VIRTUAL RESEARCH TEAMS TO DEVELOP EFL STUDENTS' RESEARCH AND ACADEMIC WRITING SKILLS

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ملخص الدراسة

تناولت الدراسة الحالية أثر فرق البحث الافتراضية علي مهارات البحث والكتابة الأكاديمية لدى طلاب اللغة الإنجليزية كلغة أجنبية. نظرا لتكامل وتداخل مهارات البحث ومهارات الكتابة الأكاديمية، تم تصميم اختبار موحد لقياس مهارات البحث والكتابة الأكاديمية. شاركت في الدراسة مجموعتان من الطالبات: مجموعة ضابطة (٣١ طالبة) وأخري تجريبية (٣٣ طالبة). تم تطبيق اختبار مهارات البحث والكتابة الأكاديمية تطبيقا قبليا على المجموعتين للتأكد من تكافئهما. استمرت المعالجة مدة فصل دراسي كامل قامت خلاله كل طالبة من طالبات المجموعة الضابطة بإعداد ورقة بحثية بمفردها، بينما عملت طالبات المجموعة التجريبية في فرق بحثية افتراضية لإعداد أوراقهن البحثية. بعد انتهاء التجربة، تم تطبيق اختبار مهارات البحث والكتابة الأكاديمية تطبيقا بعديا على المجموعتين. أوضح اختبار "ت" لعينتين مستقلتين وجود فرق دال إحصائيا بين متوسطي درجات المجموعتين في الاختبار البعدي لصالح المجموعة التجريبية. لذلك خلصت الباحثة إلي أنه يمكن استخدام فرق البحث الافتراضية لتنمية مهارات البحث والكتابة الأكاديمية لدى طلاب اللغة الإنجليزية كلغة أجنبية.

الكلمات المفتاحية :

فرق البحث الافتراضية، مهارات البحث، مهارات الكتابة الأكاديمية، طلاب اللغة الإنجليزية كلغة أجنبية

Abstract:

The present study explored the effect of virtual research teams on EFL students' research and academic writing skills. As research and academic writing are related and overlapping, one test was devised to measure them both. Two groups of EFL students: a control group (n=31) and an experimental group (n=33) were pretested in research and academic writing skills to insure that the two groups are equivalent. For a whole semester, participants of the control group were creating their research papers individually while participants in the experimental group used virtual research teams to create theirs. After the intervention was completed, both groups were posttested in research and academic writing skills. An independent samples t-test revealed a statistically significant difference between the means of scores of the two groups in the research and academic writing skills posttest in favor of the experimental group. Therefore, it was concluded that virtual research teams can be used to improve EFL students' research and academic writing skills.

Keywords:

virtual research teams, EFL students, research skills, academic writing skills .

Introduction

The increasing complexity of today's society and workplace requires better understanding of scientific results and research-based information (Van Merriënboer & Kirschner, 2017). Therefore, graduates need to possess the necessary research skills that would enable them to successfully handle or even produce this information (Summers, 2019). Mastering research skills is also important for higher education students as it enhances their academic development (Kazura & Tuttle, 2010; Zulu, 2011) through developing their fundamental intellectual skills (Chamely-Wiik, Dunn, Heydet-Kirsch, Holman, Meeroff, & Peluso, 2014). It also increases their graduation rates (Craney et al. 2011), helps them gain more knowledge of science and research processes (Carter, Ro, Alcott, & Lattuca, 2016; McCarthy, 2015), and enables them to pursue post-graduate education (Chamely-Wiik et al., 2014). Consequently, an increased international acceptance that students need to acquire research skills before they graduate has emerged (Gilmore, & Feldon, 2010; Meerah et al., 2012; Nwangwa, Yonlonfoun, & Omotere, 2014; Strnadová, Cumming, Knox, Parmenter, & Welcome to Our Class Research Group, 2014). That is why courses like research methodology have been a bedrock of academic activity in colleges and universities (Carter et al., 2016) and most universities have provided their students with considerable resources in order to help them acquire research skills and to prepare them to become knowledge-based workers (Balloo, Pauli, & Worrell, 2016; Meerah et al., 2012).

Another requirement of higher education is the need for students to develop high levels of academic writing (Salamonson, Koch, Weaver, Everett, & Jackson, 2010) as they are required to: search for information from multiple sources (Giridharan, 2012), evaluate what they read (Al-Fadda, 2012), develop their own opinion and give evidence for it (Proske, Narciss, & McNamara, 2012), adopt the styles and genres of academic discourse

(Tardy, 2010), and write a research paper (Grabe & Zhang, 2013). Moreover, there is growing evidence of a strong and direct correlation between students' academic writing and their achievement in all academic disciplines, regardless of the subject area (Borglin, 2012; Giridharan, 2012; Margolin & Ram, 2013; Shrestha & Coffin, 2012). Likewise, poor academic writing skills have often been alluded to as a key factor in the failure of EFL students in meeting institutional literacy expectations (Margolin & Ram, 2013). Therefore, developing academic writing, has become a dire need for most undergraduate learners to pursue their academic career successfully (Milad, 2017).

