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### To cite this article:

Banat, M. (2021). Collaborative learning through Mendeley: Effectiveness and students' perceptions. *International Journal of Studies in Education and Science (IJSES)*, 2(2), 87-101.

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## Collaborative Learning through Mendeley: Effectiveness and Students' Perceptions

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### Abstract

The positive impact of collaborative learning (CL) on students' learning in general and language learning as well as its impact on learners' interaction in classrooms has been stressed a lot in the literature (Ghaith, 2003; Johnson & Johnson, 1996 among others). Nevertheless, despite stressing collaborative learning in language classes, students often complain that their partners in group projects don't contribute equally to the task. Another problem they report is that their note-taking skills aren't properly utilized and that they find difficulty retrieving relevant resources for their group projects despite working in a team. Therefore, the researcher aims in this research to examine (1) students' collaboration as a result of using an online social network platform; (2) students' note-taking skills as a result of using an online social network platform; and (3) students' resource discovery skills as a result of using an online social network platform, as well as, (4) students' perception of the effectiveness of working collaboratively using an online social network platform.

**Keywords:** Mendeley, Collaborative learning, Social networking, Note-taking, Referencing

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### Introduction

Students' collaboration in tasks such as research writing, projects, and essays plays a vital role in their learning as well as their acquisition of communication skills. The importance of collaboration has been stressed in a lot of literature. Saba'Ayon (2013) defines it "as a pedagogical practice in which students work together in small groups of two or more to complete a common task within the class session or outside the classroom for a certain period of time ranging between two weeks and a month depending on the complexity and the scope of the task" (p.3).

However, with the integration of technology into pedagogy, collaboration takes a new dimension; for instance, it now entails students' usage of platforms or apps to collaborate in various tasks. Various social networking sites have been created for that purpose; those sites are referred to as Educational Social Networking Sites (ESNSs). ESNSs are "social networking sites that are built to promote collaboration among learners" (Alkathlan & Al-

Daraiseh, 2017, p. 1). Refworks, EndNote, Zotero, and Papers among others are existing examples of educational social networking sites.

This paper discusses the use of Mendeley as one of those social networking tools. Utilizing this platform by both researchers and students offers a whole array of benefits from tools and functions that keep users updated in today's virtual information world. The incorporated set of tools that Mendeley offers brings together elements of collaboration, resource discovery and information management and citation (MacMillan, 2012). Originally, Mendeley, name derived from biologist Gregor Mendel and Chemist Dmitri Mendeleev, was developed in 2007 in London (Hicks, 2010 cited in MacMillan, 2012).

Like the previously mentioned social networks, Mendeley allows users to collect and store citations taken from numerous sources, extract bibliographies and format citations and references. It further serves as a social networking tool that supports users' collaboration and resource discovery using Web 2.0 capabilities. Users can back up their resources on Mendeley platform and retrieve resources that others in the field have previously retrieved and tagged (MacMillan, 2012).

### **Problem and Rationale**

Social networking sites are potentially useful for encouraging and improving collaborative learning due to their participatory nature and collaborative capabilities (Alkhatlan & Al-Daraiseh, 2017). The value of collaborative learning has been highlighted a lot in the literature (Gaith, 2003; Saba'Ayon, 2013; Johnson, 1993 among others). Nevertheless, despite stressing the importance of collaboration in group projects, students too often complain that their partners in group projects don't contribute equally to the task. Along this line, students report other problems in research writing, namely poor utilization of note-taking skills and shortage in finding relevant resources for research purposes despite their availability in accessible databases. To this end, the researcher explores the use of Mendeley as a collaboration, note-taking tool, and resource discovery tool in a writing class, namely Advanced English, at a private Lebanese English-speaking university. Due to the absence of empirical research that explores university students' attitude towards CL, specifically via social networking and due to absence of research in the Lebanese context (at least to the researcher's knowledge), the researcher aims to investigate (1) if students' collaboration for research projects will improve as a result of using Mendeley, (2) if students' note-taking skills as well as resource discovery skills will improve as a result of using Mendeley, (3) students' perception of utilizing Mendeley for research writing.

### **Research Questions**

This empirical study targets answering the following research questions:

1. Does students' collaboration enhance as a result of using Mendeley?
2. Do students' note-taking skills improve as a result of using Mendeley?
3. What is students' perception towards using Mendeley?
4. How do these students perceive the impact of using Mendeley on their learning?

## **Literature Review**

### **Collaborative Learning Theory**

Smith and MacGregor (1992) provide a comprehensive description for CL, defining it as “an umbrella term for a variety of educational approaches involving joint intellectual effort by students, or students and teachers together. In most collaborative learning situations, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product” (p. 10) (cited in Barkley et al., 2014). In such CL communities, all group members are expected to actively engage in the task to achieve assigned objectives. A key word in this definition is ‘actively’; hence, if a group member doesn’t contribute equally to the task, then this is no more collaborative learning. Accordingly, in CL, two or more students labor together and share the workload equitably to achieve the target learning outcome (Barkley et al., 2014). According to reviewed literature, CL is of vital importance to learners; specifically, it increases students’ retention, enhances their academic achievement, problem-solving skills, critical thinking, higher-order thinking, and fluency; in addition to its positive impact on learners’ motivation and academic engagement (Ghaith, 2003; Saba’Ayon, 2013; Barkley et al., 2014 among others).

