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Digitalisation of writing in higher education: the COVID-19 pandemic impact

Natalia Mospan
Borys Grinchenko Kyiv University, Ukraine, monavik123@gmail.com

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Digitalisation of writing in higher education: the COVID-19 pandemic impact

Abstract

The COVID-19 pandemic has accelerated the digital transformation of higher education worldwide. It also has facilitated digital writing in remote classrooms and beyond. During lockdowns, digital writing has become a constant way of communication in our lives. The research examines the COVID-19 pandemic impact on digital writing transformation in higher education. It also assumes the dependence of writing modes on distance learning types. Empirical evidence gathered through quantitative and qualitative research methods involves higher education teachers and students surveyed in a Ukrainian university to understand their perceptions and experience of writing online during the Coronavirus lockdowns in 2020-22. The research results reveal trends in transforming writing modes (traditional vs digital), writing conditions, and educational technology. Furthermore, the research shows that the higher education transition to digital format during the COVID-19 pandemic has encouraged the digitalisation of writing, and even new modes of collaboration through digital writing. They include detailed description and visualisation of interactive learning activities with additional ICT tools that can optimise the educational process. The findings and guidelines can contribute to studying digital writing in higher education during and post-pandemic.

Practitioner Notes

1. EdTech integration in educational settings promotes new modes of digital writing.
2. Higher education in the pandemic is characterised by increased digital writing and dominance over handwriting.
3. There are ‘student-used’ and ‘teacher-used’ digital writing tools in distance learning.
4. Writing modes and written e-feedback (typed and delivered electronically) depend on distance learning types, digital tools and participants.
5. Implementation of additional digital tools and apps can enlarge the EdTech potential for synchronous digital writing practices in a virtual educational environment.

Keywords

Digital Writing, Digital Transformation, Higher Education, COVID-19 Pandemic

Introduction

The COVID-19 pandemic has accelerated the digitalisation of higher education worldwide, forcing universities to respond with online teaching (Kaqinari et al., 2021) and digital resilience (Eri et al., 2021). In turn, it has substituted traditional writing in education. For example, during lockdowns, the EdTech integration created an online educational environment, which required university teachers and students to transition to digital writing (DW) mode. Although DW was quite a standard mode for Z-generation students (Miranda, 2020), it caused new challenges for teachers in terms of extra workload and upskilling. Consequently, higher education emergency digitalisation has caused a transition from traditional paper-based to digital screen-based texting and typing in educational settings. Besides, online education provision is likely to increase the amount of DW cases and their variety, i.e., annotating, texting, typing, and e-mailing.

This paper investigates writing conditions in higher education during the COVID-19 pandemic, and sheds light on the following research questions:

RQ 1. Have the writing modes transformed significantly (from traditional to digital) in higher education during the COVID-19 pandemic?

RQ 2. Do DW forms depend on the distance learning types?

Distance learning types refer to video conferencing, hybrid distance education, and fixed-time online courses (Simon, 2021).

As this is predominantly an empirical research paper, a discussion of the thematic literature review intends to fill the previous research gaps – examining the contemporary concept of DW in education. Based on 70 publications available from the Web of Science core collection (2013-2022), an effort is made to distinguish six recurring central themes referred to DW in education – modes of writing, digital writing educational potential, digital writing tools, teaching, students' or teachers' perception, assessment and feedback. Regarding this, the literature review is organised into these six subsections that address each aspect of this topic.

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Literature Review

Contemporary Concept of Digital Writing

Modes of Writing

The Digital Era brought a new concept of writing – DW. Contemporary scientific literature presents various terms regarding writing. For instance, writing on paper and digitally (Driskell, 2016; Taipale, 2014); digital and traditional writing (Steffi, 2016); handwriting and digital writing (Dahlström & Boström, 2017); handwriting and keyboard writing (Mangen, 2018); analogue and

digital writing (Wurth et al., 2013); personal writing and digital composing (Sorapure, 2019). The variety of the terms refers to two modes of writing – conventional and DW.

Semingson & Amaro-Jiménez (2017) define 'digital writing' as writing via digital tools "that takes place in digital/virtual spaces such as blogging, digital storytelling, word processing, cloud-based writing, and more" (p. 321). Pandya & Sefton-Green (2021) emphasise that there is no generally accepted definition of 'digital writing'. Therefore, this term encompasses all forms of writing on social media, blogs or forums, texting, extended filmmaking, animation, and complex design (Pandya & Sefton-Green, 2021). The current assumptions of writing "no longer only refers to analogue text but also includes digital" (Garcia & Diaz, 2021, p. 228). DW does not erase but re-produces analogue or paper-based writing (Wurth et al., 2013).

Following Semingson & Amaro-Jiménez (2017), Nordquist (2018), and Wurth et al. (2013), 'digital writing' in this research refers to creating texts via ICT tools (e.g., texting, typing, annotating, chatting and emailing), which re-produces paper-based writing. The social practices of DW are diverse and wide-ranging (Sefton-Green, 2021). Exploring children's digital emergent writing on tablets, Neumann (2021) ranged five types of DW development. Scholars distinguish various forms of DW utilised in education, e.g., asynchronous digital writing (Vazquez-Cano et al., 2019); digital collaborative writing (Godoy, 2021); digital multimodal composition (Maghsoudi et al., 2022); writing instant messages (Simoes-Perlant et al., 2018); chatting or producing texts with media (Doldi, 2008). Besides, DeVoss (2018) highlights three matters of digital writing, e.g., the network context, collaborative composing, and "the ways in which digital writing is policed" (p. 9). All these forms, including student academic writing and digital writing projects (multiliterate and multimodal), are produced via ICT tools (Bell & Hotson, 2021).

Distinguishing traditional writing from DW, Steffi (2016) points to the dynamic and multimodal nature of the last mode. Unlike printed text, a digital setting "opens up comprehensive horizons of the text" in educational practices (Conte et al., 2022, p. 1). Moreover, digital written content differs from spelling standards (Simoes-Perlant et al., 2018). For example, digital writing in instant messaging apps has unique ortho-typographic and audio-visual characteristics (Sampietro, 2022; Vazquez-Cano et al., 2015).

