

Analysis of the implementation of teletraining and teleIEC in healthcare services: Case study

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Abstract

INTRODUCTION: Following the COVID-19 pandemic, telemedicine and telehealth have emerged as crucial technological resources for providing medical care and enhancing the competencies of healthcare professionals.

OBJECTIVES: Analysing the implementation of Teletraining and TeleIEC in the healthcare services of Hospital II-2 Tarapoto in Peru.

METHODS: A basic descriptive study with a mixed cross-sectional approach was conducted. The sample consisted of 266 healthcare specialist professionals and 4293 beneficiaries divided into three groups: healthcare personnel, healthcare students, and community members. The techniques employed included record analysis and surveys, with instruments consisting of a data registration form and a virtual questionnaire.

RESULTS: In 2020, only 18% of professionals participated in teletraining and teleIEC activities. By August 2023, this figure had increased to 38%. It is also evident that the majority of professionals participating in these services as of 2023 were physicians (44%), followed by psychologists (16%), nurses (13%), and nutritionists (11%), reflecting limited participation from dentists (2%), obstetricians (1%), among others.

CONCLUSION: The implementation of teletraining and teleIEC has a positive impact through the strengthening of competencies among professionals, students, and the general public, with learning levels reaching the second and third levels according to Bloom's taxonomy, namely comprehension and application.

Keywords: public health, telehealth, telemedicine, information technology, COVID-19

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1. Introduction

The economic crisis faced by countries in recent years has had significant consequences for individuals and society [1]. So much so that the World Health Organization prioritized the analysis of social and economic determinants in the health-disease balance in 2023 [2].

Health inequality constitutes an urgent social justice issue, resulting in increased morbidity and mortality rates

that disproportionately affect disadvantaged populations. There is an inverse relationship between the level of financial protection provided by the healthcare system and the financial burden incurred when individuals fall ill [3]. This leads to limited access to healthcare services, particularly for low-income populations, especially in developing countries where healthcare costs range from low to moderate, further exacerbating health disparities [4].

This health impact has led to a collapse in healthcare systems, resulting in a higher number of relapses of chronic diseases such as diabetes mellitus and hypertension due to

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increased demand and saturation of healthcare services for their management [5]. In response, access to healthcare services through telemedicine has become a primary tool for clinical management, impacting public health that was previously limited to very specific scenarios [6].

Studies demonstrate that following the COVID-19 era, hybrid health services have become normalized [7,8], thanks to technology and its integration into professional development, yielding favourable results in virtual settings [9]. For instance, in Canada, online learning was adopted by a group of surgeons to engage in teleconferencing sessions for surgical education, filling theoretical knowledge gaps [10].

In Peru, the National Health System advocates for the use of ICTs to prevent hospital collapses and succeed in the detection, monitoring, and comprehensive care of cases, including mental health [11]. However, professionals at the primary level face unmet needs due to budget constraints for hiring qualified personnel, further exacerbating the limited access to healthcare services, particularly affecting low-income individuals. Additionally, political instability in managing healthcare in the country contributes to the rise of diseases previously thought to be under control, such as measles, dengue, and Guillain-Barré syndrome, as well as new diseases like COVID-19, exacerbating the economic crisis and posing challenges to the sustainability of the National Health System [12].

An example of the effectiveness of telehealth incorporation was the teletraining of 1400 professionals from 120 interconnected hospitals in Peru's National Health Network to detect and treat dengue. This action took place in March 2023, from the Santa Rosa Hospital in Piura, a northern region facing a health emergency due to this disease. However, the technical document of the national Telehealth plan 2020-2023 indicates that telehealth projects developed in Peru by 2022 are predominantly focused on telemedicine (58%) and telemanagement (37%), with only a low percentage (21%) dedicated to the use of ICTs for Information, Education, and Communication in health (TeleIEC) for preventive-promotional interventions aimed at improving the capacities of professionals and workers [11].

The reality of hospitals in the Peruvian jungle, such as Hospital II-2 Tarapoto, is not different from the global healthcare service landscape; on the contrary, it adds geographical access limitations, climatic conditions, and low internet coverage. Nevertheless, in the San Martin region alone, there are 76 Health Service Providers that belong to the national telehealth network. Hence, there is a need to strengthen professional competencies and raise awareness while promoting preventive health measures among the population.

Given the aforementioned reality, this research aimed to analyse the implementation of teletraining and TeleIEC in the healthcare services of Hospital II-2 Tarapoto as a case study, reflecting the adoption landscape of ICTs in the public health sector and proposing strategic measures to enhance the competencies of healthcare professionals.

