



Collaborating Online with Four Different Google Apps: Benefits to Learning and Usefulness for Future Work

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This project is in response to the need to integrate new forms of technology in language-learning classrooms, to not only enhance learning, but equip students with the technological and collaborative tools to prepare them for future academic and professional contexts. The purpose of this study was to 1) investigate student attitudes towards doing various language-learning tasks on Google apps, 2) explore some of the advantages and limitations of using Google apps as a cloud-based collaborative tool, and 3) investigate student behaviors while collaborating on Google apps. Surveys and interviews were used with 31 participants in a pre-university EAP course in the UAE to explore student perceptions of using four Google apps (Sheets, Slides, Docs, and Forms) to do various language-learning tasks. Field notes based on observations of one in-class task were also analyzed to investigate student behaviors while collaborating. Participants reported advantages of collaborating on Google apps such as ease of use, working together from different places, and being able to give feedback online. In regards to behaviors, participants showed a tendency to divide their work while collaborating. Some possible limitations to doing language-learning activities on Google apps will be discussed, as well as implications of the study.

Keywords: computer-supported collaborative learning, collaborative writing, EAP, computer-assisted language learning, Google apps, Google Docs

Introduction

The arrival of advanced and complex communication and information technologies has changed the skills needed of students in the 21st century (Dede, 2009). Constantly evolving technologies have required people to learn a variety of new skills to complete tasks and solve problems in digital environments (Eshet-Alkalai, 2004). These new digital literacies are “transformational for higher education” (Goodfellow, 2011, p. 140), and educational institutions must adapt to help students operate successfully in a future networked society where digital technologies are widespread and deeply embedded (Beetham et al, 2009). One of the skills which is changing, and which educational institutions need to adapt to, is the way people collaborate. Collaborative learning provides an authentic, motivating, and socially-enriched learning environment where students interact with one another to solve a specific problem (Kumar, 1996). Mastering skills associated with collaboration can help prepare students for contribution in society and the workforce (Chu, Kennedy, & Mak, 2009). However, the skills required to collaborate in the modern workplace are changing with the emergence of new technologies, and the way students learn to collaborate in the classroom might not reflect the reality of current work contexts. Students need to be prepared for a future where they may be required to communicate and work together with others through various technologies and media (Beetham et al., 2009).

In response to this problem, this research project integrated collaborative online tasks throughout two English language courses at a university in the UAE. The tasks were completed using Google apps because of the affordances they allow for the synthesis of multiple 21st century skills—which can be defined as creativity, communication, collaboration, and information/media/technology (Partnership for 21st Century Learning, 2019¹). Google applications are collaborative learning technologies which include word processing, spreadsheets, and presentation software used for goal and work-oriented activities (Cheung & Vogel, 2013). Google apps include such programs as Google Docs, Google Sheets, Google Slides, and Google Forms, which enable multiple users to produce content and edit each other’s content on the same document at the same time. Team activities which require collaboration benefit from the simultaneous editing capabilities of the Google system (Rienzo & Han, 2009). In comparison to traditional word processors which Slavkov (2015) refers to as “static”, Google Docs is more dynamic because sharing online documents allows both instructors and peers to “have a privileged view of the process of invention and creation in real time” (p. 83). Documents created on Google apps exist in the cloud, and students who have a Google account, can log into Google Drive, create documents, store them on the cloud, and access them anywhere. This can have educational advantages because of an improvement in productivity and collaboration (Johnson et al., 2014), and can prepare students for the workforce as students learn how to use cloud-based software (Edwards & Baker, 2010).

The purpose of this study was to 1) investigate student attitudes towards doing various language-learning tasks on Google apps, 2) explore some of the advantages and limitations of using Google apps as a cloud-based collaborative tool, and 3) investigate student behaviors while collaborating on Google apps. This study did not seek to measure any improvements to language learning as a result of students using Google apps to complete tasks. Although this is an area of importance that needs to be studied (especially considering the rising popularity of Google apps), the small sample size and difficulty controlling the many variables that can influence language development were problematic in this study. Instead, this study sought to investigate some of the benefits and possible limitations of using four different Google apps from a student-user perspective, and to investigate how Google apps as an online collaborative tool can possibly change the way students work together in the language classroom.

Literature Review

Technology Acceptance Model and Google Apps’ Ease of Use

A starting place to examine literature related to attitudes towards technology is the Technology Acceptance Model (TAM). The TAM is a model used to explain why users accept different information systems based on perceived usefulness and perceived ease of use (Davis, Bagozzi, & Warshaw, 1989). Davis et al. define perceived usefulness as the belief a user has that a “specific application system will increase his or her job performance”, and perceived ease of use as being the extent to which the “user expects the target system to be free of effort” (1989, p. 985).

The TAM can be a useful framework to evaluate students’ perceptions of using collaborative online technologies like Google apps. Perceived ease of use and perceived usefulness influenced student attitudes towards Google apps in a project-based learning environment (Cheung & Vogel, 2013), and influenced students’ intention to use Google apps for a platform-based personal learning environment (Rejón-Guardia et al, 2019). Studies investigating Google apps in other learning contexts also suggested Google apps were easy to use. Students in an online college speech class recommended Google apps be used in future courses because of the ease and accessibility of the tool (Edwards & Baker, 2010), and students using different collaboration strategies for essay writing found one of the main advantages of

¹ Partnership for 21st Century Learning is a network of businesses, organizations, and associations that work with schools, school districts, and other learning organizations in the U.S. to promote the skills, knowledge and expertise students need for success in work and life.

Google Docs is that it is easy to use (Apple, Reis-Bergan, Adams, & Saunders, 2011). These studies align with TAM because they suggest that participants had favorable attitudes towards using Google Docs because its ease of use.

