Application of the Industry 4.0 Technologies to Mobile Learning and Health Education Apps

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The so-called fourth industrial revolution brought a disruptive change in the way that communication technologies, distributed systems, intelligent data management, analytics and computational capability and other technologies are integrated to enable new functions and enhance capabilities not only to production systems, but also in many other domains such as education. Mobile Health (m-Health) education is one of these, where the number of applications and tools for m-Health education is extensive. The SARS-Cov2 (Covid-19) pandemic brought to life immense challenges towards education, technology, and the symbiosis with medicine. This paper introduces 31 of the current state-of-the-art m-Health education applications and analyses the results of an an inquiry to students and junior doctors during the confinement, designed to understanding their knowledge, use and trust regarding these apps. The results show that several applications are well perceived by their users and deserved their trust andconfirms a good relation between use and trust on the applications analysed. This analysis open doors to a deeper study to evaluate at which extent improving m-Health education means not only to transmit knowledge but also to developing skills and better practices.

Keywords: *Industry 4.0; Education 4.0; mobile learning; mobile health; education; health.*

1. INTRODUCTION

Industry 4.0 represents a disruptive change in the way that communication technologies, distributed systems, intelligent data management, analytics and compu–tational capability and other technologies are integrated to enable new functions and enhance capabilities in pro–duction systems [1], but that represents a significant asset to a huge array of applications, such as education and learning, in fact, the new teaching and learning paradigm called Education 4.0 [2].

In the emerging context of Education 4.0, modern learning tools can be applied to learn to work with ena–bling technologies, as it happens for example within the intelligent manufacturing systems [3] and health [4], [5].

This work addresses the mobile learning (m-Lear–ning) and mobile health (m-Health) education, within the new teaching and learning paradigm of Education 4.0. and its relevance during confinement due to the SARS-Cov2 (Covid-19) pandemic. The SARS-Cov2 (Covid-19) pandemic brought to life immense challenges towards educations, technology, and the symbiosis with medicine. All around the world there is a need to have a fast access to information, specifically complex information, without creating additional stress or risk to who is actively tackling the pandemic crisis. Among these challenges learning supported in tech–nology is now considered the top of the line in schooling professional e crises scenarios [6], like i-t was possible to observe since 2020.

The focus of this research is not to analyse and compare existing mobile platforms that contain Covid-19 material hence, it is more pertinent to understating what can aid in normal medicine teaching, overlapping the constrains of having lecturer and teachers assisting in medical urgencies within hospital environment, and having students less means to access to learning sources to achieve their objectives, when universities across the world are closing or passing their lectures to online methods [7], [8].

There is a large range of medical mobile application that can support medical students as an aide-memoire or help them understand and visualize complex mecha–nisms in human health and disease [9]; the currently most used and important mobile applications of this ca–tegory are summarized in this text, and were the subject of analysis in term of usage and confidence based on data collected locally from medical students in two distinct universities of Porto, a city in the North of Portugal).

This paper presents the education 4.0 concept in section 2, and section 3 includes a review of the current state of the art of mHealth education applications, focusing on specific areas of higher visibility. Section 4 describes the study undertaken and analyses the results, and section 5 presents the limitations, future work and conclusions of the study.

2. EDUCATION 4.0

Recently Industry 4.0 enabled a paradigm shift as a result of the combination of internet technologies and future-

Received: January 2021, Accepted: September 2021
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doi:10.5937/fme2104876M

oriented technologies, where devices, machines, sensors and people communicate with each other. To face the paradigm shift of an industrial revolution, people must be prepared for the disruptive changes that may arise. The 4th industrial revolution has an impact in many areas in addition to the industrial one, including education (teac–hing and learning processes) [1]. In par–ticular, the field of education has the role of preparing new professionals, agents of the industry of the future - through a model called Education 4.0 - the starting point for such a paradigm shift [10]. The new educational model aims to meet the needs and potential of the Industry 4.0.

Education 4.0 is based on the concept of learning by doing, in which students are encouraged to learn and ex–perience different things in a unique way from experi–mentation. It promotes users not only to acquire new kno–wledge and skills, but also to identify sources of learning.

E-Learning has proven to be a key element in teaching in the field of bioengineering [11], particularly in the medical domain [12,13]. Examples include medical instrumentation, namely laparoscopic instru–ments and utilization [14], echocardiography [15], sur–gery [12], imageology, diseases [16,17], anatomy [18].

