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Title

College students' adoption of Sonocent, a specialized
notetaking software: A descriptive study

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Abstract

Notetaking is critical to students' academic success. Students have many notetaking software programs to available for support. This study aimed to describe college students' adoption and use of a comprehensive notetaking software (Sonocent). Freshman students (n=138) were offered a free Sonocent license with free training on its use during first semester science coursework. The study found a small adoption rate among participants and an overall low level of satisfaction with the software. Students who reported difficulty with notetaking at the start of the semester were more likely to use Sonocent with the audio recording feature deemed most useful.

Introduction

Notetaking is critical to students' learning as it assists them with making connections between content, organizing material, and retaining information (Boyle et al., 2015; McGuire, 2015; Peeverly et al., 2013). Traditionally, students have taken handwritten notes in class; however, with the advent of portable technological devices, students now often engage in digital notetaking (Luo et al., 2018; Quade, 1996). A growing body of literature has questioned the value of digital notes for student learning (Glass & Kang, 2018; Muller & Oppenheimer, 2014; Quade, 1996; Sana, et al., 2013). Benefits of digital notetaking have been identified in the literature, such as an increased amount of notes taken, legibility of notes, ease of editing, comprehensiveness of notes, and ease of searching for information later (Bui et al., 2013; Mueller & Oppenheimer, 2014; Ward & Tatsukawa, 2003). More importantly, undergraduate students have reported that typing notes was more enjoyable and convenient than handwriting their notes (Aguilar-Roca et al., 2012; Gose, 2017; Luo et al., 2018).

Digital notetaking has evolved with advances in technology. Students who opted for digital notetaking reported having to use a combination of several software until specialized notetaking software became widely available (Reimer et al., 2009). Some of the software used by students for notetaking in the past included word processing, text editing, and slide annotation (Steimle et al., 2007). The lack of software designed specifically for notetaking may have been a reason most students continued to take handwritten notes (Ward & Tatsukawa, 2003). But in recent years, a number of specialized software has been developed with the primary purpose of taking digital notes. Examples of such software include OneNote, Evernote, Note Taking Express, and Sonocent (Evernote.com; Notetakingexpress.com; OneNote.com; Sonocent.com). These software offer features such as visual categorization of notes in colorful digital notebooks (OneNote and Evernote),

transcription services for audio recorded notes with the ability to bookmark specific time points in the recording (Note Taking Express) and audio recording of lectures tagged and color coded within typed notes with a direct correlation to an uploaded slide deck (Sonocent). Some of these features, such as collaborative notetaking with peers, may appeal more to the current generation of students who value social connection and support (Popescu et al., 2020; Twenge, 2017).

Despite these advances in the quality of specialized notetaking options, little is known about student adoption of notetaking software. Most students (>80%) still report a preference for handwritten notes in recent studies (Masked authors, submitted; Morehead et al., 2019). The reasons behind students' continued preference for handwritten notes are unclear, since research on the use of specialized notetaking software is still extremely limited (Berque, 2006; Schepman et al., 2012). In evaluating the use of a cloud-based notetaking software (Evernote), researchers found that the majority of college students who adopted the notetaking software reported using it for academic purposes, and students who did not adopt the notetaking software cited difficulty in changing habits as the primary reason (Schepman et al., 2012). This contradicts assumptions made of 'modern' students, especially those of the iGen generation who were raised with technology, as not being set in their ways with technology and being able to quickly develop the skills to use new specialized software (Shatto & Erwin, 2016; Rue, 2018). No published studies have been found investigating the use of the Sonocent notetaking software. This software, believed to have great promise specifically with students who have disabilities, has been discussed in a few published papers in terms of exploring tools that universities make available to students (Alabi & Mutula, 2020; Bakken et al., 2019; Murphy et al., 2019; Tucker, 2017).

To learn the role of the Sonocent notetaking software for all college students, we conducted a study to determine: (1) the degree to which college students would adopt the

software; (2) the characteristics of students who elected to use the software compared to those who did not; (3) the features within the software that students valued; and (4) the student satisfaction with the software.

Methods

This study was a component of a larger descriptive study conducted to determine freshman students' preferences and habits towards notetaking in college (Masked authors, submitted). Participants were recruited from all sections of two introductory science courses (biology and chemistry) at a comprehensive private not-for-profit university in the United States. All students taking these courses were eligible to participate in the study.

