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RESIDUAL POST-PANDEMIC ICT LITERACY IN HIGHER EDUCATION

The case of foreign language teachers and students in Japan

Alfabetización residual postpandemia en TIC en Educación Superior.
El caso de profesores y estudiantes de lenguas extranjeras en Japón

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KEYWORDS

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ABSTRACT

The COVID-19 pandemic forced higher educational institutions to an emergent transition to online education, which required that teachers and students were ICT literate enough to continue with their curricula. As most universities in Japan have already transitioned back to face-to-face lessons, this study aimed to analyze the process of acquisition and use of ICT knowledge in a pre, mid and post-pandemic scenario. Findings showed a drastic gap of ICT literacy between teachers and students. However, results suggest that the acquired ICT knowledge remained and is currently being used in a face-to-face or hybrid environment.

PALABRAS CLAVE

Alfabetización en TICs
Metodología de Enseñanza Universitaria
Educación de Idiomas Extranjeros
Educación Post-pandemia
Recursos Virtuales de Enseñanza
Educación Online
Metodología en Educación Superior

RESUMEN

La pandemia de COVID-19 obligó a las instituciones de educación superior a una transición emergente a la educación en línea, lo que requirió que docentes y estudiantes tuvieran suficientes conocimientos en TICs. Actualmente, al volver a las lecciones presenciales, este estudio analizó el proceso de adquisición y uso del conocimiento de las TIC en un escenario previo, medio y posterior a la pandemia. Los resultados mostraron una brecha drástica de alfabetización en TIC entre profesores y estudiantes. Sin embargo, los resultados sugieren que este conocimiento se mantuvo y continúa siendo utilizado actualmente en un entorno híbrido o presencial.

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1. Introduction

1.1. Traditional vs. Modern ICT-driven Education

Most educators believe that any type of learning is adequate in essence and that students should be able to engage in a lesson regardless of the method. Traditionally, lectures are one of the preferred methods for teaching at higher institutions; however, it does not translate to be the most effective in terms of learning outcomes. Faust and Paulson (1998) insist that there is, though, a wide range of teaching strategies available to educators that go beyond the traditional teacher-centered model, in which students tend to only be passive spectators of the learning process. It is not a foreign idea to say that instructors see themselves as the providers of knowledge and see students as receivers of such knowledge, which tends to also be the image students have of themselves.

In his study, Campos (2019) summarized the two main streams of education. Firstly, the traditional teaching methods (under the "objectivism" paradigm), which are product-driven learning centered, have a subject-specific focus and consider teachers as the 'knowledge transmitters' and 'doers' for learners. In this model, students spend the whole learning process attending lectures and doing individual work, which usually results in lower learning outcomes. Secondly, more modern methods (under the "constructivism" paradigm) focus on the learning process and learners themselves, with a holistic learning focus and viewing teachers as 'knowledge organizers' and 'enablers or facilitators' for students. In these methods, students actively participate and involve in individual and group activities in order to develop core skills — maximizing learning outcomes.

These new more modern paradigms of educational methodologies came with a technological twist. Nora and Snyder (2008) posit that the inclusion of technological resources into education have a single aim, which is to improve academic achievements; however, they caution against the possible issues of insufficient ICT literacy of users in the implementation of such methodologies. Mpungose (2020) also points out the problems of assuring the execution of an effective ICT learning system, as students and educators should be assured the access to online and technological resources so that they could face the possible arising challenges. Cole *et al.* (2019) added to this idea claiming that in order for a successful learning experience to occur through ICTs, active learning strategies are required.

1.2. Japan and the challenges ahead

The Ministry of Education, Culture, Sports, Science and Technology (MEXT) planned and launched its educational aim "The Vision for ICT in Education" (MEXT, 2011), as an attempt to ensure the implementation of ICT in educational institutions. This project was envisioned to improve the quality of Japanese education in terms of ICT usage in course instruction and school administrative work. However, most Japanese universities had already been functioning under more traditional educational paradigms, characterized by teacher-centered methodologies using a lecture style, and using only printed materials and hand-written assignments.

