The Role of Technology-Mediated Feedback Pre- and Post COVID-19: A Case Study of First-Year Communication Students

Sally Lewis, Thai McGill, Lisa-Angelique Lim, and Rebecca Godwin
University of South Australia, Australia

Abstract

As universities welcome students who completed their secondary education during the disruptive period of the COVID-19 pandemic, it is timely to consider if their prior learning experiences influence receptiveness to technology-mediated communication. Australian Year 12 students struggled to stay motivated and connected with their learning during the pandemic, while also experiencing an increase in screen time of more than a day each week. Studies also indicate more secondary school students felt disengaged with online learning, likely due to the pandemic forcing them to learn online. This study explored commencing university student online activity and performance in a first-year course with technology-mediated communication in 2022 (n=118) and compared results with a similar pre-pandemic course in 2019 (n=192). Learning analytics data was used to create technology-mediated feedback based on student interaction with the course content and student learning experiences were evaluated. Course engagement data and a range of metrics were examined including the frequency of access to course information and assessment related content. Course performance data including final course grades and individual assessment results was also collected and examined. While an early outcome of research on post-pandemic technology-mediated communication, our findings suggest the 2022 student cohort were less receptive to technology-mediated feedback when compared to the pre-pandemic cohort.

Citation

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Introduction

Feedback from educators in higher education can be a contributing factor to improved academic performance in students (Zimbardi et al., 2017), with research conducted prior to the COVID-19 pandemic indicating that feedback has a positive impact on learning (Hattie & Timperley, 2007; Lewis et al., 2021). Using learning analytics, technology-mediated communication becomes a personalised and in-depth process that allows students to develop and improve learning strategies as well as other related skills (Banihashem et al., 2022).

Engagement and retention of commencing university students has been an issue of ongoing concern. The catalyst for this research was anecdotal information gathered from a commencing first-year communication course. In that course, 17% of students who were enrolled post census and passed their initial assignments, subsequently disengaged, and failed the course (n= 212). Three contributing reasons become apparent: the number of hours students were in paid work, transition "shock" moving from secondary school to university, and assignment submission anxiety. In response, an intervention strategy was trialled: an integrated strategy incorporating learning analytics and personalised communications with targeted feedback was embedded in first-year single-unit course. A previous study (Lewis et al., 2021) evaluated the effectiveness of an intervention strategy on strengthening the engagement of first-year students, with students reported that the personalised feedback increased their motivation to engage with their learning and "nudged" them to complete their course tasks. Some students even reported that the reminders "saved [their] grade a few times" because they submitted assessments that they otherwise may have missed.

However, research since the start of the pandemic has identified changes in how university students engaged with online learning platforms. Of note, some studies found that many students do not view, or open technology-mediated feedback (and emails in general), and individual learner differences can be a contributing factor as to whether they ignore or use the prompts (Bahari, 2021; Woods, 2022; Sauchelli et al., 2023). Due to the differences in student interaction with feedback, as well as the recently diminished face-to-face interactions in higher education (Palvia et al., 2018; Scull et al., 2020), the personalisation of technology-mediated feedback is of interest to educators.

Given the positive outcomes of a previous study (Lewis et al., 2021), which was conducted prior to the disruptions caused by the pandemic, the primary objective of this research was to investigate the influence of technology-mediated feedback emails on academic achievement in the post-COVID-19 era. A significant proportion (61%) of the study cohort completed their secondary education during a period characterised by widespread lockdown restrictions, leading to a substantial surge in online and hybrid education practices (Palvia et al., 2018; Scull et al., 2020). Consequently, this study aimed to assess whether the transition to online learning in the final years of secondary school had impact on the responsiveness of students to technology-mediated feedback emails upon commencing university. Specifically, this study aimed to identify any differences in how students who recently completed their secondary schooling primarily through online and/or blended learning due to the pandemic restrictions, respond to technology-mediated communications in their commencing year at university.

Research Questions

This study explores two research questions:

Research question 1: What is the impact of personalised technology-mediated feedback on communication students' online activity in 2022 compared to 2019?