Digital Writing Educational Potential

There is enough evidence of DW's potential for supporting student writing at any level of education. Examining different writing conditions at primary school, scholars find that digital access and opportunities to practice improve student's writing and spelling (Dahlström & Boström, 2017), enriche motivation (Baker & Lastrapes, 2019) and increase students' agency (Dahlström, 2019). DW carries beneficial opportunities for university students as well. First, Taipale's (2014) investigation shows that writing on a keyboard enables university students to increase textual productivity. Second, asynchronous digital writing improves the orthography of university students (Vazquez-Cano et al., 2019). Third, the digital environment encourages an intrinsic motivation to improve students' research writing abilities (Azizian, 2014) and writing scientific articles online (Mufidah et al., 2019). In addition, the combination of the traditional skills of writing and hybrid forms afforded by technology fosters the creative potential of writing (Ashton et al., 2017). Finally, Godoy (2021) shows that digital collaborative writing interactions activate various forms of group construction and personal identity. However, there is evidence that word processing programs

(i.e., Microsoft Word) can pose a barrier to technology-based writing proficiency and typing fluency among students with learning disabilities who need individualised assistance (Foxworth et al., 2019).

Digital Writing Tools

Early research reveals that digital technologies for analysing writing products improve writing and cognitive processes (Doldi, 2008). Emphasising the rapid development of artificial intelligence, McKnight (2021) believes that in the last decades, humans have needed less input in the writing process, co-composing with digital tools for spelling and grammar checkers. In this respect, EdTech creates a digital educational environment providing various tools for encouraging students' writing proficiency and achieving successful teaching goals. Besides accessibility, digital tools provide emerging opportunities for writing, editing and storytelling (Dahlström, 2019).

Scholars discuss the significant benefits of online resources incorporated into teaching DW. Ching (2018) points out that the advantages of digital tools vary and depend on different writing tasks. For instance, Powtoon, Google Docs and the Wiki system are potential means to foster collaborative writing and develop digital skills in classrooms (Azzari, 2019; Soh et al., 2013). Artificial intelligence-powered writing tools (e.g., Web 2.0 tools) have a positive impact on writing instruction in L2 classrooms (Laire et al., 2015), and they are efficient for teaching academic writing of native (Catala et al., 2013) and non-native students (Nazari, 2021). DW tools promote university students' access to content-area knowledge and new forms of academic literacy (Ronan, 2017), support creative writing and improve the students' quality and accuracy of writing (Sari, 2022). Moreover, introducing a digital whiteboard in distance education activates learning dynamics fostering student engagement (Reguera & Lopez, 2021). However, the evidence of the social media potential (e.g., Facebook) for teaching writing differs. While "a small but growing body of research has indicated positive effects of social media on learning outcomes" (Laire et al., 2015, p. 6855), others express rhetorical concerns about social writing in narrow digital spaces for limited purposes and audiences (Gold et al., 2020).

Digital Writing Instruction

Scholars discuss the urgency of DW integration into assignments, classrooms, and curricula (Sorapure, 2019). However, teachers and students face challenges while integrating the new resources into educational settings, as EdTech requires multiliteracies from participants in a rapidly evolving technological environment (Skains, 2019; Soh et al., 2013). In turn, Benzie and Harper (2020) express concern about digital products increasingly guided by university students for writing in online learning environments. Digital tools "position writing as a technical process and elide the role of social context in determining what 'good' writing is" (p. 633).

Nevertheless, there is evidence of good DW practices at school, namely through applications such as the iPad, which provides vast learning opportunities for students to produce texts in flexible and recursive ways (Franklin & Gibson, 2015; Kervin & Mantei, 2016; Wollscheid et al., 2016). Concerning higher education, various approaches are used to integrate digital tools into writing instructions successfully. For instance, the integration of digital tools and multimodal texts into teaching collaborative writing maximising digital literacy learning opportunities (Link, 2021); creative writing with a focus on digital fiction and interactive design (Skains, 2019); development of digital scrapbooking strategies related to writing skills (Vincent et al., 2019); combining

analogue and digital methods in teaching humanities (Stepanchuk, 2018). However, Bell and Hotson (2021) found a significant need for writing centre support for multimodal DW projects. This issue indicates that teaching writing in a digital environment requires instructors to pay attention to continuous professional development and awareness of emerging digital tools (Gillis & Marshall, 2014).

Digital Writing Assessment and Feedback

Rapid implementation of digital tools in educational settings has dramatically changed the assessment of writing. In this concern, current investigations focus on the methodological, technological, and ethical approaches to DW assessment (i.e., multimodal, networked texts) (McKee & DeVoss, 2013). West-Puckett (2016) states that digital tools applied in education have made assessment of writing more visible, equitable, and portable. Educators need to utilise digital resources for teaching and assessing writing as rhetorical tools in line with audiences, educational objectives and contexts (Neal, 2010). One of the practical tools for assessing writing is digital ink (Xavier et al., 2014). Teachers evidence that collaborative assessment of students' DW increases learning outcomes (Hicks, 2015).

Furthermore, written feedback in teaching and assessing DW is beneficial to improving a student's performance. Digital tools implementation in the classroom causes the emergence of e-feedback (typed feedback delivered to students electronically) (Chang et al., 2012) and its various forms – e-mail, audio and video feedback, as well as digital written feedback, provided via iPad and a digital red pen (Clark-Gordon et al., 2019; Lee & Cha, 2022). Scholars found that students prefer e-feedback for its timeliness, accessibility, legibility, psychological relief, and self-regulation (Chang et al., 2012; Lee & Cha, 2022), while teachers prefer e-feedback for its usability, acceptance and benefits for students (Clark-Gordon et al., 2019).

Students'/Teachers' Perception of Digital Writing

Students and teachers are direct users of digital products when writing digital texts, so their opinion is an objective of current investigations demonstrating students' positive attitudes to digital writing practices in the classroom. Hence, students perceive collaborative digital graphic writing as an "opportunity to learn from each other's comments and suggestions" (Kilickaya, 2020, p. 58). A digital whiteboard as a dynamic tool contributes to understanding abstract concepts and class engagement (Reguera & Lopez, 2021). Students believe digital storytelling improves their writing skills and harmonise technology and writing (Tanrikulu, 2020). Moreover, recent findings reveal the correlation between digital media usage and students' self-perception of writing abilities and styles (Parrella et al., 2021).

