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Analytic survey on the challenges of Moroccan students in higher education institutions face to distance learning

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ABSTRACT

This research presents an investigation of the problems faced by Moroccan higher education students after the face-to-face learning was reinstated following the COVID-19 pandemic crisis. The proposed methodology is based on an exploratory descriptive analysis through a survey that involved students from different higher education institutions and residing in various regions of Morocco. The collected results revealed that students face pedagogical, technical and organizational constraints that prevent them from making a successful transition to distance learning, even if only partially. Indeed, many students are not motivated by the use of information and communication technology (ICT). The study finally provides recommendations for understanding and overcoming these problems.

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1. INTRODUCTION

Higher education in Morocco continues to experience various problems due to the consequences of the COVID-19 pandemic. These problems result from the transformation of the teaching mode from face-to-face to distance learning. During the period of school closures, many studies to evaluate distance education have been conducted [1]–[11] The majority of these researches have pointed out that the digital transition exposed several socioeconomic problems, notably that of inequality among students [12]. The lack of computing resources and a good network infrastructure, [13]–[16] has prevented the effective implementation of distance learning among low-income families [17], [18] and those living in rural areas. In addition, students were not experienced with the use of information and communication technology (ICT) for distance learning, so from the very beginning, every student was confronted with different teaching techniques or teaching platforms, depending on the institution or sometimes on the class. Moreover, the use of digital tools has created computer-related eye Fatigue among students [19], [20]. As well as the inability to keep up with the new learning pace.

After the brutal transition to distance learning, and due to the absence of a ministerial decision that homogenized the digital tools to be adopted by the instructors, several approaches have been adopted. Some professors decided to record and publish their courses on private/public websites. Some simply shared their course materials, either by e-mail, on WhatsApp, Edmodo or via the cloud (Google drive for example). Some institutions have developed privatized platforms to allow a restricted and protected sharing of course materials. So, the diversity of sharing platforms within the same institution has further complicated the process of distance learning, especially in the absence of a prior training on the use of these tools. There is also the psychological impact of the confinement during the crisis that has limited contact and interaction

between students and teachers [21], [22], and even between students, which significantly reduced their motivation and satisfaction of using ICT particularly for distance learning [23], [24]. This result led to a series of problems after the return to face-to-face teaching, which we will discuss further in this paper. With the transition to distance learning during the period of confinement, an urgent need for reviewing teaching methods was revealed, this must be conducted through a deep reflection on new tools and platforms to ensure continuity of access to education and also to limit the inherent inequalities in the economic, social and demographic situations of families [25], [26].

In September 2020, the Ministry of National Education, Vocational Training, Higher Education and Scientific Research has announcing the restoring of classroom learning in Moroccan institutions. Classroom learning will be accompanied by a set of preventive measures, in full coordination with the appropriate public authorities, to improve safety and health protection. Following this decision, some Moroccan institutions have chosen to combine distance learning with face-to-face courses (hybrid system), while others have adopted 100% distance learning. In fact, the mandatory transition to digital is becoming a real opportunity for the digitalization of Moroccan education. This transition requires a solid operational structure that will help and support the educational actors. This structure must be based mainly on an in depth analysis at the micro and macro levels, for the first place, the learners. In this context, this study is aimed at collecting data from a micro perspective on students' experiences, problems and preferences after resuming their studies in higher education institutions in Morocco. We intend to collect information on students' feedback on the use of distance learning devices as well as on their digital problems and preferences of learning styles. The proposed study conducts a quantitative analysis through a survey targeting a selected sample of 300 students enrolled in higher education in Morocco.

The rest of this paper is structured as follows: Section II introduces the motivation for the research. In section 3, we review the problems encountered by Moroccan students in relation to digital technology. In Section 4, we provide a description of the experiment in terms of the approach adopted and the results. Section 5 presents a discussion of the obtained results while section 6 concludes the paper.

2. MOTIVATIONS

According to Unesco, as of 21 April 2020, 191 countries had closed their schools, with more than 1.5 billion students affected by this measure, representing 90% of the total number of learners worldwide [27]. In Morocco, a total of 2,250 schools were closed due to the risk of contamination with the new coronavirus, with an estimated 950,000 students affected, according to figures obtained by the agence france-presse (AFP) from the Ministry of Education. To ensure pedagogical continuity, some Moroccan institutions have chosen to continue with distance learning in conjunction with face-to-face teaching (hybrid system), while others have opted for 100% distance learning. In this same context, a large proportion of students are not always equipped with the necessary access resources (computers and tablets) and still do not have regular access to the internet, and even with regular access, the throughtput provided remains relatively variable across regions [28], [29]. In particular, students living in urban areas often have much more reliable and ensured internet access than those living in rural areas [30]. However, the transition to teleworking and distance learning in almost all production sectors has led to a degradation and instability of service due to high collective consumption.

The use of ICT induces additional costs and expenses for hardware, software and internet connection [31], especially when some distance learning platforms that are used are not actually free. This problem is more accentuated in public access institutions where the number of students exceeds the number of users authorized to register on the platforms, which complicates the management and use of the EAD platforms. In addition, several security related problems were revealed, (vulnerability of ZOOM and Microsoft Exchange) [32]-[34]. On the human side, there are other problems such as the lack of student commitment to synchronous and asynchronous follow up of courses. In plus, the use of ICT for teaching still a new practice for many students and even teachers [35], [36], especially those that retain the traditional teaching method.

Over the last two decades, Morocco has made several efforts to promote the pedagogical integration of ICT, which are manifested in several projects that focus on the infrastructure aspect (computer equipment), widening the scope of access to the Internet as well as training for the various actors in education. Among these projects are the GENIE program, INJAZ, LAWHATI, MARWAN and E-SUP, and Moroccan Virtual Campus [37]. Several Moroccan universities have adopted the digitalization of their teaching systems. We attest the emergence of MOOCs, as well as the creation of electronic sites and plateforms destined to host various content of courses even more interactive. In the field of scientific research, the resources of the International Digital Library "EBSCO" have been made available free of charge to students, professors and researchers, in addition to a number of international platforms and libraries, such as "Al-Manahil", "Cairn" and "Dalloz" [38].

On June 09, 2020, the Ministry of National Education, Vocational Training, Higher Education and Scientific Research, in conjunction with the office Chérifien des Phosphates (OCP) Foundation and the Mohammed VI Polytechnic University signed a framework agreement for the development of scientific research and the digitization of education in Morocco, in order to enhance the results of research and promote digitization and distance learning. Although the challenges of distance learning are discussed by many Moroccan university leaders and researchers, it is unfortunate that these problems are very underestimated. No solutions that meet the needs of students and teachers have been put in place. On the one hand, there is a total absence of helplines dedicated to assist and support the various actors in education sector. This absence is particularly noticeable among learners with disabilities, who in turn have been marginalized because of the lack of the necessary equipment, access to the Internet, adapted materials and the support that would enable them to follow online programs [39].