The four aspects of CL according to (Dillenbourg, 1999 cited in Alkhathlan & Al-Daraiseh, 2017) are: a situation, the interactions, the process, and the effect. (1) The first aspect is situation: In this feature, Dillenbourg declares that collaborative situations take place when learners come from similar backgrounds, have similar skills, and are expected to perform similar actions with similar outcomes. (2) The second aspect is interactions: In this feature, Dillenbourg states that the degree of interactivity among learners should be measured by how much these interactions enhanced peers’ cognitive processes. (3) As for process, the third aspect of CL, it entails according to Schwartz (1995) cited in Alkhathlan and Al-Daraiseh (2017) four learning mechanisms that are vital to individual cognition. These mechanisms occur in CL as induction, cognitive load, self-explanation, and conflict; they start at the individual level and extend to peers and groups.

Briefly, induction is the main process that requires peers in CL communities to integrate common features of the representation built by each one of them (Schwartz, 1995). Cognitive load on the other hand stands for decreasing cognitive labor among peers since tasks are distributed among them. As for self-explanation, a term borrowed from social context, it entails explaining and justifying tasks among group members; this is when learning happens. “The amount of learning by an individual who provides explanations seems to be related to the cognitive activities necessary for constructing and presenting explanations” (Alkhathlan & Al-Daraiseh, 2017, p.5). Finally, conflict is another social feature; it normally takes place among group members in any collaborative situation (Doise & Mugny, 1984 cited in Alkhathlan & Al-Daraiseh, 2017). (4) Effect, the last aspect of CL, consists of different contexts and interactions. According to Dillenbourg et al. (1995) cited in Alkhathlan and Al-Daraiseh, 2017), educators should be concerned with the effects of a certain interaction instead of the effect of CL in general. These effects are measured by individual task performance measures (Dillenbourg, 1999 cited in Alkhathlan & Al-Daraiseh, 2017) rather than being measured by group performance.

## **Collaborative Learning in the Online Environment**

Bakery et al. (2014) hold a comparison between onsite collaborative learning and online collaborative learning. The researchers find that both types of CL's features are typically the same; nevertheless, they unfold differently.

The first feature of onsite CL is intentional design; however, it is arguably even more vital in online CL. The necessary integration of technology in online CL requires more planning and structure on the part of the instructor to be effective (Major, 2010 cited in Barkley et al., 2014).

The second feature of CL is the co-laboring of all learners in projects; this contribution is required in group processes and products. Also, according to Major (2014), sharing an equal workload is more challenging in online CL than it is in onsite CL. Furthermore, communication among group members in online CL is often asynchronous online; hence, planning time for co-laboring is demanding and challenging for those learners.

The third characteristic of online CL is meaningful learning, which entails from learners to practice authority and control their own learning. According to Williams, Karousou, and Mackness (2011) cited in Bakery et al. (2014), measuring this goal and its acquisition is challenging in online CL environments where much of the learning is emergent. In other words, students acquire the skills and knowledge on their own without direct interference from the instructor. Due to this feature, instructors who apply online CL need to find authentic ways to plan objectives in a flexible, planned, and emergent learning environment.

## **The Theoretical Rationale for Online Collaborative Learning**

Barkley et al. (2014) list several principles taken from various learning and new social learning theories to provide a valid rationale for online CL.

The first principle for online CL is that learners gain knowledge by integrating new information into their prior understandings. According to Barkley, et al., during an 'online collaborative process', learners are dependent on other partners just as they normally do in onsite classes; nevertheless, online CL requires adding technological tools that 'hold their collective knowledge' (p.19). Hence, learning takes place both internally and externally.

The second principle for online CL is that learners acquire knowledge by observing and imitating their peers. For instance, when online, learners acquire new skills like evaluating online sources for credibility by observing and imitating others who are online. Lurking according to Barkley, et al. (2014) is a common practice in online communities where learners spend time observing others before engaging into an online collaboration.

The third principle for online CL is learning through intentionally scaffolding activities. According to Major (2015) cited in Barkly et al. (2014), novice online learners benefit from scaffolding in which learners are supported until they can finalize a task independently. Major (2015) suggests partnering in online reciprocal

peer tutoring activities low achieving students with high achieving students because those can provide additional support for their peers.

The fourth principle for online CL is learning through pooling knowledge and creating new knowledge. Barkley et al. (2014) suggest the example of engaging students in collaborative writing assignments which would at a later stage contribute to the entire class knowledge base or be used with prospective students to add further knowledge into it.

The fifth principle for online CL is learning upon seeking understanding. According to Thomas and Brown (2011) cited in Barkley et al. (2014), learning entails a process called ‘situated learning’ through which learners aim at learning ‘course, disciplinary, and institutional norms to situate themselves within a group’ (p. 19). This is normal according to researchers because online learning which is often associated with situated learning takes place in a vast online network.

The sixth principle for online CL is that students learn in a situated, social process in which knowledge is co-constructed. Knowledge normally takes place in communities where learners collaborate, share interest, ideas, knowledge and experiences. This process of interaction is vital for knowledge acquisition which is built and held by the entire group (Barkely et al., 2014).

The seventh and last principle for online CL is that learning takes place through a distributed process of human agents who interact dynamically with artifacts. According to Siemens (2005) cited in Barkley et al. (2014), learners’ interaction with each other and with technological agents and tools is intrinsic to the process of learning; this normally happens in communities of common interest, social networks, and group tasks. Thus, online CL offers learners the chance to be active participants in ‘a sociocultural and socio-technological environment that creates learning distributed among humans and technological tools’ (Major, 2014 cited in Barkley et al., 2014, p. 20).

