University Extension Activities in Higher Education: Open Pathways for Lifelong Learning

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ARTICLE INFO	ABSTRACT
Published: 20 May 2020	Sustainability and the Agenda 2030 bring as main concern the promotion of Lifelong Learning. A diversity of aspects is important to consider improving quality of life: (a) access to preventive and health promotion actions through training programs and continuous digital inclusion; (b) the technological innovation development for the contexts involved in the programs of permanent training and digital inclusion, encouraging action research and teaching applied to real situations. An example is the use of mobile devices in health. Interesting alternative in well-being and education situations, where there is a need to involve a large number of people and there are difficulties in accessing information, either because of the distance from urban centers or the lack of health professionals and educational actions, especially for the prevention and improvement of quality of life. In this way, this study focuses on: (i) social aspects - access to preventive and health promotion actions through training programs and continuous digital inclusion; (ii) technological - the development of a specific application for the contexts involved in the programs of permanent training and digital inclusion, encouraging action research and teaching applied to real situations, through mobile technologies. Considering the technological advances and the identification of different pedagogical strategies, this paper presents a proposal of online booklet for elderly people about functional exercises. Considering the technological advances and the identification of different pedagogical strategies, this paper presents a proposal of a process that includes some objectives from SDG 3 and 4 for extension activities for developing a booklet as a concept prove. **Keywords:** digital inclusion, digital booklet, mobile learning, extension activities

INTRODUCTION

Open and Distance Education for lifelong learning is a demanding in a diverse area, especially in health. The face to face, flexible and open education are placed to evolve and evaluate the process of social inclusion and entrepreneurship in Higher Education (HE) (UK Universities, 2018).

University extension consists in a set of actions that aims to integrate research and teaching, looking for society benefits. Innovative technological applications have been developed with the goal of to not only being theoretical proof of concepts, but also to bring economic and social impacts at short, medium and long term. The usage of mobile technologies is an example of this kind of action, in which the application is seen at clinical and at educational context. In the context of proposal and development of digital booklet, realizes that there is a need of to better determine preventive actions to population, especially the poorer population, due to lack of resources to access technologies.

A trend that must be considered is micro-credentials. In the digital economy where ongoing upskilling is required for the future of work, micro-credentials and other forms of non-formal learning are rapidly emerging and making the landscape ever more complex, for learners, employers and providers (Oliver, 2019). Micro-credentials are short, verified courses or learning experience with digital certification (Rossiter & Tynan, 2019).

The insertion of the Distance Education (DE) into people's daily lives has also been observed in the corporate world. Changes in business needs, with more complex tasks and projects and shorter execution times, require greater professional qualification, as well as changes in the way organizations work (UK Universities, 2018). With the greater dynamics and demands of the market, more and more people are submitted to trainings and courses in the most different modalities in order to add value to the professional competences and the institutions to which they are linked.

Structuring a course for a health professional in primary care means to deal with work process, integration and interaction between workers and assisted population. Developing an online platform is a complex task that involves multiple demands, such

as selecting appropriate materials, qualified people and resources, especially technology, so that the learning objectives can be achieved.

Strategies that allow collaboration and exchange of experiences between participants should be defined, otherwise students will be harmed, and the course will not succeed. This becomes even more complex when it comes to creating not only an isolated course (an instance), but a programme with several courses. The coherence and uniformity of content must be logical and must also meet the needs of adults who already have professional experience in the subjects addressed, not to mention the importance of a viable and lightweight technology solution. In this way, the educational offer will fulfil its formative role for the students who enter it.

The importance of education and health promotion is universally evoked from the Sustainable Development Goals (SDG) 4 and 3 and theirs targets, from Agenda 2030 (SDG, 2015). The subobjective 4.7 from SDG 4 has as a target (UNESCO, 2017):

> The knowledge, skills, values and attitudes required by citizens to lead productive lives, make informed decisions and assume active roles locally and globally in facing and resolving global challenges can be acquired through education for sustainable development and global citizenship education, which includes peace and human rights education, as well as intercultural education and education for international understanding.