This study aims to explore the issues of distance education, from the perspective of students in Moroccan higher education institutions, in order to build a micro view of the challenges faced by Moroccan students, as well as their preferences and learning styles. The research follows the quantitative method in the first stage throughout publishing an online survey. The collected results will be analyzed by different statistical software's in order to deduce conclusions.

3. METHOD

Our study focused on a quantitative approach using a survey that was destined to identify the challenges faced by Moroccan students in higher education institutions after the reopening of classes in higher education institutions. This survey is conducted following two main steps [40]: development and validation. The first phase is focused on the formulation of questions and the selection of answers. Results are then evaluated according to the following three criteria: reliability, validity and the acceptability of the changeover. The second validation phase aims to test several criteria of the survey such as structure and content. The validation is performed by several interveners. To be able to generate more representativeness, we targeted participants from different regions of Morocco, different universities and schools, different disciplines and different levels of higher education.

The survey consisted of two main parts. In the first part, students are asked to enter their demographic data (age, gender, region, background, level of education), also to describe their computer skills and to indicate whether they had ever participated in online courses or not. In the second part, students are asked about their digital practices and equipment's regarding access to the Internet. They are also asked about their learning styles as well as the problems experienced in using ICT, and their teaching preferences. The survey was administered online through "Survio" tool. The dissemination period for the questionnaire started on 02 November 2020 and ended towards the end of April 2021, via mail and social media with a short text explaining the purpose of the questionnaire.

This survey was completed by over 300 students from 24 institutions. For data processing and analysis, we used descriptive and explanatory statistics techniques based on the Python language, more specifically based on the Plotly library which allows the creation and management of the main data visualization tools. We also used natural language processing (NLP) to analyze the students' comments and to generate the word cloud using natural language toolkit (NLTK).

4. RESULTS AND DISCUSSION

4.1. Results

Table 1 describes the Demographic and specific characteristics of the participants in terms of Gende, age, and region. Among the 300 students, 37% were male and (63%) were female. The age of the students varied between 18 and 24 years. A total of 74% of the population surveyed live in urban areas, whereas 26% reside in rural areas. A percentage of 42% of the students are enrolled at engineering schools when 58% study at Moroccan public and private universities.

According to the Figure 1, The sample population that responded to the survey covers the entire territory of Morocco, according to the following regional distribution presented below. According to the results, there is a strong participation from the following 3 regions: Drâa-Tafilalet (25.1%), Marrakech-Safi (22.1%) and Casablanca-Settat (14.3%).

The histogram Figure 2 presents the establishments to which the students who took part in the survey belong in descending order. We notice that the four dominant institutions respectively are Faculté Polydisciplinaire-Ouarzazate (FPO) (22.44%), Ecole Hassania Des Travaux Publics (EHTP) (19.68%), Ecole Supérieure de l'Education et de la Formation El Jadida (ESEF) (9.84%) and Faculté des Sciences Semlalia

(FSSM) (6.69%). As shown in Figure 3, (60%) of students reported being familiar with the use of computer-based instructional tools, while the remainder stated not being familiar with those tools.

Table 1. Demographic and specific characteristics of survey participants

	Features	n (%)
Gender	Male	36.8%
	Female	63.2%
Age group	Under 18 years old	3.0%
	18-24	92.5%
	25-35	4.5%
Region	Tangier-Tetouan-Al Hoceima	3.8%
	Casablanca-Settat	15.0%
	The Oriental	6.8%
	Marrakech-Safi	21.8%
	Drâa-Tafilalet	25.6%
	Fès-Meknès	6.8%
	Rabat-Salé-Kénitra	11.3%
	Souss-Massa	3.4%
	Guelmim-Oued Noun	1.1%
	Laâyoune-Sakia ElHamra	1.1%
	Dakhla-Oued EdDahab	0.4%
	Béni Mellal-Khénifra	3.0%
Areas	Urban	73.7%
	Rural	26.3%
Institution type	Engineering schools	42.10%
	Universities	57.89%
Institution	Ecole Hassania Des Travaux Publics (EHTP)	19.68%
	Ecole Nationale de Commerce et de Gestion (ENCG)	0.39%
	Ecole Nationale des Sciences Appliquées (ENSA)	1.18%
	ENSA-El Jadida	2.36%
	ENSA-Kénitra	2.75%
	Ecole Nationale Supérieure d'Electricité et de Mécanique (ENSEM)	1.18%
	Ecole Supérieure de l'Education et de la Formation (ESEF-El Jadida)	9.84%
	Ecole des Sciences de l'Information ESI	3.93%
	École supérieure des industries du textile et de l'habillement (ESITH)	0.39%
	Ecole Supérieure Technique (EST-Essaouira)	1.96%
	Ensa-Kénitra	0.39%
	Faculté Polydisciplinaire-Ouarzazate (FPO)	22.44%
	Faculté des Sciences (Oujda FS-Oujda)	2.36%
	Faculté des Sciences -Tétouan	0.78%
	Faculté des Sciences Appliquées (FSA-Ait Melloul)	1.18%
	Faculté des Sciences d'El Jadida (FSJ)	1.57%
	Faculté des Sciences Semlalia de Marrakech (FSSM)	6.69%
	Facultés Sciences et Techniques Marrakech (FST-Marrakech)	0.39%
	Facultés Sciences et Techniques Mohammedia (FST-Mohammedi)	0.39%
	Institut National des postes et télécommunications INPT	3.93%
	Institut Supérieur des Professions Infirmières et Techniques de Santé (ISPITS)	4.33%
	ISPITS-Safi	0.39%
	ISPITS-Taza	0.39%
	Université Cadi Ayyad (UCA)	0.78%
	Université Chouaib Doukkali (UCD)	2.36%
	Université Internationale de Casablanca (UIC)	1.18%
	Université Ibn Zohr (UIZ)	1.57%
	Université Mohammed VI Polytechnique (UM6P)	2.75%
	Université Mohammed Premier Oujda (UMP-Oujda)	2.36%
Level of study	Bac+1	25.7%
	Bac+2	22.3%
	Bac+3	25.7%
	Bac+4	11.7%
	Bac+5	14.7%

According to the graphs (Figure 4 and Figure 5), (71.9%) of the participants have daily access to the internet while (57.8%) of them suffer from irregular and unreliable internet access. On the other hand, (28.1%) reported that they lacked network service. According to the graphs below (Figure 6 and Figure 7), (73%) of students claimed to have a visual learning style, while (17%) of them confirm to have a kinesthetic learning style and (10%) of students favor something auditory. The proportion of students who suffer from visual and auditory problems exceeds (50%).