One of the mechanisms higher educational institutions in Japan put into place to drive the ICT movement into their curricula was the introduction of Learning Management Systems (LMS), also under MEXT's "Vision for ICT in Education" project (2011). An LMS, in principle, is a software application to support the management of content, communication and resources of courses, with automated and tracked activities to ensure in-depth feedback and meaningful learning. These educational platforms could be accessed from any device regardless of time and place, turning this learning mechanism into the new standard at higher education. Unfortunately, as Eto (2021) states, "computer literacy or mobile technology literacy can affect the outcome of using an LMS in the curriculum" (p.29).

ICT knowledge allows both teachers and students to break the limitations of time, place and means — enhancing the possibilities to find and use information available in multiple sources around the globe as well as helping to extend and improve time management and resources. Nevertheless, there is no clear relationship between the addition of this technological component and effective learning in students, in particular in foreign language education (Nora & Snyder, 2008). Without the necessary ICT knowledge and training, it is possible to maintain the same old traditional methodological pathways, as ICT usage is not a synonym of a transition in teaching methodologies. It is very possible that some traditional educators, who use lectures as their main method of instruction, continue using this method with ICT components. A lecture will continue being so whether it is inside of a classroom or in front of a computer. There are several studies which have proven that ICTs facilitate the transition of educational methodologies, but neither they assure it nor they mean significant learning outcomes (Kennedy, 2000; Snyder, 2001; Mentzer *et al.,* 2007).

1.3. Transitioning under a world-wide pandemic

The emergent transition to online education due to the COVID-19 pandemic has exhaustively been researched in every corner of the world for the last few years. These studies have described the challenges this crisis involved in terms of institutional management (Izumi *et al.,* 2021; Kruse *et al.,* 2020; Kavrayıcı & Kesim, 2021), teaching

methodologies (Allen *et al.,* 2020; Pena-Levano & Melo, 2022), learning challenges (Gonzalez *et al.,* 2020; Al-Ansi *et al.,* 2021; Paudel, 2021), technical implementation (Mpungose, 2020; Muñoz-Najar *et al.,* 2021), educational ICT resources (Mielgo-Conde *et al.,* 2021; Sathishkumar, *et al.,* 2020) and even social and affective dimensions (Lemay *et al.,* 2021). Most of them focused on the transition into the pandemic so-called 'new reality' and the adaptations that had to take place to continue with the education of the new generations entering higher educational institutions. However, so far, online teaching and learning transitions in higher education have always been voluntary or planned (Allen *et al.,* 2020) and not suddenly pushed by an international health crisis.

After vaccines started to circulate in every country, different measures have also been taken by each institution to safely and progressively return to universities' facilities. From this year (2022), in the case of Japan, where the national rate of 2-dosis vaccination reached 80.78% by the end of June (NHK, 2022), most universities have opted to return to the classroom and offices and continue with a semi-flexible in-class instruction methodology. 1,157 out of 1,165 universities (99.31%) planned to have more than half of their lessons face-to-face, from which 1,116 universities planned to offer face-to-face lessons at a rate of at least 70% or more, accounting for 95.79% of the total (MEXT, 2022a). This situation occurred considering that it was left at the discretion of universities which modality to use, whether it was completely online (real time), hybrid (online and in classroom at the same time), alternating hybrid (some in-class lessons and some online), completely face-to-face (in-class lessons), on-demand (recorded lessons) or partial on-demand (some content is recorded and some is taught whether online or in-class lessons), among other less common variations.

Taking into account this context, a number of questions have been raised that this study will try to cover, such as: Were university foreign language teachers and students ICT literate before the COVID-19 pandemic? Which kind of ICT knowledge did they acquire during the pandemic? Has some of that knowledge remained with the return to face-to-face lessons? How much of what has been learned in ICT continues to be put into practice? Have the educational methodologies transitioned back to what they were before the COVID-19 pandemic?