In addition, students' perception of digitally-based writing likely depends on their level of digital literacy and awareness. For example, comparing Italian and Finnish students, Taipale (2014) shows that Finnish students prefer DW affordances more to their non-digital alternatives. Regarding teachers' perceptions of DW, fewer studies examine this issue. For example, Hicks (2014) shows that while some teachers incorporate DW tools and make significant changes in their writing instructions, others do not. Nevertheless, teachers integrate DW practices gradually into the classroom and perceive them positively. Besides, teachers consider e-feedback to be time-saving, effective and more understandable to students (McKee, 2016, p. 27). Despite the educational potential of DW and its positive perception by students and teachers, analogical

practices are still common, although there is a trend in shifting from paper-based practices to DW, namely in thesis writing (Alvarez-Cadavid et al., 2022).

Methods

The answers to the research questions, whether the writing modes have transformed significantly (from traditional to digital) in higher education during the COVID-19 pandemic and whether the DW forms depend on the distance learning types, were received through empirical data and practical experience. The empirical evidence gathered through quantitative and qualitative research methods involves university teachers and students surveyed at Borys Grinchenko Kyiv University to understand their perception and experience of writing online during the lockdowns in 2020-2022. The University's Ethics Committee approved the study before the commencement of the research.

The research presents data collected from two surveys – primary and secondary. The primary surveys were conducted mainly to give answers to the research questions. The data from the secondary surveys, also conducted by the author, aimed at investigating students' perception of distance learning during the COVID-19 pandemic, is used to demonstrate trends in DW in higher education in 2020-2022.

In the primary surveys, two quantitative questionnaires for students and lecturers were designed in Google Forms and administered online via university e-mail, and responses were anonymous. A snowball technique for sampling was utilized, whereby students and teachers were asked to share the questionnaire with their group peers and colleagues. As a result, the respondents are university teachers (n = 90) and students (n = 413) from three departments – the English Philology, the Teacher Education, and the ICT Departments. This approach allows us to cover teachers and students from different fields. Concerning the secondary surveys, the data is collected from the responses of Bachelor's and Master's students of the English Philology Department in 2020/2021 (n = 514) and 2021/2022 (n = 134) academic years. Data analysis is based on descriptive statistics. In addition, based on personal teaching experience, the author illustrates good practice examples in DW provided with Bachelor and Master students in synchronous distance education during the COVID-19 pandemic.

The article is divided into two parts – empirical and practical.

Results

Empirical Evidence of Digital Writing in Distance Learning

One of the instruments of university digitalisation is EdTech integration and distance learning provision. During the COVID-19 pandemic, universities have experienced various types of distance learning – learning through fixed-time online courses, hybrid distance education or video conferencing. Thus, creating different educational environments and writing conditions promote a range of new digital tools for writing, e.g., annotations or collaborative writing on a whiteboard and texting in chats on video conferencing platforms. In addition, fixed-time online courses provide digital assignment comments as a tool for teachers' e-feedback. EdTech and digital tools can equip teachers and students with a vast opportunity for e-mailing, texting via messaging apps,

presenting learning material through PowerPoint presentations or Word Docs, and recording audio or video task performance/comments.

Collected data from surveyed teachers and students makes it possible to 1) reveal trends in DW 2020-2022; 2) investigate the role of handwriting and DW in distance learning. The data analysis sheds light on the variety and frequency of DW tools utilised in virtual classrooms, in online exams and for e-feedback from the perspectives of teachers and students. Accordingly, based on the students' evidence collected in 2020-2022, there are noted trends of a slight increase of DW in higher education since the first wave of the COVID-19 pandemic, namely in emailing (M = 80.9%) and texting (M = 52.7%) (see Figure 1).

Furthermore, comparing responses from survey participants, that regarding writing conditions in distance learning, the majority of students (75.7%) and teachers (86.6%) practise DW via ICT tools. Students' and teachers' evidence of writing conditions almost coincide except for indicators of video conferencing, where data differs significantly. Students' handwriting indicators are higher (28.0%) than teachers' (8.8%), which is likely due to the video conferencing provided for lectures as well, where students could traditionally take notes – with a pen on paper (see Table 1).

Figure 1

Digital Writing Trends 2020-2022 (%)