The potential and use of mobile devices in higher education is a relevant issue for educational research and key findings indicated that: i) mobile learning in higher education is a growing field, ii) the most com–mon research topic continues to be about enabling m-learning applications and systems; and iii) mobile phones continue to be the most widely used devices in mobile learning studies.

Mobile systems and mostly smartphones are cur–rently very important for education in general and the area of health and medical education is no exception hence many tools already start to onboard artificial intelligence solutions [19].

M-Health education is a relatively new concept in health promotion, but a strong one in m-Learning. This composite term is used to describe a range of health edu–cation and technologic communication activities. Based on these facts, health education is directed affecting the developing of m-Health and its use in m-Learning.

Nowadays, mobile systems allow connectivity to the Web and that is essential in healthcare medicine and also plays a decisive role in medical student learning, continuous learning for health professionals and health awareness promotion in the general population [4,20,21].

3. M-LEARNING AND M-HEALTH EDUCATION APPS

A total of 31 m-Learning and m-Health applications were selected for the study, based on their number of downloads from the Apple[1] and Google[2] stores. This section presents a review of these 31 apps, organized in three classes, namely: (i) mobile applications for medical students, junior doctors and trainees, (ii) mobile applications for patient education and (iii) mobile applications for general health education.

2.1 Mobile applications for medical students, junior doctors and trainees

There is a wide range of medical mobile application that can support medical students as an aide-memoire or help them understand and visualize complex mecha–nisms in human health and disease [9].

Below is presented the currently most used and im–portant mobile applications for medical students that were classified into five categories: General references tools; Clinical skills tutors; Study of anatomy and radi–ology; Medical calculators and prescribing tools; and Tests and examinations. Most of these applications are only available for iOS and Android operating systems.

General references tools

One of the most popular hospital websites in terms of traffic in USA is the one of the University of Maryland Medical Centre. Medical encyclopaedia [22] is an example of a complete medical reference from this University. This encyclopaedia contains more than 50.000 pages of medical information and is available in English and Spanish. The medical information is provided through articles, medical illustrations, doctor interviews, doctor profiles and patient success stories.

Similar to University of Maryland Medical, Med–Hand Mobile Libraries developed an Oxford Handbook for Clinical Medicine [23]. This handbook is a guide for all medical students, junior doctors and trainees. It contains the knowledge of more than 15 authors with the last 20 years of clinical experience.

Several applications focus on Medscape [24] and PubMed [25] as the most important mobile reference tools. Medscape [26] developed by WebMD provides a drug reference library, a disease library, procedure and protocols and a drug interaction checker. PubMed mobile pro [27] is a mobile friendly interface to access to PubMed web site. This web site contains millions of citations from biomedical journals.

OSCE and Clinical skills

The selection of suitable methods for the assessment of clinical skills is extremely relevant for medical students' education. The Objective Structured Clinical Exami–nations (OSCE) are now one of most reliable tests for the evaluation of clinical skills. When medical students need to study for OSCE, clinical skills practice is essential and there are a lot of preparative tools to help students in this area.

MyMedicalTutor [28] it an iOS application that allows students, junior doctors and trainees to improve their presentation skills. This application has 40 illustrated cases that are frequently referred in practical exams.

OSCE Trainer [29] helps students prepare for OSCEs, it has 47 mock OSCE sheets and provides check lists for students. This application is divided into three categories: i) History, with clinical history of skills; ii) Clinical, with information on body systems; and iii) Practical, with stations for clinical skills training.

[1] https://apps.apple.com/
[2] https://play.google.com/

Study of anatomy and radiology

The field of Anatomy is very rich in mobile applications likely because these are very useful for medical students to visualize and learn this discipline. These applications are mainly exercising and tests of memory. Speed muscles MD, Speed bones MD, Speed Angiology MD, Speed Anatomy quiz are six examples of mobile applications in this area developed by Benoit Essiambre [30]. These applications test the knowledge of anatomy regarding to muscles, bones, arteries and veins with speed and memory tests.