The written informed consent process occurred in class during the first two weeks of the Fall 2018 semester. Of the 214 potential subjects, 138 students signed the informed consent form. As described to them during the informed consent process, students who signed the informed consent form were asked to download a free 30-day trial of the Sonocent software. These students, now study participants, were encouraged to utilize this software in all their courses that semester. To ease their adoption of the software, a one-page instruction sheet was provided, and one technology support session was offered during a university free period, a time unopposed by class. Technology support was also available to any participant requesting assistance from the investigators. Only one participant availed themselves of these offers of support. As described during the informed consent process to the participants, after the 30-day trial ended, participants were offered a free license for the remainder of the semester and would be given the option of a free a license through the end of the academic year.

The study was approved by the university institutional review board. Data was protected through use of password-protected electronic files on a secure network, de-identified codes as subject IDs, and document storage in locked file cabinets.

Description of the Software

Sonocent is a specialized notetaking software that has been commercially available since 2007. It enables students to upload Microsoft PowerPoint files provided by an instructor, then type notes associated with each slide in another window within the software. In parallel, students can audio record the lecture within the software, which then tags the recording to slides and the corresponding section of their typed notes (Sonocent, 2022). Sonocent is available as laptop software and a tablet app and is being transitioned to a cloud-based system called Glean (Sonocent, 2022). When using the software with a touchscreen device, it allows students to draw in their notes, enabling them to replicate figures and take more visual notes. This is a positive feature since the use of visuals within notes is a strategy that has been found to help students learn (Luo et al., 2018; Ramsay & Sperling, 2011). All the students' uploaded, typed, recorded, and drawn content in the Sonocent software can be categorized, organized, and searched. Students also can color code various portions of the typed notes to highlight important information for later review (Sonocent, 2022). In short, Sonocent is a comprehensive notetaking software package with the potential to substantially improve students' digital notes and ultimately their learning, grades, and college success.

Data Collection

A member of the research team collected data at three points during the semester: Time 1 (Weeks 1-2), Time 2 (Weeks 5-6), and Time 3 (Weeks 11-12). The data was collected during class at the convenience of the course instructors. The research team developed three questionnaires that were the primary source of data for the study: Sociodemographic Questionnaire (SDQ), Notetaking Abilities and Strategies of University Students questionnaire (NASUS) and Software Usage Questionnaire (SUQ). The SDQ was administered at Time 1; the NASUS was administered at Times 1, 2 and 3; and the SUQ was

administered at Times 2 and 3. The psychometric properties of the NASUS were estimated in a parallel study (Masked authors, 2021).

Data Analysis

Descriptive statistics (e.g., mean, standard deviation, percentage, count and mode) were used to summarize the data collected utilizing R and Microsoft Excel.

Results

Description of the Sample

Of the 138 participants, 102 were female (73.38%) with a mean age of 18.43 years (SD=1.00), which was expected given their status as freshman students in their first semester of college. The majority of participants reported being Caucasian (61.31%), whereas 16.05% reported being Asian, 10.21% Hispanic or Latinx, 8.76% Black or African American, 1.46% Pacific Islander, and 2.19% “other.” Approximately 80% of participants reported that at least one of their parents had some college degree (e.g., associate, undergrad, graduate, doctorate) with the majority having a bachelor or master’s degree (~64%). The average self-reported SAT score was 1249.93 (SD = 191.72; n = 106), placing the participants in the 86th percentile nationally. Just under 45% of the sample reported having some type of disability, with ~17% of participants reporting a diagnosis of anxiety. Table 1 provides more detail on the sociodemographic characteristics of the sample organized by their request for a Sonocent license at Time 2.

Table 1: Sociodemographic Information of Participants

Characteristic	No License Requested at D2 n=94	License Requested at D2 n=44
Age (mean)	18.56	18.73
Self, Previous Education Level		
High School	96%	100%
Associates Degree	4%	0%

Gender Identity		
Female	73%	44%
Male	26%	23%
None-Binary	1%	0%
Undergraduate Status	Freshman= 68%	Freshman= 84%
	Sophomore= 20%	Sophomore= 11%
	Junior= 6%	Junior= 5%
	Senior= 5%	Senior= 0%
Parent Highest Educational Level	Less than High School/GED= 7%	Less than High School/GED= 2%
	High School/GED= 11%	High School/GED= 20%
	Associates Degree= 11%	Associates Degree= 14%
	Bachelor's Degree= 36%	Bachelor's Degree= 23%
	Graduate Degree=30%	Graduate Degree= 36%
	Doctorate Degree= 4%	Doctorate Degree= 5%
	Not Applicable= 1%	Not Applicable= 0%
Ethnicity	Asian= 15%	Asian= 18%
	Black or African American= 11%	Black or African American= 5%
	Hispanic or Latino= 10%	Hispanic or Latino= 11%
	Native American= 0%	Native American= 0%
	Pacific Islander or Native Hawaiian= 2%	Pacific Islander or Native Hawaiian= 0%
	White= 59%	White= 66%
	Other=3%	Other= 0%