Despite the necessity for higher education students to possess adequate research and academic writing skills (Borglin, 2012), many of these students find difficulty in the acquisition of research skills (Hampden-Thompson & Sundaram, 2013; Lopatina et al., 2015; Mafenya, 2014; Nwangwa et al., 2014; Rahman, Yasin, Salamuddin, & Surat, 2014; Pym, 2013) and academic writing skills (Al-Fadda, 2012; Borglin, 2012; Caldwell, 2012; Elton, 2010; Fernsten & Reda, 2011; Giridharan, 2012; Grabe & Zhang, 2013; Horstmanshof & Brownie, 2013; Lai, 2010; Margolin & Ram, 2013; Proske et al., 2012; Wingate, 2010). Moreover, lack of skills in research and academic writing is a major cause for students' withdrawal from courses (Goldfinch & Hughes, 2007). The situation is even more complicated for EFL students (Grabe & Zhang, 2013; Tardy, 2010) who come from non-Anglicized linguistic and cultural backgrounds (Al-Fadda, 2012) and for whom both context and limited linguistic competency compound the research and academic writing difficulties they experience in college-level classes (Caldwell, 2012).

Saudi higher education students seem to suffer from the same problems in acquiring both research skills (Abdulrahman, 2012; Al-Ghamdi & Deraney, 2018; Al-Nassar & Dow, 2013; Al-Suhaibani, Al-Harbi, Inam, Alamro, & Saqr, 2019; Binsahl, Chang, & Bosua, 2015; Naji et al., 2017; Noorelahi,

Soubhanneyaz, & Kasim, 2015; Qasem & Zayid, 2019) and academic writing skills (Al-Hasemi, Al-Subaeie, & Shukri, 2017; Al-Khairy, 2013; Al-Mansour, 2015; Al-Murshidi, 2014; Al-Rabai, 2016; Ankawi, 2015; Fageeh & Mekheimer, 2013; Javid, Farooq, & Umer, 2013; Javid & Umer, 2014; Mahmoud, 2014). Working as an associate professor at Jubail College of Education, IAU University, enabled the researcher to notice how EFL students struggled with research and academic writing skills. Moreover, the researcher applied a research skills test and an academic writing test to a pilot group of EFL students. Analyzing students' answers to these tests showed many weaknesses that these students suffered with research and academic writing.

Twenty-first century education calls for more innovative tools which can help learners to acquire new skills necessary for communication in academic and professional contexts (Kuteeva, 2011). One promising pedagogical paradigm is virtual research teams. Therefore, the researcher decided to investigate the effect of virtual research teams on EFL students' research and academic writing skills.

Literature Review

A team is a group of persons with interrelated abilities who are committed to a common goal and who share responsibility for achieving specific team outcomes (London, 2013). As higher education providers have an obligation to prepare future employees (i.e. students) to meet the demands of the highly competitive knowledge-based work environment (McLaughlin & Daspit, 2016; Pessoa, Miller, & Kaufer, 2014), team-based activities have become common practice in most higher education undergraduate programs (Devlin, Marshall, & Phillips, 2017). This might be because working in a team provides an opportunity for students to learn a greater variety of skills (Hansen, 2016) which include critical reasoning, creative thinking, responsibility, and communication (French & Kavanagh, 2015). Working in a team can also lead to better academic performance

(Wen, 2016), improved interthinking skills (thinking through interactions with others) (Barrett & Kaye, 2014), greater comprehension and retention of material, higher levels of motivation, and greater persistence when facing adversity (Kolomaznik, Sullivan, & VyVyan, 2017 .(

In the past few years, however, the nature of teams and teamwork has changed (Basoglu, Fuller, & Valacich, 2018; Norris, Voida, Palen, & Voida, 2019; Olaniran, 2017). Continued globalization, the need for innovation, and the improvements in information and communication technology have resulted in a new form of teams, i.e., virtual teams (Chin, 2017; Hill & Bartol, 2018). These teams are sometimes referred to as geographically dispersed teams (Hill & Bartol, 2016; Siegel & Madni, 2019), computer-mediated teams (Chen, 2016), remote teams (Spiro, 2018), far-flung teams (Watson-Manheim, Chudoba, & Crowston, 2012), e-teams (DuFrene & Lehman, 2010), online teams (Ergulec & Zydney, 2019), and nomadic teams (Ko, To, Zhang, Ngai, & Chan, 2011). As organizations are increasingly moving toward the use of virtual teams (Graham, Daniel, & Doore, 2016) and as online education has significantly increased (Vance, Kulturel-Konak, & Konak, 2015), it has become essential to provide students with the experience of using such teams (Guo, Li, Shen, & Zheng, 2015; Konak & Kulturel-Konak, 2016).

Definition of virtual teams

Due to the evolution of virtual teaming (Ivanj & Bozon, 2016), the definition of virtual teams has changed over time and no single widely accepted definition can be found (Grahamet al., 2016; Van Wyk, 2016). However, most specialists agree that a virtual team refers to a group of persons who act interdependently across locational, temporal, and organizational limitations using communication and information technologies to solve a problem or accomplish a shared objective within a specified timeline (Berry, 2011; Brandt, England, & Ward, 2011; Green &

Roberts, 2010; Harvard Business Review, 2010; Ivanj & Bozon, 2016; London, 2013; Mitchell & Zigurs, 2013; Pitts, Wright, & Harkabus, 2012; Rawlings, 2012; Vance et al., 2015; Van Wyk, 2016; White, 2014; Wolusky, 2016).