Computer-Supported Collaborative Learning and Google Apps

Computer-supported collaborative learning (CSCL) aids and enhances group work, interaction among peers, and the “sharing and distribution of knowledge and expertise among community members” (Lipponen, 2002, p. 72). Koschmann (1996) describes CSCL as a paradigm shift in instructional technology because it simulates problems in a real-world context, mediates communication inside and between classrooms, and provides a shared space for participants to store the products of their group work and “model their shared understanding of new concepts” (p. 14). Computer supported collaboration also includes Computer-Supported Collaborative Work (CSCW), which deals with workplace collaboration (Kumar, 1996). Both CSCL and CSCW are important to expose students to in order to enhance learning and prepare them for work in the future.

Google apps is a tool which can foster CSCL. Google Docs facilitates efficient collaboration by providing team members with a “mechanism” that enables them to “work within a single user space” (Perron & Sellers, 2011, p. 490), which is perhaps why it was found to be useful for group work in out-of-class collaborative writing activities (Zhou, Simpson, & Domizi, 2012). In addition to Google Docs, medical students in a first-year pathology course found the collaborative capabilities of Google’s version of PowerPoint (Google Slides) helpful for creating presentations (Peacock & Grande, 2016).

Studies have also shown some advantages of participants collaborating on new mediums instead of traditional ones. Students enjoyed collaborating to edit and expand a pre-written essay more on Google Docs than Microsoft Word (Apple et al., 2011), and students creating collaborative mind maps on Google Docs used peer collaboration more to discover science concepts than students collaborating on paper (Lin, Chang, Hou, & Wu, 2015).

Collaborative Second-language Writing and Vocabulary on Google Apps

The collaborative capabilities of Google apps have shown to benefit second language learning. In an L2 writing class in the U.S., Bikowski and Vithanage (2016) found that participants who performed collaborative web-based writing tasks on Google Docs experienced improvements in their writing. Similarly, Thai undergraduate students in a collaborative writing group using Google Docs performed better on a written activity than students in a face-to-face group (Suwantarathip & Wichadee, 2014). Some reasons why Google Docs may improve L2 academic writing is because of the online peer editing capability of Google Docs (Ebadi & Rahimi, 2017), and because students can gain ideas from watching others write, and benefit from seeing what mistakes their co-authors make and the teacher corrects (Aubrey, 2014).

Google Docs may also benefit vocabulary acquisition, as Liu and Lan (2016) found that students who worked together collaboratively on a vocabulary activity on Google Docs had better vocabulary gain than students who worked individually. In addition, Bilova (2018) found that Google Docs (coupled with Quizlet) was an efficient tool for vocabulary learning and language teaching in general.

Giving Feedback and Monitoring Student Work

Another advantage of Google apps is its ability to give instant feedback which can help the learning process (Edwards & Baker, 2010). Google Docs is an interactive platform that supports the teaching of writing through exchanging feedback (both teacher-to-student and student-to-student) and correcting texts (Alharbi, 2019). This giving and receiving of feedback is an example of how Google Docs supports

collaborative learning behaviors which can lead to improved student to student and student to teacher interactions (Ishtaiwa & Aburezeq, 2015).

The revision history feature of Google Docs, which allows the storage and organization of different drafts, can also benefit the writing process as it allows the teacher to check and follow the changes made on different drafts of student writing (Firth & Mesureur, 2010; Alharbi, 2019). This revision process on Google Docs is more interactive as comments can be explained through the chat function embedded in the software (Aubrey, 2014). The revision history can also help monitor group work and check to see which students have contributed to the work and when (Apple et al., 2011). Second language writers, who may rely on the support of their teachers and peers while going through the writing process, appear to benefit from the close monitoring and live feedback which Google Docs provides.

Limitations of Using Google Apps

There have been a few disadvantages reported about using Google apps, such as the need to have a Google account to use the different Google tools (Firth & Mesureur, 2010), and problems with formatting and editing (Chu, Kennedy, & Mak, 2009). Perron and Sellers (2011) also mention a few downsides to using Google Docs such as: the need to have an internet connection to share, edit, and upload/download documents; more limited editing tools and features than Microsoft Word; and the lack of integration with bibliography management systems (e.g. EndNote and Refworks). Although it is suggested that Google apps are easy to use (Edwards & Baker, 2010; Apple et al., 2011), they may not be easy for everyone as participants in Ishtaiwa and Aburezeq's (2015) study reported that lack of technological skills can be a limitation when collaborating on Google apps. This study will investigate both advantages and limitations of collaborating on Google apps.

Research Purpose, Gap, and Questions

This project examines student attitudes towards the use of Google apps for learning and preparation for future work, explores the benefits (and drawbacks) of using Google apps as a cloud-based collaborative tool in the L2 classroom, and investigates how students work together online. The incorporation of collaboration, computer mediation and distance education has "problematized the very notion of learning and called into question prevailing assumptions about how to study it" (Stahl, Koschmann, & Suthers, 2006, p. 409). The Google suite of apps are new technological tools which are changing the way we work and learn together. Although studies have investigated the impact Google apps have on learning and student attitudes towards using Google apps (Bikowski & Vithanage, 2016; Edwards & Baker, 2010; Lin et al., 2015; Suwantarathip & Wichadee, 2014; Zhou et al., 2012), no known research has focused on four different Google apps in the classroom to investigate students perceptions of the advantages and disadvantages of doing language tasks on Google apps, and no known research has examined student behaviors while collaborating online in the language classroom on Google apps.