2. Methodology

In order to answer some of the questions raised, two online surveys were conducted. The surveys were prepared to measure a number of criteria within ICT resources, namely LMS management, use of video conferencing systems, use of document creating software, types of files used, and use of printed and virtual class materials. All the criteria were measured in three time periods: 'Before COVID-19' (face-to-face lessons), 'During COVID-19' (online mode) and 'Currently' (after returning to face-to-face lessons, if so).

The first survey was aimed at university foreign language instructors at a wide radius of public and private universities in Japan. There were 42 participants in a broad range of age (35 to 74 years old), nationality (Asia: 28.57%, North America: 21.43%, Latin America: 19.05%, Europe: 26.19%, other: 4.76%), foreign language teaching experience (1-5 years: 11.90%, 6-10 years: 26.19%, 11-15 years: 14.29%, 16-20 years: 16.67%, 21-25 years: 16.67%, More than 25 years: 14.28%), and language of instruction (English: 42.86%, Spanish: 35.72%, English+Spanish: 11.90%, German: 7.14%, non-respondent: 2.38%).

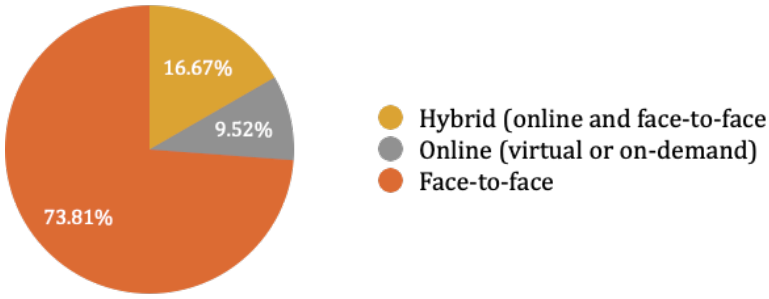
The second survey, under the same parameters, was conducted to university foreign language students, all of them coming from multiple prefectures throughout Japan. There were 190 participants (Age range: 18 to 22 years old) from diverse faculty and department backgrounds (Engineering: 48.42%, Social Sciences and Humanities: 22.11%, Medical Sciences: 20.53%, Agriculture: 8.42%, Other: 0.52%) and studying one or more foreign language courses (English: 75.78%, Spanish: 47.39%, Chinese: 7.37%, German 6.32%, Other: 2.63%).

Additionally, both foreign language educators and learners were asked to alternatively share any particular experience in ICT during the aforementioned transition that they considered valuable for their personal and educational/professional growth. There were 38 responses which were analyzed and synthesized in order to be presented within each corresponding section of this study.

3. Results

As expected, and due to the guidelines dictated by national and local governments (MEXT, 2022a; MEXT, 2022b), most of the foreign language teachers are currently developing whether face-to-face lessons or hybrid (face-to-face and online) lessons. Only a few percent of participants responded to keep their online lessons due to university regulation of language teaching (Figure 1). In the case of the students, there were only a small percentage of responses of students whose courses were currently online (0.53%), but some of them reported to learn under a hybrid method (37.57%), in contrast to the rest of students who are currently learning a foreign language in a face-to-face format (61.90%).

Figure 1. Current Teaching Modality



Source: Author, 2022.

In terms of the use of Learning Management Systems, as many foreign language instructors used one or more systems in parallel during the different time periods measured, a ranking list was created to illustrate the range of use of the LMSs based on the number of respondents (Table 1). There were several other LMSs suggested by the participants in the survey which were listed separately. In terms of the video conferencing systems, Zoom was the most prominent platform used by the FL teachers during the pandemic (83.33%) and in their current courses (52.38%), followed by Google Meet (35.71% and 14.29%, respectively). No more than a small percentage of respondents (9.52%) had had some experience using a video conferencing system in their lessons prior to the COVID-19 pandemic, with Zoom and Skype being the most noticeable.