Research question 2: What is the impact of personalised technology-mediated feedback on communication students' academic performance in 2022 compared to 2019?

Literature

Personalised Feedback and Learning Analytics

Effective feedback can improve student skills including self-regulated learning, committing to more challenging tasks, self-feedback skills, and error detection skills leading to improved academic performance. Students are also more likely to increase their effort when a goal is clear (Hattie & Timperley, 2007). While online feedback presents the chance to improve student engagement, it can also result in in an increased variability in student performance (Zimbardi et al., 2017). Learning analytics aims to improve students' learning experiences by drawing on digital activity and performance data to personalise feedback and support at scale. Feedback systems based on learning analytics can draw on log data, grade data, and other data collected from offline sources such as attendance records. It is through this collection of data that educators can create technology-mediated feedback emails that are personalised, based on each student's interaction with online course content (Pardo et al., 2018).

The utilisation of learning analytics to deliver personalised feedback emails to students is under continual review with research suggesting that personalised feedback emails increase students' academic achievement and self-regulated learning (Dart & Spratt, 2021; Lewis et al., 2021; Lim et al., 2021; Mousavi et al., 2021; Sauchelli et al., 2023). Personalised feedback can also increase feelings of connection to the course and educator for commencing, first-year students, with studies also suggesting emails of this nature encourage students to ask for assistance, which in turn results in educators providing them with additional feedback (Dart & Spratt, 2021; Farrell & Brunton, 2020). Technology-mediated feedback emails based on learning analytics can support the processes that allow students to develop and improve learning strategies as well as other related skills (Banihashem et al., 2022). However, studies have also found that many students do not view, or open technology-mediated feedback (and emails in general), and individual learner differences can be a contributing factor as to whether they ignore or use the prompts (Bahari, 2021; Woods, 2022; Sauchelli et al., 2023).

Technology-Mediated Communications

In a study on student-centric technology-mediated communication aimed at Millennials and Gen Z university students (Gen Zs defined as being born after 1997 to 2012, which includes the age range of interest in this case study), Ross (2019) observed "instructors attempting to engage classes of Millennial and post-Millennial students may find deploying LMS [Learning Management System] an inefficient and/or ineffective use of course preparation time, relative to students' active learning engagement" (p. 92). The students in that study indicated that feedback communicated through the learning management system was less than effective at helping facilitate interactions.

Students also identified technology related challenges and accessibility related issues as impeding their ability to use various university systems. This research (Ross, 2019) also highlighted the wide range of different communication technology platforms used by the students, with 17 different communication channels being used at various levels of frequency. Also of note is research into the use of email by communication students – the cohort in this study. Research (Ha et al., 2018) suggests communication students are generally high social media users and this is likely to increase their overall email avoidance: "dealing with a large load of e-mails, one strategy is to avoid or ignore the e-mails in general, read them less frequently, or selectively choose emails to read" (Ha et al., 2018, p. 217).

Further research since the start of the pandemic has also identified changes in how university students engaged with online learning platforms and technology-mediated communications. Given the shift to online learning during the peak period of COVID-19 disruptions, a study by Ploj Virtic et al. (2021) found that students' use of email only increased in the low to medium range while their use of messaging apps (specifically Microsoft Teams) increased significantly. Heim's (2022) research during the pandemic measured the influence of academic emails on psychology students, and determined there was no measurable impact in relation to engagement across five measures including motivation and self-efficacy in response to emails sent by academics.

Method

Participants

The participants involved in this study were first-year students enrolled in a communication course at an Australian university in 2022. At the beginning of the course, students were informed that they would be receiving technology-mediated feedback emails based on how they engaged with the course material as part of an ongoing study. They were also informed that their de-identified course activity data from the Learning Management System (LMS) and grades would be used to gauge the effectiveness of the feedback. Students were given the chance to opt out of the study at this time. At the end of the course, students were invited to provide feedback via an anonymous online questionnaire to gather feedback about their experience with the technology-mediated feedback emails. The associated participant information sheet and explanatory video also advised students the questionnaire was optional and that responses were anonymous.

