

Gender Differences: The Impact of Gender Grouping on Egyptian STEM Undergraduates' Online Group Work¹

Wesam K. Morsi², Hala M. Assem³, The British University in Egypt, Cairo, Egypt

Abstract

This paper reports a study that compares teaching English as a foreign language (TEFL) through face-to-face (FTF) and CALL (Computer Assisted Language Learning) methods, comparing them with the interdisciplinary perspectives of sociology, social psychology, and educational technology. Based on the sociocultural theory, the influence of gender grouping on the academic performance of 141 English as a foreign language (EFL) Egyptian undergraduates enrolled in a technical writing course in the Faculty of Engineering was examined in a CALL context. Students' academic performance was measured by overall grades on group work assignments and submitted peer evaluation forms. Sixty-six students were assigned to a FTF control group, and 75 students were included in the experimental online group. Findings suggested that the performance of the online group was superior to that of the FTF control group. There were highly significant differences in the online group between males and females in their academic performance with females being more successful. In addition, all female-only groups attained higher grades than mixed and male-only groups. These findings emphasize the importance of teaching EFL learners' teamwork skills to complete their tasks successfully (Holmes, 2000).

Resumen

Este artículo informa sobre un estudio que compara la enseñanza del inglés como lengua extranjera (TEFL) a través de métodos presenciales (FTF) y CALL (aprendizaje de idiomas asistido por computadora), comparándolos con las perspectivas interdisciplinarias de la sociología, la psicología social y la tecnología educativa. Con base en la teoría sociocultural, se examinó la influencia de la agrupación por género en el desempeño académico de 141 estudiantes egipcios de inglés como lengua extranjera (EFL) matriculados en un curso de redacción técnica en la Facultad de Ingeniería en un contexto CALL. El desempeño académico de los estudiantes se midió por las calificaciones generales en las tareas de trabajo en grupo y los formularios de evaluación de pares presentados. Sesenta y seis estudiantes fueron asignados a un grupo de control FTF y 75 estudiantes fueron incluidos en el grupo experimental en línea. Los hallazgos sugirieron que el desempeño del grupo en línea fue superior al del grupo de control FTF. Hubo diferencias altamente significativas en el grupo en línea entre hombres y mujeres en su desempeño académico, siendo las mujeres más exitosas. Además, todos los grupos solo de mujeres obtuvieron calificaciones más altas que los grupos mixtos y solo de hombres. Estos hallazgos enfatizan la importancia de enseñar a los estudiantes de EFL habilidades de trabajo en equipo para completar sus tareas con éxito (Holmes, 2000).

Introduction

Most of the research (Sawyer & Obeid, 2017; George et al., 2020; Kan & Claesson, 2022 Abance et al., 2023; Shal, 2024; Morsi & Elseoud, 2024) conducted on cooperative learning strategies has shown that they are indispensable for successful teaching and learning of a second or a foreign language. Cooperative learning can contribute significantly to the development of English as a foreign language (EFL) learners' critical thinking, technical writing, and language skills specially when the group members represent different genders (Morsi & Assem, 2021; Morsi & Elseoud, 2024). Engaging discussions among EFL learners provide opportunities for extra practice, understanding concepts, and receiving immediate feedback. During such interactions, most students usually develop constructive social and group work skills required for their future employability (Takedia & Homberg, 2014). At present, the adoption of Online Collaborative Learning (OCL) has become very popular in higher educational institutions (Abance et al., 2023; Sawyer & Obeid, 2017), and specially for STEM (Science, Technology, Engineering, Mathematics) education (Chacko & Jones, 2021). A study about online collaborative learning for college students enrolled at a large Midwestern public university in the United States concluded that STEM students from different backgrounds could be able to participate equally in self-regulated learning through online platforms (Valdiviejas et al., 2024). However, few studies have examined the influence of gender differences in Eastern cultures on successfully achieving these collaborative tasks (Namaziandost & Çakmak, 2020). This paper reports a study that compares teaching English as a foreign language TEFL through face-to-face (FTF) and CALL (Computer Assisted

¹ This is a refereed article. Received: 18 January, 2022. Accepted: 20 January, 2023. Published: 3 December, 2024.

² This is the first author. Faculty of Arts and Humanities, Department of English Language and Literature, Wesam.Morsi@bue.edu.eg, 0000-0002-8671-4009

³ This is the second author. Faculty of Engineering, Department of Architectural Engineering, Hala.Medhat@bue.edu.eg, hala.medhat@hotmail.com, 0000-0003-1383-5771, Correspondent.

Language Learning) methods to science, technology, engineering, and mathematics (STEM) Engineering students, while comparing the methods from the interdisciplinary perspectives of sociology, social psychology, and educational technology. Additionally, the findings of this study address the UN sustainable development goals (SDGs) number 4 and 5: Quality Education and Gender Equality.

Studies across disciplines have found that gender differences are closely related to self-identity, learning preferences, power dynamics, gender traits, gender roles, and inequality between men and women (Yoo & Huang, 2011; Kroska, 2014; George et al., 2020; Methias & Morsi, 2020; Rudman & Glick, 2021; Morsi, 2024). For instance, numerous studies have investigated male and female's learning preferences and attitudes in secondary and higher education. Findings of these studies have generally shown that women are interested in learning foreign languages and tend to be more successful at learning second or foreign languages than men (Yoo & Huang, 2011; Mahmood, 2017; Almasri, 2022; Wightman, 2020). Male learners, however, tend to prefer scientific subjects (Kans & Claesson, 2022). In this study, Male students in Sweden were more interested in physical education, physics, technology, and mathematics which are logical, scientific structured disciplines such as STEM. On the other hand, female students were more inclined to analytical, practical, and more creative subjects, such as arts, English and civics. Results of the study showed that personal interest is the main factor for both genders when choosing subjects to study; the majority of women, for example, expressed their preference for challenges and problem-solving, while men accentuated logical and theoretical aspects (Kans & Claesson, 2022). There is a gap in the literature in the findings of studies about gender differences in EFL, specifically for STEM learners; Almusharraf et al.(2023) mentioned that uncertainty persists over the learning needs and preferences of male and female students in the EFL environment.

Wehnwein et al. (2007) argued that female students are "internally focused"; they appreciate a connection with peers, cooperation, and self-confidence, and tend to believe that their hard work in class is behind their success. Conversely, males are "externally focused" (p. 31); their success can be a result of external factors such as tutoring, access to resources, family support, and cultural norms (Kans & Claesson, 2022; Wightman, 2020). Unlike male learners, it is argued that female learners often use their analytical skills to reflect on their performance as well as others' behaviour. These differences are said to relate to gender identity, which develops naturally from early childhood during the interaction of "biological traits, developmental influences, and environmental conditions" although individual exceptions do exist. (Rafferty, 2018, para 3).

In Sweden according to Gullberg et al., (2018), gender stereotypes may explain pre-school Swedish children's interests and define which gender is better at science. To avoid this, the Swedish national curriculum states that all children should learn science and draws the attention of pre-service teachers in preschools to use different discourse models. Sweida and Reichard (2013) suggested that masculine gender stereotyping that is related to high-growth entrepreneurship has been said to exclude women. This has caused limitations to the progress in this area. In particular, previous studies have suggested that parental interaction and socialization processes with infants and children over two years old can affect their behaviour and may also play a significant role in forming their predicted gender-related preferences (Eagly & Wood, 2013). This suggests that complete knowledge and understanding of gender development is still insufficient. Further research is still required to explain how social interaction in the surrounding environment can affect gender-linked preferences and behaviour (Boe & Woods, 2018; Eagly & Wood, 2013; Kans & Claesson, 2022).

In education, with the advancement in the use of e-learning management systems in secondary schools and universities, the incorporation of online learning (OL) components in curricula design is now indispensable to support traditional FTF learning (Anderson and Haddad, 2005; Ashong and Commander, 2012; Johnson 2011; Rovai & Baker 2005, Sánchez Franco et al., 2006; Yoo & Huang, 2011). Many educators and researchers have become interested in discussing individuals' use and adoption of new technologies. For instance, the Technology Acceptance Model (TAM) designed by Venkatesh et al. (2008) shows that gender plays a significant role in the frequency of use and the perception of ease or usefulness of ICTs. This is also supported by (Goswami and Dutta,2016). Discussions and interactions using web-based platforms enhance their understanding of the subject matter, teach them how to cooperate to find a solution to a problem, and ultimately develop their interpersonal skills (Adolphus & Omeodu, 2016). To learn more about aspects that can promote the development of learners' communication skills and help them attain effective online learning outcomes, research into the influence of gender on participation in online collaborative group work has become important (Alharthi et al., 2018; Cen et al., 2014; Rannastu-Avalos & Siiman, 2020).

Sánchez-Franco et al. (2006) identified three aspects in which male and female individuals' usage and acceptance of web technology were different: levels of trust, risk inversion, and information processing. A strong body of evidence shows that women have been more satisfied with OL and have a higher social presence (Johnson, 2011; González-Gómez et al., 2012). Other studies have noted that women's enrolment and academic success in online courses were also greater (Anderson & Hadad, 2005; Price, 2006; Selwyn, 2007), and this learning method led to positive achievements (McKnight et al., 2011). Other researchers compared OL to FTF learning in the field of EFL, second language (L2) learning, and technical writing. OL provides a flexible learning environment that may be perceived differently by students from different cultures. One of the studies, which was carried out in Egypt, investigated the effect of Google Docs as an online collaborative tool on the performance of EFL learners' technical writing skills (Mahmoud, 2017). Findings showed that technology did improve the quality of collaborative work delivered by students and that using online tools were perceived positively by students; yet, more studies were deemed necessary in the same cultural context to affirm these findings.

Currently, attention is being given to investigating gender differences and learners' satisfaction and frequency of use of different online platforms by looking into EFL academic achievements (Morsi & Assem, 2022). In a study conducted by Namaziandost & Çakmak (2020) to examine gender and self-efficacy in a flipped intermediate-level EFL classroom, female learners in the experimental group were better in language learning performance than their male counterparts. They used the flipped classroom activities on the Edmodo platform more than their male classmates. Their self-efficacy scores were, therefore, higher than their male counterparts. It was concluded that learning English in the flipped classroom approach could promote females' self-confidence and increase their in-class active participation. On the other hand, a study with undergraduate students registered in two STEM online courses at the Faculty of Computer Science and Engineering in North Macedonia, revealed female students majoring in STEM fields, particularly computer science, are reliable and self-sufficient learners who can perform better than their male counterparts in traditional FTF classrooms. However, in online learning environments, male students outperformed their female students by a small margin (Idrizi et al., 2023). The question remains whether the results would be the same for different genders of STEM students enrolled in language courses, as the nature of the content studied can influence students' perception of OL. In Qatar, which is considered a similar context to Egypt falling in the Middle East, males were more satisfied overall with OL than females when studying courses in STEM online (Newsome et al., 2022).

From the previous literature, it can be inferred that male and female students may have shown different interests, learning abilities, and preferred learning strategies. These factors and others, such as culture, ethnicity, or socioeconomic class, can influence the effectiveness of OL on EFL students' performance (Kan & Claesson, 2022; Shal, 2024). Gender can reflect issues of inequalities and social identity among students in OL environments (Kim et al., 2018; George et al., 2020). In another study about using online learning for second- language STEM students at The National University of Science Technology, which is an English language institution that provides degrees in Medicine, Pharmacy, and Engineering in the Middle East, Chacko and Jones (2021) found a clear tendency among STEM students in favor of interactive, synchronous online learning.

Significance of the study

The outbreak of COVID-19 made OL the only choice to ensure learning in all educational institutions (Demuyakor, 2020). As a result, academics and students started to use OL platforms such as Zoom, Edmodo, Microsoft Teams, and others to facilitate remote learning and soon new applications were developed that allowed students to work in groups online. Chacko and Jones (2021) observed a clear tendency for interactive, synchronous online learning among STEM students studying second-language in the Middle East. For this reason, studying gender differences in the completion of online group assignments has become a significant research topic in both developed and developing countries, and especially in the latter where the technological infrastructure of higher educational institutions had to make improvements to cater to those massive online activities (Morsi & Assem, 2022; Newsome et al., 2022). A gap still exists in the literature about gender differences in EFL, specifically for STEM learners while trying to find consensus in existing findings. As stated by Almusharraf et al. (2023), the learning needs and preferences of male and female students in EFL environments are still foggy.

In fact, in the Middle East, few studies discuss how male and female EFL STEM Engineering learners perceive online learning and what effects the OL environment could have on their learning outcomes. Hence, more research is required in the Arab world to reach conclusive findings (Adedapo, 2020; Kupczynski, et al., 2014; Rovai & Baker, 2005; Yoo & Huang, 2013).

This study attempts to interpret the relationship between gender traits and learners' academic achievement in both OL and FTF environments as measured by final scores on technical writing course reports. These reports were completed by STEM undergraduates in Egypt, enrolled in the Faculty of Engineering. The gender traits and achievement scores of an experimental group who completed the assignment online were compared with the gender traits and scores of a control FTF group who completed it by arranging meetings inside or outside the classroom.