Table 1. FL teachers' use of LMS ranking

Ranking	Before COVID-19 (% of respondents)	During COVID-19 (% of respondents)	Currently (% of respondents)
1	University privately-owned LMS platform (35.71%)	Google Classroom (54.76%)	Google Classroom (61.90%)
2	Moodle (16.67%) Blackboard (16.67%)	University privately-owned LMS platform (38.10%)	University privately-owned LMS platform (38.10%)
3	Google Classroom (11.90%) Personal Webpage (11.90%)	Other* (28.57%)	Blackboard (19.05%) Other* (19.05%)
4	Microsoft Teams (4.76%) Other* (4.76%)	Microsoft Teams (19.05%)	Microsoft Teams (16.67%)
5	Slack (2.38%)	Blackboard (14.29%)	Personal Webpage (7.14%)
6	Classi (0.00%)	Personal Webpage (11.90%) Moodle (11.90%)	Moodle (4.76%)
7		Slack (7.14%)	Classi (2.38%) Slack (2.38%)
8		Classi (2.38%)	

*Other FL teachers' informed LMSs: Zoom (21.43%), Flipgrid (4.76%), Manaba (4.76%), Canvas (2.38%), Edmodo (2.38%), Kahoot (2.38%), Socrative (2.38%), Paddle (2.38%), Respon (2.38%).

Source: Author, 2022.

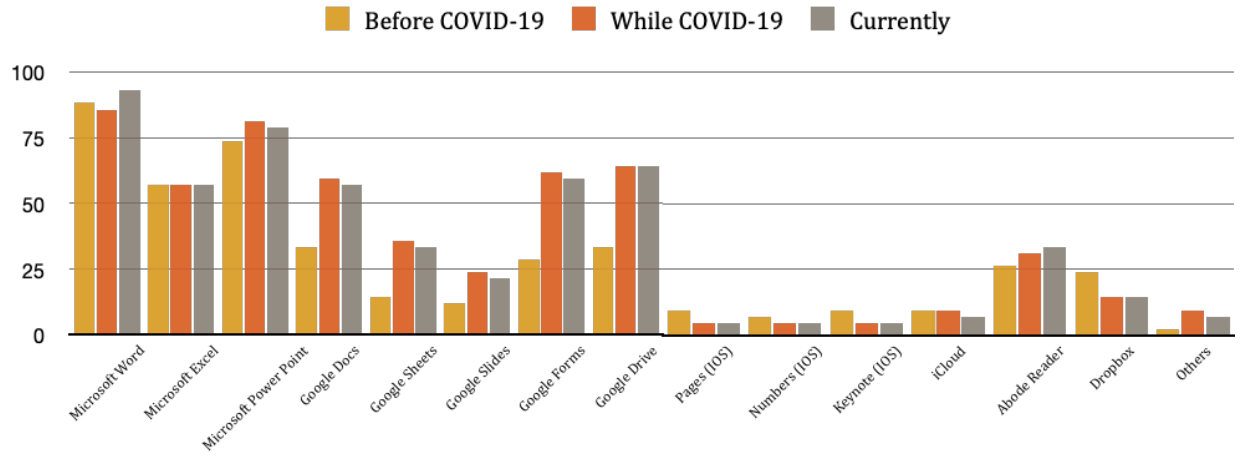
The survey conducted to students showed that only 11.05% of them had ever used an LMS before the pandemic. Even when this rate includes students who had already entered university at the time the pandemic spread in Japan. The rest of respondents had to learn how to use the different LMS platforms after universities closed their doors to prevent the spread of the virus infection. Based on their comments, students not only struggled to learn the use of a given LMS, but they had to face several LMSs chosen by different instructors for their multiple courses, whether by institutional manuals, online tutorials or their teachers' instructions.

In the same way as reflected in the FL teachers' use of LMS ranking (Table 1), Google Classroom was the LMS most used by students, with a 61.05% usage rate mid-pandemic and a 95.26% usage rate in their current courses, followed by their university's privately-owned LMS platform (40.00% and 16.26%, respectively). In parallel, only 10.00% of respondents had never used a video conferencing system as a means of instruction before the COVID-19 pandemic. During their online learning, Zoom was the most used online class system (54.74%), followed by Google Meet (54.21%) and Microsoft Teams (25.79%). However, after returning to their universities' facilities, students

report using Google Meet as their main means of instruction (72.11%), over Zoom (44.74%) and Microsoft Teams (6.32%); taking into account that some of their lessons continued based on a hybrid method. The remaining video conferencing systems did not provide any significant data in the acquisition of ICT knowledge during the pandemic as well as the current use of them.

