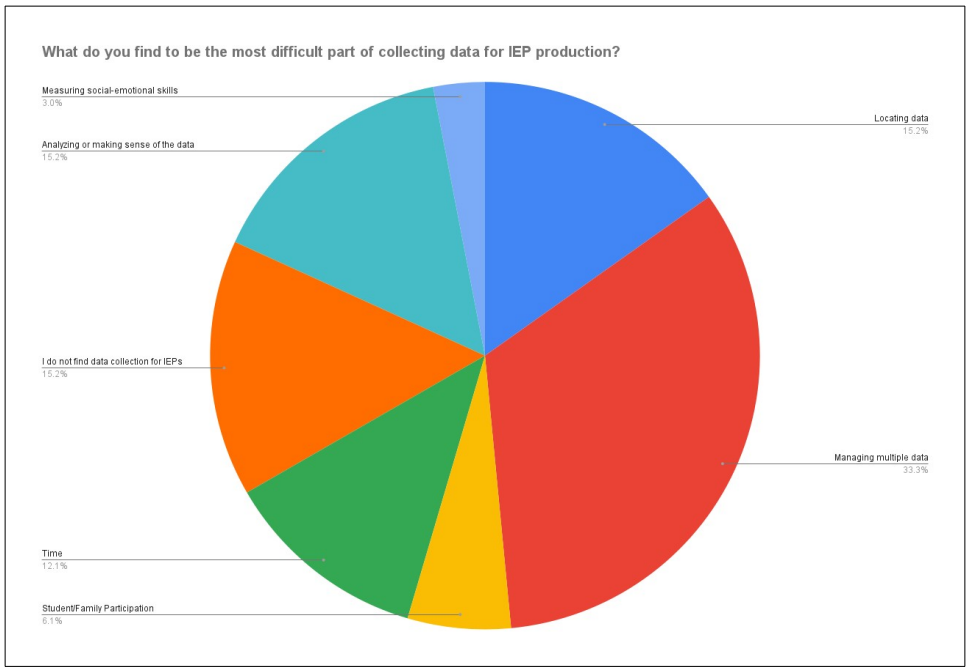
Appendix 13.1.7—Question 7



Appendix 13.1.8—Question 8



Appendix 13.1.9—Question 9

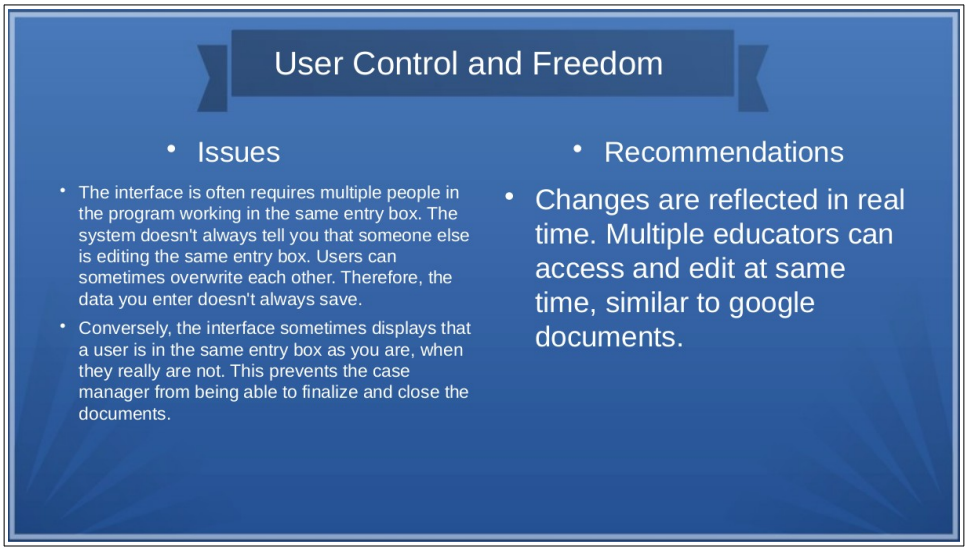


Appendix 13.1.10—Question 10

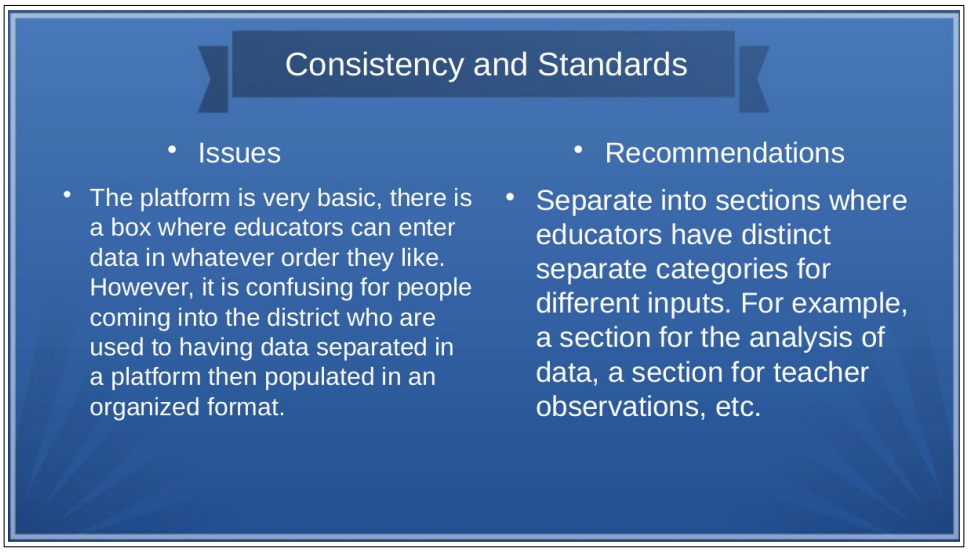
What, if any, additional data assessment tools do you think would improve the IEP writing process?

- A place to enter all data to review and write goals
- A tool to incorporate all the data into the IEP without having to manage multiple programs
- A tool where all the information can be saved, collected and monitored
- All assessments have an online analysis to help me interpret data and so I do not have to manually score assessments to save time
- An online system that is automated to track data and provide statistics on the student progress
- consolidated area to gather school wide information for assessments, MTSS info, etc.
- Easy data collection for online schools. Data collection to help engage students.
- GAP analysis explanations
- Having access to multiple quantitative data points in order to create a clearer and more holistic view of where the student is academically/socially/developmentally so that a more meaningful IEP can be created
- If the different systems could “talk” to each other
- If there was a series of quick assessments to test skills for each subject for each grade/ability
- It would be great if Aimsweb, STAR, etc could "talk" to Powerschool and student data could be imported into an eval report or IEP. Additionally, bx intervention data, such as data collected on bx charts or academic scores, like weekly progress monitoring data points should be graphable within Powerschool to demonstrate progress or lack of progress for eligibility, not just progress toward goals.
- Possibly have a large “bank” of ideas for attainable, objective, and measurable goals that can be tweaked for different student levels for academic, speech, behavioral, etc.
- SchoolPsychAI ; tips on interventional strategies, goals, BIP writing etc
- Summary of previous assessments-(shortened summary of course)