The present study will try to address this gap in the literature by investigating the following research questions:

1. What are student attitudes towards collaborating on Google apps in regards to enjoyment and usefulness for learning and future work?
2. What do participants report as advantages and limitations to using Google apps?
3. What are the behaviors of students when they collaborate?

Methods

Participants

Participants in this study consisted of 31 Arabic-speaking female students taking a foundation studies course to help prepare them for entry into an English-medium instruction university in the United Arab Emirates. The participants came from a lower-intermediate English for Academic Purposes (EAP) course, and an upper-intermediate EAP course. Participant numbers varied in this study between 11 and 31 as students from the lower-intermediate class took part in less activities because of time constraints and different curricular requirements.

Procedure and Design

Students completed five Google app activities in class throughout the course of the semester. To answer the above research questions, a mixed-method explanatory sequential design (Creswell, 2014) was employed using five surveys (Appendix A) after each Google app activity, a final survey after all the activities were completed, and two focus group interviews (n = 3, 3; Appendix B) at the end of the semester. The design was sequential as the interview questions mirrored the survey items to more deeply explain the results of the survey questions.

Close-ended survey items were used to gather quantitative data to help answer Research Question #1. To answer research Question #2, each survey also included open-ended questions to “explain the quantitative results in more depth” (Creswell, 2014, p. 6), and explore advantages and limitations of using Google apps.

To answer research question #3, an additional collaborative activity was introduced to focus on the choices students made and the behaviors they showed while completing activities in pairs or groups. Surveys, interviews, and observations were used to investigate whether online collaborative tools like Google apps can change the way students learn in the language classroom.

Initial self-designed surveys went through a series of stages to help ensure validity: 1) creation of a survey based on a pilot study done the previous semester; 2) revision of survey based on colleague feedback; 3) pilot of survey with two students; and 4) revision of survey following the student feedback. Students were asked to sign consent forms, and these forms, surveys and interview questions were approved by the Office of Sponsored Research at the university.

Data Analysis

This study used both quantitative and qualitative approaches to collect and analyze data in order to answer the research questions. The study relied on developing theory that was grounded in the data (Strauss & Corbin, 1994) through an inductive and integrated process where data “pattern themselves” instead of the researcher patterning the data (Glaser, 1996, as cited by Cohen, Manion, & Morrison, 2011, p. 598).

The quantitative data was collected using surveys on Google Forms, and was analyzed through mean scores and standard deviation on Google Sheets. The qualitative data came from open-ended survey questions, interviews, and field notes based on observations. Field observations were used to analyze student behaviors while collaborating, and were triangulated with the surveys and interviews to “balance out” and “confirm or contradict” participant responses (Cuban & Spiliopoulos, 2010, p. 1).

The grounded data was analyzed using codes, in the form of a word or short phrase that was symbolically assigned an attribute to a portion of data (Saldana, 2013). The coding process started with “open coding” whereby raw data was broken down and “delineated” into “concepts” (Corbin & Strauss, 2008, p. 195), and then repeated codes were highlighted, counted, grouped into themes, and analyzed to answer the research questions.

The Five Google App Activities

Table 1 shows a description of each of the five online collaborative activities completed on Google apps throughout the semester. Each activity had a specific language learning goal tied to the curriculum (e.g. review vocabulary), and students were required to complete them online in pairs or small groups on one of the four Google apps—often simulating a workplace situation with a manager who set up the document and shared it with co-workers. The motivation for these activities was to teach students target language and academic skills (e.g. making a presentation or writing an essay), while equipping them with collaborative tools they could use in their future studies and work.

TABLE 1
Five Google App Activities

Activity	Description
Google Docs vocab review	Groups of 3-4 worked together simultaneously on one Google Doc to complete a table of 20 vocabulary words with a definition, an example sentence, and a picture of the word. Students could work next to each other, or in separate locations, but each had to work on their own device.
Google Sheets vocab activity	Groups of 3-4 worked together simultaneously on an online spreadsheet to write the definition and Arabic equivalent of 75 target vocab words. Students could work next to each other, or in separate locations, but each had to work on their own device.
Google Slides presentation	Pairs of students used Google Slides to collaboratively produce a presentation related to a theme in class. To simulate real-time collaboration in different locations, each student in the pair had to work in separate locations to jointly construct and organize presentation slides. Students could not communicate face-to-face, but used phone, text, or the 'comment' function on Google Slides.
Google Docs essay	Pairs of students wrote a four-paragraph persuasive essay after first meeting with their partner face-to-face to discuss the topic, make a plan for their essay, and decide who was going to write what parts of the essay. Students wrote their essays together on Google Docs while working on their respective devices either face-to-face or by distance.
Google Forms survey	Pairs of students simultaneously online used Google Docs to develop research questions and do background research on a topic. Then, students used Google Forms to create and administer a survey to attempt to answer the research questions. Finally, students analyzed their results, and presented their research findings to the class on Google Slides.

Results and Discussion

The results and discussion of this study will be organized according to the three research questions. The first section will report data and discuss findings related to student enjoyment and perceived usefulness of Google apps (Research Question #1). The second section will show the advantages and disadvantages of working on Google apps from a student-user perspective (Research Question #2) and discuss themes which emerged from qualitative survey and interview data. The final section will report on and discuss observation and interview data related to student behaviors while collaborating online (Research Question #3).

Research Question #1: Enjoyment and Usefulness of the Five Google Activities

At the end of each of the five Google activities, a survey was administered to evaluate student enjoyment and perceived usefulness—both for the language activities and learning how to use the Google apps. Table 2 shows the results of these five surveys for each activity.