Review of Literature

Sociocultural theory

According to McLeod (2020), the sociocultural theory of Vygotsky states that people acquire different skills from the surrounding culture as they interact with others. These skills are acquired both on the social and individual levels. In this socio-structural theory, the social structure in different cultures is the main reason for the roles adopted by men and women.

In the past, it was believed that the discrepancy in gender characteristics led to assigning men dominant leading roles in the family; women, as subordinates, acted as caregivers, role model mothers, mentors since they had a "facility for relationships" (Hyde, 2007). Nowadays, on the other hand, there is a substantial, dramatic shift in the conventional gender roles with both men and women taking responsibility for a wider range of tasks in homes and workplaces (Oláh, 2018; 2020). As women indulge more into the workforce, the necessity for equitable sharing of home duties and childcare with men has become a-must because women are so much pressured. This is leading to a new perspective and controversies towards achieving a balanced work-family life. These transforming roles act as a contribution towards creating more egalitarian structures of families, while new discussions about the roles of different genders arise with new challenges and controversies, in a trial to sustain the wellbeing of families and the upbringing of children. Olah also claimed that the way these transformations are viewed and take place in society depends upon the cultural context (i.e., norms and values) that affect decisions about the responsibility of each gender. He also concluded that there are future possibilities of continuous transformations in family structures as well as gender roles due to changing life and societal structures that encourage equal gender shares.

A study conducted with 1375 undergraduate biology students in GCC countries in the Middle East, specifically in Kuwait's educational system, assigned students randomly to twelve different educational settings (Almasri, 2022). The study relied on quantitative insights and context-based evidence and discovered that the reserved sociocultural setting and deeply ingrained gender-segregated social norms primarily impacted the attitudes and academic performance of female pupils. The different learning settings impacted on students' attitudes and achievements. Whether they were in the classroom or through e-learning, male students showed more positive attitudes and obtained higher scores in mixed-gender collaborative contexts, while female students expressed higher marks and more positive attitudes in single-gender settings. Males preferred collaborative learning environments independent of gender-grouping and learning techniques, but females only did better when the collaborative learning environments were applied in e-learning or in traditional-class single-gender groups. The socio-cultural boundary that makes female students feel uncomfortable in FTF mixed-gender groups may be dealt with the help of e-learning (Almasri, 2022).

In another study by Yu, (2021), a research on the disparities between genders in online learning, outcomes were contradictory or changing along the years after analyzing several studies. There may be more justifications than the ones listed above for discrepancies in gender disparity findings. Yu (2021) recommended that further investigation into this field should be conducted in the future. Further research into gender disparities would aid in predicting and integrating strategies to provide equal opportunities for all students, which will improve the overall behaviour and academic performance. This leads to the controversial argument of whether the inherent differences in behavioral and learning preferences between men and women are related to sociocultural or gender differences. No conclusive evidence in recent studies has been reached concerning this point; therefore, further investigation is required.

Behavioural intention about the use of technology

Different models have studied the behavioral intention⁴ of using technology in many activities by implementing the theoretical framework of various technology models. These models include the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), the Combined-TAM-TPB model (C-TAM-

⁴ Behavioral intention: A measure of the likelihood that a person will perform a specific behavior, such as adopting a new technology, using software, or participating in online activities.

TPB), the Motivational Model (MM), and the Innovation Diffusion Theory (IDT). Two models, however, are commonly used to study male and female differences in behaviors toward adopting technologies: the Technology Acceptance Model (TAM) and the Unified Theory of Adoption and Use of Technology (UTAUT), the latter which represents a combination of eight models developed by Venkatesh et al. (2003), including the previously mentioned ones in the section. This paper uses TAM theory adapted from Davis et al. (1989) as a theoretical framework. It is a model that illustrates why individuals would accept and use a specific technology. Users' behavioural intention is considered the motive for using technology; this motive is affected by users' attitudes toward such a technology, namely their perceived usefulness and ease of use of the technology (Lala, 2014).

There are two elements that can influence individuals' impressions of new technology and when and how they would use it (Venkatsh et al., 2008): 1. Davis et al. (1989) explains Perceived Usefulness (PU) as the individual's belief about whether the technology they use is useful for fulfilling a task or not; 2. Perceived Ease of Use (PEOU) illustrates that using a specific technology would be effortless. Any technology that displays a user-friendly interface and interesting, practical operational options would make a positive impression on the users and remove all obstacles.

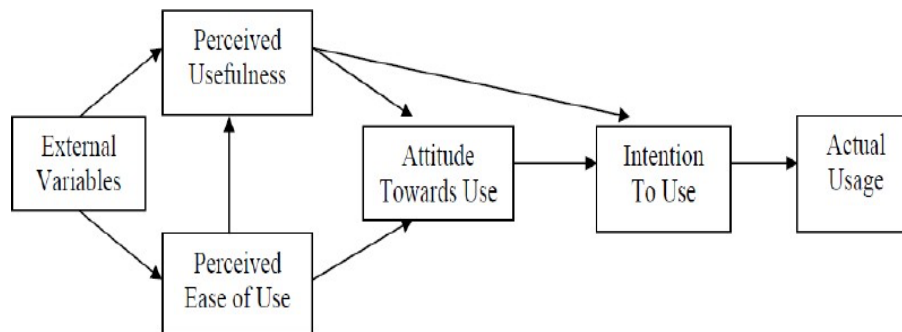


Figure 1: Technology Acceptance Model (TAM), first modified version (Davis et al., 1989)

Previous studies

Gender, gender traits and academic achievement

In Online group learning few studies have examined the potential effect of gender on the academic achievement of learners. Some research findings have shown that gender-balanced or mixed groups had effective group work and less social loafing behavior; complaints about equitable contributions were rare, which meant that both genders made similar contributions, probably reflecting on the shared-responsibilities concept popular between men and women in Western cultures (George et al., 2020; Takeda & Homberg, 2014;). On the other hand, poor performance was found in male-only groups, inferring that outgoing and indifferent behaviour were usually adopted by males, as mentioned in similar studies in Western and Eastern cultures (Hartsell, 2005; McKnight & Thackaberry, 2011; George et al., 2020), and reduced cooperative behaviours were found in groups consisting of females and only one male member (Davis et al., 1989).

Tvalchrelidze, (2013) conducted a study about group work and different cultural differences. In the study for students enrolled in the Faculty of Education, English Philology bachelor level, Turkish females who came from a mixed Greco-Roman, Islamic, and Westernized Ottoman culture felt more positive when working in single-gender female groups as they all engaged in answering questions and exchanging opinions. On the other hand, Georgian girls who came from Eastern European and Western Asian countries were very well engaged when working in mixed-gender groups as they were more used to mingling with men in their communities and shared almost equal roles with men in all aspects of life; however, Georgian males always took the lead in all group presentations.

Constantiou and Mahnke (2010) studied the use of mobile TV services - these are mobiles that are connected to special networks or satellite broadcast so that people can entertain TV services - by 232 Austrian young adults and students. It was found that male adults were interested in following sports news and events, whereas women enjoyed daily soaps, weather forecasts, and lifestyle news.

Gender and online learning

Regarding online learning, few studies have addressed gender differences, especially in non-native English-speaking countries (Almasri, 2022; Cen et al, 2014; Mahmood, 2017). Many though have examined gender and its impact by looking at how males and females perceive technology, using the internet or chatting on

mobile devices; they also examined differences in men and women's self-esteem after completing a specific task using the internet and computer technology.

Some studies in the past have investigated learners' perceptions of OL. Ong and Lai (2006) looked at how 67 female and 89 male Taiwanese employees from Asian cultures accepted it. Overall male employees liked using computers. For them, computers were easy to use and useful; therefore, they had more positive behavioral intentions of doing/engaging in e-learning compared to their female colleagues. In contrast, in Kay and Knaak's (2008) study, the learning outcomes of younger learners who were secondary students of both genders in western Canadian culture, revealed insignificant differences. Female students attained higher scores in online learning courses than male students. It was concluded that because women tend to engage more and take care of and look after others, they would appreciate human relationships; men, on the other hand, tended to prefer abstract thinking, which directed their focus towards personal achievement and subordinate relationships. Men are frequently under pressure from society to show that they are capable and independent, which can deter them from seeking assistance when necessary (Venkatesh and Morris, 2000). Ong & Lai (2006) and Kay & Knaak (2008) confirmed that males feel more comfortable using computers and their intensive internet use than females.

More recent evidence is required to show the effect of gender as an independent variable on male and female reception of information computer technology (Adedapo, 2020). In past and recent studies, mixed findings have been reported about users' behavior and achievement in web-based environments. This indicates that the influence of gender could be neutral among young generations in using computer technology (Takeda & Hamberg, 2014). For example, UTAUT was used to examine 684 chats in Norway and male participants appreciated mobile chat services more than female participants (Goswami & Dutta, 2016). Further, although some differences have been exposed in using e-learning, other studies report no significant differences between men and women in adopting a particular technology (Morsi & Assem, 2021).

Online group work learning

There is a scarcity of research about the effect of gender on the accomplishments of online group work in the Middle East in general and in Egypt in particular. In L2 speaking environments, more research is required to give insights on how technology can affect the collaborative learning process among undergraduate students specifically STEM students. It is worth noting that high density classrooms in Egypt have always been a great challenge which negatively impact students' learning (Ismail & Kinchin, 2019). That is why many educators consider integrating online learning tools in the course syllabi, as the best solution to overcome the lack of sufficient time for one-to-one feedback and close monitoring of students' performance. Additionally, doing this creates opportunities for sustainable online learning and ensures the effectiveness of independent and collaborative group work accomplished online (Morsi, 2023; Adedoyin & Soykan, 2020). However, other tutors and parents who are really influenced by the cultural beliefs in the Middle East still resist the idea that online collaborative learning can provide credible proof of a student's actual academic performance (Ismail & Kinchin, 2019; Mahmoud, 2020). In Qatar, Shal (2024) discussed how parents regard FTF tutoring of higher quality; they only perceived online learning as positive only when certain conditions such as COVID-19, parental guidance, and an abundance of resources coexisted. This, in fact, seems to stand in contrast to developing important skills that students need in the present trend of the digitalized global economy (George et al., 2020). In another study in Qatar, during the outbreak of the COVID-19, STEM students had negative perceptions of the overall OL experience while studying courses in their major. The authors attributed this to the lack of full-preparation of instructors and substantial problems with network facilities in their country (Newsome et al., 2022).

The primary aim of this study is to investigate the effects of gender differences, namely gender grouping on Egyptian STEM EFL learning outcomes in a technical writing course for engineers. It is important to consider the Egyptian culture and the fact that Egypt is a developing country where the digital infrastructure is still undergoing continuous development to provide the successful delivery of online learning in national and international universities (Morsi, 2023, Morsi & Assem, 2022).

Research Methodology

In this study, the influence of gender was analyzed by comparing Egyptian EFL STEM Engineering students' group project scores, their observed behavior, and attitudes toward completing their writing projects. For example, the first project was a basic IMRD (introduction-methods-results-discussion) report. At the same time, the second was a more formal report that required extensive research and collaboration on the part of students. Groups of students had either female-only members, male-only members, or both male and female members. Participants were further divided into experimental and control groups; the former

completed the first project, FTF, and the second project entirely online using either Google Suite or Quip. The control group completed both projects FTF. The researchers used the TAM model of perceived ease and usefulness of the online tools to explain any differences in the participants' scores achieved FTF versus online. In addition, the researchers reflected on differences between project groups based on the gender composition of each and their observed behavior, and their actual usage of the technology to analyze and organize information, communicate effectively, and track the progress of other members as they worked collaboratively as done in (Davis et al., 1989).

This study followed the quasi-experimental research design. It is the second part of a study about collaborative learning. Project scores were quantitatively compared, and other outcomes were qualitatively analyzed.

Participants

Participants in this study were 141 Egyptian first year Engineering students enrolled in an EFL technical writing course to improve their English language and writing skills required to submit formal group reports. The FTF control group had 66 students (16 females and 50 males), while the online experimental group included 75 students (35 females and 40 males). Their ages ranged from 19 to 21 years old. The university administration assigned the students, and the convenient sampling procedure was followed to choose participants for the study (Cohen et al., 2000). Students completed the course in 12 weeks. In prior years, students had attended this course on campus, but due to the COVID-19 pandemic, students in the academic year 2020-2021 were asked to go to classes only two days a week on campus, where the course met on those two days.

Task requirements

According to the syllabus of the English technical writing course, students were required to write two technical reports in groups: a basic IMRD report by the end of Week 6—which required students to demonstrate a grasp of the main aim and structure of the genre—and a more formal report by the end of Week 12—which required in-depth and more sophisticated research and collaborative work on the part of students to receive high scores based on the assessment rubric developed by the researchers (See Appendix 1). This study compared the IMRD report results for each student versus their results in the formal report. Then the focus was on the results of the formal report only to answer the second research question. All students completed the basic IMRD report FTF on campus by the end of Week 6. The difference between the FTF control group and the online experimental group was in the modality in which the formal report was completed by Week 12: The control group completed all the steps of the second group project FTF on campus, either in the classroom or outdoors and also received feedback from their instructors or peers on campus FTF, whereas the experimental group was required to complete the entire project online (via Google Suite or Quip) and were followed up by their instructors online.