The subobjective 3.8 from SDG 3 has a target (United Nations, 2017):

> Coverage of essential health services (defined as the average coverage of essential services based on tracer interventions that include reproductive, maternal, new born and child health, infectious diseases, non-communicable diseases and service capacity and access, among the general and the most disadvantaged population)

In this context, the development and usage of digital booklet, although it is focused on university extension actions and for older adults, it encompasses projects that deal with teaching and research (Gusmão, 2019). Therefore, we developed actions of digital inclusion, transferring of knowledge for the society through training, and research & usage of innovative technologies, and all aiming to promote and to improve health and life quality, with special attention, in this project, to physical educators, physiotherapists and occupational therapists.

When applied at a national context, the health support technology is an effective way of universalizing access to health and information. Mobile health (mHealth) fits the need of technology, describes the use of portable electronic devices with software applications to provide health services or manage patient information. mHealth can also support the performance of health care workers by the dissemination of clinical updates, learning materials, as well as for the assisted community.

Embedded applications in mobile devices, for example, allows to perform actions of distance education, and aims to: (a) increase access to educational actions through the usage of guidelines in an easy-to-understand language, using an evidence-based approach and in multiple formats; (b) increase the efficiency of care in health units; (c) minimize hospital spontaneous demands; (d) expand coverage of services; (e) enable medical triage; (f) reduce waiting time for consultations and; (g) record healthcare services.

Therefore, the focus on education in this study is due to involved demands and tools, because there is a need of requirements gathering to apply specific protocols for using in mobile devices, as well as to perform studies of application scenarios (UK Universities, 2018).

The usage of mobile devices as a health learning tool tends to contribute to reduction of social costs, once it promotes the educational process through field research, during the work, without the need to remove the professionals from their workplace for training and qualification (Rowe et al., 2007). We realize that the usage of mobile devices in healthcare performs an important role supporting healthcare services, facilitating in data collection to the decision-making process of application in their various levels of complexity (Baumgart, 2006).

This study, in specific, approaches the usage of elements that aim to stimulate engagement and interest of professionals and the aided population by educational objects. Online platforms are changing the traditional teaching and learning paradigms. The student became an important actor of the teaching learning process. A methodology that is considered intuitive is the one that is based on problems and situations that refer to common aspects of the user's day to day.

Thus, there are integration points that support the proposal and development of digital booklet (Gusmão, 2019), the inseparability between teaching, research and extension, that allow health education in the context of primary healthcare, especially older adult population, as well as the development of innovative technologies and interfaces with undergraduate and postgraduate courses of higher education institutions.

After this introduction, section two presents the background, concepts that supported the proposal. Section three introduces Methods and Materials for the analysis of the literature, presents the methodology defined and strategic actions for assessment indicators. Section four continues the literature analysis finding and examines the outcomes of the Mapping Systematic Review. The activities done and results are discussed in section five. Finally, section six presents the final considerations and ongoing activities.

FUNDAMENTALS CONCEPTS

The particular educational roles of those involved in distance and online education have been changing since the introduction of technology into higher education (Ní Shé et al, 2019). The age of information society promotes several opportunities, including socio-economic and cultural ones, in which knowledge and learning have become valuable assets of each individual. Extending the use of internet through social media, for example, requires training in order to understand new ways of using digital learning objects in their respective domain of interest. In this context, digital inclusion plays a vital role for social inclusion, and it is necessary to take into consideration some aspects (Mattos and Chagas, 2008): (a) insertion of people on job market and generation of income; (b) improvement of the relationship between citizens and public entities; (c) improvement and facilitation of people everyday tasks; (d) increase of cultural and social values and citizenship improvement; (e) spreading of technological knowledge.

Health Promotion in Brazil

Primary healthcare in Brazil, due to its social and preventive nature, is an opportunity to develop digital and social inclusion, once it allows the integration ant continuous training of professionals, as well as educational actions with the population. In this context, it is worth mentioning that the process of decentralization of Brazilian Healthcare System brought changes in the way the actions and services are managed in Brazilian public health. By prioritizing primary healthcare, Brazilian Ministry of Health sought to transform the logic of financing, to promote changes in the healthcare model in order to make it more efficient, allowing the monitoring of the obtained results and employed resources, ensuring integrality in the development of the actions, contributing to universal access and consolidating the link between population and services.

This decentralized model of health management was reinforced by the valorization of programs and strategies of primary healthcare, currently represented by Family Health Strategy (FHS), according to Ordinance No. 2.488, of October 21, 2011 (Brasil, 2011). FHS is the priority strategy of Brazilian Ministry of Health (MS) to organize primary healthcare – whose one of its foundations is to provide universal and continuous access to health services with quality, reaffirming the basic principles of Brazilian Healthcare System: universality, equity, decentralization, integrality and community participation – trough users' registration and linking.