TABLE 2
Survey Results after Each Google Activity

	I enjoyed the activity		I enjoyed learning how to use the app		The activity was useful		Working together helped me learn		Learning how to use this app will be useful in the future	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Google Docs vocab (n = 29)	4.62	0.90	4.93	0.27	4.89	0.31	4.79	0.62	4.71	0.46
Google Sheets vocab (n = 15)	4.80	0.41	4.67	0.49	4.73	0.59	4.43	0.65	4.67	0.49
Google Slides present (n = 31)	4.48	0.89	4.65	0.84	4.58	0.89	4.45	0.85	4.67	0.80
Google Docs essay (n = 11)	4.55	0.72	*		4.64	0.65	4.55	0.66	*	
Google Forms survey (n = 11)	4.91	0.30	4.91	0.30	5.00	0.00	4.82	0.40	4.82	0.40

*Note. There is no data for this question because participants were already asked about Google Docs on a previous survey.

Enjoyment

According to the 5-point Likert scale with '5' being 'strongly agree' and '4' being 'agree', the results show that students enjoyed doing the Google Docs vocab ($M = 4.62$), the Google Sheets vocab ($M = 4.80$), the Google Slides presentation ($M = 4.48$), the Google Docs essay ($M = 4.55$), and the Google Forms survey activity ($M = 4.91$). In regards to enjoyment of learning how to use the apps, the mean scores were also very high (Docs, $M = 4.93$; Sheets, $M = 4.67$; Slides, $M = 4.65$; and Forms, $M = 4.91$).

Usefulness

Similar to responses related to enjoyment, the mean scores were high for students' perceived usefulness of the five activities (Google Docs vocab, $M = 4.89$; Google Sheets vocab, $M = 4.73$; Google Slides presentation, $M = 4.58$; Google Docs essay, $M = 4.64$; Google Forms survey, $M = 5.00$). Similarly, most participants believe that learning how to use these apps will be useful in the future (Docs, $M = 4.71$; Sheets, $M = 4.67$; Slides, $M = 4.67$; Forms, $M = 4.82$). These findings suggest that participants not only find the learning activities useful in the classroom, but also believe learning how to work on the apps will be useful for their future lives.

Additionally, the majority of participants responded that working together helped them learn for each of the five Google activities (Google Docs vocab, $M = 4.79$; Google Sheets vocab, $M = 4.43$; Google Slides presentation, $M = 4.45$; Google Docs essay, $M = 4.55$; Google Forms survey, $M = 4.82$). Participants not only valued the activities and apps as being enjoyable and useful, they also found the process of working together with classmates beneficial to their learning.

Research Question #2: What Do Participants Report as Advantages and any Possible Limitations with Using Google Apps for Language Learning?

Open-ended survey questions

Research question #2 examined advantages and potential limitations of using Google apps for language learning by asking participants on the surveys different open-ended questions such as why they did or did not enjoy the activities or find them useful, and if they had any difficulty doing the activities. Table 3 shows themes which emerged from the qualitative data derived from the open-ended survey questions. Positive responses related to why they enjoyed the activities or found them useful are classified as advantages. Negative comments related to why they didn't enjoy/find useful the activities, or any difficulties they had with the activity, are classified as possible limitations.

TABLE 3

Student Responses Related to Advantages and Possible Limitations with the Google App Activities (Themes which Emerged and Frequency of Themes)

	Advantages	Possible Limitations
Google Docs vocab	Learning new vocab (7) Working together (6) Sharing work (2)	Inserting pictures (2) Using it on a phone (1) Partner not working hard (1) Boring (1)
Google Sheets vocab	Learning a new program (3) Well-organized app (3) Easy to work in different places (1) Help me for my job (1) Beneficial for group projects (1)	Work deleted by mistake (2) Didn't know how to use the app well (1)
Google Slides presentation	Easy to use (7) Learning a new app or a new method (5) Working together in different locations, by distance, or online (5) Completing work quickly / saving time (4) App helped share work and ideas (3)	Difficulty learning how to use it (1)
Google Docs essay	Working together one document (5) Easy to use (2) Working together with partner (2) Dividing up work (2) Writing from different locations (2)	Different ideas or points of view as co-writer (2) Not knowing how to use the app well (1)
Google Forms survey	Watching and reading the responses (4)	

The most frequent advantages were related to learning something new, working together online, sharing work, and being easy to use, while some limitations were not knowing how to use the app and problems working with a partner. These themes (along with the interview data in Table 4) will be discussed in the "advantages" and "limitations" sections below.

Interview data

In addition to the open-ended questions on the surveys, two groups of participants (n = 3, 3) took part in interviews at the end of the semester to further investigate student opinions about the advantages and limitations of using Google apps (Research Question #2). The semi-structured interview questions mirrored the survey questions but also included additional questions. Table 4 shows the number of themes which emerged in relation to the different question topics. The interview questions were asked to investigate students' overall perceptions of using Google apps (Docs, Slides, Sheets, Forms) throughout the semester, and for the most part did not focus on specific activities or apps like in Table 3.