Research Questions

The research questions were the following:

FTF IMRD Report Scores vs. Online Formal Report Scores -paired sample of students

How did each gender achieve in their "total individual score" upon completion of the IMRD FTF report vs. their Online Formal report?

Formal Report scores-control FTF group vs. Online group

How did each gender perform in "the 5% individual contribution of each student" (see this band in Appendix 1 of formal report rubric) FTF or Online in the groupwork assignment?

How did different groups of students (FTF vs. Online) perform in their total individual scores?

Online Formal Report Only

According to the scores of groups that consisted of: male-only student groups, female-only student groups, and the scores of groups of mixed gender,

How did males and females achieve in students' "final total individual results" in OL?

Was there a significant difference between groups of different genders in students' "final group results" in the Online learning method in the Egyptian Culture?

In comparison to other studies in the same field, what do the research findings suggest regarding the behaviour and learning preferences of different gender and gender groups in the Egyptian culture? Were gender differences among young Egyptian learners more likely to be related to cultural backgrounds rather than gender traits?

Hypotheses

The following hypotheses were formulated to be tested at 0.05 or 0.01 level of significance:

For Question 1, it was hypothesized that there are significant differences in the scores of the paired sample of males (FTF performance vs. Online performance); similarly, there were significant differences in the scores of the paired sample of females (FTF performance vs. Online performance) methods.

For Question 2, the null hypothesis was proposed with no significant differences to be found for the influence of gender on students' individual scores in both learning methods (FTF vs. Online), and for the effect of different gender grouping on group scores when working online.

For Question 3, it was suggested that gender differences in students' behaviour and preferences were related to gender traits rather than cultural backgrounds.

Data collection and data analyses methods

Before students' submissions of Group Project One (basic IMRD report), students were informed about the purpose of this study. A consent form was distributed in class to emphasize that students' names would be confidential and mean grades would be used for the aim of this research (see Appendix 2). The researchers informed students that the findings of this study would be used to provide suggestions on how to improve students' performance in collaborative learning.

Data were collected from the scores of the basic IMRD and the formal reports completed in groups, archives of students' work, chats, and students' observations. SPSS 20 was used for quantitative analyses. Students' scores were quantitatively analyzed using the Paired Samples T-test for answering Question 1 and independent samples T-test, one-way ANOVA, and Post-Hoc Test for answering Question 2; whereas, to answer Question 3, students' behaviour and their performance in male-only, female-only, and mixed groups, the (Tukey HSD) was used. In addition, students' stated acceptance and perceived usefulness of online learning in group work were qualitatively analyzed based on the instructors' observations of students' performance, progress, and attitudes by their instructors during work, archives of students' work (online or on campus FTF) and their chats while working, and peer evaluations' results.

In the control group, which used the traditional FTF method for both reports, students arranged meetings during class time on campus and sometimes outdoors to discuss their roles and complete their assigned tasks. They used paper and pen to draft their notes, and instructors followed students' progress in a class by checking these drafts and giving them feedback whenever they needed it. On the other hand, the online group was instructed to use either Quip or Google Suite online tools to complete the second, more formal report. The instructors explained to them how to share information, review each other's contribution, benefit from the tools' options in communicating, editing, and saving drafts, and, finally, receiving feedback from the instructor.

Due to the fact that these were group assignments, a peer evaluation rubric (See Appendix 3) was filled out by students to assess their peers' effective contribution and cooperation in accomplishing their tasks. A peer evaluation form was required to be uploaded on the e-learning platform by the group leaders on behalf of the students to assist instructors in grading the "Focus on task & shared responsibility band" in the formal report assessment rubric (See Appendix 1).

Group members also filled out task sheets for the second assignment. The task sheets are meant to help students organize their work and keep a record of each member's contribution. They included the names of the students' names and their exact contributions to the group project after receiving approval from all team members. Again, the FTF group filled out a hard copy, while the online group had an electronic copy saved in the online program. In class, students were informed about the purpose of completing the peer evaluation form and the task sheets and were instructed to submit these with their formal reports.

The benefits of using peer evaluation forms have been emphasized in the literature (Kang, 2016; Takeda & Homberg, 2014; Zhou, Simpson & Domizi, 2012;;). Many educators consider peer evaluation a significant component of any formative or summative assessment as it motivates learners to work cooperatively and reduces "social loafing." Actual learning occurs as they share feedback while working collaboratively in their groups. Accordingly, it was important to check that students in each group completed their task sheets, highlighting their roles in the group project and responsibilities. Peer evaluations would subsequently guarantee effective and cooperative fulfilment of these responsibilities. Each student was asked to complete the peer evaluation form for each team member in their group to evaluate his/her contribution and cooperation as they worked on the assignment. When students changed their assigned roles in the group work, they had to document this in the task sheets.

Results

It is worth noting that the final grade given to each student in the assignment was calculated as follows: A 5% of the total group report grade is allocated for evaluation of each student’s individual contribution to the completion of the group project (Appendix 2, Band #10 – Focused and shared responsibility). This means that although students’ have equal grades in all the other bands of the rubric; their grades in Band 10 slightly varies according to the quality of their individual contribution. In this section, paired t-test and independent t-test were used to find the differences in the individual scores of male and female students across the two learning methods (FTF and online). Findings of overall group scores segmented by gender groupings as male-only, female-only and mixed groups were analysed using one-way ANOVA with post-hoc test (Tukey HSD). Each student was evaluated for each report based on the following:

Gender differences in total individual scores of FTF IMRD report vs online formal report for a paired sample

The paired samples t-test was used to compare students’ means for total individual scores received for the IMRD (FTF) versus the formal reports (online) of each student in the team. This analysis was performed separately for male and female participants who were assigned to the test groups. As shown in Figure 2, both males and females scored significantly higher individual grades in the online group work “formal report” than in the FTF group work IMRD report. The p-value was 0.01 (high significance), and t-values were 3.952 and 6.102 for male and female students’ total individual scores, respectively. The means are shown in Figure 2.

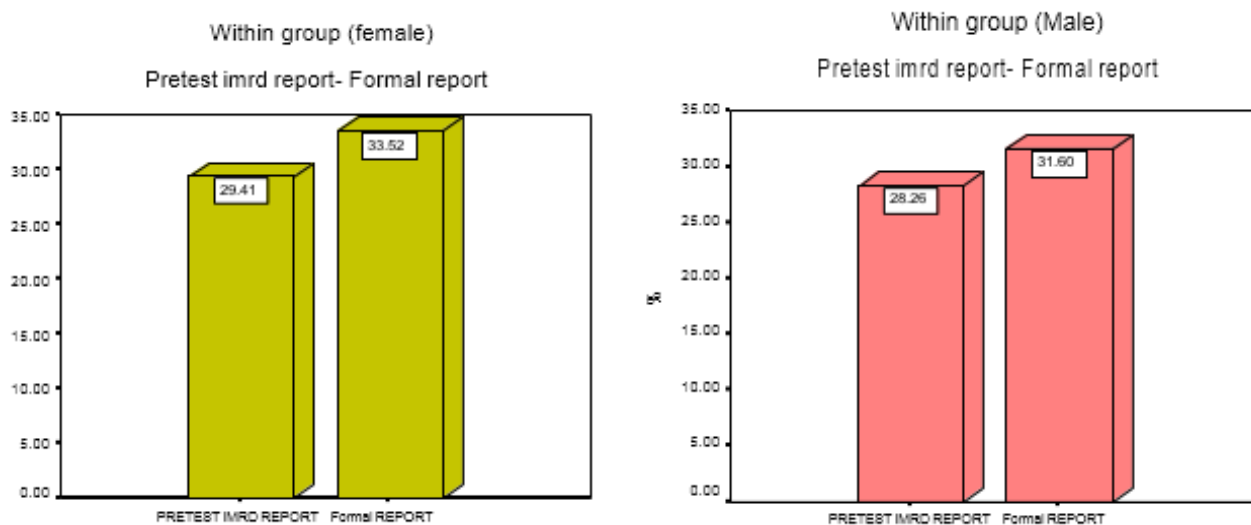


Figure 2: Male and female total individual scores in FTF IMRD & online formal report

Formal report scores

Sample Distribution

In the formal report, two classes of students were assigned to finish the FTF report (66 students – control group), while two classes were assigned to finish the online report (75 students -experimental group). Table 1 presents the distribution of this sample of students.

#	Gender	Face to face		Online	
		Frequency	Present	Frequency	Present
1	Male	50	75.8	40	53.3
2	Female	16	24.2	35	46.7
Total		66	100	75	100

Table 1: Sample distribution in FTF and online groups of the formal report assignment

In the FTF group, the percentage of male participants in the class (75.8%) exceeded the percentage of females (24.2%), unlike the online group whose percentages were nearly equal. With regards to the distribution of students, the researchers had no control over this since it was arranged by the administration of the university.

Comparing students’ formal report total individual scores in FTF vs online groups irrespective of gender

Analysis of the results of all students (66 participants FTF and 75 participants online) showed that students who worked in online groups to finish the report attained higher scores than those who worked FTF. As mentioned above, the total individual scores were calculated by adding the 5% individual contribution to the group work mark. The independent T-test revealed significant differences between both groups at p-value (0.05) for the benefit of the online group: ($t(141) = 2.127, p=0.04$), with means shown in Figure 3.

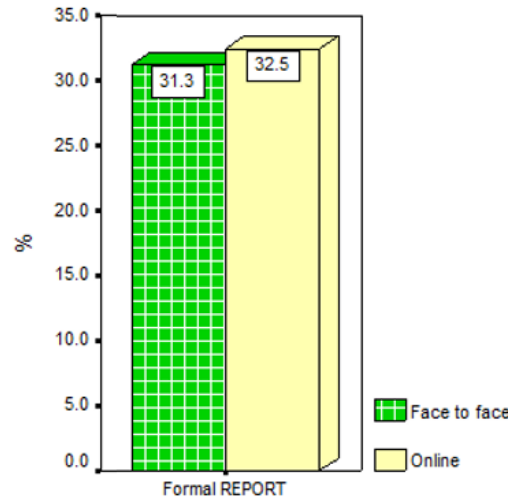


Figure 3: T-test differences of total individual scores in the formal report (FTF vs online groups)

Performance of each gender in only the 5% individual contribution scores of the FTF vs. online formal report for two independent samples

By comparing the 5% individual contribution (Appendix: Focus on task and shared responsibility) of males in the FTF vs. online formal report groups, no significant differences were found in the FTF and online groups since the p-value is more than 0.05. Similarly, females’ academic performance in the FTF group was not significantly different than those in the online group for the 5% individual contribution (Focus on Task and shared responsibility) as the p-value was more than 0.05 (Tables 2 and 3).

Variable	Sample	N	Mean	Std.	t-test	P-value	Result
Comparison of scores in FTF vs online groups	Face to Face	50	31.12	2.39	0.672	0.50	N. Sig
	Online	40	31.60	4.22			

Table 2: Differences between the FTF and online formal report groups based on 5% individual contribution scores (Focus on task and shared responsibility) using independent T-test for the male samples

Variable	Sample	N	Mean	Std.	t-test	P-value	Result
Comparison of scores in FTF vs online groups	Face to Face	16	31.78	3.27	1.742	0.08	N. Sig
	Online	35	33.52	3.34			

Table 3: Differences between the FTF and online formal report groups based on 5% individual contribution scores (Focus on task and shared responsibility) using independent T-test for the female samples

Comparing males vs. females’ total individual scores in the online formal report

The Paired Samples T-test showed significant differences (($t(75) = 2.170, p=0.03$) for the benefit of the female sample with mean equal 33.52, while the mean for males equals 31.60 with p-value less than 0.05 as shown in (Figure 4).

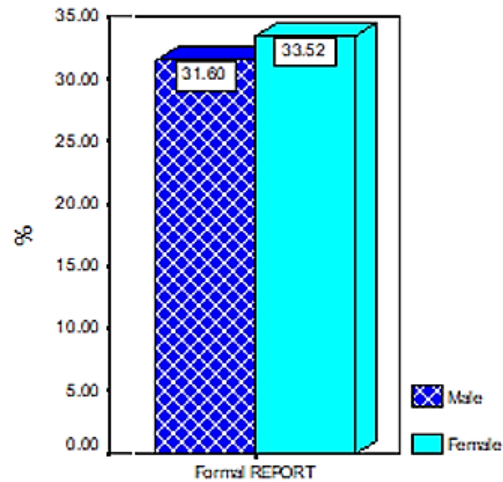


Figure 4: T-test differences between male and female total individual scores in the online group

Online formal report only

Differences of "group scores" based on gender grouping in teams: male-only, female-only and mixed groups in online group work

Data used was gathered from students' group work scores on their submitted online formal reports. These groups consisted of male-only, female-only, or mixed team members (males and females).

One-way ANOVA results indicated that highly statistically significant differences were found between the means of scores of the three gender group categories as determined by ANOVA ($F(2,18)=19.844, p=0.00$).

