Glean Qualitative Study

Prepared by Rachel Schechter, Ph.D.
On behalf of Glean as part of the application for Digital Promise's Tier 4 Certification

Introduction

Problem of Practice

The Glean platform addresses a significant problem in higher education: the challenges associated with digital note-taking. As online learning platforms have become increasingly prevalent, traditional note-taking methods have often been replaced by digital alternatives. However, this shift presents issues, particularly the tendency for students to engage in verbatim transcription rather than deeper cognitive processing. Research has shown that typing notes can lead to passive learning strategies and distractions, resulting in a false sense of comprehension and lower academic achievement (Luo et al., 2018; Morehead et al., 2019). Glean aims to mitigate these issues by providing features that encourage active engagement with lecture content.

Outline of Existing Research

Studies have consistently highlighted the drawbacks of relying solely on laptops for note-taking. Luo et al. (2018) found that students using laptops are more susceptible to distractions, and Flanigan et al. (2023) observed that computer notes often lack visuals and are less likely to be revised, hindering the process of transforming information into personal understanding. Additionally, research indicates that the physical act of writing promotes cognitive engagement and deeper processing, leading to better recall and understanding (Chen et al., 2024). Despite these findings, some studies, like Wiechmann et al. (2022), have not found significant differences in learning outcomes between handwritten and digital note-taking, suggesting that individual preferences and approaches to note-taking also play a role.

Effective learning strategies emphasize active engagement with material. Bjork & Yan (2014) advocate for "elaborate processing," where new information is actively connected to prior knowledge. This approach contrasts with passive methods, which hinder information retention. Chen et al. (2024) suggest that note-taking can reduce mind-wandering and enhance information encoding, provided that the approach is generative, involving paraphrasing and the use of visual aids (Luo et al., 2018). Active retrieval methods, such as those advocated by Roediger & Karpicke (2006), have been shown to be more effective than passive strategies like rereading.

Glean's design addresses the limitations of traditional digital note-taking by integrating features that promote active engagement. One key feature is the combination of student notes with

lecture transcripts, which encourages students to capture key points and elaborate on them, fostering deeper understanding. This aligns with the concept of "elaborate processing" (Bjork & Yan, 2014). Glean also supports the collation of various learning materials, such as slides and definitions, which aligns with the concept of "spacing"—exposure to information from multiple sources over time, enhancing learning and retention.

Glean further enhances learning outcomes through multiple-choice quizzing, a form of retrieval practice shown to improve long-term retention and understanding (Roediger & Butler, 2011). By incorporating quizzes within the note-taking environment, Glean encourages students to revisit material at spaced intervals, strengthening memory consolidation. This feature, combined with the platform's overall design, aims to transform digital note-taking from a passive to an active learning process, addressing the cognitive challenges identified in previous research.

Researcher Positionality

As the author of this paper, Dr. Schechter brings a background in educational technology and a deep commitment to improving literacy outcomes for students. Her professional experience includes several years of working directly with educational software developers at Lexia Learning and collaborating with school leaders to evaluate the effectiveness of integrating digital tools into their classrooms (see all of my work on ERIC here). This experience has shaped her belief in the potential of technology to enhance traditional teaching methods and provide additional support for student skill-building outside of the classroom.

Her positionality as an advocate for digital learning tools may influence my interpretation of the data. She acknowledges that her enthusiasm for educational technology could introduce bias, particularly in interpreting positive feedback or underestimating challenges faced by teachers. To mitigate this, she has employed strategies such as peer debriefing, where colleagues and program developers review and validate the findings, and triangulation, using multiple data sources to confirm the results - in this case parent testimonials. This approach aims to ensure a balanced and accurate representation of teachers' experiences and perspectives on Glean's potential to support enhanced learning and retention.

Study Context

This survey aims to evaluate the effectiveness of Glean on supporting students with disabilities through the collection of quantifiable measures and qualitative responses from its users. Conducted in October 2023, this survey reached a diverse group of students in higher education. The study seeks to understand the users' perspectives and perceptions of Glean's impact on their well-being and studies.

Research Questions

1. What perceived impacts does Glean have on the confidence, well-being, study habits, and academic achievements of students with disabilities?
2. How, if at all, did Glean impact students' confidence, stress levels, and study habits?
3. Which features were most favorable to Glean's users, and why?