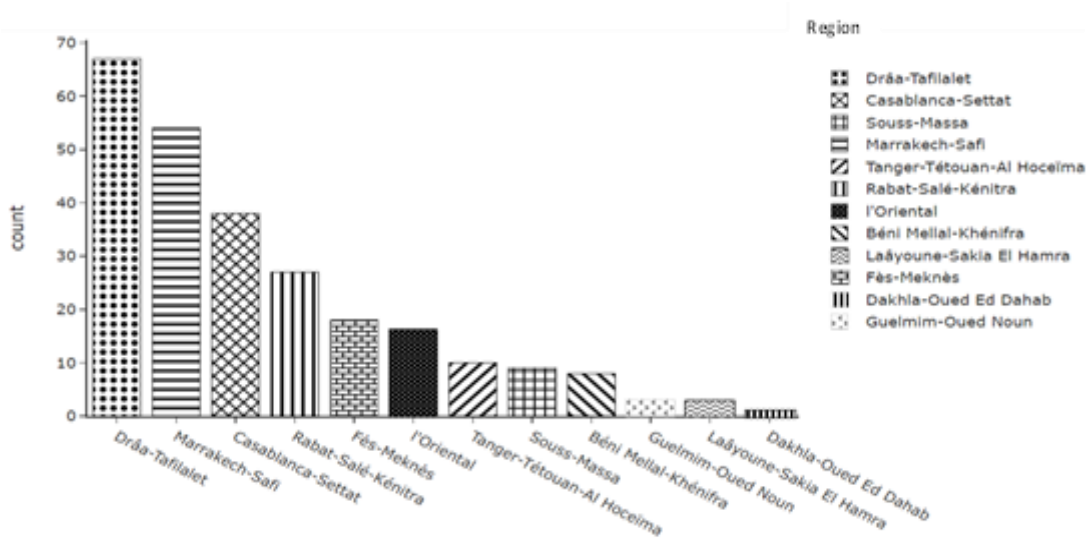

Figure 1. Distribution of students by region

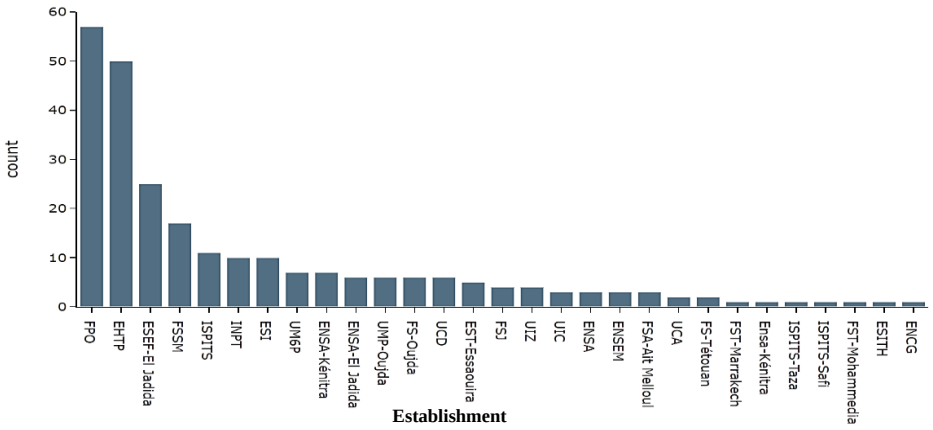

Figure 2. Number of participants per institution

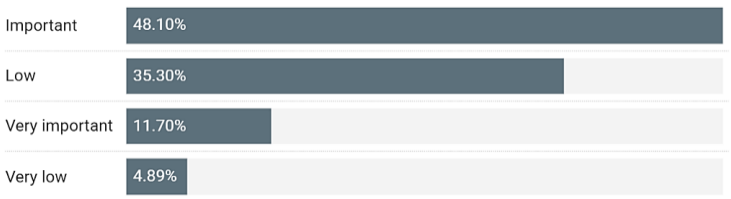

Figure 3. Familiarisation with the use of digital education

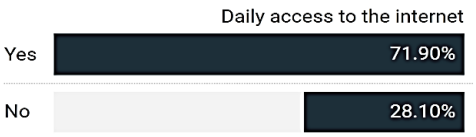

Figure 4. Do you have access to the internet every day?

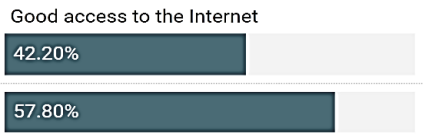

Figure 5. If yes, do you have good access to the Internet?

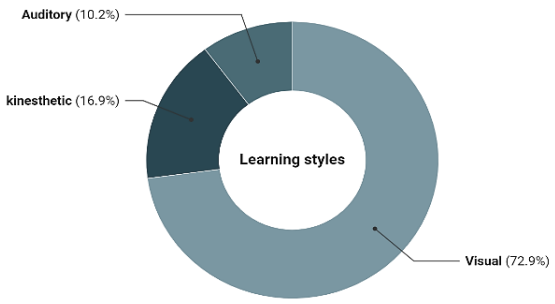

Figure 6. Student learning styles

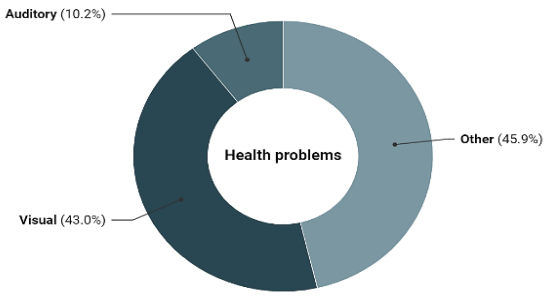

Figure 7. Students' health problems

Figure 8 shows that after the resumption of face-to-face teaching, (76.3%) of the institutions started to deploy hybrid teaching that combines face-to-face and distance learning, while (23.7%) of the institutions chose to restrict themselves to the traditional mode that is face-to-face learning. According to the Figure 9, 56.1% of the participants admit that the uploaded content provided by the teachers is not properly conceived and developed.