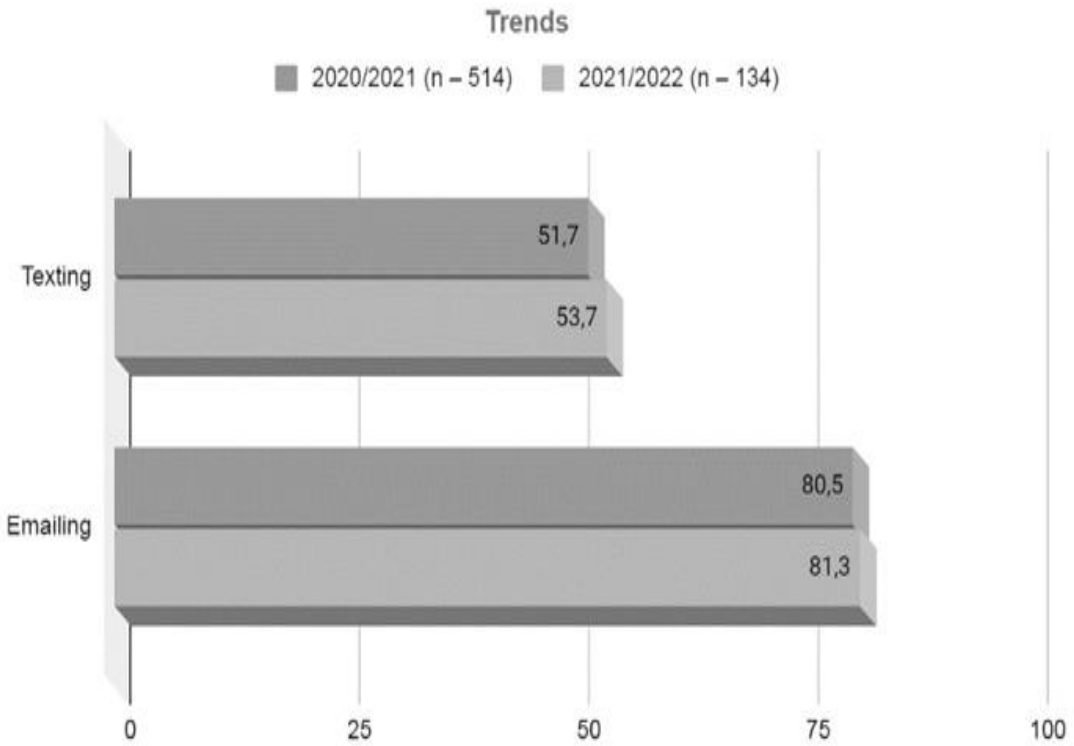


Table 1

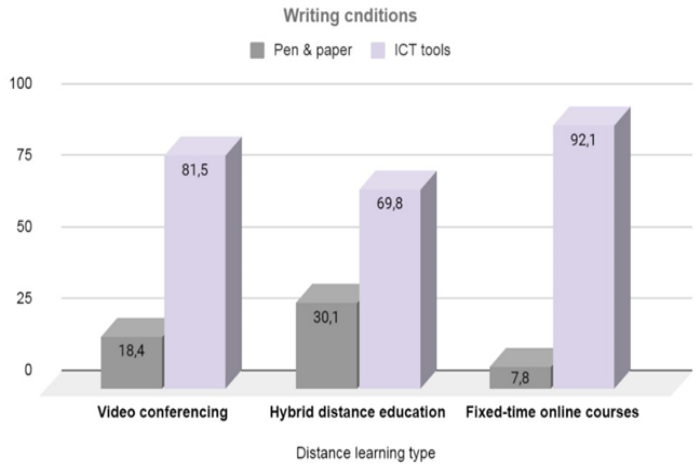
Frequency of Writing Conditions in Distance Learning (%)

Distance learning type	Pen & paper			ICT tools		
	Students' data	Teachers' data	Mean	Students' data	Teachers' data	Mean
Video conferencing	28.0	8.8	**18.4**	71.9	91.1	**81.5**
Hybrid distance education	35.8	24.4	**30.1**	64.1	75.5	**69.8**
Fixed-time online courses	8.9	6.6	**7.8**	91.0	93.3	**92.1**
Mean	**24.2**	**13.3**	**18.8**	**75.7**	**86.6**	**81.1**

In terms of dependency of writing conditions on distance learning types, data shows that DW is more frequently used on fixed-time online courses (M = 92.1%) and in virtual conferencing (M = 81.5%). In comparison, in hybrid distance education, DW (M = 69.8%) is combined with handwriting (M = 30.1%) which is explained by the educational potential of the last format – a combination of online and offline learning (see Figure 2).

Figure 2

Writing Conditions in Distance Learning Types (M, %)



The next issue examined through the surveys is distance learning-related writing tools frequently utilised in higher education during the COVID-19 pandemic. Comparing students' and teachers'

evidence, the significant difference in data in dependency on DW tools provided by distance learning types is worth noting.

1. Students use traditional writing tools more frequently than teachers in video conferencing (61.7% vs 27.8%), hybrid distance education (72.6% vs 42.2%) and fixed-time online courses (41.6% vs 14.4%).
2. Students utilise Word Docs more frequently than teachers in video conferencing (84.0% vs 60.0%) and on fixed-time online courses (90.5% vs 70.0%). At the same time, in hybrid distance education, the indicators are almost the same (88.6% vs 81.1%).
3. Such distance learning-related writing tools as PowerPoint presentations, whiteboards and chats on video conferencing platforms are more usable by teachers for learning material presentation in virtual classrooms and hybrid distance education.
4. Chats in messenger apps are more common for students in video conferencing (51.3% vs 45.6%) and hybrid distance education (51.5% vs 48.8%), with a slight advantage in indicators in favour of teachers on fixed-time online courses (33.6% vs 41.1%). Though e-mailing is preferable for teachers. These figures suggest that messenger apps and e-mails are widely used writing tools for exchanging instructions and learning tasks when oral communication is not affordable.

There is evidence of utilising audio and video assignment recording. Students use the opportunity to record audio assignments more frequently than video recording, whose indicators significantly dominate in fixed-time online courses (82.2%). In comparison, Moodle allows quick and efficient commenting on students' assignments, therefore, teachers use this DW tool (65.5%) on fixed-time online courses (see Table 2).

Table 2

Frequency of Digital Writing Tools (%)

Writing tool	Video conferencing		Hybrid distance education		Fixed-time online courses	
	Students' data	Teachers' data	Students' data	Teachers' data	Students' data	Teachers' data
Pen & paper	61.7	27.8	72.6	42.2	41.6	14.4
Word Doc	84.0	60.0	88.6	81.1	90.5	70.0
PowerPoint	60.7	84.4	67.5	86.6	60.0	80.0
E-mail	29.3	48.9	36.0	62.2	29.5	47.7
Chat (apps)	51.3	45.6	51.5	48.8	33.6	41.1
Audio task	22.3	16.7	22.7	20.0	23.2	13.3
Video task	17.4	25.6	15.4	30.0	82.2	27.7
Whiteboard	33.4	46.7	24.2	42.2	-	-
Chat (Zoom)	44.3	76.7	30.0	58.8	-	-
E-comment	-	-	-	-	15.0	65.5