Courses

Course A (2018 and 2019)

To enable the analysis between cohorts who commenced pre and post pandemic, this study examined data from a core, first-year communications course reported on in a previous study (Lewis et al. 2021), where students showed increased performance after receiving technology-mediated feedback. In the previous study, data from 2018 (where students did not receive technology-mediated feedback) was compared to 2019 (where students did receive technology-mediated feedback). Course A followed the same structure in 2018 as it did in 2019. Each week the participants viewed multiple short lectures ranging from 5–50 minutes. The tutorials ran for 1 hour and 50 minutes, with eleven of the tutorials delivered in class and one tutorial delivered online. The final course grade was aggregated from 3 assignments. The first was worth 30% of the course grade and consisted of writing short answers, the second was an essay worth 30%,

and the final assignment was a presentation worth 40%. The 2018 and 2019 student cohorts were demographically similar, and the assessments and pedagogical approach of the teaching teams were the same.

Course B (2021 and 2022)

Course B was selected due to its close alignment to Course A. Course B is a similar core, first-year course from the same communication and media degree. Course B followed the same structure in both 2021 and 2022, with 12 weeks of teaching delivered via online lecture videos (ranging from 9–45 minutes) and in-person tutorials (running for 1 hour and 20 minutes each week). In 2022, however, the week 2 and 3 tutorials were held on Zoom due to COVID-19 restrictions. The final course grade was aggregated from 3 assignments. The first was worth 30% of the course grade and consisted of writing short answers, the second was an essay worth 40%, and the final assignment was a presentation worth 30%. The student demographics were similar across Course A and Course B in terms of student gender ratios, age, and enrolment type. The assessment and pedagogical approaches of the teaching teams were also similar.

Table 1 summarises Courses A and B in terms of the year delivered and the feedback intervention employed.

Table 1

Courses in the Study

	Pre-pandemic course (Course A)		Post-pandemic course (Course B)	
Name	Communication and Media		Public Relations Theory and Practice	
Details	4.5-unit, core introductory course, year 1, AQF level 7			
Year	2018	2019	2021	2022
Technology-mediated Feedback	No	Yes	No	Yes
Number of Students	206	192	156	118

Note. The 2018 and 2021 students did not receive technology-mediated feedback emails. The 2019 and 2022 students did receive technology-mediated feedback emails.

OnTask for Personalised Feedback

The OnTask system (Pardo et al., 2018) collects a multitude of data points of student engagement with the LMS. Instructors can select specific online activity data for which to develop "if-then" rules to generate personalised feedback messages to all students. The online activity data was used to generate rule-based personalised feedback messages that were sent as batch emails to

students based on their engagement and performance on the weekly activities and assessments. For example: students were sent an email welcoming them to the course the week before commencement. If a student had already accessed the course site, they were congratulated and prompted to look at the important materials for week 1. If they had not accessed the course site, they were reminded that it contained important information and it would be a good idea to view it before the first week. This follows Hattie and Timperley's (2007) approach on providing effective feedback, with a focus on where and how students are going, and where to next. OnTask was used to create similar emails about tutorial attendance, lecture viewing, assessment materials access, and assessment results, among other areas. This technology-mediated feedback was sent in the week prior to teaching commencing, in weeks 1–3, weeks 5, 7–8, during the teaching break, and in weeks 11 and 14. A handful of studies have been conducted to evaluate the impact of personalised feedback using OnTask, by examining LMS activity data over the course of the intervention (e.g., Lim et al., 2021; Matcha et al., 2020). In such studies, analysis of LMS activity data has been helpful for uncovering how personalised feedback can influence students' learning behaviours.

Data Analysis

This study employed statistical analysis of student course data gathered from the LMS from 2022 (compared to 2021) and 2019 (compared to 2018). As the data were not normally distributed, Mann-Whitney U tests were conducted to compare Course A 2018 to Course A 2019, as well as to compare Course B 2021 to Course B 2022. At the conclusion of the Course B 2022 semester, the academic performance of that cohort (who received technology-mediated feedback) was compared to that of the 2021 cohort (that did not receive technology-mediated feedback). This comparison is the same as the 2019 study, where the 2019 results were compared to the 2018 class that did not receive technology-mediated feedback.