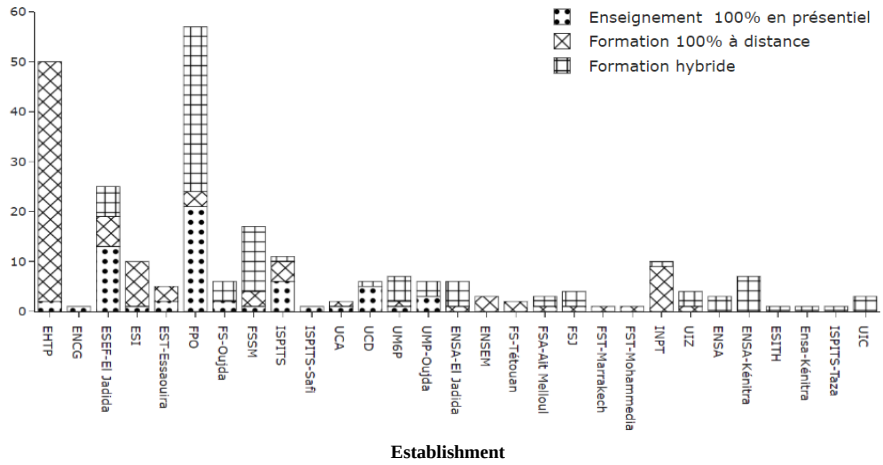

Figure 8. Mode of teaching adopted by the different institutions

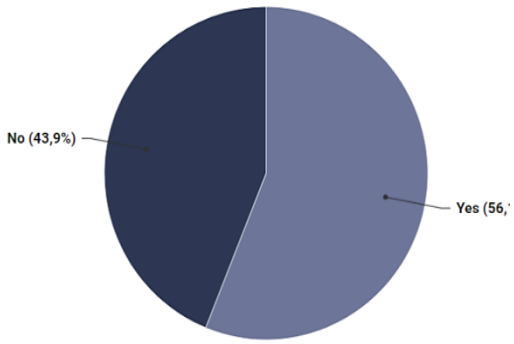

Figure 9. Are the educational resources put online by your school well enriched?

According to the statistics illustrated in the Figure 10 , the most used platforms and applications for publishing online courses are (Teams, ZOOM and Google tools) (57%), followed by social networks (37%).While online learning platforms, especially MOODLE, are proved to be used rarely (7%).

Figure 11 captures a variety of different responses regarding students' favorites for content and resources shared by their instructors throught different learning platforms. Most participants agree to prefer accessing resources via these platforms because they offer a variety of tools that allow for good explanation of concepts (51.7%), better illustration of ideas (21.1%) which improve the quality of the content posted and then allow some learning flexibility (19.5%).

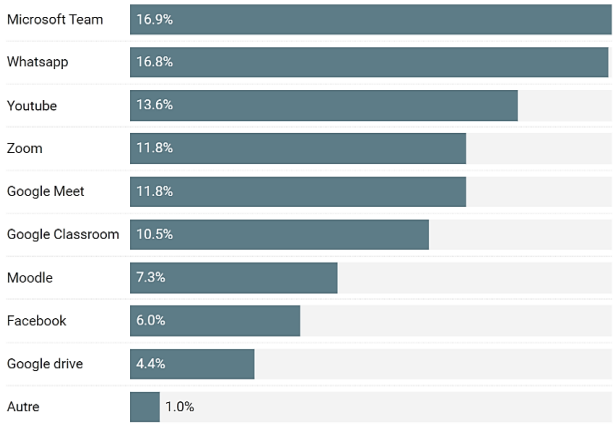

Figure 10. Platforms and applications used by students for distance learning

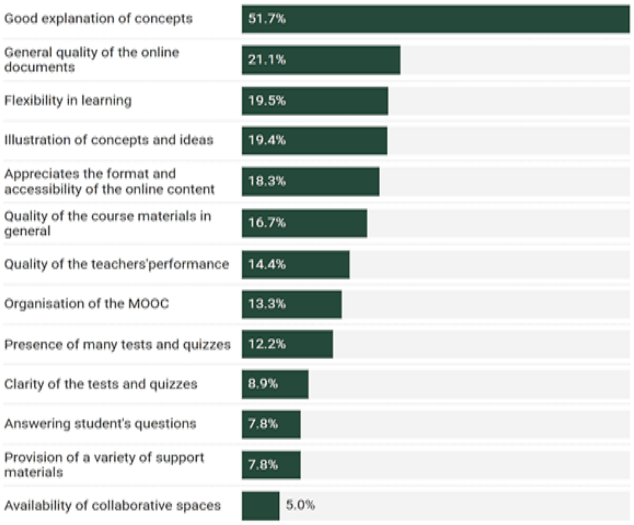

Figure 11. Why do you prefer these platforms

According to the Figure 12, it is explicitly demonstrated that (97.36%) of the students use their smartphones or tablets for distance learning. A percentage of (79.69%) of the respondents declare using also their computers. A percentage of 20.30% of respondents confirm not having personal computers while (2.63%) do not have smartphones.

The results obtained by Figure 13 show that (55%) of students from urban areas are not satisfied with the stability and the quality of their internet access, while in rural areas (71%) of the students are not satisfied at all due to the absence of network service. According to Figure 14, (44%) of students affirme favoring Learning in Arabic (Since Arabic is their native language), while (34%) prefer the French language and (22%) prefer the English language.

Figure 15 shows that (72%) of students prefer graphics and images for illustrating the content more than the plain text during the learning process. Figure 16 reveals that (55.8%) of the students affirmed their insatisfaction with the online learning materials provided by their institutions.

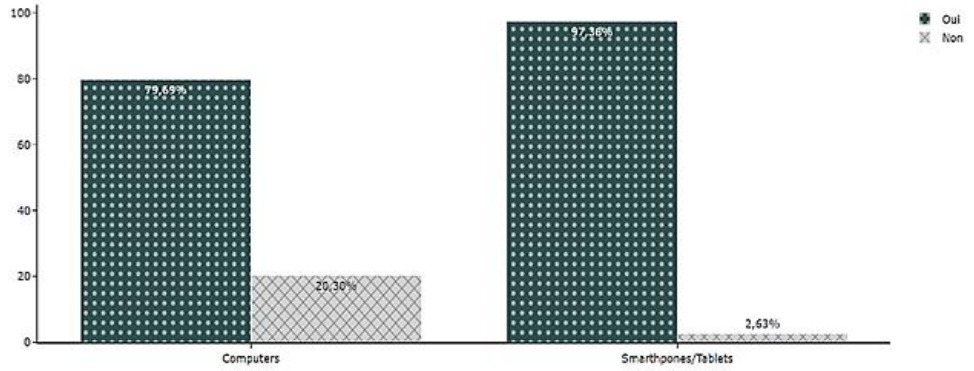

Figure 12. IT equipment used (computers, smartphones and tablets)