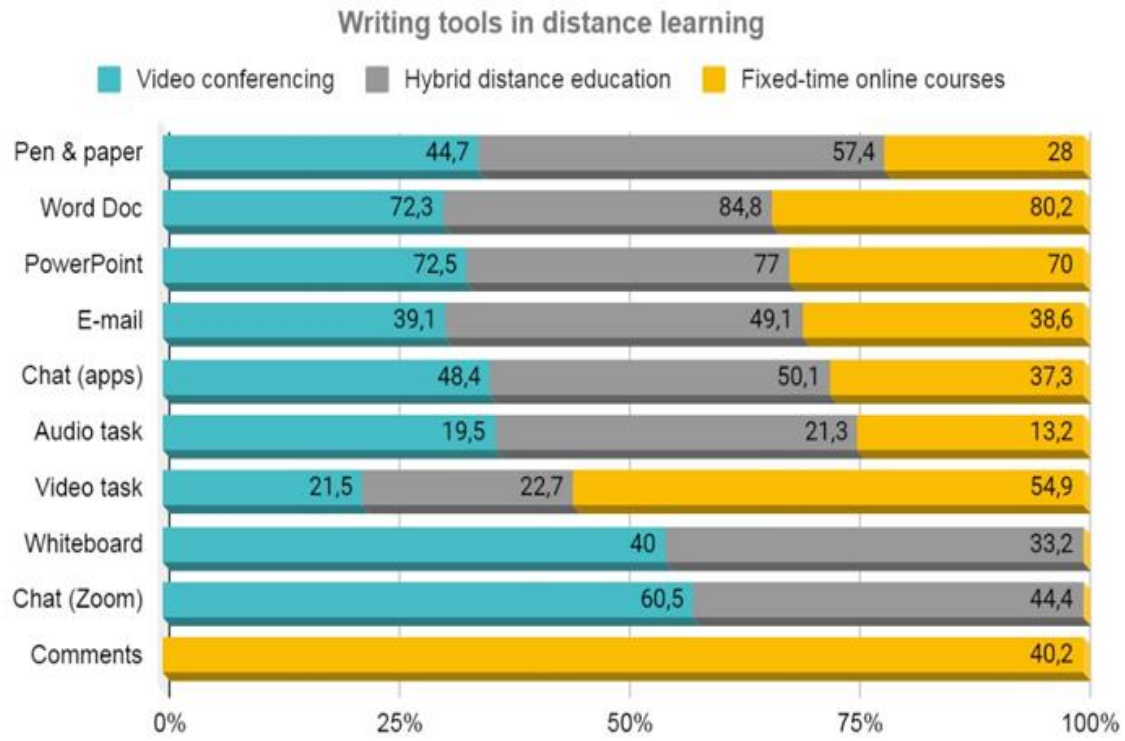
DW tool implementation varies from distance learning types as well. For example, ranking the top 3 digital writing tools shows that in video conferencing, the most usable instruments are

PowerPoint (M = 72.5%), Word Docs (M = 72.3%), and chats on video conferencing platforms (M = 60.5%).

In hybrid distance education, the most suitable writing tools are Word Docs (M = 84.8%), PowerPoint (M = 77.0%), and pen & paper (M = 57.4%). The top 3 digital tools in fixed-time online courses are Word Docs (M = 80.2%), PowerPoint (M = 70.0%), and video assignment recording (M = 54.9%). The use of tools is subject to the technical capacity of EdTech. Video conferencing platforms allow text in chats, and this affects its frequency in the learning process. Fixed-time online courses (i.e., Moodle) allow students and teachers to upload various files, which explains the frequency of video assignment recordings substituting the lack of live communication (see Figure 3).

Figure 3

Digital Writing Tools per Distance Learning Types (M, %)



Concerning writing tools utilised in online exams, both students and teachers employ Word Docs (M = 65.1%), chats on video conferencing platforms (M = 40.3%) and pen & paper (M = 30.1%). In turn, students write with a pen more frequently than teachers (44.3% vs 13.3%), while e-mailing is a common digital tool for instructors (33.3%). In addition, PowerPoint (M = 25.9%), and whiteboards (M = 25.4%) are applied in online exams as well (see Table 3).

The final issue the survey reveals is teachers' e-feedback provided in distance learning. Comparing students' and teachers' responses, presented in Table 4, the data indicates a significant superiority of e-feedback over handwritten feedback. For example, students' evidence

that teachers frequently annotate (46.4%) and text via messenger apps (52.3%) to provide e-feedback in video conferencing. However, teachers report giving most e-feedback through texting in chats on video conferencing platforms (74.7% and 70.0%) and texting comments on students' test tasks on Moodle (65.5% and 84.7%) and e-mailing (41.1%, 55.5%, and 48.8%). Recording of audio and video task comments is also undertaken.

Table 3

Writing Tools Utilised in Online Exams (%)

Writing tools	Students' data	Teachers' data	Mean
Word Doc	70.2	60.0	**65.1**
Chat (Zoom)	26.3	54.4	**40.3**
Pen & paper	44.3	13.3	**30.1**
E-mail	19.6	33.3	**26.4**
PowerPoint	24.2	27.7	**25.9**
Whiteboard	25.4	25.5	**25.4**
Chat (apps)	16.4	22.2	**19.3**
Video assignment	11.6	18.8	**15.2**
Audio assignment	9.68	7.77	**8.73**

Table 4

Feedback in Distance Learning (%)