2. Materials and Methods

A basic descriptive study with a mixed cross-sectional approach was conducted. The population consisted of 323 healthcare specialist professionals working in Hospital II-2 Tarapoto in clinical areas, with a non-probabilistic convenience sample of 266 professionals. For the calculation of beneficiaries of Teletraining and TeleIEC, all participants connected from the institutional Zoom platform from 2020 to August 2023 were considered, totalling 4293. However, to measure the perception of learning, they were classified into three groups: healthcare personnel, students of health sciences from regional and national universities, and the general public who chose to participate voluntarily in the study in the months of July to August 2023.

Regarding data collection techniques, telehealth records provided by the Telehealth office of the mentioned Hospital from 2020 to August 2023 were analysed. For the evaluation of information from Teletraining and TeleIEC, a beneficiary matrix was used, categorizing participants as healthcare personnel, students, and the general public. Additionally, a survey was conducted to assess the perception of the usefulness of the information with the level of learning in knowledge, comprehension, and application of health topics discussed virtually.

The instrument used was a digital questionnaire with 12 items administered to the beneficiaries related to the first three levels of learning according to Bloom's taxonomy: the first level implies knowledge with an achievement of 6 to 12 points, the second comprehension with a range of 13 to 24 points, and the third application with 25 to 36 points. The questionnaire underwent a validation process through the judgment of three experts. Data collection was carried out through a Google Form during the months of July and August 2023, in the context of Teletraining-TeleIEC. Before participating in the study, informed consent was obtained from the participants.

Subsequently, the collected data were exported to an Excel spreadsheet and underwent analysis using SPSS version 26 software for processing and subsequent interpretation in figures and tables.

3. Results and Discussion

In Figure 1, the number of healthcare professionals is shown, indicating an upward trend in participation in academic and informational activities from 2020 (pandemic period) to August 2023. This reveals a growing institutional culture of continuous training.

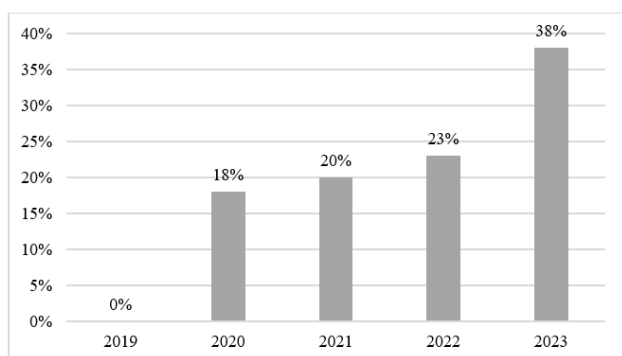


Figure 1. Healthcare professionals participating as speakers

In the year 2020, a total of 18% (49) healthcare professionals participated as speakers in Teletraining. This indicates a modest interest in participation in Teletraining and TeleIEC compared to subsequent years. In 2021, the number of speakers increased to 20% (54), signalling the growing recognition of the importance of Teletraining in the healthcare sector. By the year 2022, the number of speakers rose to 23% (62). This increase could suggest a rising trend in the adoption of Teletraining. Finally, up to August 2023, the number of speakers was 38% (101), indicative of a growing demand and acceptance of Teletraining in healthcare services, possibly driven by the COVID-19 pandemic.

The findings respond to the health crisis caused by the pandemic, where various virtual learning platforms were implemented. Among these, the Learning Management System in the Integral Health Insurance stands out, proving to be a beneficial tool to support the universal insurance policy support program known as the SISTEC program. The results reflected improvements in healthcare provision, especially thanks to the implementation of monitoring and evaluation systems for medical care. The experience of virtual reality involves immersing the participant in a virtual scenario resembling the real environment; furthermore, it drives the exploration of new concepts in the application of technology in healthcare and the training of healthcare professionals [13].

However, changes in the healthcare environment have generated an urgent need to improve continuous training and updating of healthcare professionals as emphasized by Pottle [14]: "Medical education is changing. Simulation is increasingly becoming a cornerstone of clinical training and virtual reality is not a panacea; it is a powerful educational tool for defined learning objectives and its implementation is growing worldwide."

Likewise, Figure 1 demonstrates the level of involvement of healthcare personnel in continuing education activities in a growing trend. As more healthcare professionals become aware of the benefits and share their experiences regarding Teletraining and TeleIEC activities, they may have influenced others to join as speakers. Currently, there is an increase in availability and awareness among both healthcare personnel and the community about

the benefits offered by online training and information modalities. This is largely due to technology becoming increasingly accessible [15].