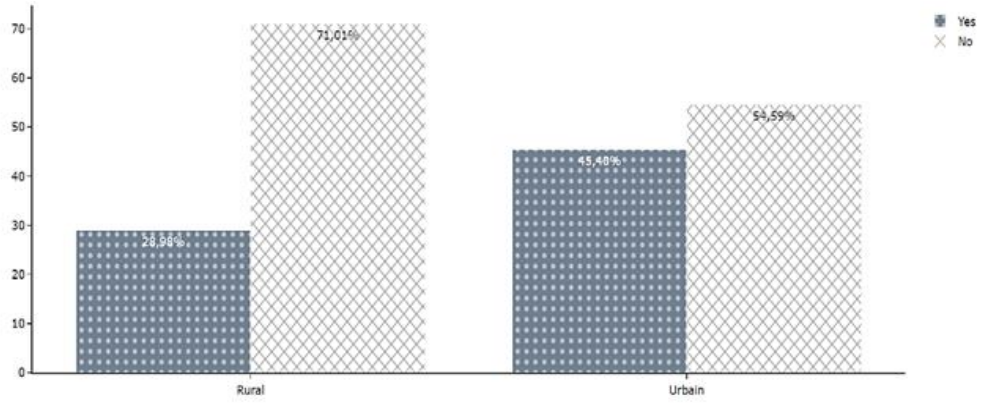

Figure 13. Network quality and access to the internet in the different areas (Yes/No)

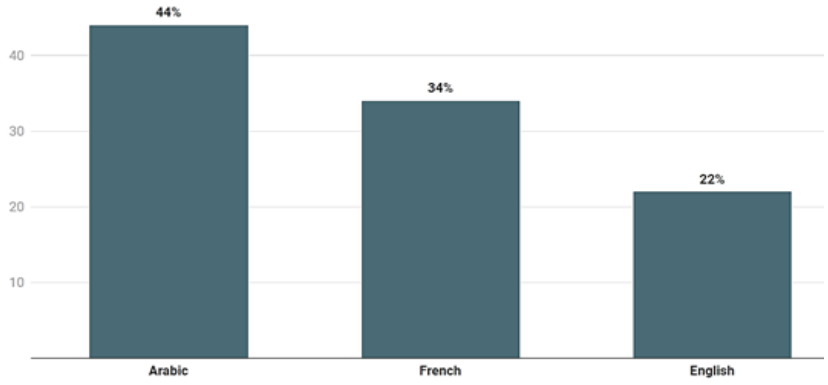

Figure 14. Student preference (language)

According to the results obtained in Figure 17, (87%) of the students are not satisfied with the quality of communication and interaction with their professors during the online sessions. As explicity shown on the word Cloud above (Figure 18) the most frequently cited challenge (47.7%) is access to the internet and poor connection. The second most frequently mentioned challenge (20.82%) is the lack of materials and resources necessary for the proper conduct of distance learning.Thirdly, (15.86%) of the students declare the problem of not mastering the pedagogical tools provided by their institutions. In addition (5.99%) of the learners surveyed mentioned technical difficulties (Micro, access to platforms, Camera). Finally, minor challenges (8.71%) encountered by students due to the lack of interaction between professors and students as well as the non-motivation of students towards the digital.

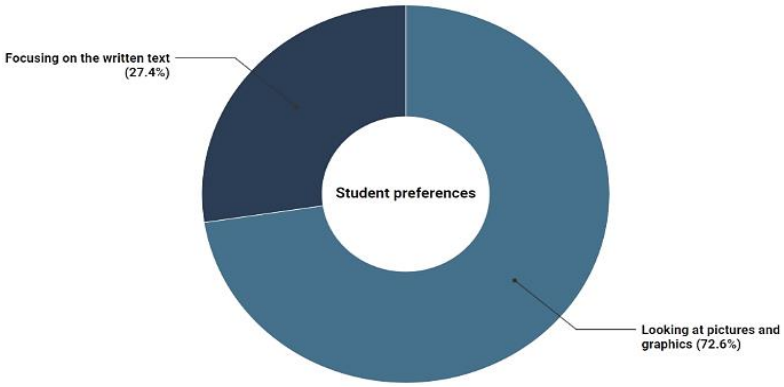

Figure 15. Student preferences (content)

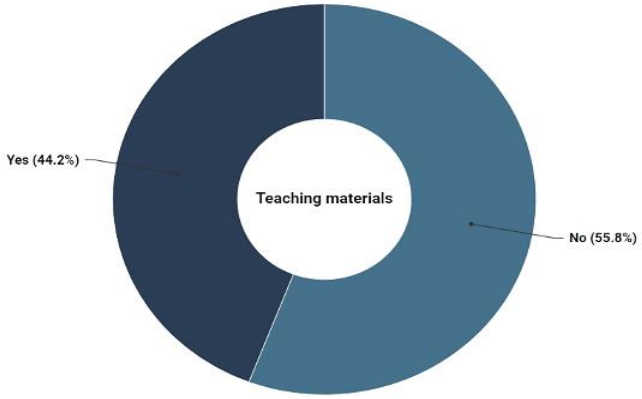

Figure 16. Are the teaching materials put online by your school well enriched?

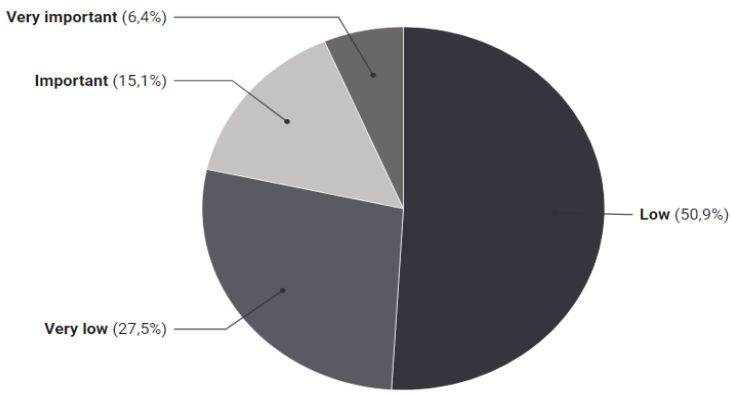

Figure 17. Level of "student/teacher" communication during distance learning

The responses to the open question indicated by the Figure 19 revealed that the majority of participants (48.73%) consider distance learning as a complement to face-to-face, while (51.27%) view it as a primary mode of learning and can completely replace the face-to-face mode to the extent that it allows for the discovery of new topics of interest and more extensive activities. It is apparent from the Figure 20 that (56.22%) of the students favor face-to-face Learning mode while (23.01%) prefer the hybrid mode.. (20.75%) support 100% distance learning.