Scores	Sum of Squares	Df	Mean Square	F	Sig.
Between groups	1181.033	2	590.517		
Within groups	535.633	18	29.757	19.844	.000
Total	1716.667	20			

Table 4: ANOVA F-test for statistical differences between three gender group categories: male- only, female-only, and mixed-gender groups

Multiple comparisons

(I) Gender	(J) Gender	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Male	Female	-17.367*	3.303	.000	-26.17	-8.56
	Mixed	-16.167*	2.817	.000	-23.68	-8.66
Female	Male	17.367*	3.303	.000	8.56	26.17
	Mixed	1.200	2.988	.923	-6.77	9.17
Mixed	Male	16.167*	2.817	.000	8.66	23.68
	Female	-1.200	2.988	.923	-9.17	6.77

* The mean difference is significant at the 0.05 level.

Table 5. Comparing multiple means of sole-gender groups by using Tukey HSD-Post Hoc

Consequently, the Post Hoc test (Tukey HSD) was used to investigate differences between the performance of the groups: male-only, female-only, and mixed groups to identify which particular mean differences between the pairs of groups caused the significance. Results of Post Hoc comparisons showed that there was a highly statistically significant difference between the male-only group and the female-only group with a mean difference equal to 17.367, and p-value less than 0.01; this means that the level of students' performance of male-only groups differed from the performance of female-only groups, with higher mean and achievement for female-only groups.

In addition, there was also a highly statistically significant difference between male-only groups and mixed groups with a mean difference equal to 16.167, and p-value less than 0.01; this shows that students' performance of male-only groups differed from the performance of mixed groups, with a higher mean and

achievement for mixed groups. On the other hand, no significant differences were found between female-only and mixed groups ($p=0.923$), although the mean of the female-only group was slightly higher than that of the mixed group. There is a valid interpretation for these findings since female-only groups scored the highest grades.

Discussion

Total Individual academic performance of males and females' samples' in FTF IMRD report vs. Online formal report

In response RQ1, it was found that when the FTF IMRD report scores of the females' paired sample, as well as the males' were compared to their online formal report scores, as shown in Figure 2 in the Results section, highly significant differences were found because the females' performance was much higher in the online tools. Similarly, the males' performance was also higher for the online tools. This reflects the benefits of using online tools in achieving group work; using the online tools focused students more on their assignments than when they did a similar assignment FTF (Morsi & Assem, 2021). This is confirmed in a previous study conducted by the same researchers in which students' answers to a questionnaire about their perception of OL showed that they perceived working collaboratively online more highly than working FTF with their peers. Moreover, online tools improved the quality of assignments regarding writing mechanics and structure, besides facilitating student-student interaction and student-instructor interaction in receiving comments and feedback. Students were less intimidated to ask questions and inquired about any information they needed through the comments box. Hence, it is inferred that learners are satisfied with using online tools that have shown effectiveness in improving their academic performance. Males and females attained almost similar results; it can be concluded that both genders are familiar with digital technology (Alharati et al., 2018). The findings about the EFL course in this study contradict the results of (Idrizi et al., 2023) where STEM males slightly outperformed females when different-gender STEM students studied a computer science online course. They also contradicted the findings of another study in Qatar, which falls within the Middle East, where STEM students had negative perceptions of the overall OL experience during COVID-19. However, this was attributed to the lack of preparation of instructors and network facilities in their country. In addition, males were more satisfied overall with OL than females. This could be attributed to the nature of the courses (STEM courses) which differed from the EFL studied courses in this study. The question that remains is whether the results of this study apply to different cultures or not.

Performance of each gender in the 5% Individual Contribution in the FTF vs. Online groups in the formal report

In response to RQ2, findings of this study displayed in Tables 2 and 3 showed that when comparing the performance of male groups in the formal report scores (FTF versus Online groups), there were no significant differences for the scores of males of the FTF vs. males of the Online group. Similarly, when comparing females of both groups, results showed no significant differences in their scores. An interpretation for this could be that the individual performance (Focus on Task and shared responsibility) in contributing to the project was the same for the control FTF or the experimental online group. Most probably the peer evaluation rubric has made students conscious that their performance was evaluated and that they should cooperate effectively with their peers. It is worth noting that Part One of the studies (Morsi & Assem, 2021) showed no significant differences in the survey results of the dimension *Cooperation and shared responsibility*. Nevertheless, the other three dimensions critical thinking, *task completion and effectiveness of work*, and *writing skills* showed highly significant differences.

Academic performance of FTF group vs. online group in the formal report irrespective of gender influence

In response to RQ3, Figure 3, when the academic performance of all members of the FTF group was compared to all members in the online group in the formal report, results showed that students who worked online achieved higher scores than those who worked FTF. This is affirmed in a study that investigated students' performance in a Research Methods course for postgraduate students of Msc. in Educational Technology in Nigeria. It was observed that working on assignments for such a course in groups was less threatening to students; there was well communication between tutors and students and improved quality work despite all the challenges involved (Adedapo, 2020). Researchers also found that online collaborative learning probably increased the retention of knowledge in students' memory and maximized their learning outcomes for STEM students in the UAE and Egypt (Cen et al., 2014; Morsi & Assem, 2021).

Females' vs males' total individual report scores: The influence of digital competence and attitude with respect to students' Egyptian culture

Regarding RQ 4.1 and RQ5, the influence of gender, shown in Figure 4, revealed significant differences for the benefit of females when their performance was compared to the males' performance in the online formal report scores. This is confirmed in Takeda and Homberg's (2014) study, as each gender may prefer certain subjects, and this could be because of the females' or males' inherent gender traits. Further, the rationale of these findings may have also originated from gender differences in students' attitudes and digital literacy skills. First, unlike previous studies that revealed males' excellence in using computers, in this study, females were competent in using online platforms and were more interactive online. This could be because members of today's generation are viewed as digital natives irrespective of culture or gender (Alharati et al., 2018). Since the invention of mobile phones and the launch of Facebook in 2004, children have been exposed to such digital tools in their surrounding environments, such as in their homes and schools. These tools and online applications are used for various purposes, such as chatting, playing games, learning, etc. This confirms the findings of studies in which children's behaviour and preferences have been found to be affected by social interaction processes regardless of the development of gender identity (Boe & Woods, 2018). Second, online platforms stimulated the females' motivation and communication skills, resulting in their outperformance over males' scores (Namaziandost & Çakmak, 2020).

Findings of previous research that discussed the connection between academic success to attitudes and traits of gender identity among the western culture in the USA argued that females achieve higher than males because they are often committed, self-dependent, organized, devoted to their studies, and work, good and patient readers and that was why they tended to obtain higher grades in school assessments (Holmes, 2000; McKnight & Thackaberry, 2011). Similarly, Canadian females also outperformed their male peers when working online in Kay and Knack's (2008) study. Females were said to often like to work harder and accept encouragement from their peers and instructors; they would be keen to abide by deadlines, respect others and cooperate with them willingly. Males, however, tended to be easily affected by peer pressure and would rather show a "cool" attitude toward meeting deadlines. They were usually less competitive, less attentive, and showed low presence in online discussions, and that is why they most probably often showed up ill-prepared for presentations or assessments. In fact, the results supported all the previously mentioned arguments since females' scores were higher than males, and female-only groups achieved higher scores than the male-only and mixed groups (Alharati et al., 2018). This suggests that gender differences should perhaps not necessarily be linked to only cultural differences because females outperformed males in both Western and Middle Eastern cultures, as explained above. Thus, gender differences may be due to gender traits or due to the effect of globalization on today's young generations, which has made them digital natives.

In this study, it was observed that females' interaction was more via Google Suite and Quip online where they posted regular questions and comments to their colleagues or teachers (see Figures 5 and Figure8). The female learners in the study were active in communication to complete their tasks. For example, in the mixed groups with two males, one female leader organized the conversations, prepared a list of completed tasks (see Figure 6) and submitted the final report on Turnitin the same as most of the female learners in the other groups (see Figure 7). In the same vein, Kay (1992) supported these findings by illustrating that females posted many comments in a blog of a mathematics course to ask for elaborations and explanations. They were more engaged in the online learning environment while males were more task-oriented. This could help explain why STEM (Engineering) females' academic performance, in this study, was higher in female-only or balanced mixed groups-with two or more female members. The previously mentioned studies in the literature suggested that females prefer to socialize and communicate in any group work until it is finished. In contrast, males tend to be task-oriented and not interested much in connecting with other team members. At this point, research question three can be answered. It could be argued that students' behavior and academic performance are possibly affected by their surrounding environments (setting, peers,..etc.) and their gender traits. Thus, different genders' behavior and learning preferences are likely to be similar in the different Eastern and Western cultures.

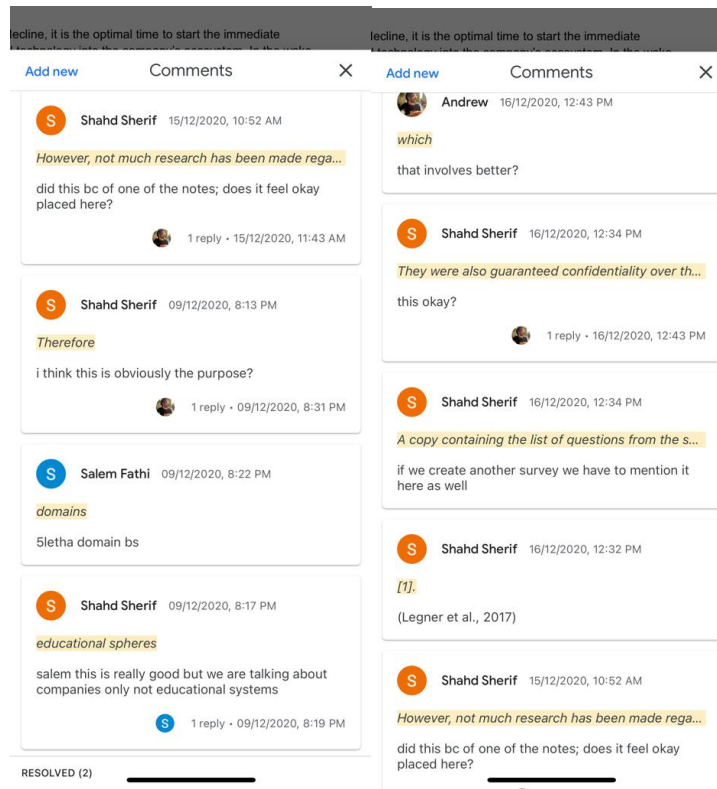


Figure 5: A screenshot sample of chats by students in a mixed group showing a female leading the conversation

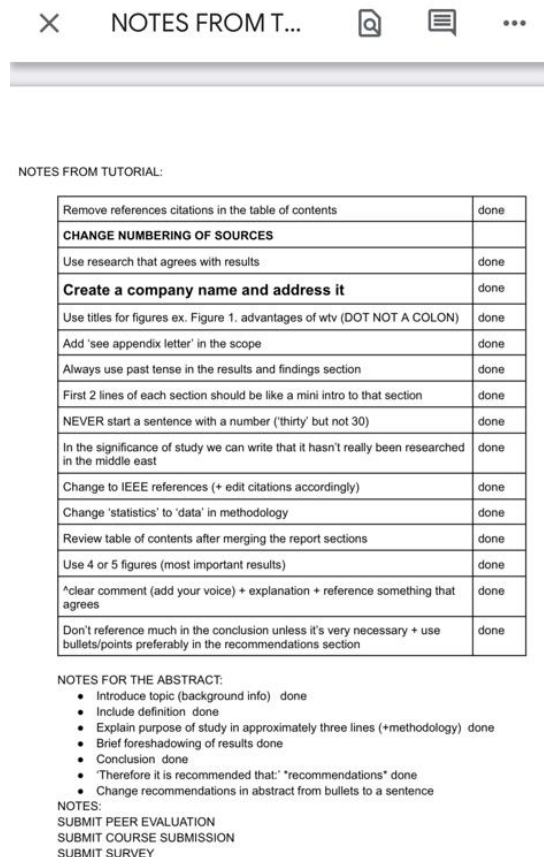


Figure 6: Task sheet organized by a female student in the mixed group

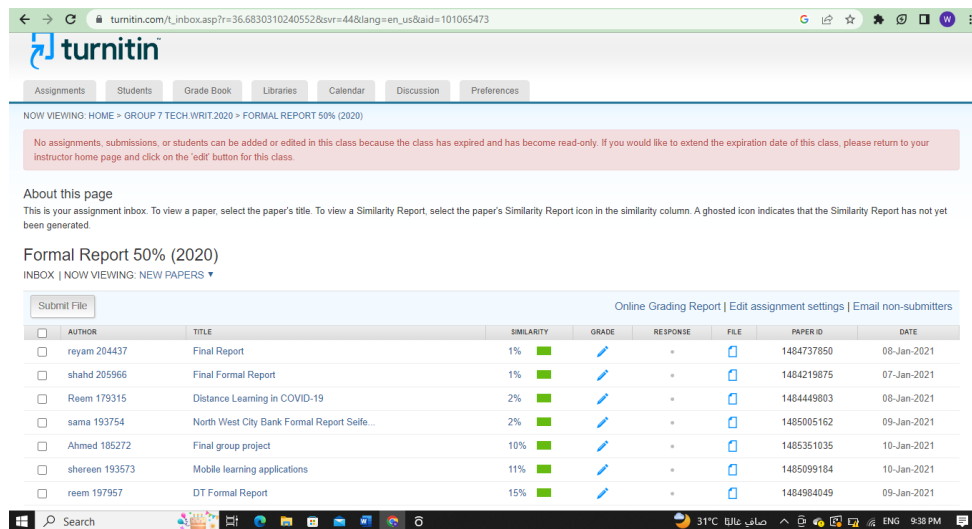


Figure 7: A screenshot of a *Turnitin* page showing submission of the final group reports mostly by female students except for one male student (Ahmed).