Student participation was voluntary, and the following groups were excluded from the 2022 study: students who withdrew from the course (n=4), students who did not log into the course website (n=3), and students who were under the age of 18 at the time of the study (n=2). The same groups were excluded from the 2021, 2019 and 2018 data sets. The researchers gained ethics approval from the University's Ethics Committee before the commencement of the study.

Results

Course Activity Data

At the end of the 2022 semester, all student data was collected from the course LMS via the online dashboard. Nine metrics were examined, and then compared with the 2021 cohort which did not receive technology-mediated feedback emails. Table 2 describes the nine learning management system metrics analysed in the study.

Table 2

Online Activity Measures Generated from Learning Management System Activity Data

Attribute	Description
Average session duration	Average duration of session (in seconds)
Frequency of AM sessions	Number of sessions between 0400 hrs and 1159 hrs per week
Frequency of DAYTIME sessions	Number of sessions between 1200 hrs and 1959 hrs per week
Frequency of NIGHTTIME sessions	Number of sessions between 2000 hrs and 0359 hrs per week
Frequency of ALL sessions	Total number of sessions
Session Regularity	Average duration between successive sessions (in seconds)
Assessment	Frequency of access to assessment-related content per week
Course-related Access	Frequency of access to course-related information per week
Topic-related Access	Frequency of access to topic-related content per week

Note. Session Regularity refers to how often students are logging on and measures the length of time between sessions; Course-related Access refers to content regarding course-related information such as the course outline and announcements; Topic-related Access includes weekly topic-related content, such as lecture recordings, readings, and formative, non-graded activities.

The online activity of students in Course B in 2021 (who did not receive technology-mediated feedback) were compared with 2022 (who did receive technology-mediated feedback) (Table 3). The data shows significant differences between the two cohorts in various attributes. A Mann-Whitney U test found that Session Regularity (how often students logged on) and Assessment (the frequency of access to assessment-related content) were the only attributes that significantly improved in 2022, when technology-mediated feedback was introduced. Other metrics were found to have significantly decreased. Table 3 compares the online student activity in a course offered in 2022 with technology-mediated feedback to the same course in 2021 offered without technology-mediated feedback (where the Mann-Whitney test statistic is 'U').

Table 3

Comparison of Online Activity Between Cohorts of Commencing Communication Students in 2021 and 2022 (Course B)

Attribute	Median		U	Sig
	2021 (n=156)	2022 (n=118)		
Average session duration	3047	2230	7836.5	<.001
Frequency of AM sessions	30	25	8325	<.001
Frequency of DAYTIME sessions	5	6	10636.5	0.406
Frequency of NIGHTTIME sessions	24	18	8575	<.001
Total number of sessions	59	50	7909.5	<.001
Session regularity	11051	8117	8186	<.001
Assessment	70	84	13212	0.011
Course-related access	79	90	12615	0.078
Topic-related access	103	92	8128.5	<.001

Note. Session Regularity (how often students are logging on) and Assessment (the frequency of access to assessment related content) were the only attributes that significantly improved from 2021 to 2022 (when technology-mediated feedback was introduced).

The online activity of students who received technology-mediated feedback in 2019 (Course A) and 2022 (Course B) was compared (Table 4). A Mann-Whitney U test found differences between the two cohorts in various attributes, with 2022 students generally spending less time per session but having increased activity in terms of the number of sessions and specific content access. Assessment, Course-related access, and Topic-related access show particularly notable increases in activity in 2022 compared to 2019.