Features of virtual teams

According to the aforementioned definition, features of virtual teams include: (1) teamwork, (2) geographical dispersion, (3) use of technology, (4) adaptability to change, and (5) shared responsibility for achieving common goals. Concerning teamwork, Martins and Schilpzand (2011) point out that virtual teams are teams first, and that the virtualness is a team characteristic. Therefore, in virtual teams, work is done collaboratively (Chastain & Nathan-Roberts, 2016) with clearly defined roles and responsibilities (White, 2014) while team members rely on each other to achieve success (Ebrahim, Ahmed, & Taha, 2009). As for geographical dispersion, virtual teams help individuals work together with no regard to differences in place (Klitmøller & Lauring, 2013). In traditional teams, members have to work next to one another whereas in virtual teams they can work in different locations (Ivanaj & Bozon, 2016). The use of computer and mobile technologies (e.g., e-mail, Web conferencing, instant messaging, online bulletin boards, wikis, social media, & document sharing systems) is another important virtual team feature (Gilson, Maynard, Young, Vartiainen, & Hakonen, 2015) as it enables members to communicate and coordinate their individual efforts anytime and anywhere (Marlow, Lacerenza, & Salas, 2017).

Features of virtual teams also include their ability to adapt better to change than face-to-face teams (Vance et al., 2015). For example, rather than involving a single type of interaction, virtual team communication can be achieved in several ways that generally fall into one of four categories: same time/same place, (e.g., face-to-face discussion), same time/different place

(e.g., videoconferencing), same place/different time (e.g., electronic bulletin board), or different time/different place (e.g., e-mail) (Zofi, 2012). Finally, virtual team members share responsibility (Ebrahim et al., 2009) for achieving the team's outcomes in addition to a common interest in a specific topic (Dulebohn & Hoch, 2017).

Virtual teams foundations

Virtual teams are based on three widely accepted theoretical foundations: web-oriented constructivism, community of practice, and media richness. Traditionally, constructivism proposes that the learner is an active agent in the process of knowledge acquisition (Bada & Olusegun, 2015). Web 2.0 applications have made learning move away from a transmission paradigm to a constructivism paradigm (Information Resources Management Association, 2010; Yusoff, 2011) and provided a strong technical platform (Wang, 2009) that enabled virtual team members to become fully engaged in the construction of their knowledge (Han, 2010). That is why virtual teams have roots in web-oriented constructivism as they employ web technologies to get students to construct their own learning (Krahenbuhl, 2016).

Virtual teams are also rooted in Jean Lave and Etienne Wenger's Community of Practice Theory that identifies learning through practice and participation (Lave & Wenger, 1991). They describe a community of practice as a group of people who work or study together and who have learned how to understand the tasks they are implicitly and explicitly required to do (Agrifoglio, 2015). Virtual teams are communities of practice (He & Huang, 2017) in the sense that members operate together to complete tasks, in either work or educational settings (Flammia, Cleary, & Slattery, 2016).

Another foundation for virtual teams is the Media Richness Theory, introduced by Richard Daft and Robert Lengel (Daft & Lengel, 1986).

Media richness is concerned with the degree of variety in the content that will be transferred through different communication media (Edwards & Wilson, 2004). For example, a phone call cannot transmit body language, which makes it a less rich communication media than a video call, which has the ability to reproduce visual social cues such as gestures (Hampel, 2019). Scholars have argued that different tasks in virtual teams require different types of media. For example, rich media are necessary for accomplishing complex tasks which require verbal and non-verbal signs and high communication effectiveness (Klitmøller & Lauring, 2013). However, less rich media are important to moderate some virtual team problems such as social fragmentation and conflict (Stahl, Maznevski, Voght, & Jonsen, 2010).

Virtual teams tools

Virtual teams have been using both synchronous (e.g. live chat and videoconferences) and asynchronous (e.g. email) tools (Fleischmann, Aritz, & Cardon, 2019). The past few years have witnessed a significant increase in the range of information technology tools which teams can use. These include tools for: collaboration (e.g., Chatwoo, Trello), meeting (e.g., TelePresence, Microsoft's NetMeeting, Skype), document cocreation (e.g., Flipboard, Scribblar), file sharing (e.g., OneDrive, Dropbox), project management (e.g., Microsoft Project, Basecamp), and social networking (e.g., Facebook, WhatsApp) (DeRosa & Lepsinger, 2010; Duus & Cooray, 2014; Endersby, Phelps, & Jenkins, 2017; Gilson et al., 2015; Guo et al., 2015; He & Huang, 2017; Kingl, 2010; London, 2013; Nunamaker, Reinig, & Briggs, 2009; Takeuchi, Kass, Schneider, & VanWormer, 2013; Taras et al., 2013; Wolusky, 2016).

Advantages of virtual teams

Virtual teams are effective educational tools that possess a wide range of advantages (Volchok, 2010). The main advantage comes from their technological nature, driven by the usage of cutting-edge technology (Etim & Huynh, 2015; Meredith, Mantel, & Shafer, 2015). This may align with the expectancies of today's higher education students (Gilson et al., 2015) to learn and study at any time and place they like (Grinnell, Sauers, Appunn & Mack, 2012). The 24-hour accessibility allows for greater flexibility and mobility (Gilson et al., 2015) and equalizes the opportunity for participation of every member (Zofi, 2012), especially those students with physical challenges that prevent them from attending traditional classes (Rawlings, 2012). Moreover, the use of technology enables a quicker gathering of more information as well as more speed in forming teams, understanding roles, and carrying out work (Bezerra, Diniz, Montalvão, & Hirata, 2016). Moreover, online communication in virtual teams provides members more time to analyze the messages received before formulating a response. This additional response time allows students to reflect, utilize more resources (Rawlings, 2012), and improve the quality of their project outcomes (Daniel, Graham, & Doore, 2017).