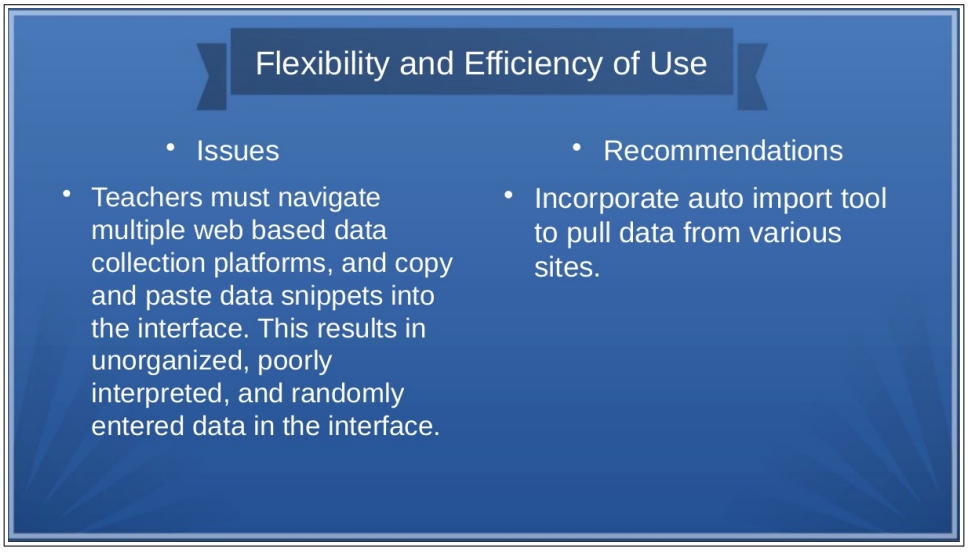
Appendix 13.1.11—Question 11



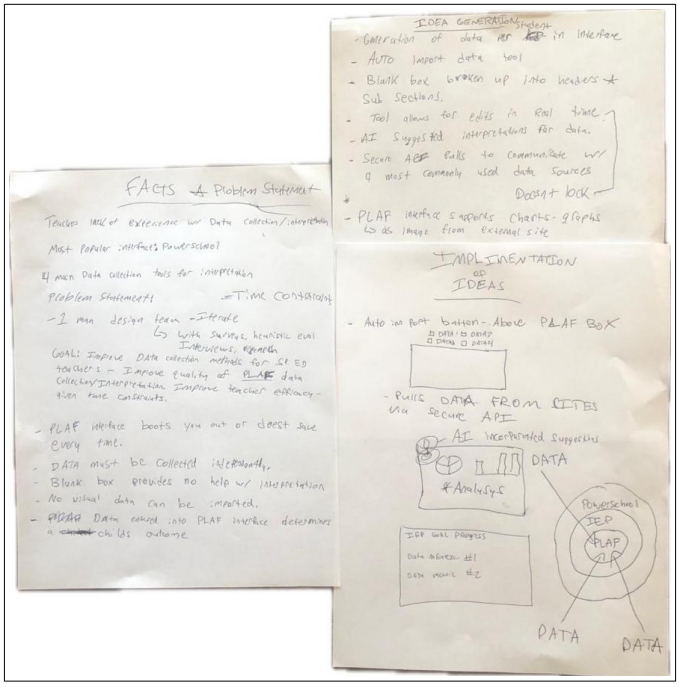
Appendix 13.2.1—User Control And Freedom Heuristic.



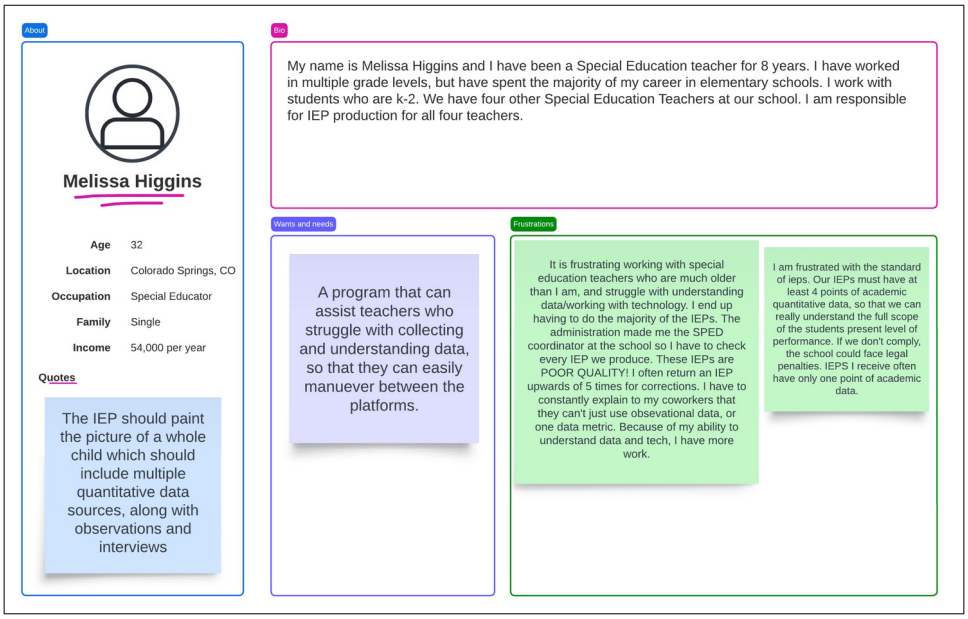
Appendix 13.2.1—Consistency and Standards Heuristic.