Table 4

Comparison of Online Activity Between Cohorts of Commencing Communication Students in 2019 (Course A) and 2022 (Course B)

Attribute	Median		U	Sig
	2019 (n=192)	2022 (n=118)		
Average session duration	5380	2230	5211.5	<.001
Frequency of AM sessions	32	25	8798.5	<.001
Frequency of DAYTIME sessions	6	6	10623.5	0.357
Frequency of NIGHTTIME sessions	24	18	7715.5	<.001
Total number of sessions	63	50	7639	<.001
Session Regularity	14459	8117	7624	<.001
Assessment	46	84	19554.5	0
Course-related Access	46	90	19764	0
Topic-related Access	118	92	7254	<.001

Note. Session Regularity (how often students are logging on), Assessment (the frequency of access to assessment related content) and Course-related Access (the frequency of access to course related information) increased from 2019 to 2022. Students in both courses received technology-mediated feedback.

Course Performance Data

The impact of personalised technology-mediated feedback on communication course performance in 2022 compared to 2019 was evaluated. Final course grades and individual assessment results were analysed.

Figure 1 compares the final grades for students in courses offered in 2019 and 2022 (with technology-mediated feedback) to the same courses in 2018 and 2021 (without technology-mediated feedback). For Course A, the 2019 cohort performed better than the 2018 cohort; their overall course grades were stronger with an increase in the proportion of Credit grades (by 7.3%) and Distinction grades (by 7.8%). Moreover, there was a decrease in the proportion of students failing the course, from 15.0% to 11.4%. In contrast, for Course B, the overall course grade between the 2021 and 2022 cohorts was in favour of 2021; 63% of students received a Credit or higher in 2021, while only 54% of students achieved this result in 2022. Additionally, despite receiving technology-mediated feedback, the 2022 cohort had 4% more students with failing grades than the 2021 cohort.

Figure 1

*Final Course Grades for the Two Core, First-Year Communication courses (Courses A and B)*
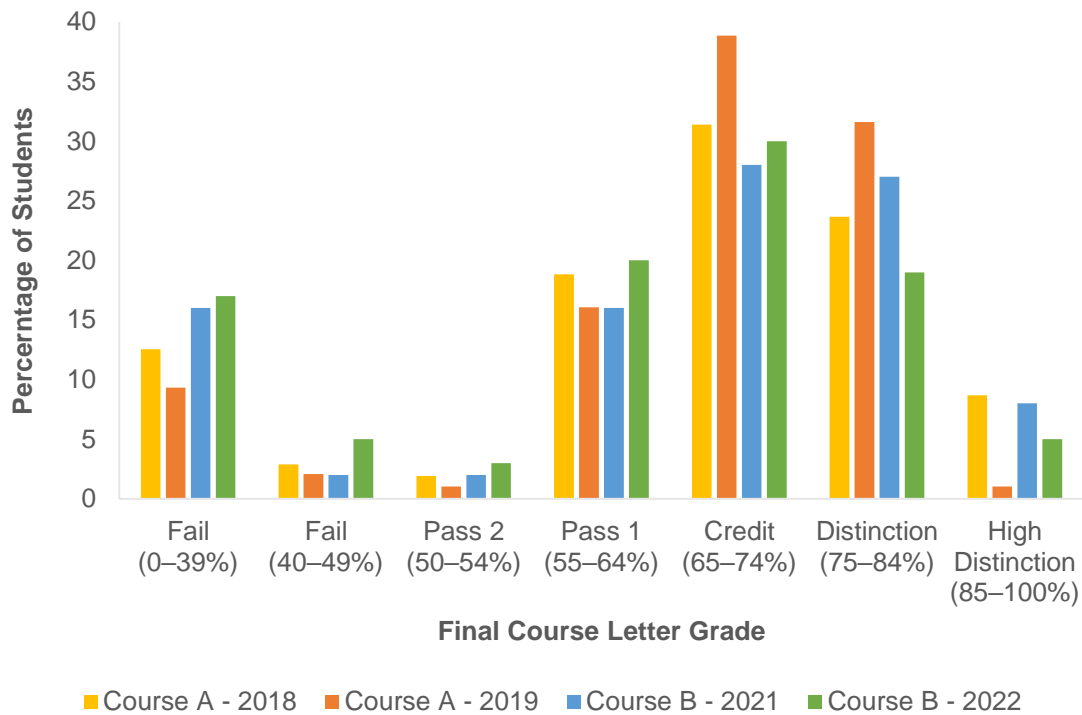
Note. The 2019 cohort who received technology-mediated feedback emails showed an increase in higher range grades. The 2022 cohort who received technology-mediated feedback emails showed a small improvement in mid-range grades and fewer high-range grades.