### **Collaborative Learning in Social Networking Sites**

ESNSs are “social networking sites that are built to promote collaboration among learners. Their main purpose is to take advantage of the social aspects to foster learning” (Al-Dhanhani, Mizouni, Otrok & Al-Rubaie, 2015). According to Alkathlan and Al-Daraiseh (2017), due to the participatory nature as well as the collaborative features of social media, such platform holds great capacities for empowering and fostering collaborative learning. Additionally, the social aspect which is at the heart of social media technology aid in enhancing collaborative learning processes. Using its interactive features, students can construct and share knowledge as part of their social connection. In fact, the wide range of communication channels presented by social networking sites support synchronous and asynchronous communication.

Theoretically, the four main features of CL theory, namely ‘Situation, Interaction, Process and Effect’, are part and parcel of the existing technology of social networks. The actual use of social networking sites in academia

creates a situation because learners can easily create their own profiles, post personal information, and share their pictures or the like with others. While students engage in a variety of collaborative activities, they create a “situation of symmetric knowledge and actions” (Alkathlan & Al-Daraiseh, 2017, p. 4).

Additionally, social networking sites are rich with interactive capabilities to support collaborative learning. This entails using wikis, discussion boards and the like to interact with peers who can provide instant feedback on interactive tasks. Consequently, this motivates partners to contribute further to the collaborative task.

Educators also can track and assess the students’ progress by analyzing interaction graphs (Fessakis, Dimitracopoulou & Palaiodimos, 2013 cited in Alkathlan & Al-Daraiseh, 2017). In turn, this positively impacts students’ cognitive abilities, critical thinking, and problem-solving skills (Williams & Jacobs, 2004 cited in Alkathlan & Al-Daraiseh 2017). Accordingly, the impact of students’ collaborative learning can be relatively easy to measure by using different social networks such as discussion boards for interaction, blogs or groups for performance and validation of collaboration ability.

### **Review of Selected ESNSs: Mendeley**

Mendeley is a free social network which serves as a reference management tool; it helps organize references, share, and collaborate using full-text documents and artifacts (Khwaja & Eddy, 2015). This online social network allows researchers, students, and academics to follow research trends and connect with similar minded people. The platform utilizes both a mobile feature and a desktop feature. Mendeley serves as a tool for employing CL in college classes.

According to Hicks (2011), what distinguishes Mendeley from other reference management tools is its social networking and collaborative feature for researchers. Zaugg (2011) emphasizes that “incorporating this social networking approach to academic research also allows for peer review and feedback much earlier in the research process. It helps establish researcher expertise in more rapid dynamic ways before an article is submitted to a potential journal.... Mendeley takes the genre of research citation management software to a new, and potentially powerful level, and offers a glimpse of how academic scholarship may adapt to the affordances of an evolving Internet” (p.36).

Accordingly, this social network is particularly beneficial in courses or programs that require research work. It is further useful in sharing contributions to group projects and thereby enhances collaborative learning (Khwaja & Eddy, 2015). This is particularly helpful in projects that require multiple student access to documents that need critique and comments. As for the social context, “the social nature of the online exchanges provides a means for scaffolding socially constructed knowledge” (Barton & Cummings, 2008 cited in Khwaja & Eddy, 2015, p. 21) during this social interaction, students construct knowledge with the support of their peers and mutually provide support to others. Instructors’ guidance remains a need during this process of collaborative learning in such online platforms.

## **Method**

### **Context and Participants**

This empirical study is conducted in an advance intensive English course at a Lebanese private English-speaking university. One of the main objectives of this six-credit course is to acquire research skills, namely evaluating sources, summarizing, paraphrasing, and quoting. Students are required to collaborate with a partner to produce their research papers. Hence, integrating Mendeley in the course platform provides a well-planned collaboration for the research project and positively contributes to students' acquisition of skills. The nine participants in this empirical study are advanced intensive English learners (Minimum TOEFL grade is 514), two of them are Master's students and the rest of the group are undergraduates coming from different majors: business, engineering, graphic design, communication and science information system, and freshman arts.

### **Instruments**

In addition to the evaluation and observation of students' annotation and collaboration on Mendeley for the seven-week summer semester, the researcher used an interview to gauge the experience of the students with the Mendeley platform. Hence, in this empirical study, the researcher employed qualitative data collection instruments: an interview and an analysis of the Mendeley platform. Each interview conducted with each group of participants lasted about 10-15 minutes.

The interview consisted of nine questions that queried students' experience with Mendeley; namely it focused on whether it was easy to learn and to use Mendeley, to what extent Mendeley eased and enhance collaboration with peers on the research project, whether Mendeley enhanced their learning, and finally, if they used this platform to create reference lists in MS or to build a virtual library for the sources used. The interview addressed the following questions: [1] Was it easy to learn and to use Mendeley? ; [2] To what extent did Mendeley facilitate collaboration and organization of information for the research?; [3] How did Mendeley help in organizing information for your research? [4] Did Mendeley enhance your learning and note-taking skills?; [5] Did you use Mendeley to create references lists in Microsoft Word?; [6] What did you enjoy most about using Mendeley?; [7] What problems, if any, did you encounter in using Mendeley?; [8] What can be improved about the use of Mendeley for this class research?; [9] Would you use Mendeley for collaboration and/or organizing documents in the future? Why or why not?