Methods

Research Activities & Materials

The study surveyed 613 students from private colleges, four-year public colleges, and community colleges across 48 states. All participants were Glean users and they were based in disability support departments of their respective schools. The survey was divided into three sections: the first section included student sentiment questions designed to gauge perceptions of Glean's impact on their academic performance; the second section asked students to self-report their grade data, including their GPA before and after the semester; the third section consisted of open-ended questions aimed at capturing detailed insights into students' usage and perceptions of the product. The full questionnaire is available [here](#).

Analysis Method

Responses were quantitatively analyzed by calculating the percentages of respondents in different subgroups who agreed with various statements, providing a numerical understanding of the students' perceptions. Additionally, open-ended responses were reviewed and categorized into themes to identify common patterns, benefits, and areas for improvement. Key quotes were selected to illustrate these qualitative insights, enhancing the quantitative findings.

Participants

User Demographics and Usage Patterns

The 613 participants of this survey came from diverse educational backgrounds and have various accommodation needs for their learning disabilities. The demographic breakdown of the participating population is shown below.

Table 1. School Type of Respondents

School Type of Respondents	Number of Respondents
Private College	187
4-year Public College	380
Community College	45
Other	1
Total	613

Table 2. Area of Study of Respondents

Area of Study of Respondents	Number of Respondents
STEM	177
Arts & Humanities	120
Business & Social Sciences	102
Healthcare	69
Other or N/A	145
Total	613

The respondents widely covered 48 states in the US. The state that is most represented was New York with 49 respondents, followed by Wisconsin with 35 respondents, and Colorado with 29 respondents.
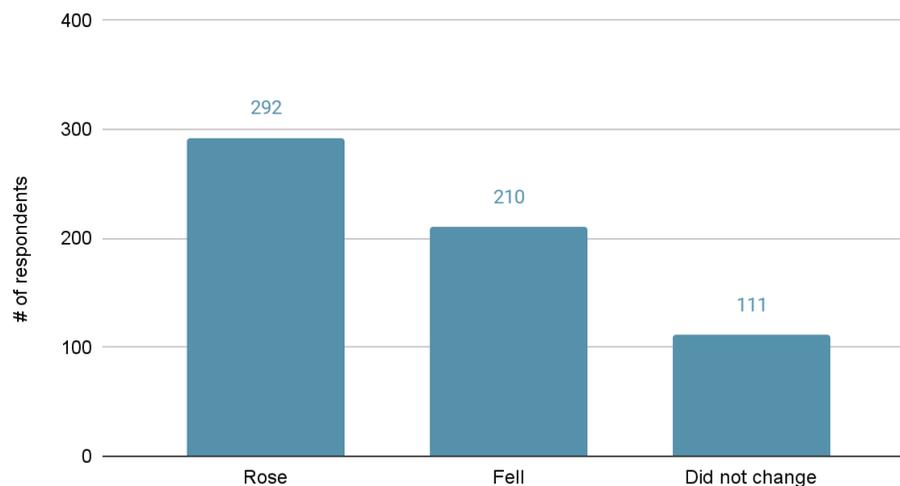
Quantitative findings: Student GPA and sentiment

Mean start and end of semester GPA
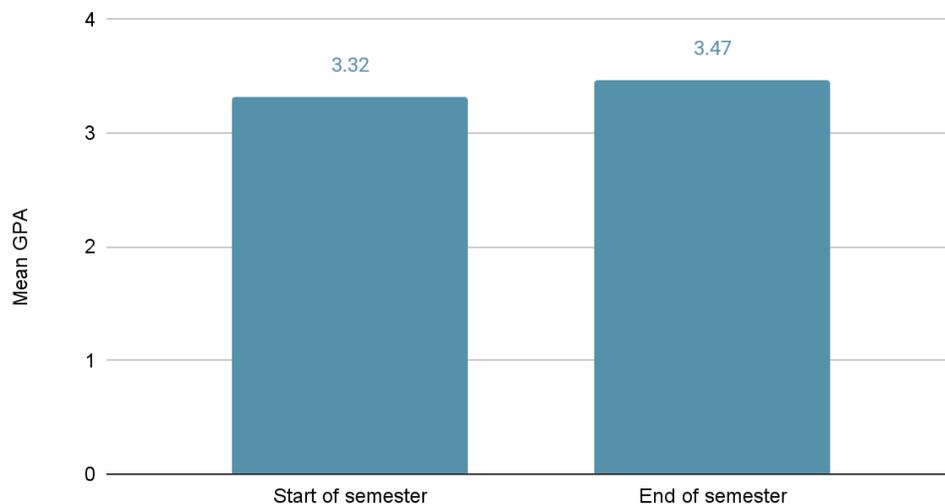
On average, students' GPAs improved over the course of the semester. The mean GPA at the start of the semester was 3.32, which increased to 3.47 by the end, representing an average change of 0.16 points or a 4.79% improvement.