The mentioned ordinance also reinforces the importance of articulating institutions and making partnerships possible with governmental and non-governmental organizations, private sector and international companies to strengthen primary healthcare in Brazil and for the training and guarantee permanent education to health professionals. It is important to notice the need of developing health education actions for the population (Brasil, 2011). Despite the easy access to information, users are still considered individuals with lack to health information. On the other hand, with the received information, the users will be capable to make decisions to prevent diseases and illnesses, as well as they will be able to assume new habits and conducts (Alves, 2005).

Telehealth and Mobile Health (mhealth)

Telehealth applications is essentially the usage of computer networks and telecommunications to exchange data about patients and to promote education in healthcare. The Brazilian Federal Medicine Council presents in the Resolution no. 1643/2002 the following definitions:

- Art 1st – to define Telemedicine as the exercise of Medicine through the usage of interactive methodologies of audiovisual and data communication, with the objective of to provide assistance, education and research in health;

- Art 2nd – the provided services through Telemedicine should have appropriate technological infrastructure and to comply with technical standards of Brazilian Federal Medicine Council, pertinent to custody, handling, data transmission, confidentiality, privacy and guarantee of professional secrecy.

In the context of education, the usage of rich user interfaces via mobile devices, as well as the better access to guides and protocols, can favor the educational process of health professionals and of the population in general. The usage of mobile devices to support education is defined as a tool that allows teaching and learning in which the receiver (the learner) is not fixed in a certain place or when she or he benefits from the technological resources offered by mobile devices (O'Malley, 2003). More specifically in mobile health computing, we can identify some benefits, such as:

i) simplify access and update of information, making it faster;

ii) strengthening evidence-based healthcare;

iii) strengthening decision-support systems;

iv) reduction of errors and inconsistencies;

v) learning tool among students and professionals (Baumgart, 2006).

The emergence of the Internet also brought the possibility of access to a range of information services, including digital repositories. This service is one of the most advanced and complex in system information, due to the activities of navigation structure definition and document research, preservation of these documents, multimedia information services and selective disclosure of information (Fox, 1998).

Virtual Scenarios and e-Learning

Some applications may need specific support to store their information. Digital objects of different formats, such as, text, searchable text, audio, video, images, coded data such as short wave and electrocardiogram need specific metadata and

particularized treatment in their documentary question, and therefore, it is necessary the usage of tools to assist in the cataloging and storage of information.

One of the educational strategies considered interesting to allow the usage of the available technological resources is through virtual scenarios, allowing the interactivity and best stimulus to learning (Greitzer, 2005). Through virtual scenarios we can use multimedia resources for presentation of situation-problems, commonly followed by other learning objects, such as videos and quizzes. In this perspective, the student become the main author of the associated findings (Cañizares, 2016). Scenario-based strategies allow that students to organize and to structure answers for the presented situations, as well as it allows the usage of practical activities that represent or even require other activities and knowledge acquired in the real world.

METHODS AND MATERIALS

One of the educational strategies considered interesting to allow the usage of the available technological resources is through virtual scenarios, allowing the interactivity and best stimulus to learning. Through virtual scenarios we can use multimedia resources for presentation of situation-problems, commonly followed by other learning objects. In this perspective, the student become the main author of the associated findings, specially based on SDG 3 (3.4) and SDG 4 (4.3).

Scenario-based strategies allow that students to organize and to structure answers for the presented situations, as well as it allows the usage of practical activities that represent or even require other activities and knowledge acquired in the real world. All methodological actions were planned with integrated extension activities to academic proposals and involved a group of students of biomedical engineering and computer science, as well as teachers and researches.

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Inception phase comprised activities of literature review, understanding of the problem to be addressed, identified gaps, related work, as well as the delimitation of the scope. The method used to perform this work was the bibliographical survey, through a systematic mapping, with a qualitative approach, with a theoretical and exploratory goal (Turisco and Case, 2001). The present research was focused on the Scientific Electronic Library OnLine (SciELO) database, in which a sample of the most significant scientific works of the area was collected from 2014 to 2017. In total, 72 articles were collected, according to the descriptors used, and 13 were selected. These papers provided a holistic view of elderly people and issues related to digital and social inclusion.