The small sample size of the class precludes generalizability of the findings; nevertheless, these findings provide a basis for other scholars and teachers to utilize and build upon both for research and teaching. The subsequent section presents the findings for this empirical study.

The major instrument used in this study is the Mendeley platform. Its key features can be roughly classified in three main categories. The first feature is the organization feature which allows for indexing and organizing PDF and other documents into a bibliography. This is displayed in Figure 1. This feature facilitates students' search, customization, categorization, and citation from uploaded materials.



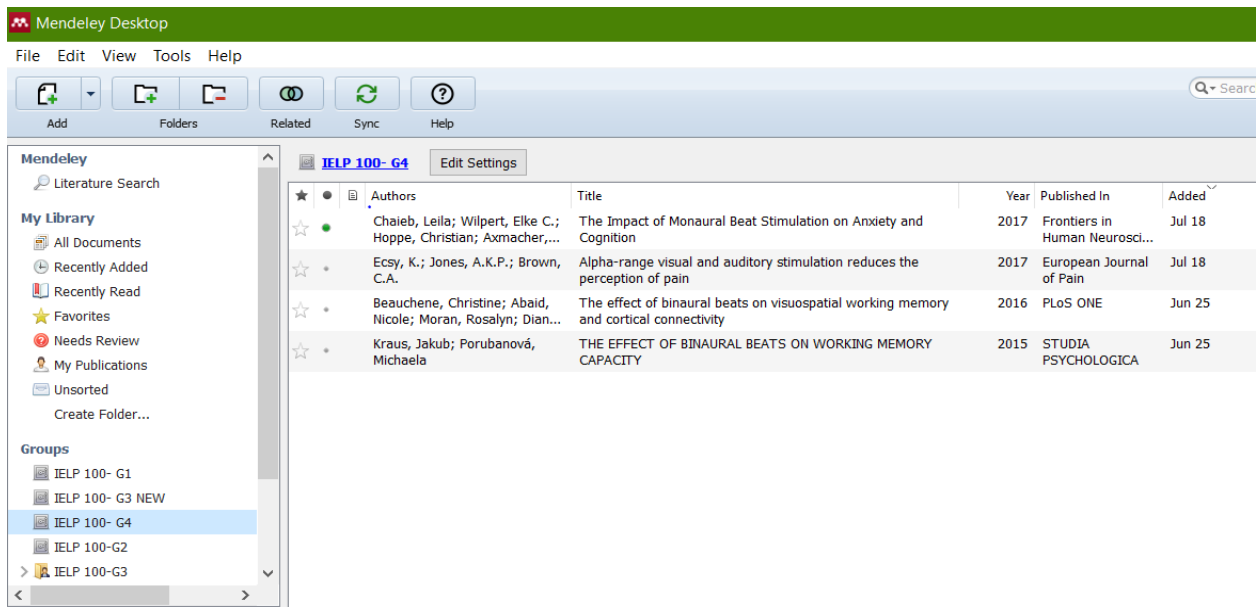


Figure 1. An Image of Mendeley Desktop, showing the Library, Filter, Groups and Documents Panes

Once students upload their documents in Mendeley, they can read, search, annotate, and highlight within the integrated PDF viewer as displayed in Figures 2, 3 and 4.