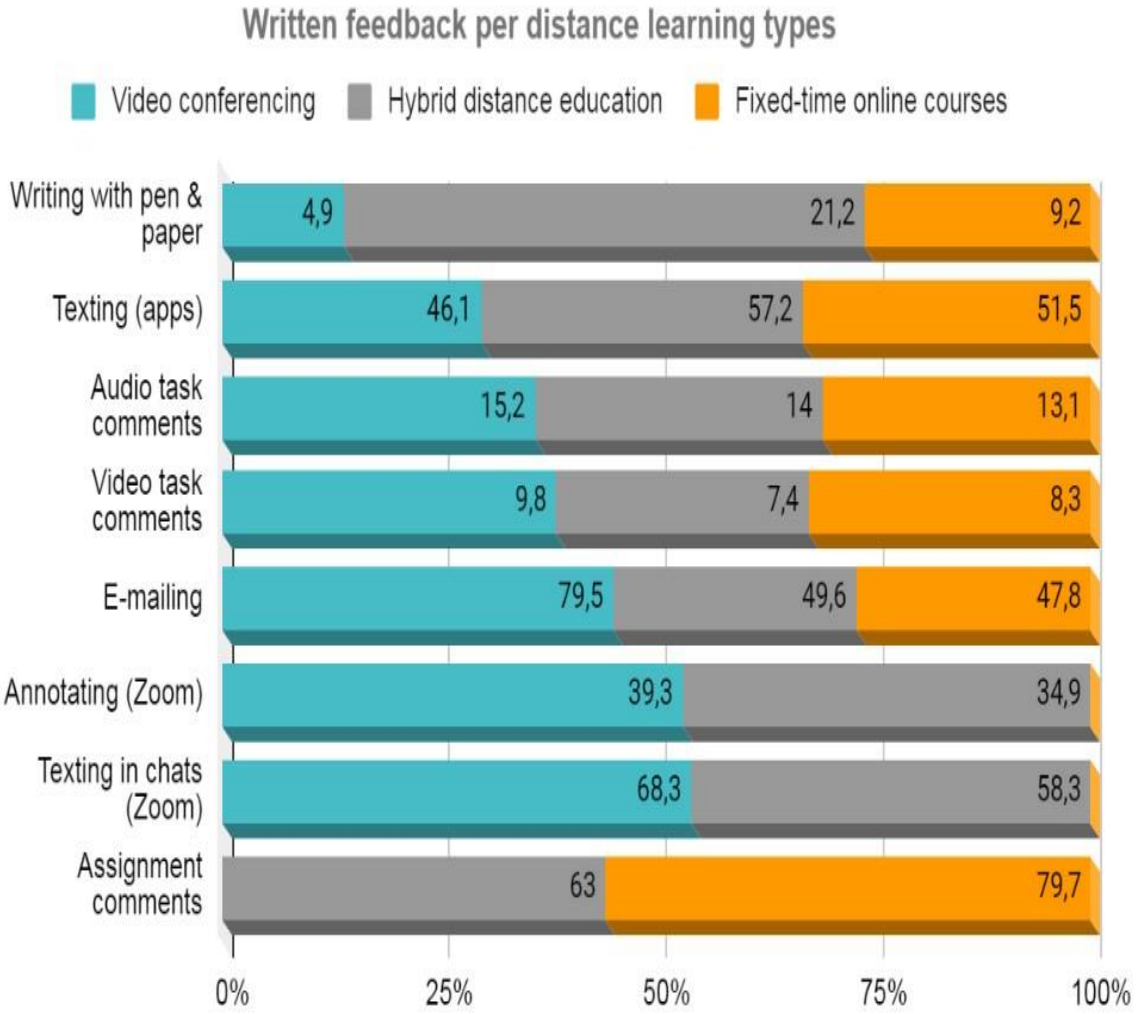
Writing tools	Video conferencing		Hybrid distance education		Fixed-time online courses	
	S*	T	S	T	S	T
Handwriting	3.14	6.6	21.3	21.1	11.8	6.6
Texting (apps)	52.3	40.0	61.2	53.3	55.4	47.7
Audio task comments	15.0	15.5	14.7	13.3	10.8	15.5
Video task comments	9.6	10.0	9.4	5.5	6.7	10.0
E-mailing	38.4	41.1	43.8	55.5	46.9	48.8
Annotating (Zoom)	46.4	32.2	37.7	32.2	-	-
Texting in chat (Zoom)	62.2	74.4	46.7	70.0	-	-
Assignment comments	-	-	60.5	65.5	75.0	84.4

S* – students' data; T* – teachers' data

Feedback provided in distance learning types is dominated by e-feedback while the percentage of handwritten feedback is insignificant, with higher indicators in hybrid distance education (M = 21.2%). The top three digital tools applied for providing e-feedback in video conferencing are e-mailing (M = 79.5%), texting in chats on video conferencing platforms (M = 68.3%) and texting in messenger apps (M = 57.2%); in hybrid distance education – texting assignment comments on Moodle (M = 63%), texting in chats on video conferencing platforms (M = 58.3%) and texting in messenger apps (M = 57.2%); in fixed time online courses – texting assignment comments (M = 79.7%), texting in messenger apps (M = 51.5%) and e-mailing (M = 47.8%%). In addition, audio task comments (M = 15.2%) and video task comments (M = 9.8%) occasionally occur in video conferencing (see Figure 4).

Figure 4

Written e-Feedback per Distance Learning Types (M, %)



Good Practices of Digital Writing in Distance Education

The article shows that the COVID-19 pandemic impacted traditional methods of conducting classes at university, course delivery and learning materials while transforming face-to-face teaching-learning into an online format. For example, in the university many paper materials (e.g., coursebooks, handouts, tests, and registers), which were commonly used and printed for traditional classes, became unsuitable for digitally-based education. As a result, educators faced challenges in searching for alternative internet resources or converting paper coursebooks into a digital format which was time-consuming and required digital literacy and ICT devices accessibility. EdTech integration resulted in a pedagogical approach shift and encouraged digital creative teaching, which is illustrated below. Examples of the problem-solution practices of synchronous DW applied by the author in synchronous distance learning in higher education during the COVID-19 pandemic are also presented below.

Following Anderson-Inman et al. (1996), 'synchronous digital writing' is defined as a writing condition when students and teachers are able to write via ICT tools in the same document simultaneously. Example 1 demonstrates synchronous digital annotating in the English Phonology course. The activity objective is to do phonetic and intonation analysis of the given sentence. The digital tools are video conferencing platforms with a whiteboard (i.e., WebEx or Google Meet and Jamboard) and the toPhonetics app for converting English text to phonetic transcription. This approach allows a teacher to demonstrate a sentence transcription for a student to perform the task, engage others to comment, and provide digital peer error correction. Besides, a teacher has an opportunity for rapid e-feedback (see Figure 5).