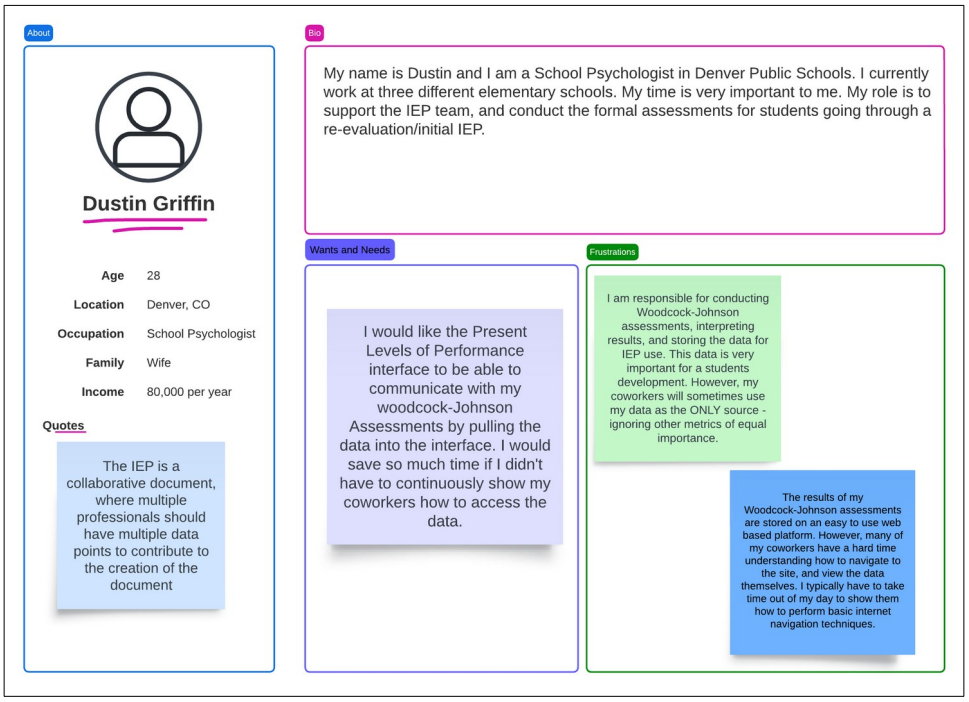
Appendix 13.2.1—Flexibility and Efficiency of Use Heuristic.



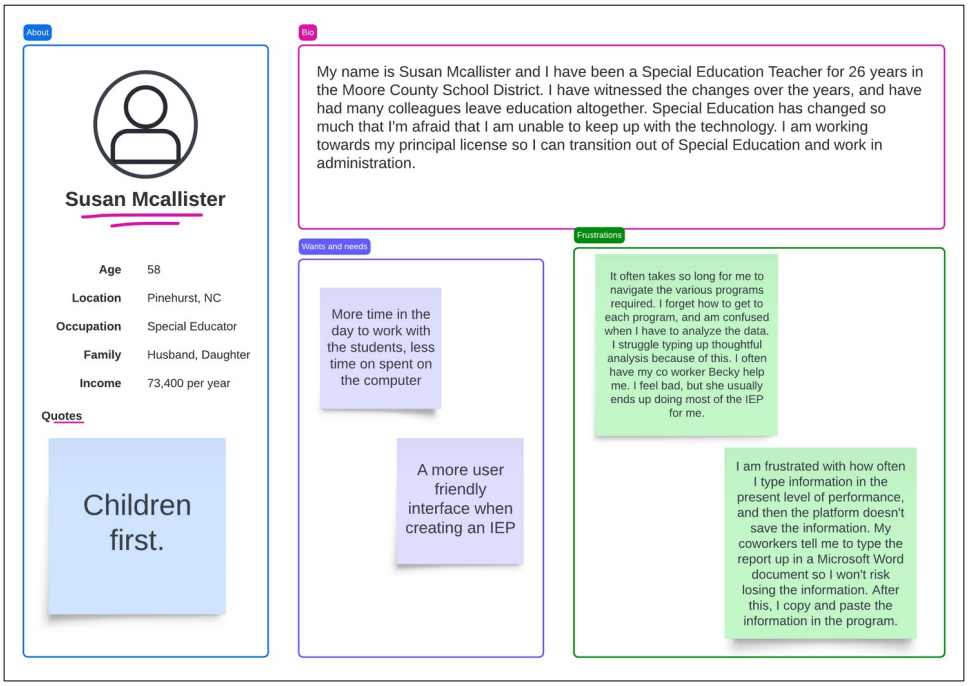
Appendix 13.3.1—Raw Brainstorming Results



Appendix 13.3.2—Melissa Higgins Persona



Appendix 13.3.3—Dustin Griffin Persona



Appendix 13.3.3—Susan Mcallister Persona

Prototype 1: Auto Import

1. On a scale of 1 to 5, how useful do you find the Auto Import feature in Prototype 1 for importing data into the PLOP interface?