Another advantage of virtual teams is that they enable students to develop a number of necessary skills such as: information sharing, knowledge creation (Flammia et al., 2016), decision-making (Shachaf, 2008), creativity (Ocker, 2008), independent learning (du Toit & van Petegem, 2008), self-regulated learning (Prasetya, 2017), social skills (du Toit & van Petegem, 2008), and teamwork skills (Rawlings, 2012). Most importantly, virtual teams help students acquire global citizenship skills which will help them transition from the classroom to the workplace with greater ease and confidence (Alexander, 2012). These skills can also serve

them in their future careers and lives, as people and institutions have become increasingly inter-connected through technology (Flammia et al., 2016).

Other advantages of virtual teams include being more focused than face-to-face teams due to the existence of streamlined verbal exchanges that focus the message (Williams, 2010). They are also believed to produce better outcomes than when students work individually (Wolfe, 2010) as they enhance their level of social interactions and participation (Hansen, 2016; Usher & Barak, 2020) in a creative learning environment that promotes their critical thinking (Tseng & Yeh, 2013) and increase overall team functioning (Marlow et al., 2017) .

Guidelines for implementing virtual teams

Researchers suggest a number of guidelines for implementing virtual teams. These guidelines can be grouped in three categories: (1) guidelines related to team composition, (2) guidelines related to team dynamics, and (3) guidelines related to team technology. As for team composition, virtual teams should have limited size of 4-6 (Marek et al., 2016) or 6-8 members (Edwards & Wilson, 2004) as it is easier to divide work in teams with fewer members (Matuska et al., 2015). Researchers also suggest four possible approaches of assigning individuals to teams: random assignment, teacher assignment, topic assignment, and self-assignment (Marek et al., 2016). Concerning team dynamics, there should be a shared team vision (Williams, 2010) in addition to a clear goal that is put at the center of team communication (Brewer, 2015). Moreover, managing virtual team dynamics involves a variety of potential issues (Lee & Mitchell, 2011) which include: selecting a topic that is immediately connected with the team members' learning (Parmelee & Michaelsen, 2010), assigning the right roles to the right people (Lyall & Meagher, 2007), designating a team leader (Price, 2015), putting a plan for minimizing dispute among team members

(Gamberi & Hall, 2019), and well-defining rules of engagement that end potential conflict (Paul, He, & Dennis, 2018). As for the usage of technology, it should be reflective of the unique needs and skills of team members (Endersby et al., 2017). Therefore, teachers using virtual teams need to select the medium that matches the communicative needs of their students (Williams, 2010), that team members are able to use (Alibhai, 2017), and that is inexpensive and accessible by all (Rains & Scott, 2006). However, teachers will always need to balance their use of technology with the interpersonal and collaborative processes necessary to support virtual teamwork (Lopes, Oliveira, & Costa, 2015). Therefore, face-to-face time, whenever possible, establishes ties among team members and strengthens the sense of responsibility to one another (DuFrene & Lehman, 2016.(

Virtual research teams

Currently, there is an increasing use of research teams in universities (De Saá-Pérez, Díaz-Díaz, Aguiar-Díaz, & Ballesteros-Rodríguez, 2017; Vasileiadou, 2012). This increase was enhanced by the use of technology (Gilson et al., 2015) that has removed the barrier of distance between researchers (Jones, Wuchty, & Uzzi, 2008) resulting in the creation of virtual research teams (Crawford & Meiring, 2018; Hanebuth, 2015; Hanebuth, 2016; Hartman, Kearns-Sixsmith, Akojie, & Banton, 2019; Richter, 2011; Rzheuskiy, Veretennikova, Kunanets, & Kut, 2018). Virtual research teams consist of a group of researchers committed to a common goal for which they hold themselves mutually accountable (Crawford & Meiring, 2018). As scientific knowledge is increasingly produced by virtual research teams, students need to learn how to work with others using these teams to produce high-quality research products (Cheruvelil et al., 2014).

Despite the increasing usage of virtual research teams, only two studies investigated the effect of virtual research teams on students' research skills

(Sampson & Comer, 2011; Stagg & Kimmins, 2012) and no study investigated their effect of students' academic writing skills, as far as the researcher knows. Therefore, the researcher decided to study the effect of virtual research teams on EFL Saudi students' research and academic writing skills .

Hypothesis of the study

The researcher hypothesized that there would be a statistically significant difference between the means of scores of the experimental group and the control group in the research and academic writing skills posttest in favor of the experimental group.

Method

Research design

A pretest-posttest control group design was used in the present study. It consisted of an experimental group (n=33) and a control group (n=31). Both groups were pretested in research and academic writing skills before the treatment and posttested after it. Pretest scores were used to ensure equivalence of the two groups while posttest scores were used to evaluate differences between the two groups.

Variables

The present study includes two variables: an independent variable (virtual research teams) and a dependent variable (research and academic writing skills). Operational definitions for both variables are listed below.

- Virtual research teams

Virtual research teams are groups of 5-6 EFL students (including a leader) who use the Microsoft Teams application to work together across time and place limitations for the purpose of producing and presenting a research

paper within a specified timeline. Team members have clear responsibilities, receive instructor scaffolding and peer feedback, and reflect on both the team's process and product.

- Research and academic writing skills

Research and academic writing skills are EFL students' ability to produce and present a research paper. These skills can be categorized into: (1) problem definition, (2) information seeking and management, (3) methodology skills, (4) writing a research report, and (5) presenting research findings.

Participants

Sixty-four EFL students participated in the study. They were studying at Jubail College of Education, IAU University. They were all females and they ranged between 21-23 years, with a mean of 21.19 years. They had learnt English for at least 10 years. They were enrolled at the Research Methodology course, taught by the researcher.