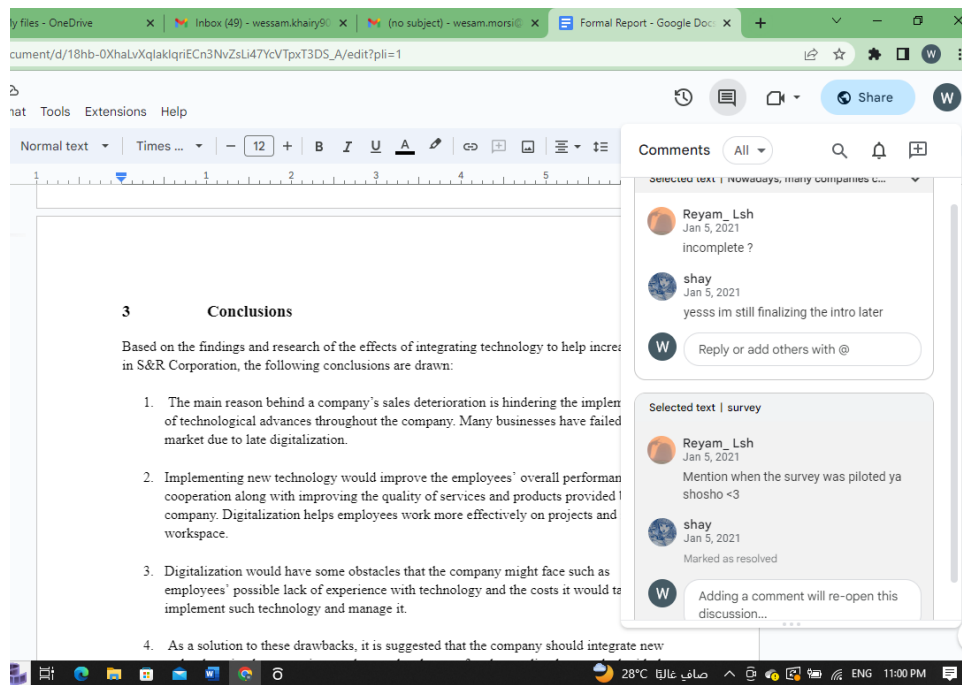


Figure 8: A screenshot sample of chats by students in different groups showing mostly female conversations and only one male (Ody_Ash)

The academic performance of gender group categories: Female-only or male-only groups vs. mixed groups

In response to RQ 4.2 and RQ5 (as shown in Table 4), students in female-only and mixed groups showed better performance than the male-only groups. It is worth noting that the groups had a balanced number of female members. This answers question two, suggesting that female-only groups had the best academic performance. As shown in Table 5, these results are supported by the previous literature findings mentioned above in this paper which explained that in collaborative work female students achieved higher scores than male students because usually, in gender-balanced groups, there is equal distribution of workload, cooperation, and collaboration among the team members and members are encouraged to reduce social loafing while working on assigned tasks as mentioned in a study conducted in the UK (Takeda and Homberg, 2014; George et al., 2020). Further, female-only groups had higher average scores than the mixed groups. This suggests that female-only groups demonstrated significant progress in online group work that relates to their higher achievement than males in individual scores.

It has been noted that women are usually proactive and take the initiative to build connections necessary to fulfill the required tasks through meaningful communication and interaction to achieve success. On the other hand, males tend to show control, dominance, and determination. In this study, male-only groups had the lowest scores because of such attitudes that did not provide an adequate environment for achievement. Thus, these differences could be related to gender traits. Females often try to compensate for the underperformance of some members in mixed groups; they may feel a heavy burden if they could not communicate with other female members to share ideas and concerns as they work on the assignments. This was illustrated through the discussions between group members in the chat boxes when working online on google and Quip (see Figures 5 and 8). This has been confirmed in Bear & Wolley (2011) who found that women's presence in collaborative team work of STEM students in science and technology contributed to the success of the team. Women showed cooperative behaviors and were proactive in solving problems and enhancing teamwork dynamics. They encouraged diverse viewpoints which enhanced the quality of decision-making, collaborative efforts and success of the team. Similarly, Davcheva & González-Romá (2023) found women again were keen on maintaining positive team spirit through healthy communication which has led to the success of team work; on the other hand, men adopted a more neutralistic approach to the team success; they were task-oriented and sometimes showed competitive, dominant attitude.

Similarly, more female students than males showed up on campus and had long feedback discussions with their instructors. Sometimes females attended on behalf of other absent male members in mixed groups specially in the step of the final submission. Consequently, more female members than males often reported communication or unfair workload problems when working in mixed groups. A female student who worked in a mixed-group mentioned to her instructor that she completed most of the tasks herself, including the introduction, the results, the conclusion and even the editing of the whole project; her colleagues, a male and female learners' participated with a small contribution in the project (See Appendix 4). Based on the instructor's assessments of each student performance in the group work during follow-ups and the peer evaluations submitted by each member, it was found that this student attained higher total grades than her peers (See Appendix 4). These outcomes shed light on the positive role of women in various cultures as successful negotiators and responsible figures, representing mothers, facilitators and mentors. Research in sociolinguistics and gender differences reveals that women tend to be proactive in addressing and resolving issues that may arise at home or at the workplace because they seek to maintain a positive self-image and social status in the community (Holmes, 2000, Meyerhoff, 2018, Methias, & Morsi, 2020).

However, there were no significant differences between the academic performance of female-only and mixed groups. This could be because when male and female students worked together in balanced groups, their gender traits complemented each other, so they received high scores close to those obtained by female-only groups. Cen et al.'s research (2014), which was conducted in the United Arab Emirates, a similar Middle Eastern culture to Egypt, explained this by showing that in their study males interacted less and worked systematically, while females worked collaboratively and scored higher. They proposed the idea that gender balanced groups could exhibit enhanced collaboration, focus on a task, and an improved quality of work outcome, representing effective synergies of gender characteristics necessary in CL environments.

It is worth mentioning that the peer evaluation and task sheet may have played a significant role in this study to help students reflect on their performance and collaborate effectively. However, in Middle Eastern cultures, namely in Egypt, it is usually not reinforced as an essential process to complete either individual or group work assignments. Consequently, in this study, the researchers decided to make the peer evaluation form for each team member a requirement of the assignment submission to affirm that all the team members would take it seriously and fairly contribute to the groupwork.

In a number of groups most of the members gave each other similar scores in the peer evaluation. Some females, however, assessed their fellow team members fairly by giving them precise and accurate scores based on their actual contribution to the group work. This again suggests the commitment and dedication of the female learners in this study to accomplish each part of their assigned tasks accurately. Similarly, in this study, females in female-only and mixed groups were keen to finish their required tasks successfully. A female in female-only group stated, "We were a cooperative group and reviewed each other's work" (See Appendix 6). The majority of females in this study were introspective and self-critical compared to males, who showed indifference while completing the peer evaluation (See Figures 6 and 8, and Appendices 5 and 6). This was also supported by (Johnson, 2011) who found that in a web-based introductory information systems course, women interacted more, had a better social presence and performance outcome than their male colleagues and were happier with the course.

In another study, it was concluded that in educational technology, gender could be a predictor of academic success (Sackett, 1991). In this study, when study groups had more than 50% female members, they achieved higher grades than males; when the groups had a lower percentage of female members which did not decrease by more than 20%, their work was still superior to that of the male-only groups.

Conclusion

In conclusion, this study showed that gender differences had no significant influence on the academic performance of STEM Engineering students when accomplishing group work tasks, whether online versus FTF although the overall scores were higher for groups working online.

Female-only groups outperformed the male-only and mixed groups, respectively, in the scores of online groupwork technical writing formal report submissions. However, it is worth stating that there were no significant differences between the scores of mixed groups and female-only groups. These results are contrary to older research findings conducted in the nineties which showed that females were intimidated by using computers or technological devices.

It could be argued that students' behavior and academic performance are possibly affected by their surrounding environments (setting, peers, etc.) and their gender traits, irrespective of culture. Females behaviour made them outperform males in both Western and Middle Eastern cultures. Results also show that gender identity affects males' performance in assessments in all different cultures. Unlike females, who appear to be well-disciplined, males do not seem to be self-reliant or well-committed. Males may not have good communication skills to interact and cooperate with others effectively but are rather task-oriented and may be easily affected by peer pressure. That is why their academic achievement might often be lower than females in group work. However, when males work with females in gender-balanced groups, they complement and balance each other.

Moreover, different genders' behavior and learning preferences towards digitalization or other are likely to be similar in the different Eastern and Western cultures. The openness and globalization among students of the current generation might be the reason. Therefore, gender differences should perhaps not necessarily be linked to only cultural differences. However, gender differences may be due to gender traits or due to the effect of globalization on today's young generations, which has made them digital natives.

Recommendations, Limitations, and Future Research

This research work has revealed valuable insights into the group work dynamics of Egyptian Engineering STEM undergraduates as they collaborated to finalize and submit their assignments. Compared to male-only and female-only groups, gender-balanced groups have contributed to the success of the students' teamwork experience and learning outcomes. In gender-balanced groups, students shared opinions, and experiences that could be reflected positively on their academic performance and eventually their communication skills, which could lead to the sustainable quality education and gender equality called for by the United Nations Sustainable Development Goals. Yet, the study has its limitations. The relatively small sample of the population which followed the sampling method used and the specific educational context in a private university in Egypt limits the generalizability of the findings and relying on self-reported data introduce biases. Future research should address these limitations by using larger sample sizes and better sampling methods, exploring diverse settings, and employing multiple data collection methods. Additionally, to gain a deeper understanding of the factors that influence gender differences, group dynamics including distribution of workload, interpersonal skills, and societal beliefs and their impact on students' performance should be explored in various contexts. By addressing these areas, researchers can develop more targeted interventions to create equitable learning experiences for all students.

References

- Abance, L. B., Gabrillo, J.-A., & Quinto, J. B. (2023). Online collaborative learning: The good, the bad, and the purported in thesis writing. *Asia Social Issues*, 16(5). <https://doi.org/10.48048/asi.2023.262187>
- Adedapo, A. (2020). Gender and entry background differences in postgraduate distance learners' achievement in the field of educational technology. *International Journal of Education and Literacy Studies*, 8(3), 98-104. <https://doi.org/10.7575/aiac.ijels.v.8n.3p.98>
- Adolphus, T., & Omeodu, D. (2016). Effects of gender and collaborative learning approach on students' conceptual understanding of electromagnetic induction. *Journal of Curriculum and Teaching*, 5(1), 78-86. <https://doi.org/10.5430/jct.v5n1p78>
- Alharthi, A. D., Spichkova, M., Hamilton, M., & Alsanoosy, T. (2018). *Gender-based perspectives of e-learning systems: An empirical study of social sustainability*. In B. Andersson, B. Johansson, S. Carlsson, C. Barry, M. Lang,