Participants were asked to report on their ability and comfort with new technology on a 6-point Likert scale anchored at both ends with 1 = strongly disagree and 6 = strongly agree. On average, participants were confident in their ability to learn new computer skills (mean = 4.56; SD = 1.43) and to learn how to use software (mean = 4.49; SD = 1.40; Table 2). Interestingly, participants' interest in learning to use new technology decreased during the course of the study (3 months) starting at a mean of 4.32/6 and ending at a mean of 3.5/6. Table 2 provides further information on the participants' confidence and comfort with technology.

Table 2: Self-Reported Competency and Confidence with Computer Skills

Items	Time 1 (N = 138)		Time 2 (N = 92)		Time 3 (N = 74)	
	M*	SD	M	SD	M	SD
1. I am interested in learning to use new technologies.	4.32	1.35	3.57	1.51	3.50	1.45
2. I can download software on my computer.	4.80	1.40	4.6	1.23	4.73	1.47
3. I am confident in my ability to learn how to use new software.	4.49	1.40	4.34	1.44	4.47	1.54
4. I am confident in my ability to learn new computer skills.	4.56	1.43	4.43	1.35	4.59	1.43

Note. *All items were rated on a 6-point Likert scale from 1 = strongly disagree to 6 = strongly agree.

Adoption of the Notetaking Software (Objective 1)

All 138 participants who signed the consent form were invited to take advantage of the 1-month free trial of the Sonocent software with the research team's support. After 1 month (Time 2), participants who completed the questionnaires (n = 88) reported a low use of the Sonocent software with a mean of 1.67(+/-1.23) out of 6 when answering the following question: 'I have used the Sonocent software in the past month as a primary mode of notetaking.' Similarly, when participants were asked at Time 2 to report the number of courses during the semester in which they used the Sonocent software, 74.7% reported not having used the Sonocent software in any of their courses; 20.5% reported using the software in one course; 3.6% reported using it in 2 courses; and 1.2% reported using in three courses. Despite these low usage rates, 73 of the participants (52.9% of the sample) accepted our offer of a free Sonocent license for the remainder of the semester. Of these, 23 participants activated their free license (6.67 of the full sample, 31.5% of those who asked for a free license).

At the end of the semester (Time 3), participants were asked again if they had used the Sonocent software as their primary mode of notetaking in the last month. We obtained responses from 66 participants who reported low, but slightly higher than at Time 2, usage of

Sonocent with a mean of 2.15(+/-1.76). As at Time 2, at Time 3, participants were asked in how many courses they used the software. Of the participants who responded, 66.2% did not use the Sonocent software in any of their classes. 22.1% reported using it in one course; 10.3% reported using it in two courses; and one participant reported using the software in all their courses (8 courses). At the end of the study, participants were asked if they wanted a free Sonocent license for the remainder of the academic year. Five participants requested the license.

Characteristics of Students who Used the Software (Objective 2)

To identify characteristics of students that might differ according to levels of Sonocent use, participants were classified into Sonocent Users (n = 21) and Non Users (n = 61) based on their answers to the SUQ at Time 2. The following results should be considered exploratory results in need of follow-up testing given the sample size of Sonocent Users and unbalanced grouping. Sonocent use was not associated with a participant's preference for recorded notes ($\chi^2(1) < 1.0, p = 1.0$), nor was it associated with a participant's preference for digitizing their notes ($\chi^2(1) < 1.0, p = 0.66$). Similarly, there was no significant difference in a participant's self-reported level of organization of notes between Sonocent Users (M = 4.30, SD = 1.42) and Non Users (M = 4.58, SD = 1.16), $t(68) = 0.85, p = 0.40, d = 0.23$.