- 1 (Not useful at all)
- 2
- 3
- 4
- 5 (Extremely useful)

2. On a scale of 1 to 5, how useful do you find the Auto Import feature in Prototype 1 for reducing amount of time spent, or offloading the task of collecting data for the PLOP requirements?

- 1 (Not useful at all)
- 2
- 3
- 4
- 5 (Extremely useful)

3. Would the use of this Auto Import tool assist in improving your workflow?

- Positively impact
- Neutral
- Negatively impact

4. Would you consider incorporating such a feature into your workflow?

- Yes
- No

5. Did the auto-import functionality effectively offload tasks from you as the educator onto the interface? Please explain.

6. If you could change anything about prototype 1, what would it be?

Appendix 13.4.1—Prototype 1 Survey Questions

Prototype 2: Guided Headers

1. How helpful do you think the Guided Headers feature in Prototype 2 would be in ensuring that essential information is included in your documents within the PLOP interface?

- Extremely helpful
- Very helpful
- Moderately helpful
- Slightly helpful
- Not helpful at all

2. Did you find the predefined headers provided in Prototype 2 to be relevant and useful for your document creation needs? Why or why not?

3. If you could change anything about prototype 2, what would it be?

4. How intuitive did you find the Headers presented in Prototype 2?

- Very intuitive
- Somewhat intuitive
- Neutral
- Not very intuitive
- Not intuitive at all

Appendix 13.4.2—Prototype 2 Survey Questions

Prototype 3: Interactive Design

1. How valuable do you perceive the Interactive Design feature in Prototype 3, which allows users to see if another user is currently editing the same screen?

- Extremely valuable
- Very valuable
- Moderately valuable
- Slightly valuable
- Not valuable at all

2. Have you faced challenges collaborating with coworkers within the PLOP interface in the past? If so, how do you think the Interactive Design feature could address these challenges?

3. If you could change anything about prototype 2, what would it be?

4. Did the active editor indicator effectively provide visual cues about who was editing the shared document in Prototype 3?

- Yes
- No

Appendix 13.4.3—Prototype 3 Survey Questions

Prototype Comparison

1. Of the three designs, which design do you consider to be most useful

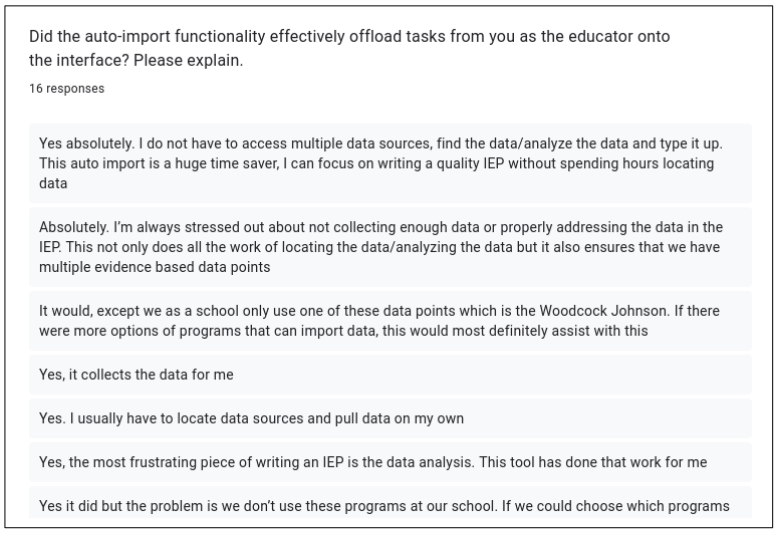
- Prototype 1
- Prototype 2
- Prototype 3