TABLE 4

Student Responses from the Focus-group Interviews Related to Advantages and Possible Limitations (Themes which Emerged and Frequency of Themes)

Advantages based on interview questions: What they liked about Google apps / Benefits over Microsoft Word or PowerPoint (PPT) / What they would use it for in the future
Work together by distance <ul style="list-style-type: none"> • Work together even if away from partner (2) • Work online by distance (1) • Useful for distance (1)
Feedback/edit <ul style="list-style-type: none"> • Easier to give peer feedback/comments than MS Word (4) • Ask questions and leave comments with partner (1) • Like a chat site (1) • Edit each other (1) • Less mistakes because of peer correction (1)
Easy <ul style="list-style-type: none"> • Easy to use (2) • Makes projects and presentations easier (1)
Collaboration <ul style="list-style-type: none"> • See each other's work at the same time (2) • Work at same time (2) • Share (2)
Efficient <ul style="list-style-type: none"> • Finish work faster (2) • Save time (1)
Advantages of cloud-based computing <ul style="list-style-type: none"> • Can't open different versions of PPT on other computers (2) • Automatically saved (2) • Everything we need is on the computer/internet (2) • Easier to send a document through a link or Google Drive (2) • One app that includes a lot of things (1) • Save space (1) • Everything is free (1) • Don't need to update (1)
Flexibility of work <ul style="list-style-type: none"> • Work wherever we want (1) • Work at any time (1) • Don't have to sit in class and can work any place because teacher can see the work (1)
Novelty <ul style="list-style-type: none"> • New thing (1) • Didn't know about it before (1)
Disadvantages based on interview questions
Technical limitations <ul style="list-style-type: none"> • Don't know how to use Google Sheets very well (1) • Problem with typing at the same time in the same location of the document (1) • Delete work by accident (1) • No Wi-Fi (1)
Problems collaborating <ul style="list-style-type: none"> • If partner doesn't do much work, you can't tell her how to do it (1) • You do it in a good way, and partner does it just to finish (1) • You do all the work and partner deletes your hard work (1)

The themes in Tables 3 and 4, along with data from a final survey that occurred at the end of the semester, are used to discuss some of the advantages and limitations of using Google apps for language learning in the sections below.

Advantages of using Google apps

Six advantages emerged from the qualitative data related to participant perceptions of the Google app activities.

Advantage 1: Learning a new program. One of the primary advantages of using Google apps in the classroom is the opportunity to expose students to a new way of learning with new forms of technology. Eight respondents in the surveys stated that a reason why they enjoyed the activity or found it useful was because of learning a new program, a new app, or a new method of learning, as one participant stated in response to the Google Sheets vocabulary activity: “I enjoy it because it’s a new way of learning vocabulary words.” One respondent from the focus group interview said she liked the Google app activities because she hadn’t used it before and didn’t know about it, and when she started using it, she found out how useful it was. The novelty of doing a language learning activity in a different way, and the exposure to a new technology, are reasons why some participants may have enjoyed the Google app activities. This aligns with Ishtaiwa and Aburezeq’s (2015) finding that Google Docs had a positive impact on peer-to-peer interaction because it allows students to learn in a “new, different and convenient way” (p. 92), and also aligns with Edwards and Baker’s (2010) finding that participants agreed that Google Docs and Google Slides should be included in future college courses because they enable students to learn something new. Learning something new not only adds to a student’s skill set but can also increase motivation as students are introduced to a new method of learning.

Advantage 2: Easy to use. Another advantage reported by the participants is that the apps are easy to use. Nine comments related to ease of use appeared on the survey in response to why participants enjoyed the activities, very few respondents reported any difficulty using these apps on the survey, and by the end of the semester 61.5% reported they were good at using Google apps, and 38.5% said they were okay—which suggests that Google apps became easier for participants as they had more exposure to them throughout the semester (many of them had never used Google apps before the class). In the focus-group interviews, the word “easy” appeared three times, as participants stated they preferred using Google because of the ability to more easily share and edit documents with their partner, in contrast with the sending, downloading, and opening of documents through traditional programs on Microsoft Office. This finding of ‘ease of use’ supports Davis et al.’s (1989) Technology Acceptance Model, and aligns with studies which have found Google apps easy to use (Edwards & Baker, 2010; Zhou et al., 2012).

Advantage 3: Working together as a group. Not surprisingly, one of the greatest benefits reported in this study of using Google apps for language learning activities is their ability to effectively facilitate collaboration. The words “group”, “partner”, and “working together” appear fourteen times in the open-ended survey questions, and six comments related to collaboration (e.g. “work at the same time”, “see each other’s work”, “share”) appear in the interview data. One of the reasons participants may have enjoyed (and found useful) the Google app activities was because the different Google apps used for each activity facilitated effective group work by allowing multiple users to create and edit on the same document simultaneously. This supports Zhou et al.’s (2012) finding that students reported Google Docs to be a useful tool for working in a group because it made collaborating easier and encouraged peer editing and sharing. This can be especially helpful for language learners as they work together to negotiate meaning in a second language and correct each other’s errors.

Advantage 4: Convenience of working together from different places. Another advantage of using Google apps is the convenience of working together from different places, as eight comments appeared on the surveys in regards to working online or in different places, and the theme working together by distance showed up four times in the interview data. One participant in the interview stated that “the main advantage is working together even if we’re far away from each other.” Another interview

participant stated that when using Google it's not important to sit and work together as they can work in separate places and leave comments for each other (directly through the app). This can be advantageous for language learners who may want to continue working on projects or do other language learning tasks outside of class time without the constraints of their partner having to occupy the same physical space.

Advantage 5: Shared view of your partner's work and peer feedback. A fifth advantage found in this study was multiple authors' ability to see each other's writing as they work on a shared document and make edits and give feedback as they work through a task. One participant commented that working together on the Google Docs essay task was useful because "everything that we wrote was there and we were able to edit and correct each other's writings." Another participant from the interview stated that they enjoyed using Google apps because they could see what each member of their group was doing, and thus plan accordingly to complete their allotted part of the work—which supports Slavkov's (2015, p. 83) observation of the "privileged view of the process of invention and creation in real time."