Figure 18. Difficulties encountered during the use of institutions' e-learning platforms

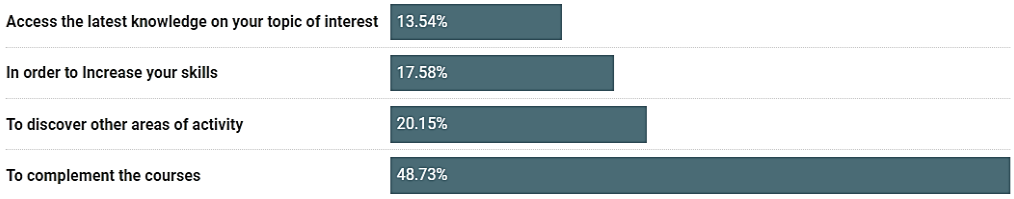

Figure 19. You see distance learning as a way?

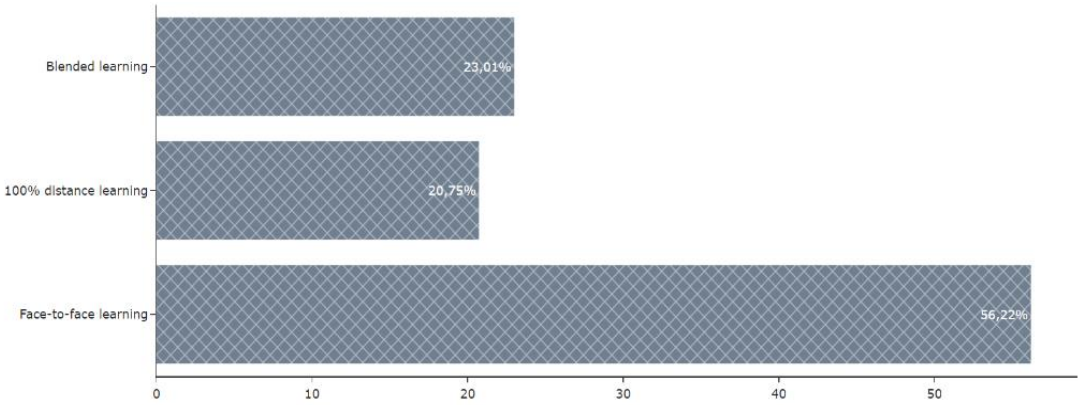

Figure 20. The mode of teaching preferred by students

4.1. Discussion

The sudden transition to distance and even hybrid learning has transformed the educational practices and strategies [41], [42]. Therefore, it has become imperative that learners and teachers adapt to this new procedure. Our survey is conducted to diagnose the challenges of students in different higher education institutions regarding their experience of distance learning during confinement and after recovery of face-to-face learning. This is done by collecting information on the degree of use and familiarity of students with the different distance learning tools, to identify the challenges they faced during the lock in, to measure the degree of inequality between students from different institutions, and to find out their preferences between the different modes of learning (face-to-face, hybrid or distance), as well as to collect the different preferences and learning styles of the different students.

The interviewed group includes 300 students from various levels of study and disciplinary fields enrolled in Moroccan higher education institutions. The different results of our survey show that despite the efforts made by the higher education institutions and the different actors to facilitate the process of distance learning and interaction between learners and teachers, several challenges have been raised, which vary from

one environment to another, from one type of educational institution to another (open access and regulated access) and from one region to another. The majority of students surveyed reported taking hybrid courses after the start of classes in September 2020. Unfortunately, 20.3% of students do not have a personal computer.

On the other hand, the most used distance learning tools are collaborative communication platforms and video conferencing services such as Teams, ZOOM, and Google Meet, as well as social networks, in addition to email and the university website. Only 7% said they had used e-learning platforms such as MOODLE. Furthermore, 40% of students are not familiar with ICT in education. Furthermore, the rate of dissatisfaction with the communication and interaction between the different actors exceeds 80%, despite the use of different communication tools. Indeed, higher education institutions ignore the importance of coaching students to improve the use and exploitation of information and communication technologies.

In general, in Moroccan higher education, each institution has its own pedagogical tools and platforms. Indeed, these platforms do not support several characteristics, among which are the learning styles [43], [44] that differ from one learner to another, the results show that 73% have a visual learning style, as well as 17% have a kinesthetic learning style while 10% have an auditory style. These learning styles need to be taken into account in the learning process of the learners and in the platforms and tools used [45]. Similarly for the languages used, the platforms need to be adapted to the needs of the students in terms of language preference and learning styles. In addition, 56% of students stated that they are not satisfied with the learning materials and content provided by their institutions, which may reduce their motivation to learn [46]. Indeed, the effectiveness of distance learning depends mainly on the preparation and understanding of students' needs.

On the other hand, the majority of students state that they are not satisfied with the quality of the network, and this dissatisfaction translates into increased inequalities within the student population, especially in rural areas. In other words, the availability of personal computers and a good internet connection are essential to the success of the distance learning process. Unfortunately, the platforms set up by the various institutions do not take these criteria into consideration, the offline version is essential to ensure equality between students. In fact, distance and face-to-face learning must complement each other in order to be more effective and to respond to the training needs of both educators and learners, and to reinforce the learning process in general.

5. CONCLUSION

Despite the efforts made by the Ministry of Higher Education and Higher Education Institutions in the field of ICT in recent decades, and especially during the health crisis, the results of our survey confirm the existence of several problems, including the digital divide. These problems could have a negative impact on the effectiveness of the learning process as they increase inequalities between students in public and private access institutions. In addition, the use of distance learning has triggered new reflexions on the development of new tools and platforms in order to ensure pedagogical continuity while minimizing economic, social and demographic inequalities between different learners' levels. As future work, we intend to propose a new model of adaptive e-learning device, which is based on artificial intelligence techniques and which will allow to take into account the set of difficulties encountered by the Moroccan student and to offer them a personalized learning experience.

REFERENCES

[1] M. Jebbour, "The unexpected transition to distance learning at Moroccan universities amid COVID-19: A qualitative study on faculty experience," *Social Sciences & Humanities Open*, vol. 5, no. 1, p. 100253, Jan. 2022, doi: 10.1016/j.ssaho.2022.100253.]