A study of mobile applications for health was performed, such as concepts of gamification and e-Learning with the goal of to define the appropriate architecture for the solution (Gusmão, 2019; Silva, Carvalho and Carvalho, 2015). System requirements have been evaluated with the support of primary healthcare professionals. All these activities were performed by researchers and postgraduate students.

Development phase comprised the selection of technologies, platform and devices for system requirements modelling. The purpose was the adoption of free platforms and technologies, because it favors the dissemination of the usage in health public services, as well as to facilitate the integration with other systems.

The technological platform adopted was HTML5 and CSS3. In developing the primer version, we use some libraries: JQuery A JavaScript function framework that interacts with HTML, designed to simplify interpreted scripts in the browser. With the "manifest" feature it was possible to point out static files making the booklet functional even without a connection.

Finally, **Assessment** phase consisted on the elaboration of simulations and empirical studies. These were developed by teachers, researches and students. It is the experimental phase, in which the proposed system is constantly assessed with the goal of to find improvement points and to quantify the impact of practical application for remote and community health services.

Indicators of Assessment

A set of indicators was defined to assess the proposal of digital booklet (Gusmão, 2019):

1. Learning: assessment of the involved actors with the usage of the technologic platform;
2. Quality of learning objects: continuous assessment of technology insertions from the viewpoint of the population directly benefited;
3. Quality of the system: assessment of the system, in order to define improvement points, especially in aspects related to usability, that is, if the learning object in the mobile system is easy-to-use.

In the assessment of the educational resource we will consider:

a) Performance: aspects associated to hardware minimum requirements, because we should consider the lightless of the product;
b) Connectivity: the system will access repository of scenarios and user data for synchronization;
c) Usability: the scenarios will be used in a self-instructional way;
d) Portability: ability to use in different mobile devices, whether on smartphones or tablets.

By the public – the assessment was a systemic and continuous, that involved: (i) Continuous assessment of the produced learning objects by the involved professionals in the execution of the scenarios; (ii) Self-assessment by the involved students and

professionals; (iii) Assessment of the used mobile technology, with emphasis on the usage impact inside educational and care contexts.

By the execution team – the execution team was responsible for the assessment of the educational resource, encompassing the analysis of technologies, as well as the training courses. System assessment was performed during and after the provision of learning objects, with the purpose of to making adjustments and improvements.

MAPPING SYSTEMATIC REVIEW

A systematic mapping was performed, with a qualitative approach, theoretical and exploratory nature. This research focused on the SCIELO (Scientific Electronic Library OnLine) platform database, where a sample was collected among the most significant scientific works in the area.

For this composition, inclusion and exclusion criteria for these publications were listed, namely: Inclusion of articles in Portuguese and / or English, with more than four pages written and published from January 2014 to December 2017; Exclusion of articles containing in their presentation the terms "Summary"; "Expanded Summary"; "Extended Summary"; "Views or Reviews" or "Short Communication", with a page number of four or less, written in a language other than those established. The objective of this method was to present scientific, conceptual studies and solid considerations on the subject, in order to allow reflections on the scientific contributions on the subject. Thus, the selected articles met the following criteria written in one of the pre-established languages, published between 2014 and 2017 and in consensus with the research theme. In total 72 articles were collected, according to the descriptors used, and 13 selected, meeting the inclusion criteria. The search was refined by articles that presented, in their texts, the words "Motor Coordination", "Balance", "Mobility" and "Endurance", available in English.

The population over 60 years has been increasing in Brazil, this fact promotes an interest in the study of population aging and its consequences. Based on the study carried out in the 13 selected articles, it was possible to identify that the practice of physical activities by the elderly population promotes greater social inclusion and, consequently, a better quality of life.

Technologies for Health Education

The dissemination of knowledge is one of the main ideas of health education as tool to increase the population understanding regarding dealing to their state of health. The association of technologies for health education seeks to establish new professional-population links that are capable to effectively stimulates health practices via application of educational tools.

Based on the found data (Guimarães et al., 2015; Silva, Carvalho, & Carvalho, 2015), it was possible to observe that older adults can be benefited by the use of technologies regarding the possible gains for health in general, from the application of educational actions. It was concluded that, despite being a topic that has not yet explored, the development of studies about technologies in education and health, especially for older adults, can be an important mean of achieving healthcare and integrality of health practices in this age group.