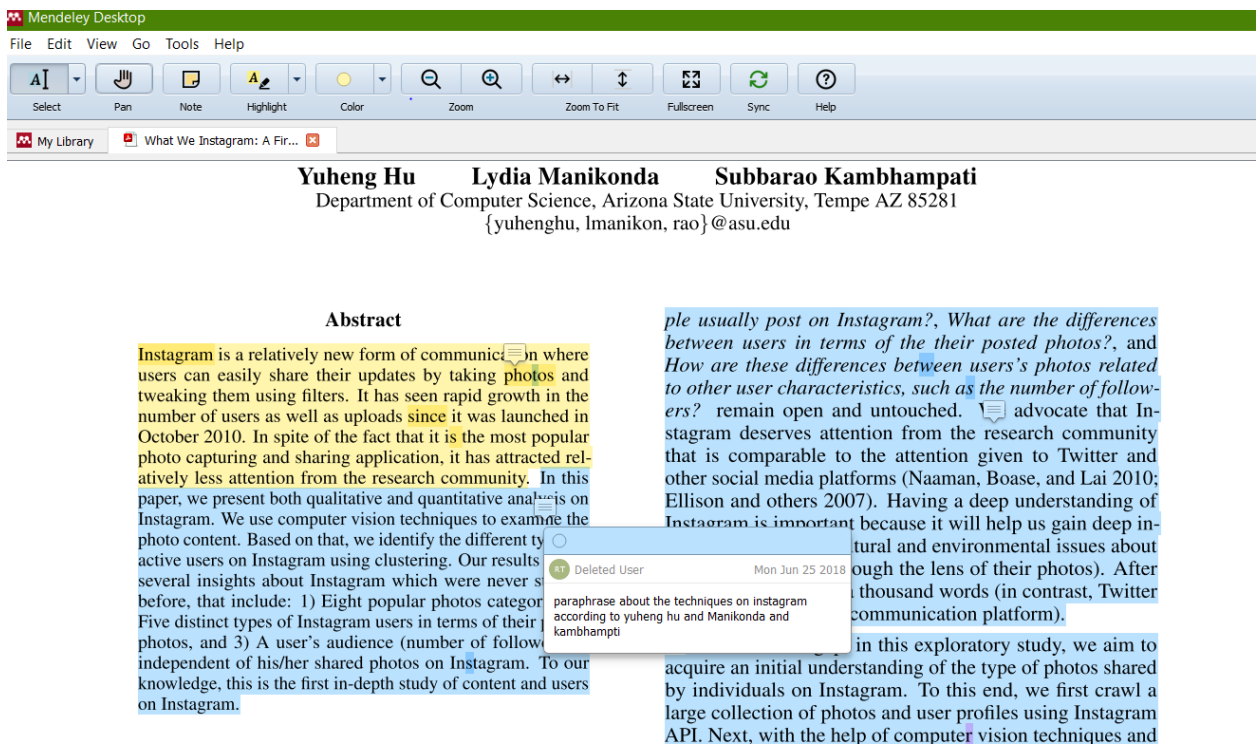


Figure 2. An Image of Mendeley, showing the Students' Annotations, Citations, and Notes/tags Fields

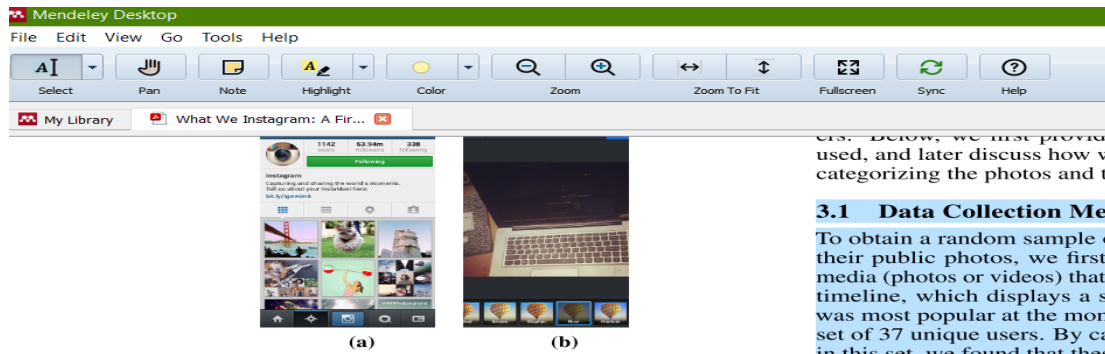


Figure 1: Interfaces of Instagram. (a) Instagram app home-page, (b) Transforming a photo using filters

## 2 Background

Instagram (Fig. 1) is a popular photo (video) capturing and sharing mobile application, with more than 150 million of registered users since its launch in October 2010. It offers its users a unique way to post pictures and videos using their smartphones, apply different manipulation tools – 16 filters – in order to transform the appearance of an image and share them instantly on multiple platforms (e.g., Twitter) in addition to the user's Instagram page. It also allows to add captions, hashtags using the # symbol to describe pictures and videos, and tag or mention other users by the @ symbol (which effectively creates a link from posts to the referenced user's account) before posting them.

Below, we first provide a brief overview of the tool used, and later discuss how we categorized the photos and the data collected.

### 3.1 Data Collection Methodology

To obtain a random sample of their public photos, we first crawled the public photos on the timeline, which displays a set of photos that were most popular at the moment. We crawled a set of 37 unique users. By crawling in this set, we found that these users (which may explain why they were popular) had crawled the IDs of both their public photos and their regular active Instagram users.

Specifically, we operationally defined regular active users as those who are 1) not spammers, and 2) had at least 60 photos posted in the last 60 days (14.6% of the seed users).

Deleted User  
Mon Jun 25 2018  
Important page and app on social medias specially Instagram and its features and hashtags as said yuheng hu manikanda and kambhampati 2014