Measure

Research and academic writing are two related aspects of academic literacy (Miller, 2014). They are also overlapping in the sense that mastering academic writing skills is important to research (Sharp, Peters, & Howard, 2017) and also it is impossible to write an academic paper without evidence of research. This necessitates that research and academic writing skills should be evaluated in an integrated way (Joyner, Rouse, & Glatthorn, 2018). Therefore one measure should be used to measure both research and academic writing skills. The initial idea that has come to the researcher was measuring research and academic writing skills through evaluating participants' produced research papers. However, as the participants of the experimental group produced their papers in groups, it would be illogical to use their scores on this group product as a measure of their research and academic writing skills. Therefore, the Integrated Research and Academic

Writing Skills Test (IRAWST) was prepared by the researcher to measure both research and academic writing skills.

First, the researcher chose two research articles. The articles were chosen based on textual complexity and length, so that students would have enough time to do the tasks of the test during one class session. Then, the researcher reviewed the recent literature related to research and academic writing skills, (e.g., Daniel & Harland, 2017; Meerah et al., 2012; Oliver, 2010; Paulus, Lester, & Dempster, 2013) in order to determine the skills to be assessed by the test. She came up with a list of 30 skills which was introduced to a number of reviewers to determine the most important skills for EFL students. The review process led to the selection of 20 skills to be included in the devised test .

The 20 skills were divided into five categories. The first category was problem definition. It included two skills: determining a research problem and formulating research questions. The second category was seeking and managing information. It included four skills: seeking information from different sources, evaluating information sources, summarizing, and paraphrasing. The third category was methodology skills. It included seven skills: formulating research hypotheses, writing research objectives, selecting a research design, designing a research instrument, collecting data, working with statistics, and interpreting results. The fourth category was writing the research report. It included five skills: writing accuracy, organization of the research paper, avoiding plagiarism, in-text citation, and reference page citation. The fifth category was presenting research findings. It included two skills: designing a research poster and presenting a research poster. One-hundred marks were divided among the 20 skills, five marks for each skill. The test included various types of questions: multiple-choice, true-or-false, matching, and short essay questions.

As for test validity, face validity was determined by three TEFL specialists. Moreover, criterion validity was achieved by administering both the IRAWST and Cambridge University Research Skills Test (University of Cambridge, 2013), which actually measured research and academic writing

skills, to a pilot group of 32 EFL students. Pearson's correlation coefficient between students' scores on both tests was 0.91, significant at the 0.05 level. Test reliability was ensured in two ways: test-retest reliability and internal consistency reliability. For test-retest reliability, the IRAWST was administered twice to the pilot group, with a two-week interval. Pearson's Coefficient of correlation between the two administrations was 0.87, significant at the 0.05 level. For internal consistency reliability, Cronbach's alpha was used to measure correlation among participants' scores on different sections of the IRAWST and it was found to be 0.81, significant at the 0.05 level .

Procedures

Procedures of the present study were carried out during 15 weeks as part of the Research Methodology course the researcher taught to students of Level Seven at Jubail College of Education, IAU University, during the first term of the academic year 2019-2020. Participants were already divided into two sections: the first section acted as a control group (n=31) while the other section acted as an experimental group (n=33). Both groups were pretested in research and academic writing skills using the IRAWST. An independent samples t-test showed that the two groups were equivalent as no statistically significant difference existed between the means of scores of the two groups in the pretest of research and academic writing skills (t=0.42, p>0.05), see Table 1.

Table 1. Independent Samples t-test for the Difference between the Means of Scores of the Control and Experimental Groups on the Pretest of Research and Academic Writing Skills

Group	N	Mean	Standard Deviation	t-value	Probability
Control	31	41.06	11.67	0.42	Non-significant
Experimental	33	39.82	11.91		

After that, both groups attended their usual weekly classes with the researcher. Each participant in the control group was required to prepare a research paper individually as a project for the course based on what she studied in class whereas participants in the experimental group worked as virtual research teams for the purpose of producing their research papers. Finally, all participants were posttested on research and academic writing

skills using the IRAWST and scores of the two groups were compared, as will be shown in the Results Section .

As for using virtual research teams, the researcher reviewed different models of virtual teams (e.g., Daim et al., 2012; Matuska et al., 2015; Zofi, 2012). Then, she decided for the implementation of virtual research teams to go through four main stages: planning, initiation, performing, and closure. Each of these stages is divided into different steps as discussed below. See Figure 1 for an illustration of the virtual team process design.