In this context, there is a need to provide clear information to healthcare personnel about the objectives and importance of their participation. It is crucial to provide them with appropriate recognition and encouragement, such as certificates or incentives, as this will contribute to fostering greater active and creative participation by professionals. Consequently, they will be more motivated to share their experiences and knowledge in managing healthcare in the era of the new millennium [16].

On the other hand, Figure 2 mentions that 72% of beneficiaries participated in Teletraining, while 28% were exposed to TeleIEC content. However, in 2022, there is a minimal difference of 2% between the two continuous education activities.

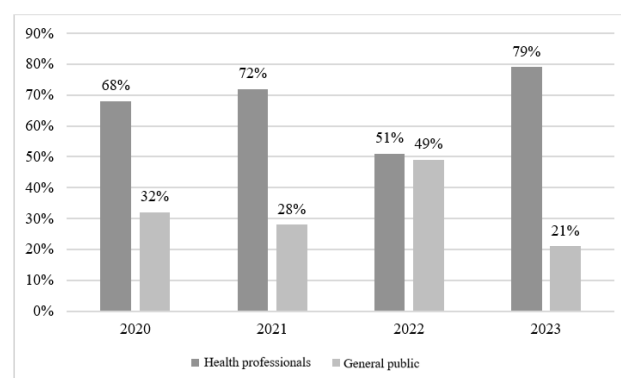


Figure 2. Beneficiaries of Teletraining and TeleIEC

It is widely recognized that digitalization has become a fundamental tool facilitating a wide variety of activities across various sectors. However, to achieve successful implementation of digitalization in the public health sector, certain fundamental pillars must be considered, as indicated by the European Public Health Association (EUPHA). These pillars include political commitment, robust regulatory frameworks, infrastructure, appropriate technology, substantial economic investments, and rigorous monitoring and evaluation, among other crucial aspects [17].

It is important to note that participation in digitalization has experienced growth in recent times. This trend is reflected in the increasingly widespread use of various digital applications and platforms. However, in the field of health, digitalization has served as a valuable means to disseminate preventive measures and promote health, in addition to addressing issues related to diseases. Nevertheless, the integration of these technologies into public health is progressing at a slower pace than in other fields, necessitating the promotion of new and innovative models to address the complexity of healthcare systems differently, with healthcare management policies being crucial [18].

Regarding Figure 3, it illustrates a timeline of the development of Teletraining and TeleIEC at Hospital II-2

Tarapoto. An exponential growth in training activity is revealed over each year.

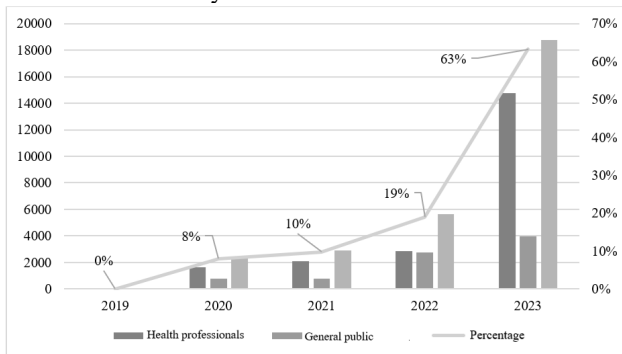


Figure 3. Timeline of Teletraining-TeleIEC (2020-August 2023)

We infer that the increase in virtual training can be attributed to the following factors:

1. The wide range of opportunities offered by the digital era to improve health provides the opportunity to reach everyone; however, it has also exposed threats, especially regarding information security. Therefore, the development of electronic processes that improve both quality and technological security in this area is required. According to Mezarina et al. [19], there has been a steady growth in the creation of mobile health applications, known as mHealth; however, this trend raises issues related to the quality of the information these applications share, data security and privacy, ease of use, and effectiveness. Therefore, it is necessary to establish a regulatory framework based on existing medical devices and health information systems to effectively address these challenges.
2. The ability to share information and connect through technology so accessible for imparting knowledge and information. In this context, the crucial challenge arises of finding the right balance of how to maximize the benefits of this digital revolution [20].
3. A variety of topics flexible to people's needs, as shown in the study conducted by de Ponti et al. [21] on pre-graduation medical education during the COVID-19 pandemic to 115 medical students, where 90% positively valued training in virtual reality and 93% valued the format in which online training was structured as adequate. Most participants considered the virtual reality training platform realistic for initial clinical assessment (77%), diagnostic activity (94%), and treatment options (81%). Additionally, 84% considered the future use of this virtual reality training useful.
4. Reduction in the cost of Teletraining; usually, virtual training has benefits such as eliminating the need for healthcare workers to travel to a training location, and it also reduces costs related to physical