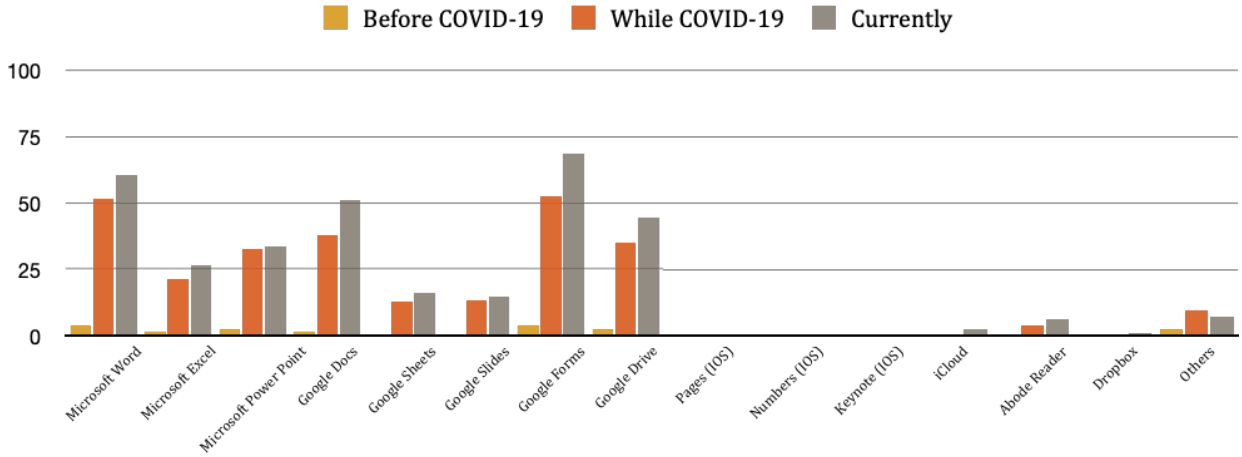
Considering the document creating software preferred by the instructors for preparing and teaching their lessons, and the level of preparedness of both teachers and students, Figures 2a and 2b show the transition within the three time frames aimed. Only the main streams of document creating software were included (Microsoft, Google and IOS), as well as some common file storing and reading programs. The number of answers was contrasted against the number of respondents and a percent rate was estimated. There were no other relevant software suggestions by the teachers or students that signified to be included in this study.

Figure 2a. Document software/tools used by FL teachers (% of use)



Source: Author, 2022.

Figure 2b. Document software/tools used by FL learners (% of use)



Source: Author, 2022.

In the survey, both subject groups were asked to recognize and indicate the type of files they used in their lessons, by showing them only the extension of such files (Table 2). In case the respondents did not know what a 'file extension' was, a brief explanation (with an example) was given in the instructions. The extensions were grouped by function or type of file, such as text files (.doc / .docx), presentation files (.ppt / .pptx) audio files (.mp3 / .m4a / .wav / .wma), image files (.jpg / .jpeg / .png / .gif / .tiff), and so on. There was only one group of extensions that were grouped by the type of software (.pages / .sheets / .key, namely IOS), as only users of these software products might be able to identify such extensions. Respondents also had the opportunity to inform if they were not familiar with a certain group of file extensions, as such an option was provided in the survey (stated as "I do not know what these extensions are"). The only suggested file extension was made by students and corresponds to a text file extension (.txt).