[2] Assessing Covid-19 pandemic-forced transitioning to distance e-learning in Moroccan universities: an empirical, analytical critical study of implementality and achievability, *The Journal of North African Studies*" [Online]. Available: https://www.tandfonline.com/doi/abs/10.1080/13629387.2021.1937138. [Accessed: Jul. 22, 2022]

[3] F. Z. Hibbi, O. Abdoun, and H. El Khatir, "Coronavirus pandemic in Morocco: Measuring the impact of containment and improving the learning process in higher education," *International Journal of Information and Education Technology*, vol. 11, no. 1, pp. 30–34, 2020, doi: 10.18178/ijiet.2021.11.1.1485.

[4] A. Ouajdouni, K. Chafik, and O. Boubker, "Measuring e-learning systems success: Data from students of higher education institutions in Morocco," *Data in Brief*, vol. 35, p. 106807, Apr. 2021, doi: 10.1016/j.dib.2021.106807.

[5] The Impact of the COVID-19 Pandemic on E-Learning Strata Among University Students in Morocco: Assessing Mechanics of Knowledge Reception, Cognition, and Approbation: Education Book Chapter | IGI Global." [Online]. Available: https://www.igi-global.com/chapter/the-impact-of-the-covid-19-pandemic-on-e-learning-strata-among-university-students-in-morocco/276236. [Accessed: Jul. 22, 2022]

[6] H. Bachiri and R. Sahli, "The the need of distance learning in the wake of COVID-19 in Morocco," *International Journal of Language and Literary Studies*, vol. 2, no. 3, pp. 240–256, Sep. 2020, doi: 10.36892/ijlls.v2i3.326.

[7] X. Wang, W. Chen, H. Qiu, A. Eldurssi, F. Xie, and J. Shen, "A survey on the e-learning platforms used during COVID-19," in *2020 11th IEEE Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON)*, Nov. 2020, pp. 0808–0814, doi: 10.1109/IEMCON51383.2020.9284840.
[8] R. Akhmassi, "Distance language teacher & learner autonomy and motivation during the covid-19 lockdown the case of mohammed vi polytechnic university," *Revue Linguistique et Référentiels Interculturels*, vol. 2, no. 2, pp. 20–26, 2021, doi: 10.34874/IMIST.PRSM/liri-v2i2.29058.
[9] H. N. Phillips, "Re-imagining higher education: A cohort of teachers' experiences to face the 'new normal' during COVID19," *International Journal of Educational Research Open*, vol. 2, 2021, doi: 10.1016/j.ijedro.2021.100069.
[10] H. K. Singh et al., "A survey of E-learning methods in nursing and medical education during COVID-19 pandemic in India," *Nurse Education Today*, vol. 99, p. 104796, Apr. 2021, doi: 10.1016/j.nedt.2021.104796.
[11] O. Boukhari and H. Bekkari, "Distance Learning during COVID-19 Pandemic in Morocco: Perceptions of Teachers from Kenitra Directorate," *International Journal of English Language & Translation Studies*, vol. 9, no. 4, pp. 28–34, 2021.
[12] B. Faturoti, "Online learning during COVID19 and beyond: a human right based approach to internet access in Africa," *International Review of Law, Computers & Technology*, vol. 36, no. 1, pp. 68–90, Jan. 2022, doi: 10.1080/13600869.2022.2030027.
[13] O. Dardary, J. Daaif, M. Tridane, and S. Belaaouad, "Distance learning in the age of Covid – 19: between perspective and reality," *International Journal of Engineering Applied Sciences and Technology*, vol. 5, no. 6, pp. 12–18, Oct. 2020, doi: 10.33564/ijeast.2020.v05i06.003.
[14] M. Abioui et al., "Covid-19 and education in Morocco as a potential model of concern for North Africa: a short commentary," *International Journal of Ethics Education*, vol. 5, no. 2, pp. 145–150, Oct. 2020, doi: 10.1007/s40889-020-00100-4.
[15] A. Rhazal, L. Ajana, and J. Khouna, "Are Moroccan Free School Support Websites Effective for Learners During the Covid-19 Pandemic?: A Study Based on an Evaluation Grid," *IJICTE*, vol. 18, no. 1, pp. 1–21, Jan. 2022, doi: 10.4018/IJICTE.292480.
[16] K. Lakssoumi, S. M. Alaoui, and F. Lakssoumi, "Moroccan University students' perceptions towards distance e-learning during the Covid-19 pandemic: challenges and opportunities," *Journal of Applied Language and Culture Studies*, vol. 5, pp. 29–50, 2022.
[17] S. El Firdoussi, M. Lachgar, H. Kabaili, A. Rochdi, D. Goujdami, and L. El Firdoussi, "Assessing distance learning in higher education during the COVID-19 pandemic," *Education Research International*, vol. 2020, pp. 1–13, Dec. 2020, doi: 10.1155/2020/8890633.
[18] M. Ben Said, A. Fadoua, and A. El Baaboua, "Distance learning during quarantine related to the COVID-19 pandemic: Reflections on some problematic of rural areas, Morocco," *Educ Research Journal*, vol. 10, no. 2, pp. 61–71, 2021.
[19] The impact of COVID-19 on education: Performance Analysis of Tracks and Tools for Distance Education in Schools during the Coronavirus Pandemic in Morocco | Proceedings of the 4th International Conference on Networking, Information Systems & Security." [Online]. Available: https://dl.acm.org/doi/abs/10.1145/3454127.3458774. [Accessed: Jul. 22, 2022]
[20] U. Usgaonkar, S. Shet Parkar, and A. Shetty, "Impact of the use of digital devices on eyes during the lockdown period of COVID-19 pandemic," *Indian Journal of Ophthalmology*, vol. 69, no. 7, pp. 1901–1906, 2021, doi: 10.4103/ijo.IJO_3500_20.
[21] "Chapter cover: How Do Moroccan Higher Education Students Behave During the Remote Education in Time of COVID-19? , SpringerLink." [Online]. Available: https://link.springer.com/chapter/10.1007/978-981-16-9812-5_19/cover/. [Accessed: Jul. 22, 2022]
[22] R. Elkhayma, "Distant learning in Morocco: examining students' attitudes and motivation at the tertiary level," *International Journal of English Literature and Social Sciences*, vol. 6, no. 3, pp. 001–009, 2021, doi: 10.22161/ijels.63.1.
[23] M. Benhima and Y. Benabderrazik, "The role of using information communication technology in the motivation of Moroccan english department students during COVID-19 quarantine," *The Journal of Quality in Education*, vol. 10, no. 16, pp. 22–47, Nov. 2020, doi: 10.37870/joqie.v10i16.226.
[24] G. Hjiej *et al.*, "Distant education in Moroccan medical schools following COVID-19 outbreak at the early phase of lockdown: Were the students really engaged?," *Scientific African*, vol. 15, p. e01087, Mar. 2022, doi: 10.1016/j.sciaf.2021.e01087.
[25] F. Ferri, P. Grifoni, and T. Guzzo, "Online learning and emergency remote teaching: Opportunities and challenges in emergency situations," *Societies*, vol. 10, no. 4, p. 86, Nov. 2020, doi: 10.3390/soc10040086.
[26] R. Taleb, "Processus de gestion du changement adopté par le système éducatif marocain, en vue d'assurer la continuité pédagogique et garantir la qualité des apprentissages pendant la crise COVID-19," *Paths of education and training*, vol. 4, no. 2, pp. 34–45, 2021, doi: 10.48403/IMIST.PRSM/massalek-v4i2.26360.
[27] A. Naji, "Educational systems put to the test by Covid: the example of Morocco," International Journal of Education of Sèvres, Oct. 2020, doi: 10.4000/ries.9783.
[28] H. Nachit and L. Belhcen, "Digital transformation in times of COVID-19 pandemic: the case of Morocco." Rochester, NY, Jul. 07, 2020 [Online]. Available: https://papers.ssrn.com/abstract=3645084. [Accessed: Jul. 22, 2022]
[29] J. Alladatin and I. Alchikh, "Distance learning practices during school closure in the context of the covid 19 pandemic in Morocco: Inventory, actors' perception and SWOT analysis of the prevailing practice in rural areas," in *SITE Interactive Conference*, 2021, pp. 451–456.
[30] A. Mouaziz and M. E. Biadi, "Teachers' Perception of Distance Learning during the Covid -19 Pandemic: The Moroccan High School as a Case Study," *International Journal of Information Science and Technology*, vol. 5, no. 2, pp. 51–58, 2021.
[31] H. Razkane, A. Y. Sayeh, and M. Yeou, "University teachers' attitudes towards distance learning during COVID-19 pandemic: hurdles, challenges, and take-away lessons," *European Journal of Interactive Multimedia and Education*, vol. 3, no. 1, p. e02201, Dec. 2021, doi: 10.30935/ejimed/11436.
[32] A. Jamiai, "Issues in e-learning during COVID-19 in Morocco: A focus on EFL master students' voices," *International Journal of Social Science and Human Research*, vol. 04, no. 01, Jan. 2021, doi: 10.47191/ijsshr/v4-i1-01.
[33] C. Çubukçu and C. Aktürk, "The rise of distance education during Covid-19 pandemic and the related data threats: a study about zoom," *Igd Univ Jour Soc Sci*, no. Ek2, pp. 127–143, 2020.
[34] A. Alexei and A. Alexei, "*Cyber security threat analysis in higher education institutions as a result of distance learning*," *International Journal of Scientific & Technology Research*, vol. 10, no. 3, pp. 128–133, 2021, [Online]. Available: www.ijstr.org.
[35] Teachers' Perceptions and the Challenges of Online Teaching/Learning in Morocco during COVID-19 Crisis by Basma Mounjid, Elhassane El Hilali, Fatima Amrani, Mohammed Moubtassime :: SSRN." [Online]. Available: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3904439. [Accessed: Jul. 22, 2022]
[36] M. Anigri, "E-learning for smart-universities: pandemic challenges and opportunities in Morocco," *E3S Web of Conferences*, vol. 297, p. 01066, Sep. 2021, doi: 10.1051/e3sconf/202129701066.
[37] K. Mouna, F. Lakrami, and O. Labouidya, "A review of the state of higher education in Morocco at the time of Covid-19," in *Researchgate.Net*, 2022, pp. 245–260.