Figure 3. An Image of Mendeley Desktop's PDF Annotation and Commenting Tools

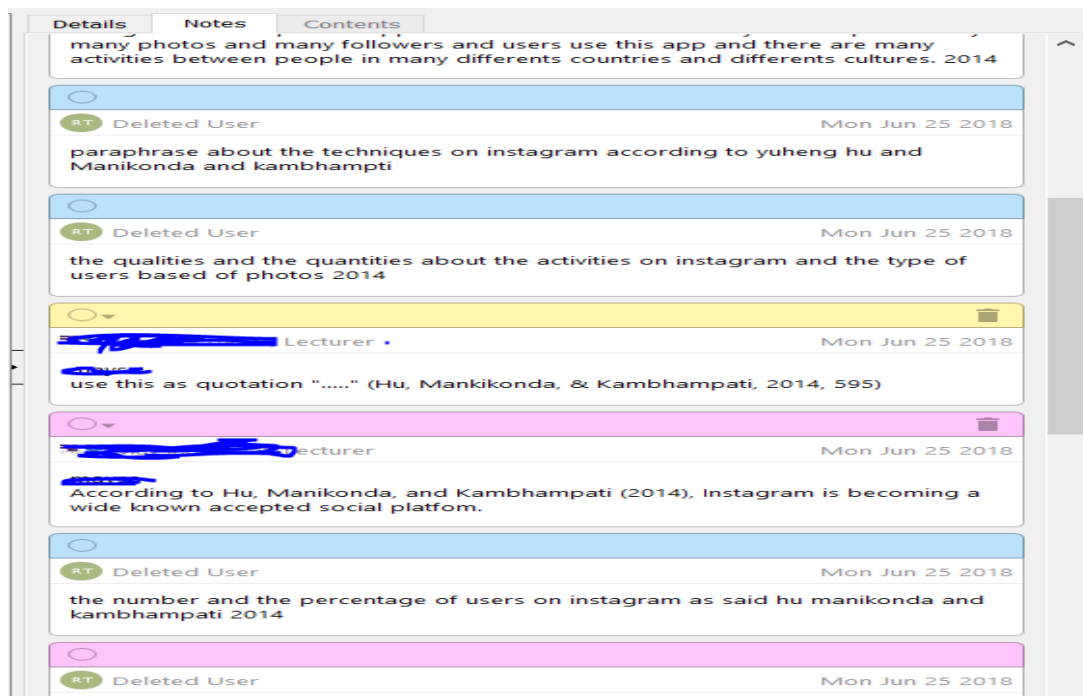


Figure 4. An Image of Mendeley Desktop's Tags and Notes field, where a Mendeley User can make Whole-document Notes or Linked Annotations

The second key feature on the Mendeley desktop is sharing. As a social network, this feature, displayed in Figure 5, is at the core of Mendeley. Using it, the users can create groups, invite friends and stay up-to-date with other researchers' readings or uploads.

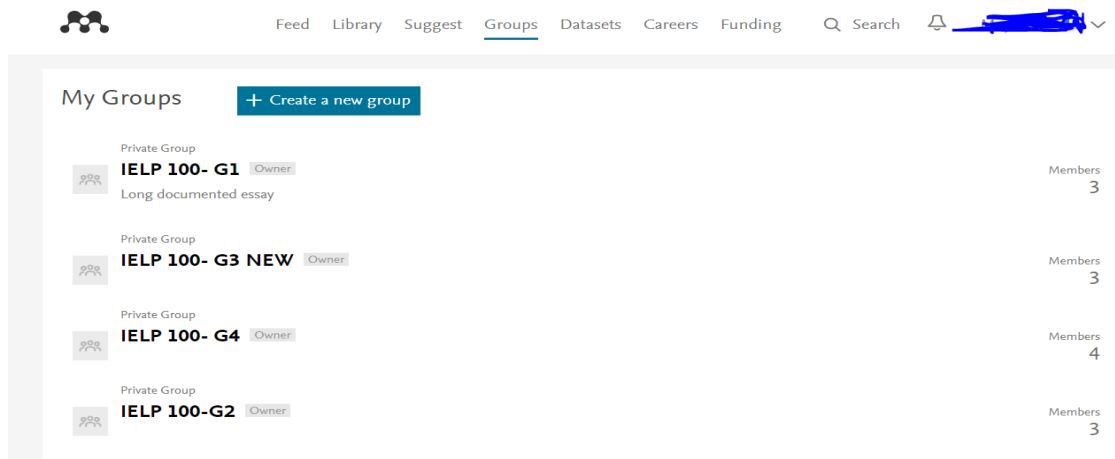


Figure 5. An Image of Mendeley Desktop's where a Mendeley User can Create or Join Groups

The third core feature of Mendeley is discovering. Using this feature, as displayed in Figure 6, Mendeley users can navigate the web and retrieve various relevant journal articles or publications to add to their research.

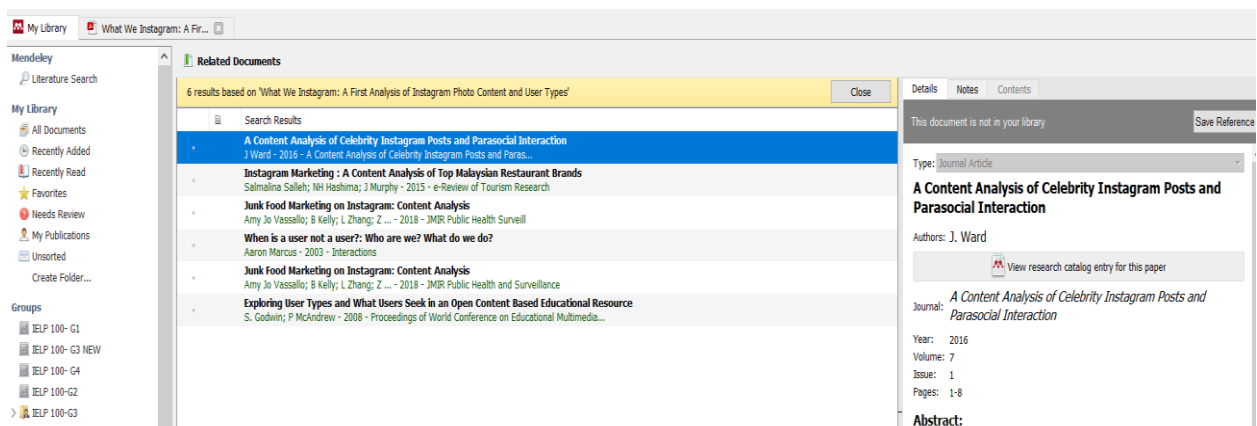


Figure 6. An Image of Mendeley's Suggested Documents based on Students' Preferences

## Study Design

This empirical study was conducted in several phases. During the first phase, the researcher conducted a Mendeley training session to introduce the participants to the features of the Mendeley platform, how it is utilized, and how to optimize its use for researching and collaborating with their peers. Students then created a Gmail account and accessed the platform from <https://www.mendeley.com/>. Then, they downloaded Mendeley Desktop for windows [[www.mendeley.com/download-desktop](http://www.mendeley.com/download-desktop)]. The students registered and personalized their profiles. At this stage, they could login in with their Gmail and password. Once they were on the platform, they installed MS word plugin to be able to import citation from Mendeley. The instructor, who is the administrator for each group, created groups and invited the participants for the joint platform. To do so, they checked their Gmail to accept invitation and join the group. The group admin (instructor) added the feature: “view group documents in the library” on her own platform to be able to check the notes and annotations done by each student on the document.