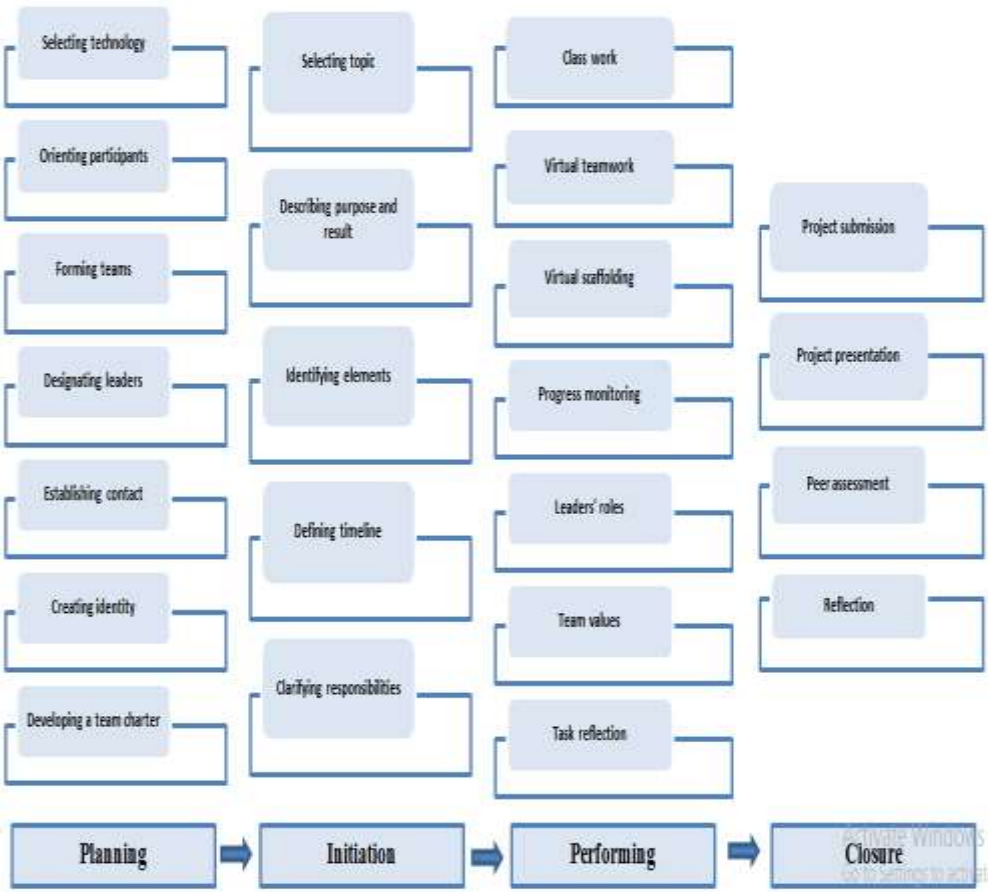
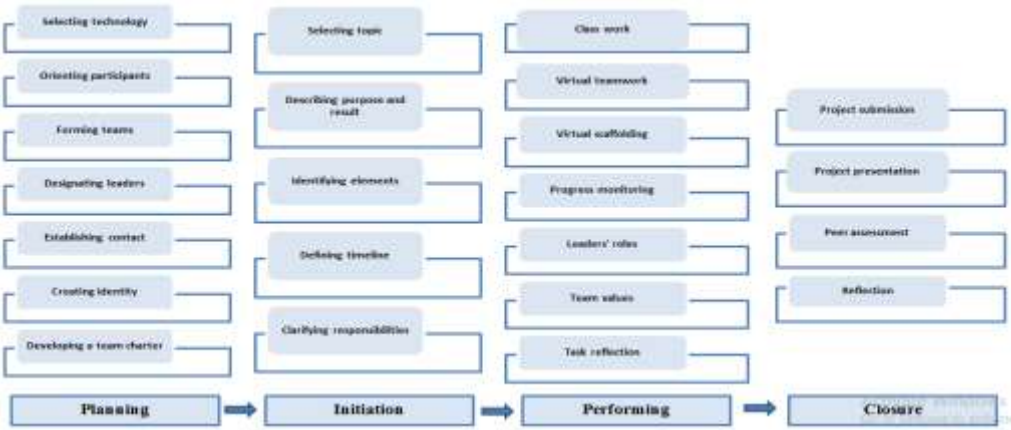


Figure. Virtual Team Process Design

١. Planning

A. Selecting technology

Microsoft Teams was selected by the researcher as a unified communication platform used by the virtual team members. This selection was based on many reasons. The first reason was that it incorporated all the features team members would need to work on their projects effectively and quickly. These features included: private or group chat, threaded conversations, instant messaging, video and voice conferencing, real-time chat history across devices, document sharing, file storage, conversation search, scheduling support, and customized notifications (Fu, Zhao, Cheng, Zhu, & Marlow, 2018; Ilag, 2018; McGloin & Coletti, 2019). The second reason for the selection of Microsoft Teams is that all these features were combined in a single shared workspace that each team member could take with her on her laptop or mobile device (Buchal & Songsore, 2019;



Hubbard & Bailey, 2018; Martin & Tapp, 2019). The third reason was that although this application requires a paid subscription, IAU University provided a free account for each teacher and student in the university.

B. Orienting participants

A detailed guide with instructions and illustrations was offered to participants. Additionally, an explanation of virtual teams was provided which included: the features of virtual teams, why they are important, and how to use them .

C. Forming teams

The researcher divided participants into six teams, three including six participants and three including five participants. During the division process, the researcher tried to balance participants' experiences and skill.

D. Designating leaders

As it is not recommended that instructors lead teams (Matuska et al., 2015), the researcher appointed a leader for each team based on her knowledge of their academic and personal capabilities .

E. Establishing contact

Members within each virtual team exchanged their email accounts, created a group on the Microsoft Teams application, and added the researcher as a member of the team .

F. Creating team identity

Each team selected a name, a logo, and a slogan and put them on their team's front page.

G. Developing a team charter

Members within each team created a team charter that included ground rules for interactions in addition to rules for how to make decisions, how to resolve conflict, and how to incorporate ideas and suggestions from each member to ensure that each member had a voice in the team.

٢. Initiation

A. Selecting project topic

A list of research topics was prepared by the researcher from which each virtual team had to select one topic to investigate in their project. The researcher provided participants with this list to help them as they did not have enough experience to identify a research topic for their project at the commencement of the intervention. The same list was also offered to the control group. The selection process was carried out through a discussion among team members via the chatting feature embedded in the Microsoft Teams application.

B. Describing the overall purpose and result

Each team wrote its top-most goal through answering the question "Why are we doing this?" Even though team members received their purpose from the researcher, they had to interpret and express it in their own words. Team members also answered the question "What are we going to do?" to describe the final product of the virtual team's work (i.e., a research paper, a PowerPoint presentation, a research poster, etc(.