Eight comments related to peer feedback or leaving comments appeared on the interviews, as one participant stated that providing feedback on documents was easier on Google because you could directly highlight and add comments on to the document in a more efficient way rather than the attaching, downloading, and pointing out where changes have been made as you might have to do with Microsoft Word. One participant stated that it's much easier to give comments through a shared document on Google apps, as she explains: "I can't give her a comment on Word [while working at the same time]... I'd have to call her or something." This supports Aubrey's (2014) suggestion that the ability to comment on a shared document makes the revision process more interactive, as well as Brodahl, Hadjerrouit, and Hansen's (2011) finding that students liked commenting and editing each other's writing while collaborating on Google Docs. One participant summed up the interactive capability of giving mutual feedback on Google apps as it being like a "chat site." As opposed to leaving feedback through traditional mediums such as paper or Microsoft Word, students might enjoy the experience of online interactive feedback on Google apps because it reflects our modern world of online social media where, as Naghdipour (2017) suggests, people can communicate in a more meaningful and authentic way.

The live nature of peer feedback directly on a shared document might also help learners immediately address problems with writing, as Suwantarathip and Wichadee (2014) suggest student writers can learn about problems with language use, spelling, mechanics, incomprehensible text, and organization. The ability of students to offer suggestions on how to improve content and address organizational issues involved in creating larger texts (e.g., essays, presentation slides) can lead to improved writing for L2 students. The survey and interview comments suggest that participants in this study valued the different Google app activities because of the collaborative nature of the activities, and the functionality that Google apps affords for online simultaneous document creation, peer feedback, and editing.

Advantage 6: Cloud-based computing. The final advantage that emerged in the qualitative data was the benefits of cloud-based computing. Participants suggested that Google apps could be used on any device without worrying about different versions or updates, documents are automatically saved, and everything is free and included on one app which can save space on your computer. These benefits of cloud-based computing can facilitate the language learning process as students are able to create, save, and continuously revise all of their tasks on one app which can be worked on multiple devices in varied locations.

Limitations of working on Google apps

In addition to advantages, three limitations emerged from the qualitative data which are discussed below.

Possible limitation 1: Some users have problems at first. Although the majority of participants stated that using Google apps were easy, some participants in this study had problems with using Google apps at first. Three comments on the surveys were related to not knowing how to use the apps well, which supports Aubrey's (2014) finding that some negative comments related to Google Docs were focused on the learning curve involved in using a new form of technology. This learning curve can provide a challenge in the language classroom for certain students who may be more comfortable producing work on familiar mediums such as paper, or word processors (e.g., Microsoft Word), and whose learning styles may be better suited towards working with tactile mediums such as paper. It's important for language learning teachers to consider different learning styles, and comfort levels with technology, when introducing tasks that require students to learn new technologies, as Edmunds, Thorpe, and Conole (2012) found that first-year university students can differ considerably when it comes to knowledge of, and ease of using, different technologies for education. For all students, despite comfort and ability level, difficulties using new technologies can be minimized by repeated exposure, as Beetham et al. (2009) state that digital skills are better attained through repeated practice with authentic tasks rather than as "one-off" and "isolated" instruction (p. 3).

Possible limitation 2: Problem with collaborating on Google apps and writing an essay. Respondents in the interview mentioned some problems with collaborating, such as a partner not pulling their own weight, or deleting the work they put in. More specifically, some respondents in both the survey and interview stated that doing the Google Doc writing activity was problematic because of different viewpoints and writing styles. One participant in the survey stated that students had different opinions on a particular topic, which made it hard "to gather ideas from different points of view." Another respondent stated that they liked to write their essay alone because each person has their own writing style and one person may change their partner's writing to have it fit in to what they think good writing is, and a third participant stated that writing an essay together is "a big problem" because your partner may get offended if you suggest that you don't like their writing style. As students collaboratively wrote their essays they were encouraged to give each other feedback and also correct each other's mistakes. Peer feedback is a "complex activity" that involves students reading one another's writing, exchanging comments, and using this information to revise drafts (Wakabayahsi, 2013, p. 32). This process might become more complex as students simultaneously write a text together and give each other live feedback because they need to be sensitive to the fact that their co-writer might have a different writing style.

Possible limitation 3: Technical problems. Finally, students reported some technical limitations such as problems with simultaneously typing at the exact same location on a shared document, deleting work by accident, and not being able to work without Wi-Fi, which supports Perron and Sellers (2011) statement that a problem with working on Google Docs is the need for an internet connection.

Research Question #3: What Are the Behaviors of Students When They Collaborate?

The procedure

In addition to the five Google activities used to investigate advantages and limitations of Google apps, an additional collaborative activity was introduced to the upper-intermediate EAP class (n = 16) to investigate Research Question #3 about how students collaborate (e.g., using Google or Microsoft; dividing up work or working together). This activity involved students completing a table of words of prefixes and suffixes (hereafter referred to as the "Prefix/Suffix activity"). During this activity students were interviewed while working together, and field notes were taken based on observations, to explore student behaviors while collaborating. The Prefix/Suffix activity was chosen to make observations because it occurred in the middle of the semester after students were familiar with working on Google

apps and because the task was similar to other previous tasks. Introducing an additional activity gave the researcher an opportunity to exclusively focus on student behaviors while collaborating.

Survey data

The first part of Research Question #3 focused on whether students chose to collaborate on Google Docs or Microsoft Word. Table 5 shows that 84.6% of students chose to work on Google Docs for reasons such as it was easy to use, they could work faster, and work at the same time and share information. These findings are consistent with the advantages listed under Research Question #2 above.