After finalizing logistics of the platform, students received the usual instruction for citing material following APA standards, retrieving credible online resources, referencing their sources, annotating the sources, and applying paraphrasing, summarizing, and quoting skills. Students then retrieved the online sources from the university database and uploaded those on the Mendeley platform. Students were encouraged to use the Mendeley feature: resource discovery. Using this feature, students can search within the Mendeley database which includes over 34 million papers from online sources added by users in different disciplines.

Students' annotations, note-taking, and paraphrasing/summarizing/quoting (all color-coded) were all documented on the Mendeley platform. The instructor checked students' work by logging in to her Mendeley platform where she could see each students' work, amount of collaboration, last date and time of document modification and the like. If a student's document was modified, the instructor would provide feedback in the Mendeley group. Such kind of feedback was almost daily until the due date of the research submission. Simultaneously, students' collaboration and equal contribution to the research was observed by the instructor. As the due date approached, the students' contributions and support requests became more recurrent. At the end of the semester, the researcher conducted a 10-15-minute interview with each group of participants to check the participants' evaluation and perception of using Mendeley for research and collaboration.

## **Findings and Discussion**

The following themes are deduced from the interviews conducted with students about their experience with Mendeley: [1] Mendeley is a useful tool to enhance collaboration with peers and instructor; [2] Mendeley is a practical tool to upload notes and annotations; [3] Mendeley is a helpful tool to retrieve reliable sources; [4] Mendeley is practical for citing references properly; [5] Mendeley has a positive impact on learning research skills.

More specifically, regarding the first theme [Mendeley is a useful tool to enhance collaboration with peers], the following quotes are extracted from students' responses: "*Mendeley facilitated collaboration and organization completely for the research*"; "*collaboration and organization of material was simple and easy*"; "*Mendeley facilitated work and dividing it*"; "*I might use Mendeley in the future for collaboration and writing my research papers*"; "*I can share ideas with the instructor by this program*"; "*I can make online discussion with my group*"; "*I enjoy it because I work online and my teacher can see my work*".

As for the second theme [Mendeley is a practical tool to upload notes and annotations], the following quotes are selected: "*Mendeley enhanced my learning and note-taking skills*"; "*when I opened my Pdf files on Mendeley, I could add my notes and paraphrase/summary easily*"; "*Mendeley helped me by highlighting the information I need for my essay using comments beside it, to know where to use the information*".

Some students' quotes on the third theme [Mendeley is a helpful tool to retrieve reliable sources] are: "*I used Mendeley when I couldn't find sources for my essay*"; "*we can save all our research, sources and work on*

*Mendeley*”; “I was working on the topic *Binaural Beats* and didn’t find related sources, but when I used *Mendeley* I found many sources that I chose from”.

A sample of students’ quotes on the fourth theme [*Mendeley* is practical for citing references properly] are: “It was practical to create reference lists in *Microsoft word*”; “*Mendeley* helped me in citing the references I used for the documented essay”.

Finally, some students’ quotes on the last theme [*Mendeley* has a positive impact on learning research skills] are: “I learned research skills better when I used *Mendeley*”; “*Mendeley* helps me add files and organize them”.

In depth analysis of the interviews conducted with the participants reflects that the students reported a positive experience with using *Mendeley*. This platform facilitated, as the students reported, their note-taking, referencing and citing skills, resource selection, collaboration with partners, and overall experience with research writing. It was observed from analyzing students’ work on the *Mendeley* platform that students collaborated closely with their partners via the *Mendeley* group. Their collaboration was reflected in various back and forth changes to the annotations, paraphrases, and summaries. Using the comments section and the generated pop-up notes, students wrote their paraphrases, summaries, and quotes. The instructor could easily check and instantly provide feedback as to what changes are needed. Regarding their note-taking skills, the researcher noted that using an online platform facilitated note-taking skills for students; this is because they used the various tools on the desktop like highlights, comment bubbles, folders, and the like. The researcher also observed that using *Mendeley* was enjoyable to students who felt comfortable using a social network to work on an academic task. They liked the idea of creating a profile on their accounts, following other students or scholars of similar interests, personalizing the desktop in a comfortable way, and utilizing all the options available on this online platform. Students were keen throughout the semester for the sessions that integrated using *Mendeley*; the first question they asked every day was ‘are we using *Mendeley* today?’.