[38] M. Benhima, "Moroccan english department student attitudes towards the use of distance education during COVID-19: Moulay Ismail university as a case study," *International Journal of Information and Communication Technology Education*, vol. 17, no. 3, pp. 105–122, Jul. 2021, doi: 10.4018/IJICTE.20210701.oa7.
[39] A. Bouaine, B. Riyami, and M. Loukili, "Efficient recommendations for improving quality of teaching: Face to face, distance-learning, and learners with disabilities," in *ACM International Conference Proceeding Series*, Jul. 2020, pp. 20–24, doi: 10.1145/3411681.3411697.
[40] S. Tsang, C. F. Royse, and A. S. Terkawi, "Guidelines for developing, translating, and validating a questionnaire in perioperative and pain medicine," Saudi J Anaesth, vol. 11, no. Suppl 1, pp. S80–S89, May 2017, doi: 10.4103/sja.SJA_203_17.
[41] M. Haoucha, N. M. B. Santos, Y. Nadri, and H. Nechad, "Distance learning as a safe haven during the COVID-19 pandemic and prospects for post pandemic," in *Policies and Procedures for the Implementation of Safe and Healthy Educational Environments: Post-COVID-19 Perspec*, 2022, pp. 106–123.
[42] U. Akcil and M. Bastas, "Examination of university students' attitudes towards e-learning during the COVID-19 pandemic process and the relationship of digital citizenship," *Contemporary Educational Technology*, vol. 13, no. 1, pp. 1–13, Dec. 2021, doi: 10.30935/CEDTECH/9341.
[43] M. M. El Hammoumi and S. El Youssfi, "Distance learning in Moroccan higher education: students' attitude towards ENS -ecole normale superieure - classroom platform and effective recommendations," *Universal Journal of Educational Research*, vol. 8, no. 12B, pp. 8478–8487, Dec. 2020, doi: 10.13189/ujer.2020.082657.
[44] E. H. Jamila, "Determining learning styles of engineering students and the impact on their academic achievement," in *Lecture Notes in Mechanical Engineering*, 2021, pp. 419–423.
[45] S. Ouahabi, K. El Guemmat, M. Azouazi, and S. El Filali, "A survey of distance learning in Morocco during COVID-19," *Indonesian Journal of Electrical Engineering and Computer Science*, vol. 22, no. 2, pp. 479–487, 2020, doi: 10.11591/ijeecs.v22.i2.pp479-487.
[46] A. Naciri, M. Radid, A. Kharbach, and G. Chemsi, "E-learning in health professions education during the COVID-19 pandemic: A systematic review," *Journal of Educational Evaluation for Health Professions*, vol. 18, p. 27, Oct. 2021, doi: 10.3352/jeehp.2021.18.27.

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