As a result, there are possibilities of to adopt patterns and to develop learning objects, applicable technologies for creation, distribution and content management. In political dimension, we can highlight the institutional leadership and cooperation networks as structuring elements for articulating efforts from academic institutions, centers of formation and services for collective creation of a technological base for education in health.

Education in Health as Main Alternative to Promote Older Adult Health

The studies developed in (Branco et al., 2015; Cesário et al., 2014; Chaves et al., 2017; Gomes et al., 2015; Mallmann et al., 2015; Oliveira et al., 2016; Preto et al., 2016; Silva, Pin, & Silva Filho, 2015; Teixeira et al., 2016; Vagetti et al., 2015; Victor et al., 2014) presented scientific evidences about educational actions in health for older adults' health promotion. Some papers were selected, in which quality of life and promotion of healthy aging as resulting factors of strategies in education in health were perceived. These features mean a lot to begin the process to model educational objects. The actions of education in health for older adults need methodologies that attenuate the complexity of aging process and relate factors that surround the individual, such as beliefs, values, norms and ways of life. Therefore, more research on this theme is necessary to increase scientific evidences and to expand the development of educational actions in health for older adult health promotion.

In this context, the papers analyzed present a trend proposition of mobile use focuses in digital inclusion and education approaches. **Table 1** shows a summarized view of the related works and the Digital Booklet benefits.

Table 1. Related works and the digital booklet

Works	Contribution	Relation between Digital Booklet	Booklet's advantage over work-related
(Silva, Carvalho, & Carvalho, 2015; Guimarães et al., 2015)	Encouragement to conduct research in health education for the elderly; Integration of the elderly in health practices. As well as Articulation of the efforts of academic institutions, training centers and services for the collective creation of a technological base for Health Education.	Use of technology in health practices as a way of caring for the health of the elderly. Incentive for the collective creation of a technological base for Health Education.	The elderly population can benefit from the use of technologies, with possible gains for health, from the application of educational actions. Possibilities for adoption of standards and the development of learning objects, applicable technologies for the creation, distribution and management of contents.
(Branco et al., 2015; Cesário et al., 2014; Chaves et al., 2017; Gomes et al., 2015; Mallmann et al., 2015; Oliveira et al., 2016; Preto et al., 2016; Silva, Pin, & Silva Filho, 2015; Teixeira et al., 2016; Vagetti et al., 2015; Victor et al., 2014)	Encouragement and training for changes by the elderly, in addition to the search for a healthier lifestyle.	Benefits of health education for an elderly person.	Promotion of Improvement in the quality of life of the elderly through health education strategies.

DISCUSSIONS

Given the previously presented problem, the development of this mobile application integrated actions of research, teaching and extension on education in health through innovative technologies – mobile. The objective was to support continuing education of professionals of physical education, physiotherapy and occupational therapy, together with educational and social initiatives with older adults' population supported by these professionals, and the development of mobile technologies and digital repositories, so that they provide support for defined actions.

Therefore, the object of this educational project was the development and assessment of technologic environment to support actions of education for older adults' healthcare based on studies and scenarios of application in primary healthcare and everyday activities. The development cycle of the digital booklet was composed by 4 phases:

Phase 1. Identification of professionals' workspace – a study was performed with physical educators, physiotherapists and occupational therapists; defined area of study – health promotion and life quality – practice of functional training; areas of interest: balance, mobility, motor coordination and resistance.

Phase 2. Capture of study and support materials – reading and researching; initial writing of didactic materials; structure of the content according to the need of older adult people; initial graphic proposal (Gusmão, 2019).

Phase 3. Project planning versus discipline – definition of activities; formation of local partnerships; planning of actions to be developed by undergraduate and post-graduate students of Biomedical Engineering and Computer Science course; Launch of pilot project – the application was made available through web, in the Endurance area, that represents one of the four areas of interest – Balance, Mobility, Motor coordination and Endurance. Other areas have been planned for future projects.

Phase 4. Development and proposal of improvements – with the identified improvements in phase 3, it was possible to revisit the planning of digital booklet development and to define adjustments; Launch the second version of digital booklet with the theme Resistance.