The findings of this empirical study align with the reviewed literature on the main objective of this study, namely exploring the impact of collaborative learning on student learning as well as their attitude towards it. The following discussion will tackle each research question and relate it to the literature relevant to it along with a brief reminder of the findings of the study. To start with the first research question: Does students’ collaboration enhance as a result of using *Mendeley*?; the answer to this question is yes; students’ collaboration with each other on the research work done in this empirical study has been enhanced. From personal observations across around ten years of teaching research writing, the researcher can deduce the following observation: generally, students don’t collaborate effectively and equally to group work especially in research writing which is a highly demanding productive skill. Nevertheless, controlled and observed collaboration for students’ work using *Mendeley* yielded better collaboration as noted in this study even though this collaboration was done in an online medium which requires more attention and effort on the part of the observer as well as the students. This is especially true because the groups on the social platform involved the course instructor as an admin. This gave more significance to students’ contributions on the platform. In other words, the students

trusted that the group admin is closely monitoring their work, hence, they took the work more seriously. This has been noted in the literature reviewed on collaborative learning in an online environment. According to Major (2014), sharing an equal workload is more challenging in online CL than it is in onsite CL. Furthermore, communication among group members in online CL is often asynchronous online; hence, planning time for collaborating is demanding and challenging for those learners. Furthermore, according to Alkhatlan and Al-Daraiseh (2017), social media holds great capacity for empowering and fostering collaborative learning due to its participatory nature as well as its collaborative features.

The second research question in this study is: Do students' note-taking skills improve because of using Mendeley? The researcher noted a relative improvement in students' note-taking skills upon using this social network. This is attributed to the user-friendly features of Mendeley like the built in citation and referencing in addition to the literature search feature. Furthermore, marking up and adding annotation on PDF files were practical and engaging for students who are more comfortable in this digital age with using online PDF files than using hard copies of material. According to one of the main principles of online CL, learning takes place through a distributed process of human agents who interact dynamically with artifacts. According to Siemens (2005) cited in Barkley et al. (2014), learners' interaction with each other and with technological agents and tools is intrinsic to the process of learning. This normally happens in communities of common interest, social networks, and group tasks. Thus, online CL offers learners the chance to be active participants in 'a sociocultural and socio-technological environment that creates learning distributed among humans and technological tools' (Major, 2014 cited in Barkley et al, 2014, p. 20).

As for the third research question: What is students' perception towards working collaboratively with their peers using Mendeley? The researcher concluded from onsite observation as well as from interviews conducted with participants that students were positive about using Mendeley for research purposes. More specifically, students found it authentic and engaging to work collaboratively using a social network that embraced their craving for technology and social platforms since, according to Al-Dhanhani et al. (2015), "social networking sites that are built to promote collaboration among learners. Their main purpose is to take advantage of the social aspects to foster learning".

The fourth research question in this empirical study is: How do students perceive the impact of using Mendeley on their learning? The answer to this question was derived from students' responses during the interview in which they noted a positive impact for using this platform on their learning. This has been further noted by the researcher herself who observed a general acceptable outcome for research work compared to other groups who applied research skills using traditional educational means. The literature on this asserts that knowledge normally takes place in communities where learners collaborate, share interest, ideas, knowledge, and experiences. This process of interaction is vital for knowledge acquisition which is built and held by the entire group (Ghaith, 2003; Saba' Ayon, 2013; Barkley et al., 2014 among others). Accordingly, this social network is particularly beneficial in courses or programs that require research work. It is further useful in sharing contributions to group projects and thereby enhances collaborative learning. This is particularly helpful in

projects that require multiple student access to documents that need critique and comments (Khwaja & Eddy, 2015).

### **Limitations**

Like any citation tool, Mendeley isn't error-free. The students involved in this empirical study experienced problems with missing some of their PDFs from the Mendeley platform along with their annotations on those files. After contacting Mendeley Support, the files were retrieved. Nevertheless, this created a delay in students' work.

Another limitation is related to in-text citations that may not be error-free. This is normal; (Childress, 2011) suggests that "without a basic understanding of formats and citation styles, students using citation managers and generators are more likely to submit improperly formatted citations and bibliographies" (p. 146). Thus, students and Mendeley users should be familiar with citation formats to spot any potential or possible errors in formatting, capitalization or punctuation.

### **Conclusion and Recommendations**

Collaboration among students is no more bounded by geographic proximity, this is due to the availability of online platforms like Mendeley that offer the students the chance to collaborate virtually on academic tasks. Hence, the integration of platforms that encourage collaborative learning becomes essential in today's digital world. Also, tools like Mendeley in specific are vital for scholarly work and must become part of higher education especially because it is free and not bound by institutional subscriptions. Because it has a relatively huge capacity to store information, students can store their data and keep them for a lifelong learning beyond the academic institution. Mendeley can be taught to students in Internet Technology classes or can be even taught during a workshop. Therefore, class time can be saved for the course's learning outcomes. Nevertheless, it remains crucial that the instructor who is integrating Mendeley into the course platform be familiar with setting up online accounts, installing program plugins and the like of technical expertise.

Depending on the IT situation, the integration of Mendeley may be technically complicated since students need to download the desktop to use the platform for research. Nevertheless, if the students bring their personal laptops to class, the installation of this platform and its synchronization with online accounts becomes relatively simple. Thus, as noted earlier, it would be beneficial to have additional help in class from IT faculty or computer science students to help with setting up and resolving potential troubleshooting. Apart from seeking immediate IT help, guidelines for using Mendeley are numerous on the web; these cites provide ample guidelines and help for users. Nevertheless, it remains practical to offer guidelines for Mendeley use in course syllabi; such guidelines will be for students' access anytime they encounter a platform problem. Due to the small non-probability sample in this study, the researcher can't claim generalization of results; yet it is recommended to conduct further research on integrating Mendeley in writing or research skills courses.

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