materials. In traditional training, manuals, books, and printed brochures are distributed, which incurs expenses in printing, storage, and shipping [14]. In contrast, virtual training offers the advantage of providing material in digital format, reducing these costs. Similarly, it saves on space and logistics. Healthcare organizations do not need to reserve training rooms or specific classrooms. Another benefit lies in reducing downtime. With virtual training, healthcare personnel do not have to be away from their jobs for long periods to receive in-person training [22].

5. Connectivity from personal space; this provides greater flexibility in when and how training is conducted, minimizing interruptions in the institution's normal operations [23]. Scalability and reusability are other key elements. Virtual training courses and materials are easier to adapt and reuse. Once created, they can be used to train an unlimited number of employees [24].

Now, Table 1 on Teletraining according to professional group of the Office of Health Management and Services (OGESS) specialized reveals the level of involvement of healthcare professionals, with results showing 119 physicians, 46 psychologists, 30 nutritionists, and 29 nurses, among other professions, between 2020 and August 2023.

Table 1. Teletraining and TeleIEC by professional group

Professionals	2020	%	2021	%	2022	%	2023	%
Doctors	25	51%	25	46%	25	38%	44	44%
Nurses	5	10%	6	11%	5	8%	13	13%
Psychologists	10	20%	9	17%	11	17%	16	16%
Nutritionists	3	6%	6	11%	10	15%	11	11%
Dentists	2	4%	1	2%	3	5%	2	2%
Obstetricians	0	0%	3	6%	4	6%	1	1%
Pharmacists	2	4%	1	2%	2	3%	2	2%
Administrative staff	0	0%	1	2%	2	3%	3	3%
Lawyers	0	0%	0	0%	1	2%		0%
Engineering	0	0%	0	0%	1	2%	1	1%
Microbiologists	0	0%	0	0%	1	2%	4	4%
Medical technology	0	0%	0	0%		0%	1	1%
Social workers	0	0%	0	0%	1	2%	1	1%
Others (guests)	2	4%	2	4%	0	0%	2	2%
Total	49	100%	54	100%	66	100%	101	100%

As referenced by Goh and Sandars [25], it is a fact that medicine has experienced a revolution in its concepts, paradigms, and processes thanks to the incorporation of informatics. This innovation has led medical professionals to utilize the advantages of informatics, at least in terms of

patient assessment, monitoring, and competency strengthening. This trend reveals the active participation of these professionals, considering informatics as a modern means to address health- and disease-related concerns in our community.

Furthermore, to understand the perception of the degree of learning imparted in Teletraining and TeleIEC, a virtual questionnaire was conducted with 4,293 beneficiary individuals, of which 31% were healthcare personnel, 35% were healthcare students, and 34% were the general public. To categorize the level of learning, the first three levels of Bloom's taxonomy were considered.

As observed in Figure 4, the general public has indicated that they have learned at level 2 with 58%. This level implies an understanding of the topics that enables them to explain them in their own words. Additionally, at level 3, which implies knowledge that can be applied to solve problems, students stand out with an 85% perception at this level of learning [26].

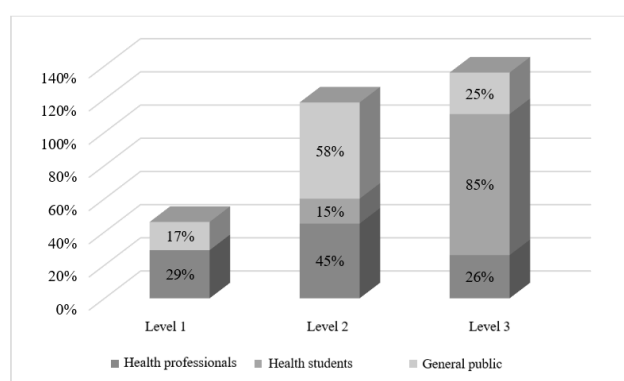


Figure 4. Perception of learning in Teletraining and TeleIEC

Similarly, we find healthcare personnel at 29%, indicating that they have only familiarized themselves with and acquired knowledge about the topics presented in Teletraining, being at the first level of learning based on Bloom's taxonomy. It is known that positive emotions influence learning; however, attention, memory, and motivation are factors that will generate brain mechanisms between cognition and emotions, making it relevant to create more positive learning environments to achieve a higher level of benefit [27,28].