The first version of the digital booklet brought, in one single space, the elements treated separately, as presented at phase 4 of the development. It was one of the identified adjustments in the first assessment with the target audience.

For each area of interest – Balance, Mobility, Motor coordination and Resistance, we developed didactical materials that approach the definition, ways of better work, benefits and losses and moral of history, based on the concepts of micro-credentials.

Figure 1 brings the view of how the elements in the application are arranged. An objective text and an illustrative image are presented.
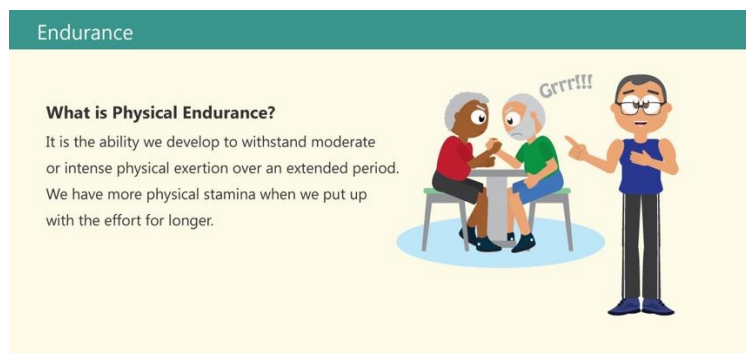
Figure 1. Example of screen that shows the definition of physical resistante

Usage Scenarios of Educational Resource

To identify the usage situations of the digital booklet, we performed actions with health professionals and older adults.

Previous knowledge and experience – the professional was invited to review concepts and fundamentals of teaching-learning situations and circumstances, inserting them and setting them in the current and future reality of older adults;

Identification and knowledge of target public – we worked social, psychological and health (physical and mental) characteristics of older adults, training the professionals about the fundamental importance of synchronizing several techniques and strategies with participants' characteristics;

Usage of reception techniques – we focused on the reception of older adults from a group in which they are members of a government program. Tools of socialization (dialogues, playful activities, group dynamics, etc.) were emphasized and associated to knowledge for application and assessment of neurolinguistics in the process of reception and referral;

Physical and functional assessment – identification of limitation and possibilities through anamnesis, specific and protocol tests, and interviews. Driving factors were fully worked out aiming to emphasize the importance, the positivity and recognition of the practice of physical activity, intervening in possible limiting obstacles;

Integration of capacity versus needs – identification and appropriation of knowledge of the psychomotor stage and relevant physical valences of older adults, driving the best, most specific, safe and motivating prescription of activities according the identified cardiovascular, neuromuscular, social and emotional needs.

The project of digital booklet was designed to firstly promote orientation to older adults, and secondly, to favor health professionals with information about the theme functional physical exercises associated with daily activities. The material developed for each area of interest, previously identified, represent, on average, 5 hours of content classes and practical activities, each.

FINAL CONSIDERATIONS AND ONGOING WORK

Many physical and psychosocial benefits resulting from the regular practice of physical activity are reported in the literature (Cesário et al., 2014; Chaves et al., 2017; Preto et al., 2016; Silva, Pin, & Silva Filho, 2015; Teixeira et al., 2016; Vagetti et al., 2015). These include: (i) increased muscle strength, (ii) improved cardiorespiratory capacity, (iii) fat reduction, (iv) increased bone density, (v) improved mood and self-esteem and (vi) the reduction of anxiety and depression.

The development and application of the exercise program, motor sequences and playful activities range from the use of simple daily actions such as sitting, lying down, grasping, taking a bus and walking to more elaborate combinations of gestures that use multiple kinetic chains in a relevant and functional way. Better body awareness and gains in postural conditioning such as balancing, holding and throwing, turning / shifting, and controlling breathing in different movement experiences. Another key component in the process is the set of recreational games. In addition to the notorious physical benefits, the importance of constructing, adapting and participating in the rules, emphasizing solidarity, group spirit and social collaboration is crucial. As an important means of preventing disease, promoting autonomous attitudes, and improving pleasant and satisfying levels of self-awareness and self-esteem, a Functional Physical Activities Program is a fundamental and even vital one.

This work aims to contribute specifically to education informatics through the development of educational resources based on researches on digital and social inclusion. Hence, it approaches the issue of consolidating educational and technological innovations using techniques and approaches that, as they are relatively recent in academia and in the market, need in-depth assessment and differentiated perspectives in order to provide the most appropriate means (software) for specific purposes (learning of primary healthcare professionals), and orientation and prevention of the assisted population.