Number of respondents by GPA trend

Among the participants, 292 students (48%) saw their GPA rise, while 210 experienced a decrease. 111 students maintained their GPA without change. Notably, 66% of the students either improved their GPA or maintained their existing grade point average during the semester. These

results suggest that a majority of Glean users in the study experienced stable or positive academic performance over the course of the semester.

Table 3. Responses to Student Sentiment Questions

Statement	% Agree	% Agree or Neutral
How confident are you that you can study effectively from class?	85%	98%
How stressed do you feel about your studies?	43%	75%
Using Glean has helped me to achieve better grades	84%	99%
Using Glean has helped me improve how I learn	86%	99%
Using Glean has helped me become more confident	86%	99%
Using Glean has helped improve my study skills	80%	99%
Using Glean has helped me better manage an overload of information	91%	100%
With Glean I find studying less stressful	81%	99%
With Glean I am more confident preparing for exams and tests	84%	99%
I review my notes more since using Glean than before	79%	98%

The survey results indicate a highly positive sentiment among students using Glean. A substantial majority (85%) of respondents expressed confidence in their ability to study effectively from class. Notably, 84% agreed that Glean helped them achieve better grades, while 90% felt it improved their learning. The tool appears to have a significant impact on students' confidence and skills, with 86% reporting increased confidence and 80% noting improved study skills. Glean seems particularly effective in managing information overload, with 91% of students agreeing it helped in this area. Additionally, 81% found studying less stressful with Glean, and 84% felt more confident preparing for exams and tests. The tool also appears to encourage more frequent note review, with 79% of students agreeing they review notes more often than before. Across most categories, when including neutral responses, agreement rates reach 98-100%, suggesting very few students had negative experiences with the tool. While 43% of students reported feeling stressed about their studies, it's important to recognize that academic pursuits inherently involve some level of stress, particularly for students with disabilities. This underscores the ongoing need for comprehensive support systems. The numerous benefits reported by students using Glean highlight its value as part of a broader strategy to support student well-being and academic success.

Qualitative findings: Effect of Glean on Users' Confidence and Stress Level

The overall findings regarding the effect of Glean on users' confidence and stress levels are highly positive, with participants highlighting several key benefits.

1) **Reduction in Stress Due to Improved Focus:** Many participants emphasized a reduction in stress, as Glean allowed them to concentrate on understanding the material rather than frantically taking notes. For example, one participant stated, "I felt less stressed because I knew I could always go back and listen to the class lecture if I needed to review the content," reflecting a common sentiment of reassurance and confidence in their comprehension. Another user compared Glean with handwritten notes: "My primary method of notetaking before using Glean was hand-writing my notes. Glean has eliminated the stress of having to write down everything I can before my professor changes topics." This sentiment was echoed by a user who struggled with note-taking, explaining that while others kept up with continuous note-taking, they would "freeze and get jumbled while trying to write and listen at once." After using Glean, the user reported feeling "safe and not anxious and scared for a lecture."

2) **Increased Confidence Through Better Organization and Accessibility:** The organization and accessibility of notes were frequently mentioned as major advantages. One user described, "I knew I had everything in one place and didn't have to look at 10 places to find specific notes from a lecture […] I knew where it was." Glean also facilitated more frequent review of notes due to its better organization and playback feature. As another user explained, "I was so much more confident this past semester because I really knew my stuff, I was able to review each class one or two or even three more times."

3) **Ease of Mind When Facing Challenges from Disabilities:** Several participants noted how Glean provided peace of mind in the face of challenges posed by disabilities. One user stated, "I have PTSD, so when I'm having a flashback, I can't hear what [the professor is] saying and I [lose] track of the situation." Glean ensured that the user had all notes ready for review, even if they could not be fully present during the lecture. Another respondent mentioned that Glean eased their worry about their hearing disability, as they "knew [they] had not missed any lecture information."

There were isolated responses indicating insignificant changes in confidence, and one respondent noted that technical difficulties increased their stress level. However, the overwhelming majority of responses perceived Glean as a helpful tool that enhanced academic confidence and reduced stress for students with different learning disabilities.

Users' perception on the features of Glean

The features which users enjoyed the most can be organized into 4 categories: The recording and transcription functionalities, the note-taking capabilities, and the organizational features. The popular reasons for each category are summarized below.