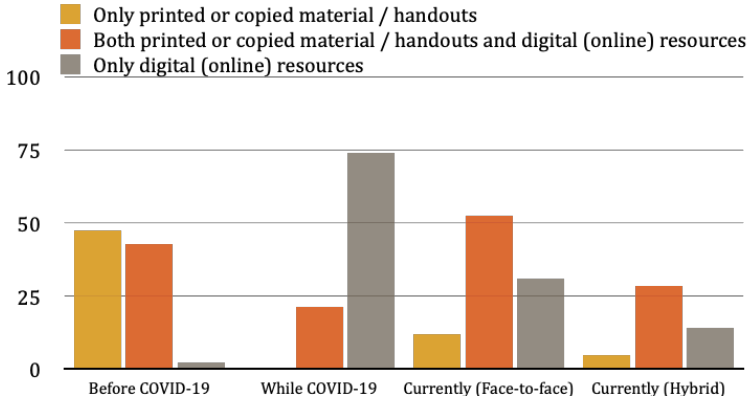
Table 2. ICT use and knowledge of file types (extensions)

	Before COVID-19 (% of respondents)		**During COVID-19 (% of respondents)**		**Currently (% of respondents)**		**Unknown files (% of respondents)**	
File extensions	Teachers	Students	Teachers	Students	Teachers	Students	Teachers	Students
.doc / .docx	87.71	5.50	90.48	55.26	90.48	72.63	7.14	10.00
.xls / .xlsx	59.52	0.53	59.52	16.84	59.52	17.89	2.38	12.63
.ppt / .pptx	69.05	0.53	69.05	22.11	69.05	26.32	9.52	12.63
.jpg / .jpeg / .png / .gif / .tiff	54.76	0.00	59.52	15.79	59.52	12.63	2.38	13.16
.mp3 / .m4a / .wav / .wma	61.90	0.52	71.43	12.11	71.43	5.26	7.14	13.16
.mp4 / .avi / .mov / .wmv	47.62	0.52	52.38	8.42	54.76	8.95	4.76	16.32
.html / .htm	26.19	0.00	28.57	7.89	28.57	7.89	2.38	13.16
.pdf	83.33	2.63	90.48	59.47	92.86	77.37	4.76	7.89
.pages / .sheets / .key	7.14	0.00	7.14	2.63	7.14	3.16	9.52	20.53

Source: Author, 2022.

Finally, the last data measurement was the use of printed versus digital (online) resources (Figure 3). Teachers were asked to determine which kind of resource they tend to use more consistently during the three periods aimed. As some of the instructors currently conduct their lessons in a hybrid mode, they were asked to note their answers on a different option (Hybrid/Dual lessons [online + face-to-face]), as the material required for such kind of lessons certainly includes a mix of resources. The use of printed or copied material as the only class resource drastically decreased due to the transition to online lessons; however, even after returning to face-to-face or hybrid lessons, teachers' usage of this type of material remained 30.95% less than pre-pandemic. On the contrary, the use of only digital class material evidently increased due to the pandemic, from 2.38% to 73.81%. This rate decreased considerably after returning to universities' facilities (45.24%). However, it is noteworthy to mention how the usage rate of a mixture of these resources almost doubled between a pre/post-pandemic comparison from 42.86% to 80.95% (including both face-to-face and hybrid lessons). In their comments, some of the FL instructors justified the usage of a given type of material based on textbooks purchased by the student as well as having on-demand lessons as part of their university requirements.

Figure 3. Teachers' use of printed vs. digital class resources



Source: Author, 2022.

4. Analysis

As seen on Table 1, there was evidently an increase of LMS use before and after the pandemic spread throughout the country. However, independently of the return to university facilities, where most of the educators are currently teaching in a face-to-face or hybrid modality, the use of some LMSs increased considerably. Google Classroom seems to be the most teaching-friendly and simple to use LMS, according to the comments provided by the FL teachers. It is important to consider that some of the reported systems in "others" are not LMS on themselves, but educational applications or video conferencing systems used for teaching — Zoom having the most extended use as a replacement of an LMS. The main difference between an LMS and this video conferencing system is that there is no record for the contents and material used in a lesson and, therefore, teachers need to outsource storing software and out-class communication means. The case of students suggests that a great majority of them were still in secondary education when the pandemic hit Japan in January, 2020 (Sim, 2020), as

88.95% of them had never used an LMS. It seems that the use of LMS is more pertinent to higher education than to secondary education in Japan, in a no-pandemic scenario.