Finally, the trend of the use of information technologies through teletraining and teleIEC must be constantly promoted in the various health establishments regardless of their levels with the objective of improving the informative scope of relevant health topics that can be used by a general public. broader in order to improve their quality of life.

4. Conclusions

The implementation of virtual training in healthcare services through Teletraining and TeleIEC has a positive impact by strengthening competencies in professionals,

students, and the general public, with levels of learning at the second and third levels, namely comprehension and application. Therefore, the annual programming of Teletraining and TeleIEC is a way to achieve sustainability of continuous education in healthcare services by using technology, creating an academic culture of training and information on health topics.

The results highlight the need to develop and implement competency strengthening programs in the use of ICT to promote greater participation of specialized healthcare professionals, which would help meet the growing demand from healthcare students and the general public. Additionally, it would contribute to reducing the gap in access to timely information in the healthcare sector.

References

- [1] Pandit T, Sabesan S, Ray RA. Medical emergencies in rural North Queensland: Doctors perceptions of the training needs. *Aust J Rural Health*. 2018;26(6):422-8. <https://doi.org/10.1111/AJR.12433>
- [2] Zhang B. Expert consensus on telemedicine management of diabetes (2020 edition). *Int J Endocrinol*. 2021; 1-12. <https://doi.org/10.1155/2021/6643491>
- [3] Martiniuk A, Challinor J, Arora RS, Handayani SA, Lam C. Digital solutions to facilitate education, training and professional support for paediatric oncology and other health professionals in rural and other low-resource settings. *Health Educ*. 2022;122(2):232-59. <https://doi.org/10.1108/HE-02-2021-0035/FULL/XML>
- [4] Erlangga D, Suhrcke M, Ali S, Bloor K. The impact of public health insurance on health care utilisation, financial protection and health status in low- and middle-income countries: A systematic review. *PLoS One*. 2019;14(8):e0219731. <https://doi.org/10.1371/JOURNAL.PONE.0219731>
- [5] Visconti-Lopez FJ, Hernández-Vásquez A, Solorzano-Salazar DM, Azañedo D. Chronic disease relapses: A cross-sectional study of the associated factors and socioeconomic inequalities during the COVID-19 pandemic in Peru. *PLoS One*. 2022;17(9):e0274697. <https://doi.org/10.1371/JOURNAL.PONE.0274697>
- [6] Montenegro P, Pinillos L, Young F, Aguilar A, Tirado-Hurtado I, Pinto JA, et al. Telemedicine and the current opportunities for the management of oncological patients in Peru in the context of COVID-19 pandemic. *Crit Rev Oncol Hematol*. 2021;157:103129. <https://doi.org/10.1016/J.CRITREVOONC.2020.103129>
- [7] Muller J, Reardon C, Hanekom S, Bester J, Coetzee F, Dube K, et al. Training for Transformation: Opportunities and Challenges for Health Workforce Sustainability in Developing a Remote Clinical Training Platform. *Front Public Heal*. 2021;9:1-14. <https://doi.org/10.3389/fpubh.2021.601026>
- [8] Saavedra Grandez SG. Intervención de las TICs en redefinición de atención externa en Hospital II-2 Tarapoto en épocas de pandemia Covid 19. *Rev Cient Sist Inform*. 2021;1(1):58-68. <https://doi.org/10.51252/rcsi.v1i1.120>
- [9] Lee SM, Lee D. Opportunities and challenges for contactless healthcare services in the post-COVID-19 Era. *Technol Forecast Soc Change*. 2021;167:120712. <https://doi.org/10.1016/j.techfore.2021.120712>
- [10] Feizi N, Tavakoli M, Patel R V., Atashzar SF. Robotics and