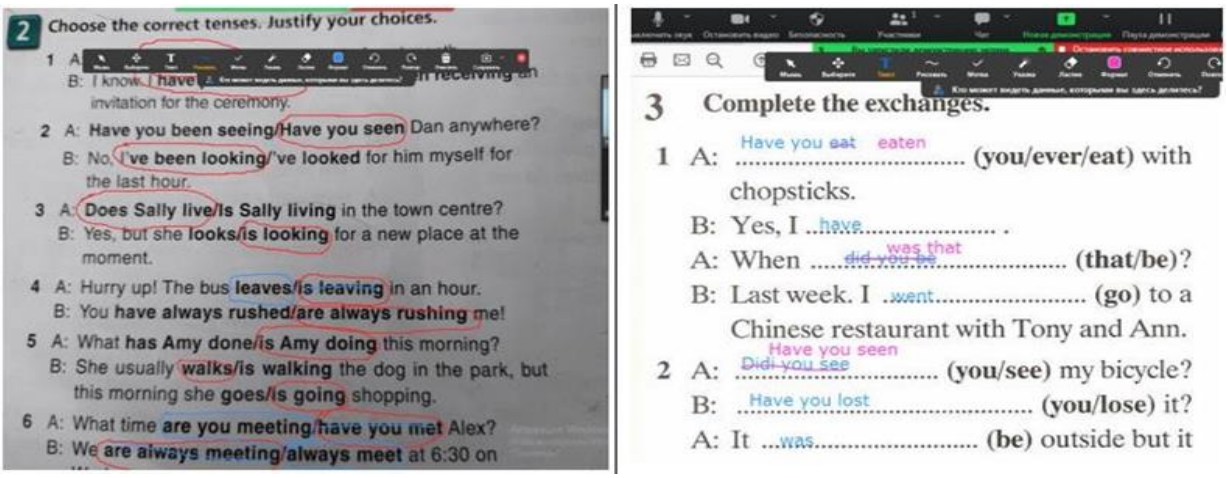
Figure 5

Synchronous Digital Annotating on Whiteboard/Interactive Board

Example 2 illustrates synchronous DW in the English Grammar course. The activity objective is to put the verbs into the correct tense. The digital tools are video conferencing platforms with an annotation panel (i.e., Zoom) and grammar exercises in PDF files or photos. While exercises are demonstrated on the screen, students have an opportunity to text sentences and correct themselves or one another. Then a teacher can provide error correction and e-feedback in different ink colour (see Figure 6).

Figure 6

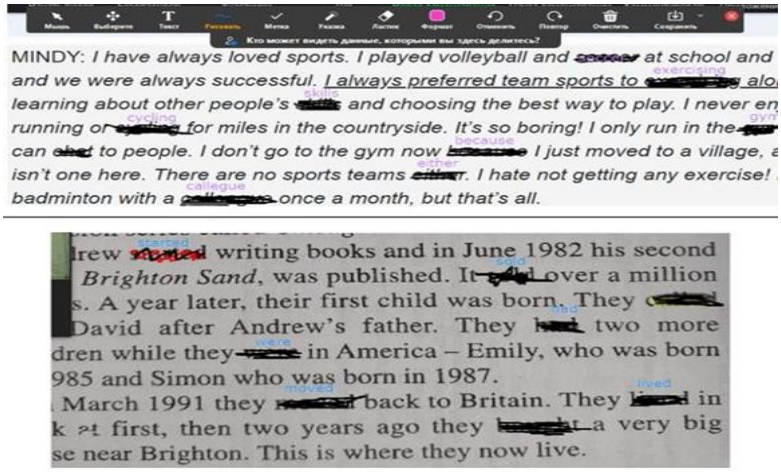
Synchronous Digital Writing, Error Correction and Written E-Feedback



Example 3 shows creative teaching of digital writing in virtual classrooms. The activity objective is to fill in the 'gaps' with the appropriate verbs or words. The digital tools are video conferencing platforms with a whiteboard (i.e., Zoom) and the Lightshot app. The e-handout is created by a teacher by screenshotting a text and painting the 'gaps' for further demonstration and students' performance on the screen. The activity effectively checks linguistic skills and digital spelling development (see Figure 7).

Figure 7

Creative Activity with Synchronous Digital Writing



Example 4 presents synchronous digital collaborative writing in the Teaching English Methodology course. The objective is to summarise the advantages of EdTech for distance learning from a student's perspective. The digital tools are video conferencing platforms (i.e., Google Meet) and an interactive whiteboard (i.e., Jamboard). This approach engages individual and team participation and teachers' instant e-feedback (see Figure 8).

The presented examples illustrate a combination of EdTech, digital tools and apps implemented to achieve learning goals in virtual classrooms successfully. This approach increases the visualisation of learning material, fosters student-student and student-teacher virtual collaborative activity, and raises students' awareness of technology's educational potential. Though the illustrated examples of good practice above, guidelines are provided for enhancing ways of teaching and learning digital writing.

Figure 8

Synchronous Digital Collaborative Writing on Interactive Board

Table 5

Guidelines on Teaching and Learning Digital Writing in Virtual Classrooms

Digital writing instruction	Modes of digital writing	Digital writing tools	Opportunities for students	Opportunities for teachers
Demonstration and explanation of the material/task performance	Annotating, drawing, highlining, underlining, and marking electronically on the whiteboard	Video conferencing platform, whiteboard, toolbar, Google Apps, other supporting apps	Perception of visualised information on the screen. Digital peer teaching or peer error correction	Focus students' attention on language patterns, engage them to comment and provide digital peer error correction, a rapid e-feedback
Synchronous Pre-Communicative (Structural) activities (e.g., gap filling, completing, matching)	Typing, texting, annotating	Video conferencing platform, toolbar, whiteboard, coursebook in PDF files	Completing tasks on the screen, digital peer error correction, peer teaching	Error correction and written e-feedback changing ink colour. Developing language skills and digital literacy
Synchronous collaborative learning/writing	Typing, texting, chatting, collaborative writing on a whiteboard/ documents	Video conferencing platform, whiteboard, toolbar, Google Apps, Word Docs	Group or team participation online for completing tasks, problem-solving or learning new concepts	Instant comments and e-feedback. Developing communicative skills and digital literacy

Consequently, the experience of good digital writing practices in synchronous distance learning offers the recommendation of implementing additional digital tools and apps, which increase the potential of EdTech in utilising and teaching multimodal DW.

Discussion

The paper investigates DW in higher education during the COVID-19 pandemic from theoretical, empirical and pedagogical points of view. The theoretical insights show that the contemporary concept of DW in education includes six aspects: modes of writing, DW educational potential, DW tools, DW instruction, assessment and e-feedback, and students' or teachers' perception of DW. Although there are different approaches to defining 'digital writing' (e.g., Garcia & Diaz, 2021; Nordquist, 2018; Pandya & Sefton-Green, 2021), there is no generally accepted definition. Therefore, the research defines 'digital writing' as creating texts via ICT tools, which re-produces paper-based writing. In addition, the paper suggests a notion of 'synchronous digital writing' – a writing condition when students and teachers are able to write via ICT tools in the same document or application simultaneously.

The empirical insights shed light on the research questions.

Regarding RQ 1, the study results prove that the writing modes have transformed significantly (from traditional to digital) in higher education during the COVID-19 pandemic.

First, based on collected data analysis, the research reveals trends in the DW increase (i.e., texting and e-mailing) in digitally-based higher education in 2020-2022. Distance learning creates

favourable conditions for further developing DW. As a result, DW (M = 81.1%) is a more usable writing condition than handwriting (M = 18.8%). Besides, the majority of students (M = 75.7%) and teachers (M = 86.6%) employ DW via ICT tools. On the other hand, handwriting is rarely practised, predominantly by students (M = 24.2%) in the distance online education.