2. Of the three designs, which design do you consider to be the easiest to understand

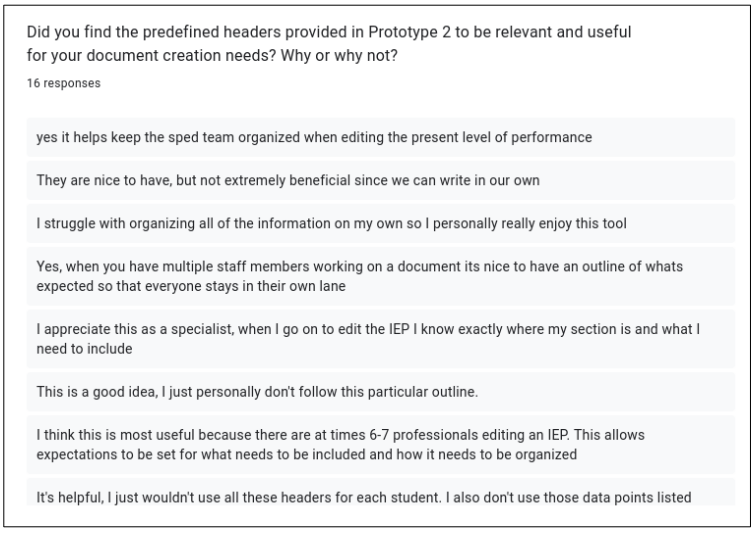
- Prototype 1
- Prototype 2
- Prototype 3

3. If you could change anything about prototype 1, what would it be?

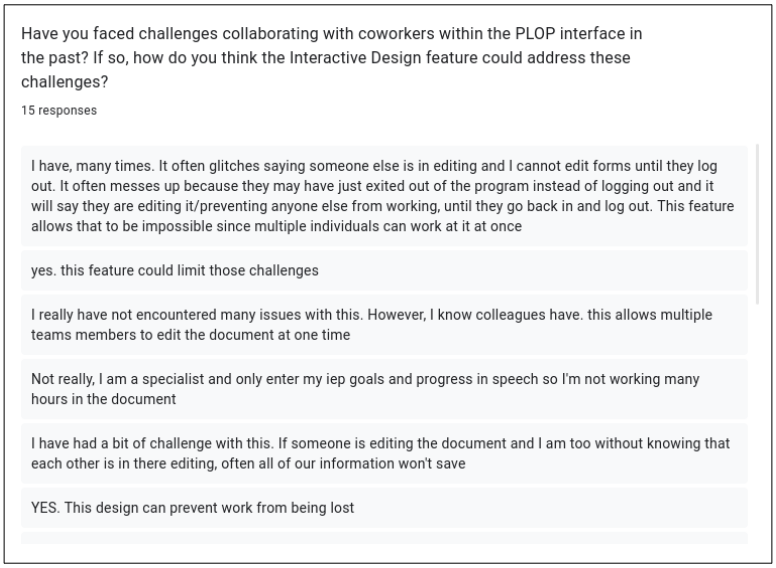
Appendix 13.4.4—Prototype Comparison Survey Questions



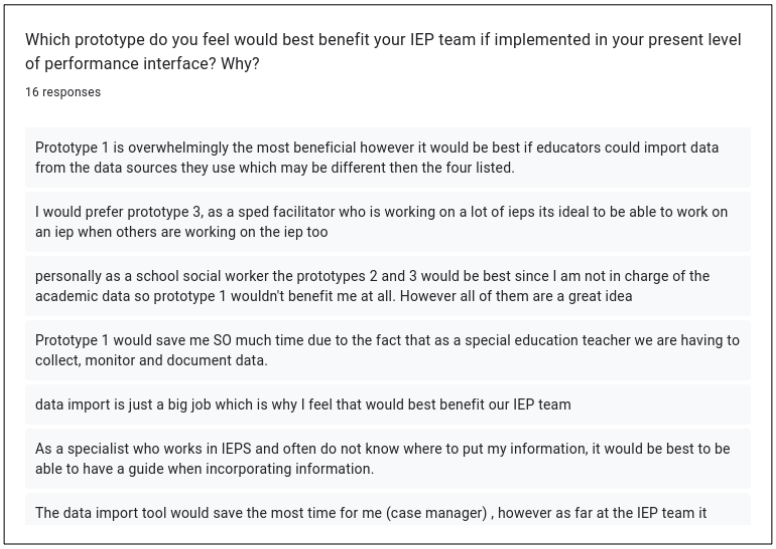
Appendix 13.5.1—Prototype 1 Survey Responses