- AI for Teleoperation, Tele-Assessment, and Tele-Training for Surgery in the Era of COVID-19: Existing Challenges, and Future Vision. *Front Robot AI*. 2021;8:610677. <https://doi.org/10.3389/frobt.2021.610677>
- [11] Ministerio de Salud - MINSA - Plataforma del Estado Peruano.
- [12] OPS/OMS | Organización Panamericana de la Salud.
- [13] Ferreira RS, Xavier RAC, Ancioto ASR. La realidad virtual como herramienta para la educación básica y profesional. *Rev Científica Gen José María Córdova*. 2021;19(33):223-41. <https://doi.org/10.21830/19006586.728>
- [14] Pottle J. Education and training virtual reality and the transformation of medical education. *Futur Healthc J*. 2019;6:181-6.
- [15] Adedoyin OB, Soykan E. Covid-19 pandemic and online learning: the challenges and opportunities. *Interact Learn Environ*. 2023;31(2):863-75. <https://doi.org/10.1080/10494820.2020.1813180>
- [16] Kitsios F, Kamariotou M. Job satisfaction behind motivation: An empirical study in public health workers. *Heliyon*. 2021;7(4):e06857. <https://doi.org/10.1016/j.heliyon.2021.e06857>
- [17] Odone A, Buttigieg S, Ricciardi W, Azzopardi-Muscat N, Staines A. Public health digitalization in Europe EUPHA vision, action and role in digital public health. *Eur J Public Health*. 2019; 29:28-35. <https://doi.org/10.1093/eurpub/ckz161>
- [18] Gjellebæk C, Svensson A, Bjørkquist C, Fladeby N, Grundén K. Management challenges for future digitalization of healthcare services. *Futures*. 2020;124:102636. <https://doi.org/10.1016/J.FUTURES.2020.102636>
- [19] Mezarina LR, Silva-Valencia J, Escobar-Agreda S, Herrera DHE, Egoavil MS, Kuljich MM, et al. Need for the Development of a Specific Regulatory Framework for Evaluation of Mobile Health Apps in Peru: Systematic Search on App Stores and Content Analysis. *JMIR Mhealth Uhealth*. 2020;8(7):e16753. <https://doi.org/10.2196/16753>
- [20] Mckee M, Van Schalkwyk MCI, Stuckler D. The second information revolution: digitalization brings opportunities and concerns for public health. *Eur J Public Health*. 2019; 29:3-6. <https://doi.org/10.1093/eurpub/ckz160>
- [21] De Ponti R, Marazzato J, Maresca AM, Rovera F, Carcano G, Ferrario MM. Pre-graduation medical training including virtual reality during COVID-19 pandemic: A report on students' perception. *BMC Med Educ*. 2020;20(1):1-7. <https://doi.org/10.1186/S12909-020-02245-8/FIGURES/3>
- [22] Correia A-P, Liu C, Xu F. Evaluating videoconferencing systems for the quality of the educational experience. *Distance Educ*. 2020;41(4):429-52. <https://doi.org/10.1080/01587919.2020.1821607>
- [23] Farra SL, Gneuh M, Hodgson E, Kawosa B, Miller ET, Simon A, et al. Comparative Cost of Virtual Reality Training and Live Exercises for Training Hospital Workers for Evacuation. *Comput Inform Nurs*. 2019;37(9):446. <https://doi.org/10.1097/CIN.0000000000000540>
- [24] Hiselius LW, Arnfalk P. When the impossible becomes possible: COVID-19's impact on work and travel patterns in Swedish public agencies. *Eur Transp Res Rev*. 2021;13(1):1-10. <https://doi.org/10.1186/S12544-021-00471-9/TABLES/11>
- [25] Goh P-S, Sandars J. A vision of the use of technology in medical education after the COVID-19 pandemic. *MedEdPublish*. 2020;9:49. <https://doi.org/10.15694/mep.2020.000049.1>
- [26] Li L, Gow ADI, Zhou J. The Role of Positive Emotions in Education: A Neuroscience Perspective. *Mind, Brain, Educ*. 2020;14(3):220-34. <https://doi.org/10.1111/MBE.12244>
- [27] Sembay MJ, Jeronimo DD. Health information systems: proposal of a provenance data management method in the instantiation of the W3C PROV-DM model. *Advanced Notes in Information Science*. 2022;2:192-201.
- [28] Gomes AS, Pinto AL, Meneses NC. A methodology for producing knowledge in public safety through data and information visualization resources. *Advanced Notes in Information Science*. 2023;4:190-212.
- [29] Araujo-Inastrilla CR, Vitón-Castillo AA. Blockchain in health sciences: Research trends in Scopus. *Iberoam J Sci Meas Comm*. 2023;3(2):1-10. <https://doi.org/10.47909/ijsmc.56>
- [30] Basumatary B, Gul S, Verma MK. Social attention to the scientific publications on mHealth research during Covid-19 outbreak: An altmetric study. *Iberoam J Sci Meas Comm*. 2023; 3(2):1-11. <https://doi.org/10.47909/ijsmc.47>