C. Identifying process elements

Each team specified a set of tasks which, when achieved together, would accomplish the overall result.

D. Defining project timeline

Each team designed their project timeline by defining approximate deadlines for accomplishing different tasks in order to rough out the pace of their activity. They used the scheduling support feature in Microsoft Teams for this purpose.

E. Clarifying responsibilities

Teams identified the members responsible for accomplishing each task according to their abilities and interests. Some tasks required only one person while others called for everyone's involvement.

٣. Performing

A. Class work

As part of the Research Methodology course, participants attended a weekly lecture where the researcher gave them the theoretical background regarding scientific research and academic writing. During the first class, the researcher gave the participants an overview regarding the required research project that would be submitted at the end of the semester. Lander, Seeho, and Foster (2019) suggest linking the different sections of the research paper to the relevant stages of the research process in sequence. Therefore, every week, the researcher assigned participants a task that they needed to accomplish before the next class. The task was an application to what they studied theoretically in class and it also constituted a part of the final paper required from them.

B. Virtual teamwork

After class, members of each virtual team used the Microsoft Teams group they created to work on the assigned task. They collaborated while working out the task. Team leaders distributed work among members. Each member posted her accomplished part of the required task to the group page and received modifications from the other members to improve the product. Members also shared the resources they collected and used while working on their tasks.

C. Virtual scaffolding

For most of the project, teams worked independently, unless they requested guidance. All team members attended a weekly one-hour synchronous session which consisted of a live audio broadcast from the researcher along

with real time text chat from the participants. For each session, the participants gathered virtually in the discussion page of the whole-class page and listened to the researcher's broadcast. The researcher also asked team participants several questions in order to encourage discussion among the teams and to ensure a deeper engagement with the projects. The participants asked questions, responded to the researcher's questions, and participated in discussion with the entire class. The text messages in addition to the live broadcasts were all archived for later use by the team members .

D. Progress monitoring

The researcher followed teams' communication and development on the Microsoft Teams platform on a weekly basis. She reviewed submissions and discussed progress in the synchronous session. The researcher assessed participants' online and in-class contributions in order to reduce social loafing (i.e., when an individual exerts less effort when working in a team than when he/she works alone) (Mihelič & Culiberg, 2018). The researcher also tried to pay attention to silent members during online discussions.

E. Leaders' roles

Team leaders were assigned important roles. These roles included: (1) clarifying team goals, individual responsibilities, and deadlines to avoid conflict among team members; (2) developing a plan for communicating among team members; (3) distributing information to all team members; and (4) ensuring that a supportive team climate is provided.

F. Team values

Team members had to respect each other, value each other's contributions, and engage in collaborative work. Any decision had to result from virtual discussions among all members of the team. Participants developed a sense of mutual trust over time, fostered a no-blame culture, and praised each other's achievements .

G. Task reflection

After completing each task, learners were given the opportunity to reflect on their own learning as a virtual team. They reconsidered the way in which they completed the task and identified their strengths and weaknesses as a team. They also discussed ways to improve the product before submitting the final project.

٤. Closure

A. Project submission

In Week 15, each team had to submit their research paper. The papers were corrected by the researcher based on a detailed rubric. Feedback was given to each team via the Microsoft Teams chat page.

B. Project presentation

Each team prepared a poster summarizing their research paper. A digital poster session was held via the whole-class discussion page where each team presented their poster. Each team assigned a representative to be responsible for answering the questions of the audience regarding her team's poster. Audience also offered feedback about the points of strength and weakness in each poster.

C. Peer assessment

Each team member was required to evaluate the performance of her teammates during the preparation of the research project. A confidential team member peer assessment form was prepared by the researcher to help participants in the peer assessment process .

D. Reflection

Students were required to reflect on the virtual team process and product. They wrote a reflective essay about working in a virtual team; i.e., skills they improved, challenges they encountered and how they have overcome them, the best experiences from working on their projects, any things they

would do differently in similar projects, and how this experience could benefit them in their future career. A list of questions was offered to participants to help them during the reflection process.

Result

In order to test the hypothesis of the study, an independent samples t-test was used to compare means of scores of the control and the experimental groups on the posttest of research and academic writing skills. Results are shown in Table 2, below.

Table 2. Independent Samples t-test for the Difference between the Means of Scores of the Control and Experimental Groups on the Posttest of Research and Academic Writing Skills

Group	N	Mean	Standard Deviation	t-value	Probability
Control	31	47.10	11.52	3.39	Significant
Experimental	33	59.33	16.74		

Table 2 shows a statistically significant difference between the means of scores of the control and experimental groups on the posttest of research and academic writing skills ($t=3.39$, $p<0.05$) in favor of the experimental group.

Discussion

Education in the 21st century challenges learners to develop different learning skills to keep up with the information revolution. Among these skills, research and academic writing are fundamental to university study. Therefore, the present study attempted to investigate the effect of virtual research teams on EFL students' research and academic writing skills. The researcher hypothesized that a statistically significant difference would exist between the means of scores of the experimental group and the control group in the research and academic writing skills posttest in favor of the experimental group. In order to test this hypothesis, both the control and the experimental groups' means of scores on the posttest of research and academic writing skills were compared using an independent samples t-test.

A statistically significant difference appeared between the means of scores of the two groups in favor of the experimental group ($t=3.39$, $p<0.05$). This result corresponds to two previous studies (Sampson & Comer, 2011; Stagg & Kimmins, 2012) reporting a benefit in using virtual teams for improving research skills.