TABLE 5
Survey Responses Related to Microsoft (MS) Word or Google Docs

Percentage of students who collaborated on...	
Google Docs (%)	MS Word (%)
84.6%	15.4%
Why students chose Google Docs or MS Word (# of themes which emerged)	
Google Docs	MS Word
Easy (8)	Face to face (1)
Work faster / save time (4)	Useful (1)
Share (2)	
Work at same time in different locations (1)	
See what each other is doing (1)	

The second part of Research Question #3 was interested in the percentages of students who divided up the work or worked closely together, and themes which emerged as to why students did this. Table 6 shows that 61.5% of participants divided up the work and did not communicate very often while completing the task, while 38.5% of participants reported that they worked together and communicated quite often. Students who chose to divide up the work did so mostly to save time or work from different places, whereas participants who chose to communicate often and work together did so to better learn and finish more quickly.

TABLE 6
Student Survey Responses Related to Dividing up Work

Percentage of students who...	
Worked together and talked quite a lot (%)	Divided up the work and didn't talk much
38.5%	61.5%
Why students chose to work like this (# of themes which emerged)	
Worked together and talked quite a lot	Divided up the work and didn't talk much
Learn better (3)	Finish fast / save time (4)
Finish fast (2)	Easier to do the work in different places (1)
Help each other (1)	Partner prefers a different location (1)
	Everything is clear—just need to do the work (1)
	Fair (1)

Observations and interviews

Finally, to further investigate Research Question #3, participants were interviewed and field notes were taken while students collaborated on the task. Table 7 shows an example of the different choices students made while working together (location, face-to-face vs. distance, application used), notes based on observations, and interview responses.

TABLE 7
Observations and Interview Responses

Group	Location of students	Working face to face (f2f) or by distance	Notes based on observations	Interview responses
1	One in learning center; one “somewhere”	Distance Google Docs	Pair of students working on same Google Doc but in different locations. Student doesn’t know where her partner is.	If we use one laptop and sit together we won’t be able to finish the work quickly. Faster if we’re separated so we can concentrate more and both of us type at the same time.
2	One in class; one in the learning center	Distance Google Docs	One student working on computer in learning center, and one working on iPad in the classroom.	Goes to learning center to use desktop computer because she doesn’t have her laptop and Google Docs isn’t as good on a smartphone. Partner isn’t sitting next to her because she can contact her by WhatsApp or call her.
3	Both in learning center	Distance Google Docs	Pair of students sitting in the same row of computer desks with one random student in between.	Don’t need to work face to face “because we have the ability to share the things here. Also, we divide the work, so no need to talk about it.”
4	Both in classroom	f2f Google Docs	Sat together and talked while they worked through the activity typing on the same document at the same time.	Worked on Google Docs instead of MS Word so they “can know everything that each other is doing.”
5	Classroom	f2f Google Docs	2 students sitting next to each other but not talking much.	
6	Study room	f2f MS Word	Students working in a study room next door on MS Word with two laptops.	“Face to face is easy...one student search on laptop and one student write... use word because both at university... if we were in separate locations we would use Google.”
7	Out of classroom on a different floor	unknown	Work was monitored by researcher on Google Docs even though location was unknown.	

Discussion of findings related to student behaviors while collaborating

These observations in Table 7 show that each pair of students exhibited their own unique behaviors. Some students chose to work in the classroom, some in the learning center, some in a study room, and some in other parts of the campus. Additionally, some groups of students chose to work face-to-face while others chose to work by distance. This suggests that using Google apps to work together online gives students the flexibility to work where they want and how they want, and this flexibility to work together with a partner while being connected to the teacher online could increase motivation and enable concentration when doing language-related tasks. Google apps can also challenge notions of traditional classroom settings, as the physical space of classroom learning extends beyond the designated four walls of the assigned class.

The observation that six out of seven groups chose to work on Google Docs instead of MS Word is consistent with the survey data in Table 5 that showed the majority of students prefer working on Google Docs for collaborative activities. The interview data from the students completing the Prefix/Suffix activity reinforces other findings in this paper related to advantages of Google apps such as working

together at the same time, seeing what each other is doing, and sharing information—although one group chose to work on Microsoft Word because they were both at the university so working face to face was easier.

Another key finding related to Research Question #3 was the tendency of students to divide up work when collaborating on Google apps, which is also related to Research Question #2 because it can be seen as both an advantage and disadvantage in this study. Many participants may have enjoyed working together on the same Google document simply because it allowed them to divide up the work, save time, and use less effort while completing a language-learning task. For example, four participants on the survey said they liked the Google Slides activity because they could complete work quickly and save time. This theme of saving time appeared three times in the focus group interviews as well, as one participant explained “I enjoyed that me and my partner got to divide our work easily and everyone wrote his paragraph without wasting time.” Students appeared to enjoy working on Google apps because they, as Perron and Sellers (2011, p. 490) suggest, enable collaboration and efficiency as team members work together inside a “single user space.”

However, this could also be a disadvantage because students do only the minimum work necessary to satisfy their allotted contribution to a task, as opposed to working together closely with classmates and using each other’s ideas and feedback as they go through the steps of completing a project. After the Google Slides presentation activity, 16.7% of participants stated that they did not communicate at all while doing the activity, and 60% reported communicating only 1-2 times. This division of labor, without properly giving each other feedback, is more attune to cooperative learning, than collaborative learning, as Roschelle and Teasley (1995) describe the distinction between the two by stating that cooperative learning involves the division of labor where each person is “responsible for a portion of the problem solving” and collaborative learning involves participants working together mutually in a “coordinated effort” to solve a problem (p. 70). The capability of Google Docs to allow for the easy division of work can lead to students not learning effectively while in groups, as students simply divide tasks into different parts to get the work done as quickly as possible, instead of working closely together sharing ideas and working through problems in order to produce the best quality product.