There was also no significant difference in a participant's self-reported perception of accuracy of notes between Sonocent Users (M = 4.80, SD = 0.77) and Non Users (M = 4.86, SD = 0.90), $t(68) = 0.26, p = 0.79, d = 0.07$. There was a significant difference in self-reported level of notetaking difficulty between Sonocent Users (M = 2.15, SD = 1.04) and Non Users (M = 1.60, SD = 0.90), in that Sonocent Users reported higher difficulty levels ($t(68) = -2.20, p = 0.03, d = -0.59$).

Software Features Students Preferred (Objective 3)

Participants were asked to identify features of the Sonocent software that they found ‘most helpful’ at Time 2 and Time 3 (see Table 3). The most often identified feature by far was the ability to audio record the lecture. Having the ability to pair audio recording of lectures with PowerPoint slides, a key feature of the software, was selected by ~10% of the participants as a feature which they found helpful. It is noteworthy that at Time 2 and Time 3, ~34% and ~46% of the respondents did not find any features of the software to be most helpful to them.

Table 3: Sonocent Software Features Participants Found Most Helpful

Software Features	Time 2 n=83 Count (%)	Time 3 n=68 Count (%)
1. Color coding	5 (6%)	3 (4.4%)
2. Audio recording of lecture	23 (27.7%)	25 (36.8%)
3. Pairing with PowerPoint slides	9 (10.8%)	8 (11.08%)
4. Working with online content	2 (2.4%)	0
5. Notes summaries aligned with my recordings	6 (7.2%)	9 (13.2%)
6. Another feature	1 (1.2%)	0
7. None of the features	28 (33.7%)	31 (45.6%)

Satisfaction with Software (Objective 4)

At Time 2, after one month of use, and at Time 3, after three months of use, participants were asked to report their satisfaction with the Sonocent software through a series of 10 questions rated on a Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Overall, the participants reported that they did not find the Sonocent software very useful in terms of improving their class notes, increasing their understanding of material, rendering class notes more useful for assignments or studying, or improving their grades (average ratings for all 10 questions ranged between 2.25 and 2.95; Appendix D). Participants also provided low ratings on average for the statements “*I would like to continue using Sonocent Software*” and “*I would recommend the Sonocent software to a friend.*” This was

selected by 33.3% to 43.9% of participants (see Table 4). Participants were slightly more inclined to recommend the software to a friend than to want to continue to use it.

Table 4: Participants Satisfaction with the Sonocent Software after 1 and 3 Months of Use (Times 2 & 3)

Items	Time 2 (n=57)		Time 3 (n=57)	
	Mean (SD)	Mode (%)	Mean (SD)	Mode (%)
1. The Sonocent software has improved my class notes	2.42(1.40)	1(40.4%)	2.52(1.7)	1(46.6%)
2. Using the Sonocent software helped me increase my understanding of class material	2.46(1.49)	1(42.1%)	2.46(1.69)	1(49.1%)
3. The Sonocent software helped me organize my notes	2.40(1.47)	1(43.9%)	2.47(1.58)	1(47.4%)
4. Using the Sonocent software helped me used notes when completing assignments	2.49(1.58)	1(43.9%)	2.35(1.48)	1(47.4%)
5. Using the Sonocent software helped me study for quizzes and exams	2.47(1.55)	1(43.9%)	2.49(1.71)	1(47.4%)
6. I believe that my grades have increased because I used of the Sonocent software	2.26(1.03)	1(43.9%)	2.37(1.54)	1(47.4%)
7. I prefer using the Sonocent software to my regular note taking strategies	2.25(1.35)	1(45.6%)	2.25(1.562)	1(52.6%)
8. I find the Sonocent software easy to use*	2.56(1.49)	1(38.6%)	2.81(1.86)	1(43.9%)
9. I would like to continue using Sonocent Software	2.61(1.73)	1(42.1%)	2.65(1.86)	1(49.1%)
10. I would recommend the Sonocent software to a friend	2.95(1.71)	1(33.3%)	2.75(1.82)	1(43.9%)

Discussion

The present study investigated college freshman students' use of a specialized notetaking software called Sonocent. The sample represented a typical college-aged sample of freshmen considered high achieving based on their reported SAT scores.