There are seven possible explanations for this result. The first of these explanations is the use of teamwork. As Brewer (2015) believes, a team is a team, and therefore, many of the characteristics of face-to-face teams have been transferred to virtual teams. For Matuska et al. (2015), teams are based on joint involvement, mutual cooperation, and responsibility of every team member in reaching the team's set goals. Moreover, teamwork creates an engaging environment (Price, 2015), activates interactions among students, encourages knowledge building (Lee & Lim, 2012), and provides an appropriate vehicle to execute a typical project with definite aims and timeline (Pineda, 2015). These features of teamwork might have improved participants' research and academic writing skills as have been found by some studies (e.g., Bowland, Hines-Martin, Edward, & Haleem, 2015; Kruck & Teer, 2019; Lopatto, 2010; Prasetya, 2017; Strnadová et al., 2014.(
The second explanation for this result is that using technology could enhance research and academic writing skills. As suggested by Miller (2014), the use of technology provides the opportunity to extend students' academic skills by editing or adding material where appropriate. Nikula (2012) adds that the Web 2.0 technology affords students opportunities to extend their academic literacy, particularly their research skills as it emphasizes active participation, connectivity, collaboration, and sharing of knowledge and ideas among users. Moreover, as Zofi (2012) suggests, technology enables quick information gathering and can equalize the opportunity for participation of every member. During the present study, participants of the experimental group used the Microsoft Teams application in almost all the steps of producing their research papers. They used it for forming the virtual teams, designing a timeline for their projects, discussing

their topic selection and all other decisions, uploading the material they collected, editing the documents they produced, getting feedback from the researcher and colleagues, and presenting their projects. This usage of technology might have facilitated and supported their acquisition and development of research and academic writing skills as have been found in some previous studies (e.g., Frantz & Rowe, 2013; Minocha & Kerawalla, 2011; Proske et al., 2012).

The third explanation for the result of the present study is the positive effect of scaffolding on research and academic writing skills, which has been confirmed by some studies (e.g., Chamely-Wiik et al., 2014; Horstmanshof, & Brownie, 2013; Huggins & Edwards, 2011). During the present study, the researcher provided different types of scaffolding to the participants of the experimental group. These included: the illustrated guide showing how to use the Microsoft Teams application, the weekly online sessions where the researcher offered extra help, and the progress monitoring as she discussed teams' progress and assessed contributions to minimize social loafing and encourage all members to participate. As explained by Loveys et al (2014), process skill development through scaffolding is an essential component of helping students to manage the increased cognitive load and, consequently, their research and academic writing skills.

The fourth explanation for this result is that using peer assessment and feedback may have helped participants improve their research and academic writing skills. As confirmed by Loveys et al. (2014), structuring the learning environment so that peers can assist learning can further improve the inquiry-oriented learning experience. However, Chen and Tsai (2009) believe that peer feedback is helpful only when the recipient executes it. Therefore, participants in the present study assessed their team members' contributions and offered them feedback to improve their work. They also offered feedback to the members of other teams. Team members had to

consider their peers' suggestions and apply them whenever possible. This explanation is supported by some studies which found a positive effect for peer feedback on research and academic writing (e.g., Chen & Tsai, 2009; Stracke & Kumar, 2014; Wu, Chanda, & Willison, 2014).

The fifth explanation for this result is that participants' reflection on their work might have improved their research and academic writing skills. Participants practiced reflection throughout the intervention as they had to reflect on each task they accomplished. Moreover, after the submission of their research papers, they were required to write a reflective essay on the virtual team process and product guided by a list of questions offered by the researcher. The positive effect of reflection on research and academic writing skills were proved in some studies (e.g., Frey, 2011; Imafuku, Saiki, Kawakami, & Suzuki, 2015; Rahman, Yasin, Salamuddin, & Surat, 2014; Watson, 2010).

The sixth explanation for the result reached in the present study is the design of the intervention which required participants to practice research and academic writing in order to produce a research paper. As confirmed by Zulu (2011) and Rafik-Galea, Arumugam, and de Mello (2012), students' engagement in an authentic research project would develop their writing and research skills more speedily in the context of a practical project. This was also confirmed by many studies that found a positive effect for learning by doing on research and academic writing skills (e.g., Davidson & Palermo, 2015; Temmen & Walther, 2013).

The seventh possible explanation is the social climate provided during the intervention. Han, Chae, Macko, Park, and Beyerlein (2017) point out that during virtual team interactions, cultivating a social climate is important for team members to feel psychologically safe to speak up. This can lead to openness to discuss new ideas and generation of novel and useful solutions. Saghafian and O'Neill (2018) add that virtual teams may actually experience a greater sense of community and better quality communication as the lack of physical presence can promote greater appreciation of the importance of

communication with other team members. Moreover, Zofi (2012) believes that more ideas can be generated during virtual team interaction because members are not stifled by dominant members, as usually happens in face-to-face teams.

Conclusion

Based on the result reached in the present study, it was concluded that virtual research teams improve EFL students' research and academic writing skills .

Recommendations

The researcher recommends that: (1) higher education teachers should exert more effort to improve their students' academic skills in order to prepare them for today's highly competitive labor market, (2) cutting-edge technological applications need to be used in higher education classes to cope up with the preferences of millennial learners to study whenever and wherever they wish, and (3) virtual research teams need to be used in teaching academic skills .

Suggestions for Further Research

The researcher suggests the following as potential areas for further study: (1) the effect of virtual teams on EFL students' oral communication skills, (2) the relative effectiveness of face-to-face teams vs. virtual teams on EFL students' research paper quality, and (3) the attitudes of master's students toward working in virtual research teams.

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