Appendix 13.5.2—Prototype 2 Survey Responses



Appendix 13.5.3—Prototype 3 Survey Responses



Appendix 13.5.4—Prototype Comparison Survey Responses

As a subject matter expert and a special education teacher of 9 years, Ms. Donovin pointed out that the PLOP interface application would decrease her time spent working on IEPs significantly due to the data import tools. Ms. Donovin explicitly stated that the way the data import boxes are designed and implemented makes it easy for her to understand how to navigate the system without any assistance or tutorial. Ms. Donovin mentioned that she felt it would improve the way educators function in special education departments and that it would “allow more time for teachers to teach”

Value Added: 5

Intuitiveness: 4

Simplicity: 3

Appendix 13.6.1—Ms. Donovin Interview Notes

During the interview with school psychologist of 7 years, Ms. Shulman, Ms. Shulman pointed out the convenience of importing a visual while maintaining a text box beside the data so that the special education professionals can write their own explanation/analysis of the data imported. She also appreciated the explanation of each assessment provided within the additional text boxes. A school psychologist is considered an expert in the field, and she is often assisting case managers with edits and guidance when writing quality IEPs. She identifies the header feature to guide those who aren’t as familiar with the IEP process. As a school psychologist who is consistently editing IEPs at the same time Special Educators are, Ms. Shulman greatly appreciated the interactive design feature.

Value Added: 5

Intuitiveness: 5

Simplicity: 4

Appendix 13.6.2—Ms. Shulman Interview Notes

Mr. Russell, special educator for 20 years, mentioned that he couldn't figure out what to type into the main box when he first began exploring the application, until he explored a little more and clicked "include headers". Once he clicked the proper button and the headers appeared, the application made more sense to him. Mr. Russell also struggled with understanding where the data from the import buttons were listed. Mr. Russell stated that he wished the interface prompted him so that he knew where the data would populate, and not click the button too many times assuming it wasn't working. Mr. Russell explicitly stated, "The application is hard to navigate without you explaining it to me." I took time to sit down and go over every tool on the application in detail with Mr. Russell, he stated, "once you explain it to me, it makes much more sense. I struggle with the technology piece that is now very prominent in special education, this data import tool could allow me less time working on IEPs which would increase my enjoyment of the job".

Value Added: 4

Intuitiveness: 3

Simplicity: 3

Appendix 13.6.3—Mr. Russell Interview Notes

Ms. Smith, special education teacher of over 8 years, highlighted the functionality behind the interactive tool where she can see what other professionals are editing the document, as well as the ability to confirm the document is saved through the save button. Ms. Davidson explicitly stated, "this platform includes more effective data than I have ever included on any of my IEPs". She also said, "I never knew these visuals existed for STAR". She mentioned she would just include the numbers in her previous IEPs. "The data I include in my IEPs is never this pretty." Ms. Smith mentioned that she feels parents especially will appreciate the data collection and visuals since it's hard for them to grasp what the data means in IEP meetings. She pointed out the color-coded items, specifically the clear button and mentioned how the fact that it's color coded helps it stand out and makes it easy to see. She also felt the familiar Microsoft Word toolbar allowed for the experience to feel more intuitive for professionals when working in the application.

Value Added: 5

Intuitiveness: 5

Simplicity: 4

Appendix 13.6.4—Ms. Smith Interview Notes

Ms. Johnson, school psychologist of 8 years, emphasized the importance of including Woodcock Johnson in the data import tool and the impact it would have on her role specifically. She emphasized how it was her role to facilitate cognitive testing, as well as collect and analyze the data. Ms. Johnson stated that often cognitive testing isn't something valued at the same level as academic testing is, within the platforms she has seen in the past they haven't been addressed. Ms. Johnson feels that this import tool could be a "game changer" for school psychologists. She feels that she has so much to do since she is currently providing testing/results for 8 schools in the district. Ms. Johnson felt this would free up her own personal time tremendously. Ms. Johnson also highlighted the headers and how that will help the teams stay organized and uniform in their data presentation. Ms. Johnson emphasized how impactful the headers and the interactive design tool could be to the IEP Team, she felt that this platform could change the entire process of writing IEPs. "This would be an impactful addition to our IEP Programming at our school and make everybody's lives easier."

Value Added: 5

Intuitiveness: 4

Simplicity: 5

Appendix 13.6.5—Ms. Johnson Interview Notes