- H. Liner, & C. Schneider (Eds.), Information systems development: Designing digitalization (ISD2018 Proceedings). Lund University. <https://aisel.aisnet.org/isd2014/proceedings2018/Transforming/1>
- Almasri, F. (2022). The impact of e-learning, gender-groupings and learning pedagogies in biology undergraduate female and male students' attitudes and achievement. *Education and Information Technologies*, 27, 8329–8380. <https://doi.org/10.1007/s10639-022-10967-z>
- Almusharraf, N., Aljasser, M., Dalbani, H., & Alsheikh, D. (2023). Gender differences in utilizing a game-based approach within the EFL online classrooms. *Heliyon*, 9(2). [https://www.cell.com/heliyon/fulltext/S2405-8440\(23\)00343-2](https://www.cell.com/heliyon/fulltext/S2405-8440(23)00343-2)
- Anderson, D. M., & Haddad, C. J. (2005). Gender, voice, and learning in online course environments. *Journal of Asynchronous Learning Networks*, 9(1), 3-14. <https://doi.org/10.24059/olj.v9i1.1799>
- Ashong, C. Y., & Commander, N. E. (2012). Ethnicity, gender, and perceptions of online learning in higher education. *MERLOT Journal of Online Learning and Teaching*, 8(2). http://jolt.merlot.org/vol8no2/ashong_0612.pdf
- Bear, J. B., & Woolley, A. W. (2011). The role of gender in team collaboration and performance. *Interdisciplinary Science Reviews*, 36(2), 146-153.
- Boe, J. L., & Woods, R. J. (2018). Parents' influence on infants' gender-typed toy preferences. *Sex roles*, 79(5), 358-373. <https://doi.org/10.1007/s11199-017-0858-4>
- Bear, J. B., & Woolley, A. W. (2011). The role of gender in team collaboration and performance. *Interdisciplinary science reviews*, 36(2), 146-153. <http://doi.org/10.1179/030801811X13013181961473>
- Cen, L., Ruta, D., Powell, L., & Ng, J. (2014, December). *Does gender matter for collaborative learning?* 2014 IEEE International conference on teaching, assessment and learning for engineering (TALE), Wellington, New Zealand. (pp. 433-440). IEEE. <https://doi.org/10.1109/TALE.2014.7062581>
- Chacko, S., & Jones, S. (2021). Quantitative analysis of the evolving student experience during the transition to on-line learning: Second-language STEM students. *Journal of Teaching and Learning with Technology*, 10(1). <https://doi.org/10.14434/jotlt.v9i2.31401>
- Cohen, L., Manion, L. & Morrison, K (2000). *Research methods in education* (5th ed). Routledge.
- Constantiou, I. D., & Mahnke, V. (2010). Consumer behaviour and mobile TV services: Do men differ from women in their adoption intentions? *Journal of Electronic Commerce Research*, 11(2). http://www.jecr.org/sites/default/files/11_2_p03.pdf
- Davcheva, M., & González-Romá, V. (2023). Proportion of women in work teams and team performance: A moderated mediation model. *Current Psychology*, 42, 25028–25041. <https://doi.org/10.1007/s12144-022-03534-9>
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982- <https://doi.org/10.1287/mnsc.35.8.982>
- Demuyakor, J. (2020). Coronavirus (COVID-19) and online learning in higher institutions of education: A survey of the perceptions of Ghanaian international students in China. *Online Journal of Communication and Media Technologies*, 10(3). <https://doi.org/10.29333/ojcm/8286>
- Eagly, A. H., & Wood, W. (2013). The nature-nurture debates: 25 years of challenges in understanding the psychology of gender. *Perspectives on Psychological Science*, 8(3), 340–357. <https://doi.org/10.1177/1745691613484767>
- George, R., Marcus, R., & Samman, E. (2020). *Advancing positive gender norms and socialization through UNICEF programmes: Monitoring and documenting change: Executive Summary*. UNICEF. https://www.unicef.org/eca/media/16441/file/Advancing_Positive_Gender_Norms_and_Socialization_through_UNICEF_Programmes%3A_Monitoring_and_Documenting_Change.pdf
- González-Gómez, F., Guardiola, J., Rodríguez, Ó. M., & Montero Alonso, M. Á. (2012). Gender differences in e-learning satisfaction. *Computers & Education*, 58(1), 283–290. <https://doi.org/10.1016/j.compedu.2011.08.017>
- Gullberg, A., Andersson, K., Danielsson, A., Scantlebury, K., & Hussénus, A. (2018). Pre-service teachers' views of the child—Reproducing or challenging gender stereotypes in science in preschool. *Research in Science Education*, 48(4), 691-715. <https://doi.org/10.1007/s11165-016-9593-z>
- Goswami, A., & Dutta, S. (2016) Gender differences in technology usage: A literature review. *Open Journal of Business and Management*, 4(1). <https://doi.org/10.4236/ojbm.2016.41006>
- Hartsell, T. (2005). Who's talking online? A descriptive analysis of gender & online communication. *International Journal of Information and Communication Technology Education*, 1(1). <https://doi.org/10.4018/jicte.2005010105>
- Holmes, J. (Ed.). (2000). *Gendered speech in social context: Perspectives from gown and town*. Victoria University Press.
- Hyde, J. S. (2007). New directions in the study of gender similarities and differences. *Current Directions in Psychological Science*, 16(5), 259-263. <https://doi.org/10.1111/j.1467-8721.2007.00516.x>
- Idrizi, E., Filiposka, S., & Trajkovikj, V. (2023). Gender impact on STEM online learning: A correlational study of gender, personality traits and learning styles in relation to different online teaching modalities. *Multimedia Tools and Applications*, 30201-30219. <https://doi.org/10.1007/s11042-023-14908-x>
- Johnson, D. W., & Johnson, R. T. (1986). Computer-assisted cooperative learning. *Educational Technology*, 26(1), 12-18. <https://www.jstor.org/stable/44424559>
- Johnson, R. D. (2011). Gender differences in e-learning: Communication, social presence, and learning outcomes. *Journal of Organizational and End User Computing (JOEUC)*, 23(1), 79-94. <https://doi.org/10.4018/joeuc.2011010105>

- Kans, M., & Claesson, L. (2022). Gender-related differences for subject interest and academic emotions for STEM subjects among Swedish upper secondary school students. *Education Sciences*, 12(8), 553. <https://doi.org/10.3390/educsci12080553>
- Kang, J. (2016). *Incentivizing survey participation: Best practices and recommendations*. DePaul University.
- Kay, R. H., & Knaack, L. (2008). An examination of the impact of learning objects in secondary school. *Journal of Computer Assisted Learning*, 24 (6), 447-461. <https://doi.org/10.1111/j.1365-2729.2008.00278.x>
- Kim, A. Y., Sinatra, G. M., & Seyranian, V. (2018). Developing a STEM identity among young women: A social identity perspective. *Review of Educational Research*, 88(4), 589-625. <https://doi.org/10.3102/0034654318779957>
- Kroska, A. (2014). The social psychology of gender inequality. In J. D. McLeod, E. J. Lawler, & M. Schwalbe (Eds.), *Handbook of the social psychology of inequality*, (pp. 485-514). Springer.
- Kupczynski, L., Brown, M., Holland, G., & Uriegas, B. (2014). The relationship between gender and academic success online. *Journal of Educators Online*, 11(1). <https://files.eric.ed.gov/fulltext/EJ1020184.pdf>
- Lala, G. (2014). *The emergence and development of the technology acceptance model (TAM)*. The Proceedings of the International Conference: Marketing - from Information to Decision. (pp. 149-160). Babes Bolyai University.
- Mahmood, N. (2017, 20 June). *Using Google Docs to support collaborative learning among non-native English speaking students*. In J. Johnston (Ed.), Proceedings of EdMedia 2017 (pp. 168-171). Association for the Advancement of Computing in Education (AACE). <https://www.learntechlib.org/primary/p/178319>
- Mahmoud, S. (2020, May 16). *Egypt goes online*. *Ahramonline*. Retrieved from <http://english.ahram.org.eg/NewsContent/50//1209/369166/AIAhram-Weekly/Focus/Egypt-goes-online.aspx>
- McKnight-Tutein, G., & Thackaberry, A. S. (2011). Having it all: The hybrid solution for the best of both worlds in women's postsecondary education. *Distance Learning for Educators, Trainers, and Leaders*, 8(3), 17-22.
- McLeod, S. (2020). Vygotsky's sociocultural theory of cognitive development. *Simply Psychology*. Retrieved from: <https://www.simplypsychology.org/vygotsky.html>
- Methias, N. W., & Morsi, W. K. M. (2020). Gender and phonological variation in Cairene Arabic. *Hermes*, 9, 197-232. <https://doi.org/10.21608/herms.2020.155648>
- Morsi, W. K. (2021). Work in progress: The effectiveness of using blended learning on developing Egyptian EFL learners' language skills [Conference paper]. In M. E. Auer & D. Centea (Eds.), *Visions and Concepts Education 4.0, Proceedings of the 9th International Conference on Interactive Collaborative and Blended Learning (ICBL2020)*, 14-16 October, Hamilton, Canada (pp. 456-465). Springer.
- Morsi, W. K. (2023). The impact of the blended learning approach on sustainable EFL learning in an Egyptian context. *Cultural Management: Science and Education*, 7(1), 69-83. <http://doi.org/10.30819/cmse.7-1.05>
- Morsi, W. (2024). Navigating educational transformation: Understanding learning styles' preferences of Egyptian students in the post pandemic era. *Edelweiss Applied Science and Technology*, 9(1), 52-72. <http://doi.org/10.55214/25768484.v9i1.2582>
- Morsi, W. K., & Assem, H. M. (2021). Online vs. face-to-face collaborative learning: Perceptions of students and instructors of technical writing for engineers. *2021 IEEE Global Engineering Education Conference (EDUCON)* (1571-1581). IEEE.
- Morsi, W. K., & Assem, H. M. (2022). Gender differences of Egyptian undergraduate students' achievements in online collaborative learning. In M. E. Auer, H. Hortsch, O. Michler, & T. Köhler (Eds.) *Mobility for smart cities and regional development: Challenges for higher education*. *Proceedings of the 24th International Conference on Interactive Collaborative Learning (ICL2021)*. Springer.
- Morsi, W., & Elseoud, M. S. A. (2024). Exploring the role of online discussion forums in endorsing Egyptian undergraduates' EFL learning. *Edelweiss Applied Science and Technology*, 8(6), 1986-2003. <http://doi.org/10.55214/25768484.v8i6.2368>
- Namaziandost, E., & Çakmak, F. (2020). An account of EFL learners' self-efficacy and gender in the flipped classroom model. *Education and Information Technologies*, 25, 4041-4055. <https://doi.org/10.1007/s10639-020-10167-7>
- Newsome, M., Piña, A., Mollazehi, M., Al-Ali, K., & Alshaboul, Y. (2022). The effect of gender and STEM/Non-STEM disciplines on remote learning: A national study of undergraduates in Qatar. *Electronic Journal of e-Learning*, 20(4), 360-373. <https://doi.org/10.34190/ejel.20.4.2262>
- Oláh, L. S., Kotowska, I. E., & Richter, R. (2018). The new roles of men and women and implications for families and societies. In G. Doblhammer & G. Gumà (Eds.), *A demographic perspective on gender, family and health in Europe* (pp. 41-64). Springer.
- Oláh, L. S., Vignoli, D., & Kotowska, I. E. (2020). Gender roles and families. In K. F. Zimmerman, *Handbook of labor, human resources and population economics*, 1-28. Springer.
- Ong, C.-S., & Lai, J.-Y. (2006). Gender differences in perceptions and relationships among dominants of e-learning acceptance. *Computers in Human Behavior*, 22(5), 816-829. <https://doi.org/10.1016/j.chb.2004.03.006>
- Price, L. (2006). Gender differences and similarities in online courses: Challenging stereotypical views of women. *Journal of Computer Assisted Learning*, 22(5), 349-359. <https://doi.org/10.1111/j.1365-2729.2006.00181.x>
- Rafferty, J. (2018). *Gender identity development in children*. Healthy Children.
- Rannastu-Avalos, M., & Siiman, L. A. (2020, September). Challenges for distance learning and online collaboration in the time of COVID-19: Interviews with science teachers [Conference paper]. In A. Nolte, C. Alvarez, R. Hishiyama, I.-A. Chounta, M. J. Rodríguez-Triana, T. Inoue (Eds.) *International Conference on Collaboration Technologies and Social Computing*, September 8-11, Tartu, Estonia (pp. 128-142). Springer. https://doi.org/10.1007/978-3-030-58157-2_9

- Rovai, A. P., & Baker, J. D. (2005). Gender differences in online learning: sense of community, perceived learning, and interpersonal interactions. *Quarterly Review of Distance Education*, 6(1), 31-44.
<https://www.learntechlib.org/p/106724>
- Rudman, L. A., & Glick, P. (2021). *The social psychology of gender: How power and intimacy shape gender relations*. Guilford.
- Sackett, P. R., DuBois, C. L., & Noe, A. W. (1991). Tokenism in performance evaluation: The effects of work group representation on male-female and White-Black differences in performance ratings. *Journal of Applied Psychology*, 76(2), 263-267. <https://doi.org/10.1037/0021-9010.76.2.263>
- Sánchez Franco, M. J., Villarejo Ramos, A. F., & Rondán Cataluña, F. J. (2006). Male and female professors. A gender analysis regarding the web acceptance and use. *Actas 5th International Congress of Marketing Trends*, January, 2006, Venice, Italy.
- Sawyer, J., & Obeid, R. (2017). Cooperative and collaborative learning: Getting the best of both words. In R. Obeid, A. M. Schwartz, C. Shane-Simpson, & P. J. Brooks (Eds.), *How we teach now: The GSTA guide to student-centered teaching* (pp. 163-177).
- Selwyn, N. (2007). Hi-tech=guy-tech? An exploration of undergraduate students' gendered perceptions of information and communication technologies. *Sex roles*, 56(7-8), 525-536. <https://doi.org/10.1007/s11199-007-9191-7>
- Shal, T. (2024). Parents' perceptions of online learning during COVID-19 pandemic: The road ahead. *Online Learning*, 28(1), 69-86. <https://doi.org/10.24059/olj.v28i1.3860>
- Sweida, G. L., & Reichard, R. J. (2013). Gender stereotyping effects on entrepreneurial self-efficacy and high-growth entrepreneurial intention. *Journal of Small Business and Enterprise Development*, 20(2), 296-313.
<https://doi.org/10.1108/14626001311326743>
- Takeda, S., & Homberg, F. (2014). The effects of gender on group work process and achievement: An analysis through self-and peer-assessment. *British Educational Research Journal*, 40(2), 373-396.
<https://doi.org/10.1002/berj.3088>
- Tvalchrelidze, N. (2013). Gender and culture differences in today's classrooms. *Journal of Education*, 2(1), 69-71.
<https://jeps.ibsu.edu.ge/jms/index.php/je/article/view/80>
- Valdiviejas, H., Azevedo, R. F. L., Bosch, N., & Perry, M. (2024). Automatic detection of metacognitive language and student achievement in an online STEM college course. *Online Learning*, 28(3), 524-565.
<https://doi.org/10.24059/olj.v28i3.4127>
- Venkatesh, V., & Morris, M. (2000) Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly*, 24(1), 115-139.
<http://dx.doi.org/10.2307/3250981>
- Venkatesh, V., Brown, S. A., Maruping, L. M., & Bala, H. (2008). Predicting different conceptualizations of system use: The competing roles of behavioral intention, facilitating conditions, and behavioral expectation. *MIS Quarterly*, 32(3), 483-502. <https://doi.org/10.2307/25148853>
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425-478. <https://doi.org/10.2307/30036540>
- Wehrwein, E. A., Lujan, H. L., & DiCarlo, S. E. (2007). Gender differences in learning style preferences among undergraduate physiology students. *Advances in Physiology Education*, 31(2), 153-157.
<https://doi.org/10.1152/advan.00060.2006>
- Wightman, M. (2020). Gender differences in second language learning: Why they exist and what we can do about it. *Chancellor's Honors Program Projects*. Tennessee Research and Creative Exchange, University of Tennessee, Knoxville. https://trace.tennessee.edu/utk_chanhonoproj/2371
- Yoo, S. J., & Huang, W. D. (2013). Engaging online adult learners in higher education: Motivational factors impacted by gender, age, and prior experiences. *Journal of Continuing Higher Education*, 61(3), 151-164.
<https://doi.org/10.1080/07377363.2013.836823>
- Yu, Z. (2021). The effects of gender, educational level, and personality on online learning outcomes during the COVID-19 pandemic. *International Journal of Educational Technology in Higher Education*, 18.
<https://doi.org/10.1186/s41239-021-00252-3>

Appendix 1

Formal Report Rubric

Formal Report Assessment Rubric 50%

Student Name:

Technical Writing Module – Year One

Student ID.....