1) **Recording and transcription functionalities:** Users frequently cited the recording and transcription features as their favorite. Many appreciated the ability to absorb information through both reading and listening simultaneously. For instance, one user mentioned, "I absorb information best when I can read AND listen at the same time," emphasizing that being able to read the lecture content greatly enhanced their comprehension. Additionally, the transcription feature provided users with easy access to information. In situations where audio playback is not feasible, such as in a library without headphones, or when time is limited, the transcript allows for quick retrieval of necessary information. Participants with physical or hearing disabilities also found transcription helpful, as taking verbatim notes can be challenging.

2) **Note-taking capabilities:** The ability to import PowerPoints and photos was another popular feature among respondents. Users appreciated having notes and original learning materials in one place, facilitated by the import function. One user enthusiastically remarked, "Having the information given in class right next to my notes and perfectly matched with audio is the best feature ever."

3) **Organizational features:** Users expressed how Glean helped them organize their learning materials and notes more effectively. The marker functionality, which links users to their notes in relation to the lecture recording, was found helpful by many. One participant suggested, "I used glean shortcut buttons to in-the-moment note areas of the lesson that I was confused about or wanted to come back to later, which made it a lot easier to remember and then study the content that was confusing or most important." Features that allow users to create a variety of points and subpoints, such as headings or review bullet points, and to mark items as important or pending review, were also highlighted as beneficial.

4) **Quizzing features:** Although the AI quizzing feature was a relatively new addition to Glean's suite, some users quickly adopted and enjoyed it. One user noted the novelty of the feature, stating, "I have experimented with it and so far feel like I am learning more efficiently." Since the feature was new, several users expressed a desire to test it but had not yet had the opportunity. However, those who had tried it agreed that it helped to "solidify the information received in classes."

Conclusion

Overall, Glean has demonstrated a significant positive impact on students with disabilities in higher education. The study reveals sizable improvements in academic performance, with an average GPA increase of 4.79% among users. More importantly, Glean has shown to enhance students' confidence, reduce stress levels, and improve study habits.

The overwhelmingly positive sentiment towards Glean is evident, with over 80% of students reporting improvements in various aspects of their academic life, including better grades, enhanced learning, managing information overload, and increased confidence. Qualitative feedback highlights Glean's role in reducing stress by allowing students to focus on understanding rather than note-taking, increasing confidence through better organization and accessibility of notes, and providing peace of mind for students facing challenges from disabilities. From a recommendation angle, Glean can further improve by addressing occasional technical difficulties and enhancing user education and adoption of its new AI quizzing feature, which garnered promising initial user feedback.

In conclusion, Glean has established itself as a valuable tool in supporting students with note-taking in a digital environment. Its recording, transcription, and organizational features have been particularly praised by users. Glean stands poised to improve the academic experiences and outcomes of students with disabilities across diverse educational settings.

References

Bjork, R. A., & Yan, V. X. (2014). The increasing importance of learning how to learn. In M. A. McDaniel, R. F. Frey, S. M. Fitzpatrick, & H. L. Roediger III (Eds.), Integrating cognitive science with innovative teaching in STEM disciplines (pp. 15-36). Washington University Libraries.

Chen, S. Y., Lin, Y. H., & Liu, Y. Y. (2024). The effects of generative note-taking strategies on learning outcomes in a flipped classroom. Journal of Educational Technology Development and Exchange (JETDE), 11(1), 1-14.
Flanigan, A. E., Kiewra, K. A., Lu, J., & Isbell, J. (2023). Computer versus longhand note taking: Influence of revision. Instructional Science, 51(2), 251-284.

Luo, L., Kiewra, K. A., Flanigan, A. E., & Peteranetz, M. S. (2018). Laptop versus longhand note taking: Effects on lecture notes and achievement. Instructional Science, 46(6), 947-971.

Roediger, H. L., III, & Butler, A. C. (2011). The critical role of retrieval practice in long-term retention. Trends in Cognitive Sciences, 15(1), 20-27. https://doi.org/10.1016/j.tics.2010.09.003

Roediger, H. L., & Karpicke, J. D. (2006). The Power of Testing Memory: Basic Research and Implications for Educational Practice. Perspectives on Psychological Science, 1(3), 181–210. https://doi.org/10.1111/j.1745-6916.2006.00012.x

Wiechmann, W., Edwards, R., Low, C., Wray, A., Boysen-Osborn, M., & Toohey, S. (2022). No difference in factual or conceptual recall comprehension for tablet, laptop, and handwritten note-taking by medical students in the United States: a survey-based observational study. Journal of Educational Evaluation in Health Professions, 19(1), 8.