Concerning the usage of document creating software (Figure 2a), most of the teachers displayed a fair level of ICT knowledge for document computer software (i.e. Microsoft Word, Excel and PowerPoint). They continued using such programs during the pandemic and even showed a slight increase. On the other hand, ICT knowledge on online document creating software (i.e. Google Docs, Sheets, Slides, Forms and Drive) was significantly lower pre-pandemic and had a considerable increase during the pandemic, continuing its usage in their current face-to-face and hybrid lessons. Other types of software did not show any relevant improvement in any of the stages of the COVID-19 pandemic. On the students' side, it is evident that the great majority of students did not possess any ICT knowledge in document creating software (Figure 2b); however, there was clearly a striking increase in the ICT knowledge acquired during the pandemic, in both computer and online document creating software. Based on the comments of respondents, not all students felt confident in the use of these software and consider themselves still in the process of learning to master these tools, resulting in not choosing such option in the survey. In the same way as in the case of teachers, there was no pertinent change in the knowledge and usage of any other types of software.

Moreover, considering the ICT knowledge on file extensions (i.e. types) shown on Table 2, it is noticeable that teachers' ICT literacy in this matter was fairly high pre-pandemic, which even slightly increased due to the pandemic in most of the options provided, and currently remains steady. There was only a 5.55% average of respondents without any knowledge on the extensions inquired. In the case of students, they were, to some extent, completely ICT illiterate in terms of types of files before the pandemic. Yet again, there was a steep improvement in their ICT knowledge after the pandemic, slightly increasing in some of the options in the survey. There is still a marginal number of students who still have not acquired any ICT knowledge on this matter (13.28%).

5. Discussion

Teachers, in general, not only had to overload themselves with transitioning their courses, methodology, assignments, material, and so on into online means of instruction but also to become masters in using such digital resources — working as part of the "front line" of all countries (Allen *et al.,* 2020). However, the fact that most of the foreign language educators were fairly trained in ICT tools might have played an important role in the implementation of these resources after the compulsory e-learning system started due to the COVID-19 pandemic. It seems that educators adapted pretty well under the emergent circumstances and were able to be resilient to the world-wide crisis in order to continue with their educational duty. Some of the teachers in the survey reported to have started using many ICT tools prior to the pandemic and even become 'paperless', opting for more eco-friendly digital resources, which is consistent with Rutson-Griffiths' (2014) study on the benefits and challenges of this last decade trend. Other educators commented that despite having already known some ICT tools, even before the pandemic, they did not really put into practice any of such knowledge but after being challenged to do so during the pandemic. Thus, through the results of this study, it is noticeable that there is still plenty of room for improvement and further acquisition of ICT knowledge.

Unfortunately, there is another side of the story. As this study showed, many students had to acquire very basic ICT knowledge for their courses, from how to use an online storing resource (clouds) to how to convert a file into a .pdf format, for instance. This responsibility and work load also affected the performance and teaching goals of foreign language educators. Some of those instructors shared their experience of turning part of their lessons into ICT skill content driven, especially when they received continuous requests for extra support to submit assignments and in other class activities. Furthermore, there were instructors who complained, to some extent, to have been forced to use certain ICT tools that they considered were not effective for their students' learning; however, they were pleased that, due to the return to the face-to-face teaching protocol, they had more flexibility and control over the ICT resources they could opt to.

Probably, the image of Japan's educational system abroad is of a high standard and of enviable learning outcomes. However, as in any educational system, it has its own challenges and not very obvious disadvantages. Some of these challenges were exposed during the world-wide pandemic, especially in terms of the use of ICT tools. In the previous section, it was shown how foreign language learners were not prepared for an educational transition where the only resources were technological. The results of this study concur with Murakami's (2016), who saw and documented this phenomenon even before the COVID-19 pandemic even occurred. In her study, 96.1% of the students surveyed stated that they had used an LMS for the first time after entering university. She ends her research asserting that educators must consider "[students'] previous ICT education and ICT literacy level" (p.9). It is remarkable that high school students face the use of these ICT tools for the first time in higher education and are required to quickly come up to speed during their first semester of studies.