Trait	Excellent (3.5-5)	Satisfactory (3-2)	Unsatisfactory (1.5-0)	E/S/U
Task Completion	<ul style="list-style-type: none"> Student has understood the objective of the task and completed the assignment as instructed. All required elements of the report (as identified in the assignment) are presented and completed to a high standard. The document is presented in a professional – looking document, using informative headings and figures/ tables where appropriate. The report meets the required word count. 	<ul style="list-style-type: none"> Student has understood the objective of the task and mostly completed the assignment as instructed. All required elements of the report ((as identified in the assignment) are presented and completed to a satisfactory standard. Attention to the presentation is given but may not be well-executed. The report almost meets the required word count. 	<ul style="list-style-type: none"> A student has misunderstood the objective of the task and failed to follow instructions. Key elements of the report are not provided and/or presented with errors. Overall presentation of the document is not to a professional standard. The report is under word limit. 	
Abstract/ executive summary	<ul style="list-style-type: none"> The purpose and objective of the report are clearly stated. The methodology of the research reached conclusion and suggested recommendations are effectively summarised. 	<ul style="list-style-type: none"> The purpose and objective of the report are stated. The methodology of the research, reached conclusion and suggested recommendations are partially summarised. 	<ul style="list-style-type: none"> The purpose and objective of the report are NOT clear. The methodology of the research, reached conclusion and suggested recommendations are poorly summarised or missing. 	
Introduction	<ul style="list-style-type: none"> The introduction is very well organized. It includes sufficient background information about the issue reported. All the necessary elements in the introduction are very well developed (the purpose, the scope and sources and methods) 	<ul style="list-style-type: none"> The introduction has background information about the issue reported. Some of the necessary elements in the introduction are elaborated (the purpose, the scope and sources and methods) 	<ul style="list-style-type: none"> The introduction has poor background information about the issue reported. Some of the necessary elements in the introduction are poorly elaborated or missing (the purpose, the scope and sources and methods) 	
Results & Visual Aids	<ul style="list-style-type: none"> Findings are arranged in well written logical segments. They are written clearly. Only facts are presented; there are no opinions or feelings. Clear, descriptive headings are used. Effective and clear visual aids are included. They are very well introduced and labelled. The section leads to an effective analysis of the findings. Discussion is clearly oriented to the purpose. It is organised in a considered, relevant manner, and leads the reader logically from the findings to the recommendations/conclusions. In other words, the justification for conclusions/recommendation is clear. If supported by appendices, these are effectively integrated into the discussion. 	<ul style="list-style-type: none"> Some findings are arranged in satisfactory logical segments. A few are written clearly. Not all facts are presented. Few visual aids are included. They are not always introduced and labelled clearly. The section leads to some analysis of the findings. 	<ul style="list-style-type: none"> Findings are NOT arranged in logical segments. They are Not written clearly. No visual aids are included/ or are very few. They are Not introduced and labelled clearly. The section does Not lead to effective analysis of the findings. 	
Discussion	<ul style="list-style-type: none"> Conclusions are relevant and accurately portray the key results of the document. Recommendations are specific action-oriented suggestions, oriented to the problem provided, and organized in a relevant manner. Conclusions/ recommendations logically flow from the document in a manner which is evident to the reader. They are presented in a clear, itemised format, with parallel grammatical structure. 	<ul style="list-style-type: none"> Discussion is oriented to the purpose, is organised but perhaps not to the best effect. The discussion provides justification and explanation leading to conclusions/ recommendations, but this is not always clear to the reader. If supported by appendices, these are integrated into the discussion, though not to the best extent. Material placed in appendices where appropriate. Conclusions are relevant and accurately portray the key results of the document. Recommendations are specific action-oriented suggestions, oriented to the problem provided, and organized in a relevant manner. Conclusions/ recommendations logically flow from the document in a manner which is evident to the reader. They are presented in a clear, itemised format, with parallel grammatical structure. 	<ul style="list-style-type: none"> Discussion is poorly organised and leaves the reader wondering how the conclusions and recommendations were made. Discussion may be supported by appendices, but the integration is not clear. 	
Conclusion/ Recommendations	<ul style="list-style-type: none"> Conclusions are relevant and accurately portray the key results of the document. Recommendations are specific action-oriented suggestions, oriented to the problem provided, and organized in a relevant manner. Conclusions/ recommendations logically flow from the document in a manner which is evident to the reader. They are presented in a clear, itemised format, with parallel grammatical structure. 	<ul style="list-style-type: none"> Conclusions are relevant and accurately portray the key results of the document. Recommendations are specific action-oriented suggestions, oriented to the problem provided, and organized in a relevant manner. Conclusions/ recommendations logically flow from the document in a manner which is evident to the reader. They are presented in a clear, itemised format, with parallel grammatical structure. 	<ul style="list-style-type: none"> Conclusions/ recommendation do not clearly flow from the document, and/ or miss key findings. They are not well organized, and are not presented in a clear, itemized format, with parallel grammatical structure. 	

Focus on Task and shared responsibility
Vocabulary, Clarity and Formality
Writing skills: Spelling, grammar, punctuation.
Referencing & in-text citation

- Report contains no errors in documentation (including citations, signal phrases, or References). The references in the list match the in-text citations and all were properly encoded in IEEE format.
- Some documentation errors exist but student generally understands how to use signal phrases; cite sources; compile a references page. No more than one or two citation errors.
- Found information is not documented correctly. Errors exist with signal phrases, citations, and references. The references in the list are missing or do not match the in-text citations.
- Very few spelling errors, correct punctuation, grammatically correct, complete sentences.
- Occasional lapses in spelling, punctuation, grammar, but not enough to seriously distract the reader.
- Numerous spelling errors, non-existent or incorrect punctuation, and/or severe errors in grammar that interfere with understanding.
- Highly appropriate, well chosen, precise and varied vocabulary.
- Consistently uses correct word choice and discipline-specific terminology.
- Argument effectively and efficiently conveyed; highly focused on the question; easily understood.
- Uses formal language.
- Consistently stays focused on task. Effectively encourages and supports the efforts of the group as a whole.
- Consistently and respectfully listens, interacts, discusses, and contributes to the group.
- Generally appropriate vocabulary; not overly repetitive. Generally, uses correct word choice and discipline-specific terminology.
- Argument reasonably clear; occasionally misses the point but answers the question; not over-elaborate or over-complicated.
- Language used is partially formal.
- Focuses on the task most of the time. Usually encourages and supports the efforts of the group as a whole.
- Usually respectfully listens, interacts, discusses, and contributes to the group.
- Excessively limited or inappropriate or repetitive vocabulary. Misuses discipline-specific terminology.
- Main point and/or argument is confused/unclear. Irrelevant information, no transition between ideas. Unclear conclusion.
- Language used is informal.
- Rarely focuses on the task and Lets others do the work. Rarely supports the efforts of the group as a whole.
- Rarely respectfully listens, interacts, discusses, and contributes to the group.

Appendix 2

Consent Form



Dear Year One Students,

Kindly be informed that your academic performance in the Technical Writing Module and Your Peer Assessment Form will be used by the Module Leader as data in a research work. The purpose of this research is to investigate the effectiveness of online collaborative group work.

Please note that students' names will **NOT** be mentioned in the research paper or any related document; your names and grades will be confidential.

Your decision to participate is voluntary. The results of this research project will be presented to the Faculty Council and may be presented at a conference or published in a journal.

If you agree to participate voluntary, please write your name and sign.

Student's Name:.....

Signature:.....

Thank you for your cooperation,

Researchers

Appendix 3

Peer Evaluation Rubric for Group Work

You are responsible for grading every other team member in your group using this rubric. Assign a score (0-5)for each of the criteria below. **Note: Your evaluation will be kept confidential.**

Criteria	Excellent 4-5	Average 2.5-3.5	Poor 1-2	Failing 0
Team role fulfillment	-Student suggested an appropriate role for him/herself and accepts their role and duties without question. -Assumed a leadership role.	-Student required some guidance to define his/her role and requires guidance to complete his/her duties. -Provided leadership when asked.	-Student required much direction and guidance to determine his/her role and required help in completing the tasks. -Provided some leadership.	-Student never accepted a role. -Provided no leadership.
Cooperation with others	-Student was always cooperative. He/she offered very useful ideas. -He/she worked extremely well with other team members.	-Student was usually cooperative. -He/she worked well with other team members and offered good ideas.	-Student was sometimes cooperative. -Student could have shared more of the workload, but only did his/her own part.	-Student was cooperative. -He/she did not do any work and did not work well with others.
Focus on task and effective contribution	-Student always completed tasks on time and was present on time to group meetings and discussions. -He/she provided effective feedback to shared content.	-Student usually completed tasks on time and was usually present on time to group meetings and discussions. -He/she provided some effective feedback to shared content.	-Sometimes completed tasks on time and was occasionally present on time to group meetings and discussions. -He/ she provided some effective feedback to shared content	-Student rarely completed his/her tasks on time and was rarely present on time to group meetings and discussions. -He/ she provided no feedback to any shared content.
Shared responsibility	-Student definitely completed the responsibilities associated with his/her role. - His/her work was very well organized, accurate, and free from errors. -He/she helped others with their tasks, and his/her work was completed early and submitted on time.	-Student complete his/her responsibilities. - He/ she helped nobody else. -His/her work met the requirements of the task and was generally complete. -His/her work was mostly done on time.	-Student did not complete his/her responsibilities and required help to finish. -His/her work tended to be disorderly, incomplete, and inaccurate. -Student's work was usually submitted late.	-Student did very little. -He/she required a lot of help from the group. -His/her work was generally incomplete and with excessive errors. - His/her work was submitted mostly late.

Names of Team Members You are Evaluating: /20;

.....:/20;:/20;: ..20

.....:/20;:/20;:..20

A sample of Students Attendance Record
Semester 1

Technical Writing
20CSCI12C

Name	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Total (%)	Gender
195141 Ahmed mohamed hassan	0	1	1	0	1	1	0	1	1	0	0	0	50	Male
192826 Ahmed Waleed Maher Mohamed	0	1	0	1	0	1	1	0	1	1	1	0	58	Male
193085 Ali Mohamed Helmi Ahmed Mahran	0	0	1	0	1	1	0	1	1	0	1	0	50	Male
195072 Ahmed Zarif Ahmed	0	0	1	1	1	1	1	0	1	1	1	1	75	Male
197957 Reem Amin Sultan	0	1	0	1	1	1	1	0	1	0	1	1	67	Female
204437 Reyam Magdy Elshiny	0	1	1	1	1	1	1	1	1	1	1	1	92	Female
193159 Sana Mohamed Loual Darwich	0	0	1	1	1	1	1	1	1	1	1	1	83	Female
206551 Sarah Mahmoud Lotfy Mohamed Amer	0	1	1	1	1	1	1	1	1	1	1	1	92	Female
195195 Seif Eldin Amr Sakr	1	0	0	1	0	1	0	0	1	1	1	0	50	Male
206002 Hagar Ali Abdelmagid Ali Shalabi	0	1	1	1	1	1	1	1	0	1	1	1	83	Female
194495 Shatha Amr Saad Hassan (Shay)	0	1	1	1	1	1	1	1	0	1	1	1	83	Female
196280 Ashraf Adel Gamil Hares (Ody Ash)	1	1	1	1	0	1	0	1	1	1	1	0	75	Male
197346 AISSATOU AIDA OUMAROU (Aisha K)	1	1	1	1	1	1	1	1	0	1	1	0	83	Female
197896 Aya Amr Hussein	1	0	1	1	1	1	1	1	1	1	1	0	83	Female
193237 Amr Hazem Mahmoud Shahin	0	0	1	0	0	1	1	1	1	1	1	0	58	Male

Mixed Group (3 females , 1 male)
Male-Only
Mixed (balanced) Group
Female-Only

Appendix 4

Peer Evaluation Rubric for Group Work Completed by Three Members of a Mixed-Group

David (a male learner) worked with female members in a mixed group mentioned that his team members were very helpful.