Second, the study emphasises that the emergency transition to distance learning during the COVID-19 pandemic has increased EdTech integration in educational settings promoting new modes of DW, e.g., synchronous annotating or collaborative writing on a whiteboard and texting in chats on video conferencing platforms.

Third, the research makes it possible to reveal 'student-used' and 'teacher-used' DW tools in distance learning. On the one hand, students write with pens more frequently (M = 58.6%) than teachers (M = 28.1%), primarily in hybrid distance education (72.6%) and in video conferencing (61.7%). Besides, students utilise Word Docs more (M = 87.7%) than teachers (M = 70.3%). On the other hand, teachers more frequently than students apply PowerPoint presentations (M = 83.6% vs 62.7%), chats on video conferencing platforms (M = 67.7% vs 37.1%), and interactive whiteboards (M = 44.4% vs 28.8%) in virtual classrooms as well as e-comments on students' assignments (65.5%) on fixed-time online courses. However, among the distance learning-related digital tools for writing, chats in messenger apps are equally applied by students (M = 45.4%) and teachers (M = 45.1%).

Finally, regarding writing tools utilised in online exams, the research demonstrates that Word Docs (M = 65.1%), chats on video conferencing platforms (M = 40.3%), pen & paper (M = 30.1%), PowerPoint presentations (M = 25.9%), and whiteboards (M = 25.4%) tend to be applied. However, students write with a pen more frequently than teachers (44.3% vs 13.3%), who prefer e-mailing (33.3%).

Regarding RQ 2, the empirical data proves that distance learning types affect writing conditions. Namely, DW is frequently used on fixed-time online courses (M = 92.1%) and in virtual conferencing (M = 81.5%), while in hybrid distance education, DW (M = 69.8%) is combined with handwriting (M = 30.1%).

In turn, the investigation shows that DW tools vary from distance learning types:

- In video conferencing, the most usable instruments are PowerPoint presentations (M = 72.5%), Word Docs (M = 72.3%), and chats on video conferencing platforms (M = 60.5%).
- In hybrid distance education, the most suitable writing tools are Word Docs (M = 84.8%), PowerPoint presentations (M = 77.0%), and pen & paper (M = 57.4%).
- On fixed-time online courses, Word Docs (M = 80.2%), PowerPoint presentations (M = 70.0%), and video assignment recording (M = 54.9%) are standard.

Consequently, in distance learning, PowerPoint presentations and Word Docs are regularly usable tools for DW with elements of handwriting and trends to video assignment recording.

Furthermore, distance learning types impact teachers' decisions to choose appropriate electronic tools for providing e-feedback:

- In video conferencing, e-feedback is provided through emailing (M = 79.5%), chatting on video conferencing platforms (M = 68.3%), and texting at messenger apps (M = 57.2%).

- E-comments on e-courses (M = 63%), chatting on video conferencing platforms (M = 58.3%), and messenger apps (M = 57.2%) are dominant in hybrid distance education.
- On fixed-time online courses, e-feedback is given through e-comments on courses (M = 79.7%), chatting on messenger apps (M = 51.5%) and emailing (M = 47.8%%).

The pedagogical insights have expanded the pre-pandemic understanding of DW modes, tools and instruction. Thus, the study reveals that in pre-pandemic time the typical DW tools implemented in educational settings were Web 2.0 tools (Laire et al., 2015), tablets and iPads (Kervin & Mantei, 2016; Neumann, 2021), and Google Docs (Azzari, 2019). In higher education, DW practices refer particularly to asynchronous digital writing (Vazquez-Cano et al., 2019).

The research results show that EdTech integration in higher education during the COVID-19 pandemic enlarges the educational potential of DW. EdTech creates online writing environments that allow synchronous DW processes. DW can be either means of task performance, e-feedback or process in teaching writing. Synchronous DW in virtual classrooms is supported primarily with keyboards or toolbars and whiteboards on video conferencing platforms. Using these DW tools, students have an opportunity for synchronous collaborative digital writing, digital peer teaching or peer error correction. At the same time, teachers can provide digital written e-feedback synchronously.

The research highlights the educational potential of a digital whiteboard for teaching writing in synchronous distance education, completing Reguera & Lopez's findings (2021). Although scientific literature points to the pedagogical value of digital written e-feedback with red ink (Clark-Gordon et al., 2019; Lee & Cha, 2022), the research reveals synchronous digital written e-feedback provided via a toolbar on video conferencing platforms. This tool allows teachers to provide digital written e-feedback synchronously by changing the ink colour, making an assessment of writing more visible and fun. Moreover, the findings of the significant texting via messenger apps and chatting on video conferencing platforms for instructions and e-feedback continue the discussion of the educational potential of social media for teaching writing (Gold et al., 2020; Laire et al., 2015).

Conclusions

The findings show that the COVID-19 pandemic accelerated writing digitalisation in higher education. As such, EdTech integration encourages the emergence of new digital writing modes in virtual classrooms: annotating on whiteboards and texting in chats on video conferencing platforms. A digitally-based higher education in 2020-2022 is characterised by the digital writing increase and dominance over handwriting, which is practised predominantly by students in HE. Consequently, distance learning provision has created conditions for handwriting substitution due to increasing digital writing cases and their variety, i.e., annotating, texting, typing, and e-mailing.

The article assumes that the level of EdTech integration in higher education affects handwriting usability; namely, the higher digitalisation in higher education, the less need for handwriting occurs. The research reveals the dependency of writing modes and e-feedback on distance learning types, digital tools, and participants. Finally, implementing additional digital tools and various apps can increase the potential of EdTech for synchronous digital writing practices in a virtual educational environment. Consequently, the higher education transition to digital format

during the COVID-19 pandemic has fostered the digitalisation of writing and new modes of collaboration through synchronous digital writing. The findings and guidelines can contribute to studying digital writing in higher education in a post-pandemic era.

Conflict of Interest

The author(s) disclose that they have no actual or perceived conflicts of interest. The authors disclose that they have not received any funding for this manuscript beyond resourcing for academic time at their respective university.

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