Even though the Japanese government has taken remarkable steps towards improving the ICT skills in students, their proposal of a program, namely the "Global and Innovation Gateway for All (GIGA)" (JapanGov, 2021), where students in elementary and junior high school were equipped with computer devices and other ICT resources,

had arrived a bit too late for those who were already in high school and university. The program had just started in 2019, with some schools within the Tokyo area, extending to a national level during spring, 2021. Unfortunately, before that, most of the ICT education relied on each school program and self-driven learning aims. Therefore, students at higher education displayed very different and even polarized ICT knowledge and skills. Many of the students in the survey shared that they considered themselves completely ICT illiterate prior to entering university and before the COVID-19 pandemic. There were several experiences received in the survey explaining various examples of basic ICT knowledge acquired during the whole process, such as learning how to use function commands, convert file formats, use shortcuts, document software management, interaction through LMS, among others. As stated by Tang *et al.,* (2021), there was not enough evidence whatsoever in how ready students were for real-time online instruction; especially, in such a historical challenge.

6. Conclusions

The COVID-19 pandemic affected the whole world in so many dimensions that it will take years or even decades to analyze and research for every single effect it left in different types of communities and societies. The pandemic led to a methodological transition in which teachers had to adapt the normal curriculum into a virtual space within a record short time. At the same time, students had to quickly respond to this transition and learn how to manage multiple systems, software, and other ICT tools. However, regardless of all the challenges faced by foreign language teachers and students in Japan, it seems that there are some benefits that could result from this forced transition caused by the pandemic.

It is evident that the gap of ICT literacy between teachers and students is still an issue that requires attention and an action plan. Teachers were, to a degree, better equipped, possibly based on their professional experience and career. However, it is not a common denominator for all instructors and relies on their personal orientation and interest in the use of ICT tools and resources in the classes. On the other hand, students start with a very low ICT literacy when they enter higher education, despite the most recent government efforts in the promotion of ICT tools in primary and secondary schools. Nevertheless, this study does not contemplate the current ICT literacy of students who are currently in secondary education and that had gone through a similar transition during the last years of the pandemic.

One of the most remarkable improvements in the case of teachers was the use of LMS platforms. Due to the fact that it was the only available means of communication and interaction with students, educators were pushed to explore and include the use of these systems in their courses. This resulted in an improvement of ICT skills and use of digital resources for both teachers and learners. In terms of document creating software and file formats, students were the ones who benefited the most during this process. There is no doubt that such a development must have been full of struggles and frustration, but the results appeal to the final literacy outcome which will enhance student learning beyond university studies. It would also be beneficial to consider and investigate on the affective dimensions implied in the process of ICT autodidactism, especially in the case of students.

It is clear to say that most of the ICT knowledge acquired during the pandemic remained in teachers and students and it is currently being used on a face-to-face or hybrid methodology. Almost all of the indicators showed an increase in the use of ICT resources in the current state of foreign language learning. Clearly, the trend suggests that the usage of these methodologies and tools will continue in the long term; however, it will be necessary to further compile data on the current ICT literacy effect evidenced in this study. This is also reflected in the last dimension included in this study, which was the use of printed or copied material versus digital or online resources. In this area, a decrease in the use of printed material is the most prominent finding. This is proof that the methodological approach in higher education is transitioning into a more technological, eco-friendly, flexible and life-long learning paradigm.

However, in order to assure that the ICT literacy of teachers and students occurs and remains over time, it is necessary to improve the process of ICT knowledge acquisition, which so far has been delegated as a self-regulated task. It is not the role of foreign language teachers, or educators in general, to assume a role that corresponds to the educational system as a whole. Students should be entitled to have access to these tools earlier in their educational life. Local and national governments, as well as educational institutions, need to create more effective policies to improve the ICT literacy at all levels of the educational system and to guarantee that the ICT-based learning is integrated as part of formal curricula, especially at higher education.

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