Faculty of Informatics and Computer Science
Technical Writing Module
Module Leader: Dr. Wesam Morsi
Fall 2020-2021
Year 1

Peer Evaluation Rubric for Group Work

You are responsible for grading every other team member in your group using this rubric. Assign a score (0-5) for each of the criteria below. Note: Your evaluation will be kept confidential.

Name: David, Hoda, Mervat, Mervat

Criteria	Excellent 4-5	Average 2.5-3.5	Poor 1-2	Failing 0
Team role Fulfillment	Student suggested an appropriate role for himself and accepts their role and duties without question. Assumed leadership role. Provided leadership when asked.	Student required some guidance to define his/her role and requires guidance to complete his/her duties. Provided some leadership when asked.	Student required much direction and guidance to determine his/her role and requires help in completing the tasks. Provided no leadership.	Student never accepted a role.
Cooperation with others	Student was always cooperative. He/she offered very useful ideas. He/she worked extremely well with other team members.	Student was usually cooperative. He/she worked well with other team members and offered good ideas.	Student was sometimes cooperative. Student could have shared more of the workload, but only did his/her own part.	Student was seldom cooperative. He/she did not do any work and did not work well with others.
Focus on Task and effective contribution	Student always completed tasks on time and was present on time to group meetings. He/she provided effective feedback to shared content.	Student usually completed tasks on time and was usually present on time to group meetings. He/she provided some effective feedback to shared content.	Student sometimes completed tasks on time and was occasionally present on time to group meetings. He/ she provided some effective feedback to shared content.	Student rarely completed his/her tasks on time and was rarely present on time to group meetings. He/ she provided no feedback to any shared content.
Shared responsibility	Student definitely completed the responsibilities associated with his/her role. His/her work was very well organized, accurate and free from errors. He/she helped others with their tasks and their work was complete early and submitted on time.	Student completed his/her responsibilities. Helped nobody else. His/her work met the requirements of the task and was generally complete. He/she worked mostly done on time.	Student did not complete his/her responsibilities and required help to finish. His/her work tended to be disorganized, incomplete and inaccurate. Student's work was usually submitted late.	Student did very little. Required a lot of help from the group. His/her work was generally incomplete and with excessive errors. Student's work was submitted mostly late.

Faculty of Informatics and Computer Science
Technical Writing Module
Module Leader: Dr. Wesam Morsi
Fall 2020-2021
Year 1

Names of Team Members You are Evaluating: ...

Jacinta 17/20
David 13/20
Hoda 13/20
Mervat 13/20
Mervat 13/20

Faculty of Informatics and Computer Science
Technical Writing Module
Module Leader: Dr. Wesam Morsi
Fall 2020-2021
Year 1

Peer Evaluation Rubric for Group Work

You are responsible for grading every other team member in your group using this rubric. Assign a score (0-5) for each of the criteria below. Note: Your evaluation will be kept confidential.

Name: Habiba, Jacinta, Mervat

Criteria	Excellent 4-5	Average 2.5-3.5	Poor 1-2	Failing 0
Team role Fulfillment	Student suggested an appropriate role for himself and accepts their role and duties without question. Assumed leadership role. Provided leadership when asked.	Student required some guidance to define his/her role and requires guidance to complete his/her duties. Provided some leadership when asked.	Student required much direction and guidance to determine his/her role and requires help in completing the tasks. Provided no leadership.	Student never accepted a role.
Cooperation with others	Student was always cooperative. He/she offered very useful ideas. He/she worked extremely well with other team members.	Student was usually cooperative. He/she worked well with other team members and offered good ideas.	Student was sometimes cooperative. Student could have shared more of the workload, but only did his/her own part.	Student was seldom cooperative. He/she did not do any work and did not work well with others.
Focus on Task and effective contribution	Student always completed tasks on time and was present on time to group meetings. He/she provided effective feedback to shared content.	Student usually completed tasks on time and was usually present on time to group meetings. He/she provided some effective feedback to shared content.	Student sometimes completed tasks on time and was occasionally present on time to group meetings. He/ she provided some effective feedback to shared content.	Student rarely completed his/her tasks on time and was rarely present on time to group meetings. He/ she provided no feedback to any shared content.
Shared responsibility	Student definitely completed the responsibilities associated with his/her role. His/her work was very well organized, accurate and free from errors. He/she helped others with their tasks and their work was complete early and submitted on time.	Student completed his/her responsibilities. Helped nobody else. His/her work met the requirements of the task and was generally complete. He/she worked mostly done on time.	Student did not complete his/her responsibilities and required help to finish. His/her work tended to be disorganized, incomplete and inaccurate. Student's work was usually submitted late.	Student did very little. Required a lot of help from the group. His/her work was generally incomplete and with excessive errors. Student's work was submitted mostly late.

Jacinta (female)

Faculty of Informatics and Computer Science
Technical Writing Module
Module Leader: Dr. Wesam Morsi
Fall 2020-2021
Year 1

Names of Team Members You are Evaluating: ...

Jacinta 13/20
Habiba 13/20
Mervat 13/20
Mervat 13/20

Team contribution

1- Introduction/ Results/ Discussion
2- Editing
3- Abstract & Conclusion
4- Abstract & Conclusion + part of introduction

Thank you Jacinta

Habiba (female)

Faculty of Informatics and Computer Science
Technical Writing Module
Module Leader: Dr. Wesam Morsi
Fall 2020-2021
Year 1

Peer Evaluation Rubric for Group Work

You are responsible for grading every other team member in your group using this rubric. Assign a score (0-5) for each of the criteria below. Note: Your evaluation will be kept confidential.

Name: Jacinta, Mervat, Mervat

Criteria	Excellent 4-5	Average 2.5-3.5	Poor 1-2	Failing 0
Team role Fulfillment	Student suggested an appropriate role for himself and accepts their role and duties without question. Assumed leadership role. Provided leadership when asked.	Student required some guidance to define his/her role and requires guidance to complete his/her duties. Provided some leadership when asked.	Student required much direction and guidance to determine his/her role and requires help in completing the tasks. Provided no leadership.	Student never accepted a role.
Cooperation with others	Student was always cooperative. He/she offered very useful ideas. He/she worked extremely well with other team members.	Student was usually cooperative. He/she worked well with other team members and offered good ideas.	Student was sometimes cooperative. Student could have shared more of the workload, but only did his/her own part.	Student was seldom cooperative. He/she did not do any work and did not work well with others.
Focus on Task and effective contribution	Student always completed tasks on time and was present on time to group meetings. He/she provided effective feedback to shared content.	Student usually completed tasks on time and was usually present on time to group meetings. He/she provided some effective feedback to shared content.	Student sometimes completed tasks on time and was occasionally present on time to group meetings. He/ she provided some effective feedback to shared content.	Student rarely completed his/her tasks on time and was rarely present on time to group meetings. He/ she provided no feedback to any shared content.
Shared responsibility	Student definitely completed the responsibilities associated with his/her role. His/her work was very well organized, accurate and free from errors. He/she helped others with their tasks and their work was complete early and submitted on time.	Student completed his/her responsibilities. Helped nobody else. His/her work met the requirements of the task and was generally complete. He/she worked mostly done on time.	Student did not complete his/her responsibilities and required help to finish. His/her work tended to be disorganized, incomplete and inaccurate. Student's work was usually submitted late.	Student did very little. Required a lot of help from the group. His/her work was generally incomplete and with excessive errors. Student's work was submitted mostly late.

Appendix 5

Peer Evaluation Rubric for Group Work Completed by a Male Student in a Mixed-Group (1 male 3 females).

The male student gave all his female peers full grades in the peer evaluation without any differences.

Seif (male)

Faculty of Informatics and Computer Science
 Technical Writing Module
 Module Leader: Dr. Wesam Morsi
 Fall 2020-2021
 Year I

Peer Evaluation Rubric for Group Work

You are responsible for grading every other team member in your group using this rubric. Assign a score (0-5) for each of the criteria below. Note: Your evaluation will be kept *confidential*.

Name: Seif, Elodin, Sakr ID#: 115195

Criteria	Excellent 4-5	Average 2.5-3.5	Poor 1-2	Failing 0
Team role Fulfillment	Student suggested an appropriate role for him/herself and accepts their role and duties without question. Assumed leadership role.	Student required some guidance to define his/her role and requires guidance to complete his/her duties. Provided leadership when asked.	Student required much direction and guidance to determine his/her role and requires help in completing the tasks. Provided some leadership.	Student never accepted a role. Provided no leadership.
Cooperation with others	Student was always cooperative. He/she offered very useful ideas. He/she worked extremely well with other team members.	Student was usually cooperative. He/she worked well with other team members and offered good ideas.	Student was sometimes cooperative. Student could have shared more of the workload, but only did his/her own part.	Student was seldom cooperative. He/she did not do any work and did not work well with others.
Focus on Task and effective contribution	Student always completed tasks on time and was present on time to group meetings. He/she provided effective feedback to shared content.	Student usually completed tasks on time and was usually present on time to group meetings. He/she Provided some effective feedback to shared content.	Student sometimes completed tasks on time and was occasionally present on time to group meetings. He/she provided some effective feedback to shared content.	Student rarely completed his/her tasks on time and was rarely present on time to group meetings. He/she provided no feedback to any shared content.
Shared responsibility	Student definitely completed the responsibilities associated with his/her role. His/her work was very well organized, accurate and free from errors. He/she helped others with their tasks and their work was complete early and submitted on time.	Student completed his/her responsibilities. Helped nobody else. His/her work met the requirements of the task and was generally complete. His/her work was mostly done on time.	Student did not complete his/her responsibilities and required help to finish. His/her work tended to be disorderly, incomplete and inaccurate. Student's work was usually submitted late.	Student did very little. Required a lot of help from the group. His/her work was generally incomplete and with excessive errors. Student's work was submitted mostly late.

Faculty of Informatics and Computer Science
 Technical Writing Module
 Module Leader: Dr. Wesam Morsi
 Fall 2020-2021
 Year I

Names of Team Members You are Evaluating:

Sara, Dem/20;
Sana Darwish/20;
Reem Amia/20;
/20;

Thank you Doctor.

Appendix 6

Peer Evaluation Rubric for Group Work Completed by a Female Student in a Female-only Gro

Faculty of Informatics and Computer Science
 Technical Writing Module
 Module Leader: Dr. Wesam Morsi
 Fall 2020-2021
 Year I

Peer Evaluation Rubric for Group Work

You are responsible for grading every other team member in your group using this rubric. Assign a score (0-5) for each of the criteria below. Note: Your evaluation will be kept *confidential*.

Name: Shatha ID#: 194495

Criteria	Excellent 4-5	Average 2.5-3.5	Poor 1-2	Failing 0
Team role Fulfillment	Student suggested an appropriate role for him/herself and accepts their role and duties without question. Assumed leadership role.	Student required some guidance to define his/her role and requires guidance to complete his/her duties. Provided leadership when asked.	Student required much direction and guidance to determine his/her role and requires help in completing the tasks. Provided some leadership.	Student never accepted a role. Provided no leadership.
Cooperation with others	Student was always cooperative. He/she offered very useful ideas. He/she worked extremely well with other team members.	Student was usually cooperative. He/she worked well with other team members and offered good ideas.	Student was sometimes cooperative. Student could have shared more of the workload, but only did his/her own part.	Student was seldom cooperative. He/she did not do any work and did not work well with others.
Focus on Task and effective contribution	Student always completed tasks on time and was present on time to group meetings. He/she provided effective feedback to shared content.	Student usually completed tasks on time and was usually present on time to group meetings. He/she Provided some effective feedback to shared content.	Student sometimes completed tasks on time and was occasionally present on time to group meetings. He/she provided some effective feedback to shared content.	Student rarely completed his/her tasks on time and was rarely present on time to group meetings. He/she provided no feedback to any shared content.
Shared responsibility	Student definitely completed the responsibilities associated with his/her role. His/her work was very well organized, accurate and free from errors. He/she helped others with their tasks and their work was complete early and submitted on time.	Student completed his/her responsibilities. Helped nobody else. His/her work met the requirements of the task and was generally complete. His/her work was mostly done on time.	Student did not complete his/her responsibilities and required help to finish. His/her work tended to be disorderly, incomplete and inaccurate. Student's work was usually submitted late.	Student did very little. Required a lot of help from the group. His/her work was generally incomplete and with excessive errors. Student's work was submitted mostly late.

Faculty of Informatics and Computer Science
 Technical Writing Module
 Module Leader: Dr. Wesam Morsi
 Fall 2020-2021
 Year I

Names of Team Members You are Evaluating:

Reyana18.5/20;
Hajar17/20;
/20;
/20;
/20;

We were a cooperative group and reviewed each other's work. Tasks were divided fairly among each of us. Each one finished her tasks and we helped each other.

Shatha

This is an open-access article distributed under the terms of a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0) license.