Adoption of the Notetaking Software

Few studies have been conducted about college students' adoption of specialized notetaking software. Schepman et al. (2012) found a high usage of Evernote, a notetaking software, when extensive training and financial incentives to partake in the training and evaluation sessions were provided. They also encouraged students to use the software for more than academic notetaking. Based on this and other studies suggesting that students prefer taking notes digitally (Aguilar-Roca et al., 2012; Gose, 2017; Luo et al., 2018), it assumed that the adoption rate for the Sonocent software would be high. It was surprising to find that the vast majority of the participants in the study showed little interest in using the Sonocent software. This lack of interest was demonstrated by low reported use of the software as a primary mode of notetaking in the last month of the semester and the low percentage of students who reported using the software in any of their classes at Times 2 and 3. Schepman et al. (2012) found that those who did not adopt the specialized notetaking software within their study cited difficulty in breaking habits as a primary cause. With this information in mind, within this study, participants were provided with notetaking software as they entered their freshman year of college before any habits related to notetaking in higher education were formed. However, that did not improve the adoption rate.

Interestingly, some participants, albeit a small minority ($n = 5$ out of 138) in the study, were interested in obtaining a year-long license at the end of the study, and one participant reported using the software in all of their courses. Identifying the characteristics of students who are likely to adopt the software would require a much larger sample size given that only 5 out of the 138 participants made this choice. The research team wonders if the first semester of freshman year is too early to introduce such software, as students are adjusting to college and may not yet have reached a need to change their notetaking strategies.

Characteristics of Students who Used the Notetaking Software

Only one characteristic of the participants' became apparent when looking at a preference for digital or recorded notes and choosing to use the Sonocent software: a higher self-reported difficulty with taking notes. This result seems to indicate that students who find notetaking difficult may be more willing to try other strategies to improve their skill or lessen the difficulty of this particular academic task. Participants' use of Sonocent was not affected by their current self-perceived levels of organization and accuracy of notes, suggesting that participants did not decide to use Sonocent as a potential organizational tool or as a tool to ensure accuracy of content captured in class.

Notetaking Software Features Students Preferred

Sonocent contains many features for a student to utilize in class to augment their notetaking skills. Of these features, the audio recording found to be the most helpful to participants, in both the ability to record in general, and the ability to pair the recording to a particular PowerPoint slide. Audio recording of lecture is believed to decrease the cognitive load related to taking notes in class (Boyle et al., 2015). However, a recent study found that students reported feeling that a class recording, in either visual or auditory format, eliminates the need to take notes (Nordmann et al., 2021). This is problematic given the known benefits of notetaking for learning (Boyle et al., 2015; McGuire, 2015; Peverly et al., 2013). Despite this one feature being the most favored, many participants did not find any particular feature of the software to be helpful. It may be that the learning curve associated with learning a new software, particularly an unfamiliar one such as Sonocent, kept participants from exploring and using features. It is also possible that the Sonocent software, which was designed primarily for students with learning disabilities in mind, had features that were less needed or helpful to the general student population.

Satisfaction with Notetaking Software

The majority of participants did not indicate a high level of satisfaction with the Sonocent software, nor did they find it useful for notetaking or supporting their academic success. Part of this may be related to the low adoption rate of the software, which would indicate that students did not wish to utilize it in the first place. Calisir & Calisir (2004) indicated that users are more likely to be satisfied with software if they feel that its use will increase their performance and productivity. Participants did seem to indicate being slightly more likely to recommend it to a friend than use it themselves. It is possible that the features' usefulness was potentially recognized, though not for themselves at that particular point in time, which supports the speculation made earlier in the discussion that the timing of introduction to the software may have been problematic.

Limitations

The sample may not be representative of the whole population as it was drawn from a single university, with primarily high achieving participants in terms of SAT scores, and from white college educated families. The sample was primarily freshman students in their first semester of college. The information regarding Sonocent use should be interpreted with caution due to a lower than expected adoption rate of the software, which makes generalization difficult to a greater population. Contrary to the study by Schepman et al. (2012), this study offered, but did not require, training in the notetaking software. This may have caused a limitation in terms of the rate of adoption given that studies have found students desire more training on how to take effective notes (Morehead et al., 2019). Finally, the primary source of data was self-reported which is only as accurate as the participants are able to remember accurate information. The latter limitation is shared by other studies relying on self-reported data.

Conclusion

Despite current students being digital natives and more accustomed to the use of technology to support their daily lives and tasks, such as academic performance, the use of notetaking software should not be assumed to be a solution to all notetaking challenges of current university freshmen. Certain students with a desire to improve their notetaking and a need for a particular feature may adopt and find Sonocent to be beneficial. It should not be assumed that all students will readily adopt new technology, and all recommendations should be made following an analysis of student skills, challenges, and needs regarding notetaking.

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Declaration of Interest

The authors report no competing interests to declare.

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