Conclusion

The majority of participants in this study enjoyed the five Google app activities and found them useful for learning and future work-related contexts. Some of the reported advantages of using Google apps were: learning how to use a new program or app; their ease of use; working together as a group; the convenience of working together from different places; and having a shared view of your partners work and giving feedback more easily. Some possible limitations to doing language learning activities on Google apps were learning how to use the new technological tools, and students having problems collaborating with a partner. Finally, in regards to behaviors while collaborating, students preferred working on Google apps instead of Microsoft Office and had a tendency to divide up work while working in pairs or groups.

A limitation of this study was not including any tools in the design to measure improvement in language learning as a result of collaborating on Google apps. There is a difference between how students perceive their learning and the actual learning that takes place as a result of introducing a new technology—which this study did not measure. Using different methods to investigate any gains to language development would have made the study more balanced, and is an area that needs to be researched more in the future in regards to collaborating on Google apps.

A second limitation of this study was the small sample size. Although conclusions have been drawn from the data in this study, they are based on the perceptions and behaviors of 31 participants, which makes generalizing the findings of this study to larger populations and contexts more tenuous. However,

some of the findings of this study did align with previous research which shows consistency between the findings of this study and the literature related to online collaboration and Google apps.

Despite these limitations, there are some implications of this study. The first implication is that integrating collaborative technologies such as Google apps into the language learning classroom can equip students with a new tool to aid in the completion of group tasks and help students see the possibilities that online collaboration can provide for learning a second language and doing group work. Using the Google suite of apps to simultaneously work on shared documents, students can: organize a table of information on Google Sheets; gather and analyze data on Google Forms; collaboratively author a text on Google Docs; and produce a presentation in groups on Google Slides. This may allow students to work together more efficiently on a shared project, receive language and content-related feedback, and learn from their partners as they view and edit each other's work as it is being created.

Working together online also gives students flexibility, as one participant stated: "the best thing is we can work together wherever we want and at any time." Online collaborative tools like Google apps can change the notion of language learning classrooms as designated physical spaces with room numbers and a specific time where groups of people meet. This is what Stahl et al. (2006)—in the context of collaboration, computer mediation and distance education—refer to as "problematizing" our notions of learning (p. 409). The group work in this study started in the classroom, extended to the cafeteria or the library, and was finished at home in the dorm room or the living room—all the while each member of the group (and the teacher) witnessed its creation in real time from different locations while being connected to the same document.

The second implication is that integrating online collaboration into different levels of L2 curriculum can help students in their professional lives who will most likely be required to work together in teams to solve real-world problems in the most efficient manner possible. Students who may be required to collaborate in their future workplaces with colleagues who work in different locations may save time and resources by collaborating online in different locations. Also, students can use their Google-equipped collaboration knowledge and skills to add technological expertise to their future workplace and offer colleagues and supervisors new and better ways to manage and complete tasks while at work.

Acknowledgments

I would like to thank the Center for Excellence in Learning and Teaching at the Petroleum Institute (now the Center for Teaching and Learning at Khalifa University, Abu Dhabi) who supported this project through a research grant, hands-on practice in Google workshops, and the exchange of various Google ideas.

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Appendix A

Google Apps Survey

Please fill out the questionnaire below. Participation in this survey is voluntary. You do not have to write your name, but please write your student number.

Please complete the last 5 digits of your student number, and circle the number of semesters below.

Student number: ____ _	Number of semesters in the ABP: 1 2 3 4	
---------------------------	--	--

Please circle only one answer for #1-10 below

	Lowest is 1 Highest is 5	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1	I enjoyed this Google Docs vocab activity	1 ☹	2	3	4	5 ☺
2	Why did you enjoy it or not enjoy it? <i>write your answer here</i>					
3	This Google Docs vocab activity was useful	1 ☹	2	3	4	5 ☺
4	Why was it useful or not useful? <i>write your answer here</i>					
5	I enjoyed working together with other students to do this project	1 ☹	2	3	4	5 ☺
6	Working together with other students helped me learn	1 ☹	2	3	4	5 ☺
7	I enjoyed learning how to use this new app	1 ☹	2	3	4	5 ☺
8	I will use this app again	1 ☹	2	3	4	5 ☺
9	What will you use it for?	<i>write your answer here</i>				
10	Learning how to use this app will be useful in the future	1 ☹	2	3	4	5 ☺
11	What difficulties did you have doing this activity? <i>write your answer here</i>					
Please circle only one answer for 12-14						
12	This activity is better done on...	paper	an app			
13	This activity is better done...	by myself	with my classmates			
14	This activity is better done...	Face-to-face with my classmates	In different locations with my classmates	It doesn't matter (it's the same).		

Appendix B

Interview Questions

1. Did you enjoy the Google app activities? Why?
2. Does it help you learn more than on paper or Word, or is it the same?
3. What's the advantage of Google Docs over MS Word, or Google Slides over PowerPoint? Do you think Google has a benefit over the traditional ways of doing things? What's the number one benefit?
4. When you did your classwork, did you work face to face or did you work in different places?
5. Do you think you'll use this in the future? When and how would you use this in the future?
6. Do you think you'll use this for your work? Do you think you'll be working from different places with your coworkers in the future?
7. What's was your favorite activity?
8. What did you like best about the Google activities?
9. When you worked together, did you give each other a lot of comments, or did you mostly divide up the work?
10. Are you missing anything when you divide up the work? Do you read each other's, do you learn?
11. Did leaving comments help? Was it the same as doing it face to face?
12. Do you think you are pretty good at using Google?
13. What if your teacher next year in your freshman year asks you to do something on paper or Word- would you recommend Google apps to her?
14. Would you recommend Google apps to a future manager?
15. Is learning new apps important for your education?