Figure 2 compares the individual assessment grades for students in Course A and in Course B. For Course A, the 2019 cohort (who received technology-mediated feedback) showed improvement over the 2018 cohort in all assessments except Assessment 1. For Course B, the 2022 cohort (who received technology-mediated feedback) showed an improvement over the 2021 cohort only for Assessment 1.

Figure 2

Assessment Outcomes for the Two Core, First-Year Communication courses (Courses A and B)
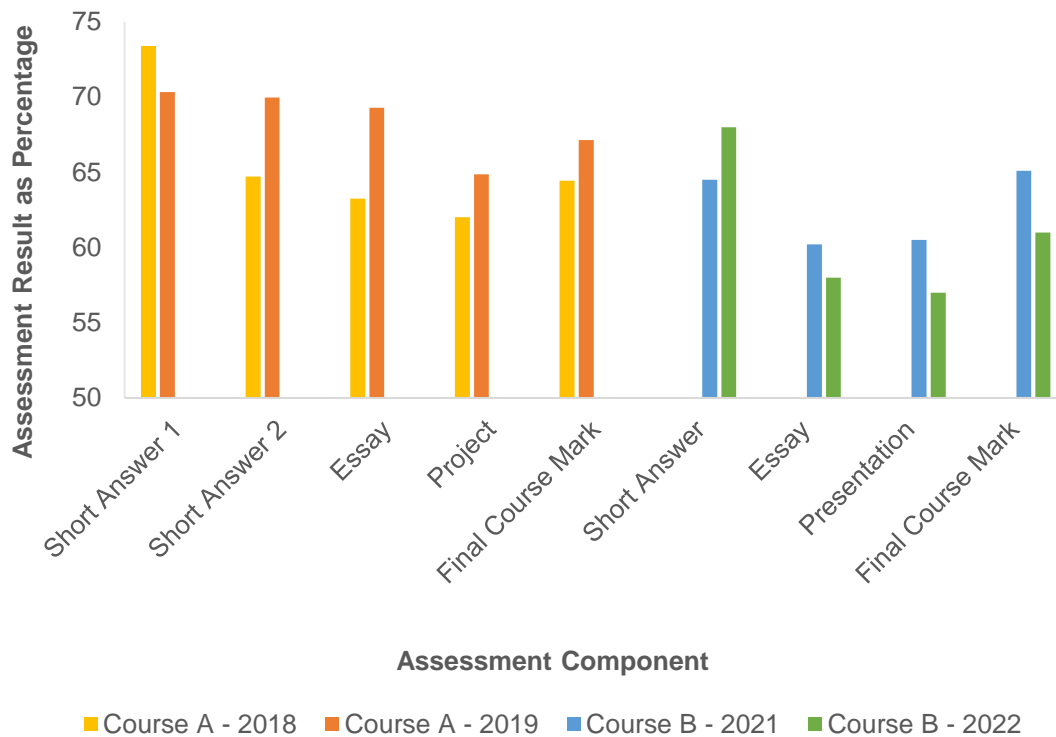
Additionally, while 12.5% of students improved their grade on each consecutive assignment in 2021, only 5.77% of students achieved this in 2022. The 2021 cohort also showed greater levels of improvement than the 2022 cohort, with respect to assignments 1–2 (36.98% improvement compared to 10.90%), and assignments 1–3 (36.98% compared to 18.59%). While the 2022 cohort did have a higher percentage of improvement between assignments 2 and 3, the increase was minimal (29.49% improvement compared to 23.96%).