A relevant and prominent point in the accomplishment of this work was the possibility of integration between academic sector and municipal health services through the sharing of experiences, knowledge and transfer of innovative technologies.

After the second assessment of the project, it was possible to identify improvements, especially in the graphic structure of the contents when accessed through smartphones.

Currently, the development of support material for health professionals is focused on usage of methodologies that allow micro-credentials elaboration and that help in the execution of their attributions when attending the assisted population.

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REFERENCES

Alves, V. S. (2005). Um modelo de educação em saúde para o Programa de Saúde da Família: pela integralidade da atenção e reorientação do modelo assistencial. *Interface Comunic, Saúde, Educ, 9*(16), 39-52. https://doi.org/10.1590/S1414-32832005000100004

Baumgart, D. (2006). Personal Digital Assistants in Health Care: experienced clinicians in the palm of your hand? *The Lancet*, (366), 1210-1222. https://doi.org/10.1016/S0140-6736(05)67484-3

Branco, J. C., et al. (2015). Physical benefits and reduction of depressive symptoms among the elderly: Results from the Portuguese "National Walking Program". *Ciência & Saúde Coletiva, 20*(3), 789-795. https://doi.org/10.1590/1413-81232015203.09882014

Brasil. Ministério da Saúde. Portaria Nº 2.488, de 21 de outubro de 2011. Aprova a Política Nacional de Atenção Básica, estabelecendo a revisão de diretrizes e normas para a organização da Atenção Básica, para a Estratégia Saúde da Família (ESF) e o Programa de Agentes Comunitários de Saúde (PACS).

Cañizares, J. C. Z. (2005). Educação a distância: reflexões sobre a aprendizagem em ambientes virtuais. Universia Brasil. Retrieved from http://noticias.universia.com.br/destaque/noticia/2005/03/10/487856/educao-distncia-reflexes-aprendizagem-em-ambientes-virtuais.html

Cesário, D. F., Mendes, G. B. S., Uchôa, E. P. B. L., & Veiga, P. H. A. (2014). Proprioceptive neuromuscular facilitation and strenght training to gain muscle strenght in elderly women. *Rev. Bras. Geriatr. Gerontol., 17*(1), 67-77. https://doi.org/10.1590/S1809-98232014000100008

Chaves, et al. (2017). Influence of functional and traditional training on muscle power, quality of movement and quality of life in the elderly: a randomized and controlled clinical trial. *Rev Bras Cineantropom Desempenho Hum, 19*(5), 535-544. https://doi.org/10.5007/1980-0037.2017v19n5p535

Fox, E. A., & Marchionini, G. (1998). Toward a worldwide digital library. *Commun. ACM, 41*(4), 29-32. https://doi.org/10.1145/273035.273043

Gomes, M. M., Reis, J. G., Carvalho, R. L., Tanaka, E. H., Hyppolito, M. A., & Abreu, D. C. C. (2015). Analysis of postural control and muscular performance in young and elderly women in different age groups. *Braz J Phys Ther, 19*(1), 1-9. https://doi.org/10.1590/bjpt-rbf.2014.0068

Greitzer, F. L. (2005). Ingredients of Effective and Engaging Online Learning. *Inter-Lab 2005 Conference*.

Guimarães, A. C. A., de Azevedo, S. F., Simas, J. P. N., Machado, Z., & Jonck, V. T. F. (2014). The effects of Pilates method on elderly flexibility. *Fisioter. Mov., 27*(2), 181-188. https://doi.org/10.1590/0103-5150.027.002.AO03

Gusmão, C. M. G. (2019). Proposal and design of digital booklet through university extension activities. In: *2019 14th Iberian Conference on Information Systems and Technologies (CISTI)*, IEEE.

Mallmann, D. G., Neto, N. M. G., Sousa, J. C., & Vasconcelos, E. M. R. (2015). Educação em Saúde como Principal Alternativa para promover a Saúde do Idoso. *Ciênc. saúde coletiva, 20*(6). https://doi.org/10.1590/1413-81232015206.02382014

Mattos, F. A. M., & Chagas, G. J. N. (2008). Desafios para a inclusão digital no Brasil. *Perspectivas em Ciência da Informação, 13*(1), 67-94. https://doi.org/10.1590/S1413-99362008000100006

Ní Shé, C., Farrel, O., Brunton, J., Costello, E., Donlon, E., Trevaskis, S., & Eccles, S. (2019). *Teaching online is different; critical perspectives from the literature*. Dublin: Dublin City Univesity.