Student Questionnaire Responses

While not detailed in this study due to low response rates (n=6), the students who did provide feedback through the optional questionnaire said the technology-mediated feedback was "fairly useful", "great reminders" with one student commenting "it seemed there was a sense of care". Of specific note, in relation to the question "Did the technology-mediated feedback emails help you transition to independent university learning?", a student commented: "Yes, it helped keep that connection and concern of that of a high school teacher while promoting independence and self-promotion". Feedback from course educators suggested that the low response rate to the questionnaire could be reflective of the general apathy among the cohort in relation to engaging with academic discourse.

Discussion

This study presents the findings from analysis of student responses to technology-mediated personalised feedback following the peak period of COVID-19 disruption (2020–2021) to better understand the receptiveness to such feedback by first-year university students who completed their secondary education during the period of COVID-19 lockdowns. Specifically, we explored student online activity and performance in a communication course following technology-mediated feedback emails and compared it to a statistical analysis of a similar pre-pandemic course.

The results of this study do not align with previous pre-COVID-19 course results (Lewis et al., 2021), with the results showing a decrease in the number of times students accessed general learning content and declining improvement in grades after the first assessment. This was unexpected given the previous 2019 study indicated that this feedback method had the potential to improve student performance and online activity. However, there were indicators even before the pandemic induced pivot to online teaching and learning with studies pointing to increased variability in the success of engaging students through technology mediated communication channels (Ross 2019; Zimbardi et al., 2017). Further post pandemic studies have assessed the impact of individual learner differences and student receptiveness to emails (Sauchelli et al., 2023) and question if some students are becoming desensitised to technology mediated email (Bahari 2021; Woods 2022).

One reason for the behaviour in this study could be that 61% of the students completed high school during the pandemic, suggesting that they gained experience in their secondary education with respect to navigating online learning and developed the self-regulated learning skills that the feedback aimed to promote. Recent studies (Hammerstein et al., 2021; Limniou et al., 2022) reflect on the challenges final secondary school students had with motivation and staying engaged with online learning during the pandemic, while the amount of screen-time increased during this disruptive period (Arundell et al., 2021). It is also possible that the forced shift into online teaching and learning due to the pandemic has resulted in university educators providing improved online instructions and more accessible online course sites.

The focus on one disciplinary area, commencing communication students, while of interest is a limitation of this research. Students in the communication discipline are likely to be high social media users and accordingly more likely to avoid emails or have strategies in place to limit their emails (Ha et al., 2018). In their research on student use and perceptions of web-based communication, Strauss and Hill (2007) determined almost 50% of marketing students (marketing and communication are aligned at the university for this study) accessed email less than once a month. However, this email avoidance may not be isolated to communication students, with more recent studies indicating that other discipline areas are also being impacted by changing student responsiveness to technology-mediated feedback. In their work on commencing Gen Z medical students, Cretu et al. (2020) discuss the differences between "traditional" academic discourse and the texting, abbreviated, informal and visual discourse favoured by this age group: "Although they use e-mail, they may perceive it as more formal (in our experience, our newest generations of medical students may even forget to check their emails while they concurrently enquire about the same issues via messenger and social media)" (p. 289). Similarly, emerging data from

Claveria (2021) suggests that Gen Zs and Millennials are increasingly engaged in messaging apps and social media platforms for communication and their use of email is declining.

Conclusion

The findings of this study suggest the 2022 commencing student cohort were overall less receptive to technology-mediated feedback when compared to the pre-pandemic cohort. This cohort of students completed their secondary education during the period when pandemic lockdown restrictions were commonplace, and schools rapidly pivoted to online teaching and learning. It is possible the increase in online learning and associated screen time during the lockdown periods could influence the effectiveness of technology-mediated feedback for this group of students upon commencing university studies. It is also possible this cohort of students have greater familiarity with learning online, and at the same time educators have also improved how they teach online, both of which could contribute to changing behaviour in engaging with technology-mediated emails. Given this, it is suggested further research is required to extend our current knowledge and evaluate the use of alternative forms of digital communication, including mobile applications and social media platforms, to encourage commencing student engagement with course learning materials.

Acknowledgment

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