O'Malley, C., Vavoula, G., Glew, J. P., Taylor, J., Sharples, M., et al. (2003). Guidelines for learning/teaching/tutoring in a mobile environment. *MOBIlearn deliverable D, 4*.

Oliveira, V. M., Brasil, M. R., Cavazzotto, T. G., Ferreira, S. A., & Queiroga, M. R. (2016). Aptidão funcional de mulheres de meia-idade e idosas ingressantes em um programa de atividades físicas em unidades de saúde. *R. bras. Qual. Vida, 8*(1), 85-100. https://doi.org/10.3895/rbqv.v8n1.3690

Oliver, B. (2019). *Making micro-credentials work for learners, employers and providers*. Deakin University, Melbourne, Australia.

Preto, L. S. R., Gomes, J. R. L., Novo, A. F. M. P., Mendes, M. E. E., & Molina, J. G. (2016). Effects of Rehabilitation Nursing Program on the Functional Fitness of Institutionalized Elderly. *Revista de Enfermagem Referência, 4*(8), 55-63. https://doi.org/10.12707/RIV15019

Rossiter, D., & Tynan, B. (2019). Designing and implementing Micro-credentials: A Guide for Practitioners. *Commomwealth of Learning*.

Rowe, S. Y., Kelly, J. M., Olewe, M. A., Kleinbaum, D. G., Mcgowan, J. E., Mcfarland, D. A., Rochat, R., & Deming, M. S. (2007). Effect of multiple interventions on community health workers' adherence to clinical guidelines in Siaya district, Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene, 101*, 188-202. https://doi.org/10.1016/j.trstmh.2006.02.023

SDG. Sustainable Development Goals. (2015). Retrieved from https://www.un.org/sustainabledevelopment/sustainable-development-goals/

Silva, C. T. S., Carvalho, J. M., & Carvalho, F. L. Q. (2015). *Tecnologias voltadas para Educação em Saúde: O que temos para a Saúde dos Idosos? In: Seminário de Tecnologias Aplicadas à Educação e Saúde*. Universidade do Estado da Bahia.

Silva, E. B., Pin, A. S., & Silva Filho, M. (2015). Changes in muscle strenght in elderly women after proprioceptive neuromuscular facilitation based training. *Fisioter. Mov., 28*(2), 357-363. https://doi.org/10.1590/0103-5150.028.002.AO16

Teixeira, A. R., Wender, M. H., Gonçalves, A. K., Freitas, C, L. R., Santos, A. M. P. V., & Soldera, C. L. C. (2016). Dizziness, Physical Exercise, Falls and Depression in Adults and the Elderly. *International Archives of Otorhinolaryngology, 20*(2), 124-131. https://doi.org/10.1055/s-0035-1566304

Turisco, F., & Case, J. (2001). Wireless and Mobile Computing, Oakland: California Health-care Foundation.

UK Universities. (2018). Flexible learning: the current state of play in UK higher education. Retrieved from https://www.universitiesuk.ac.uk/policy-and-analysis/reports

UNESCO. (2017). United Nations Educational, Scientific and Cultural Organization. *Unpacking Sustainable Development Goal 4 Education 2030*. Retrieved from https://www.campaignforeducation.org/wp/wp-content/uploads/2018/07/SDG4.pdf

United Nations. (2017). *Sustainable Development Goals Knowledge Platform*. Retrieved from https://sustainabledevelopment.un.org/sdg3

Vagetti, et al. (2015). Functional fitness in older women from southern brazil: normative scores and comparison with different countries. *Rev Bras Cineantropom Desempenho Hum, 17*(4), 472-484. https://doi.org/10.5007/1980-0037.2015v17n4p472

Victor, L. G. V., Oliveira, M. R., Teixeira, D. C., Paes, M. A., Fujisawa, D. S., Bispo, N. N. C., & Silva Júnior, R. A. (2014). Postural control during one-leg stance in active and sedentary older people. *Motriz, 20*(3), 339-345. https://doi.org/10.1590/S1980-65742014000300014