In Radiology most of the applications are visual guides that contain some case information. RealWord Radiology [31] developed by Hyperexis is an example of an iOs guide that contains information of more than 30 real cases with X-rays, appropriate series, clinical information, radiologic interpretation and drawing of every radiological finding on the X-ray. Radiology 2.0 [32] developed by Daniel Cornfeld is another example of an iOs application that contains 65 radiology cases used to simulate the reading of computer tomography scans and Picture Archiving and Communication System (PACS) workstations. Finally, in this area, one of the highly recommend applications for medical students is iCXR [33], that is a chest radiograph pocket manual for healthcare professionals and students that are interested in developing their Chest X-Ray (CXR) interpretation skills.

Medical calculators and prescribing tools

Medical calculators and prescribing tools are essential to all medical students, junior doctors and trainees regardless of their specialty.

MedCalc [34] is an example of a medical calculator application that has medical formulas. Each medical formula contains detailed and bibliographic information. This application includes medical formulas of several subjects like Anaesthesiology, Cardiology, Electrolytes, Neurology, Obstetrics, Pediatrics, Pulmonology and nephrology.

Epocrates [35] is a drug reference application used in prescribing that includes drug monographs, drug interaction checker, pill identifier and some additional features like disease information and billing codes.

Tests and exams

To help students test their medical knowledge one of the most famous application is OnExamination [36]. It contains format revision questions from British Medical Journal (BMJ) since 1996. Especially for students it includes: i) Medical students finals, with clinical practice questions for the whole medical curriculum; ii) Situational judgement tests, with training questions for new foundation programme situation judgment test; iii) Medical students finals modular, with final revision by topic and category; iv) Medical students' years 2 to 3 with revision resources for basic sciences and clinical medicine knowledge; v) Medical students' year 1 with pre- clinical questions for anatomy, physiology and pathology; vi) Medical student fresher, with e-learning recourses for first term; vii) UK Aptitude Test (UKCAT) with practice question for the principal sec–tion of UKCAT; viii) Self-assessment for assist students to develop knowledge with accredited providers; ix) videos Tutorial to aid interpret medical results and clinical examination.

PastTest [37] is another example of a multiplatform application (iOS, Android, Windows Mobile 7 and blackberry 6+ devices) that can test medical knowledge. It contains a question browser, timed test, mock exams and podcasts divided into 16 categories.

2.2 Mobile Applications for Patient Education

Seventy percent of smartphone users use their phone to search health information online; most patients search for health information and health advice to obtain self-diagnosis [38]. In fact, health mobile resources have changed the way patients connect with and healthcare professionals and the way how heath information is presented to the general public [39]. Diagnosis is the first step to treat a disease and if health professionals can properly educate patients and give tools to self-diagnosis they can act more quickly in their treatment and evolve patients in the whole process which is likely to produce better results.

The next sections will present some examples of mobile applications for patient education, predominantly in self-diagnosis and condition management information.

Self-diagnosis

Symptom Navigator [40] and Common Symptom Gui–de [41] are the most famous applications in this area.

Symptom Navigator was developed by Ebix Health and helps patients to identify symptoms and also includes an illustrated medical encyclopaedia.

Common Symptom Guide is a guide that focus essentially on health concerns for adults and children. It contains a list of questions and physical findings for more than 100 of the most common symptoms of patients and helps them to instantly diagnose their condition.

The *Merk Manual Home Symptoms* [42] developed by Unbound Medicine is a home guide to respond to specific medical symptoms. These application aims to advice patients at home allowing them to avoid emergency rooms unless necessary. It includes more than 100 common medical problems, prevention and age-related recommendations, summaries with causes, evolutions and treatments and an appendix of most common medical tests.

Treatments and condition management information

In the area of treatment and condition management, one of most fun and useful ways to teach patients is the use of videos. These videos may describe their treatment or provide information about their health status or symptoms and pathological consequences of disease. Videos developed in this area have to be tested and reviewed by medical experts to avoid dangerous misconceptions or incorrect medical knowledge.

HealthClips® Rx [43] is an example of a patient education application that sends customised videos to patients about their treatments and health status via mobile devices such as tablets and smart phones (iOS and Android operating systems).

Most applications in this area are designed for patients with chronic conditions. Patients with chronic condition make daily decisions about self-care and search often for new information for their self-management. Self-management education is used as a complement for traditional patient education to promote the best quality of life possible for patients given their chronic conditions. Self- management education is used in most of patient education applications and allows patients to identify their own problems and teach them some techniques to make appropriate decisions when met with changes in their conditions or diseases [44].

INform™ Patient Education App [45] is a patient self-education application that help patients to under–stand better their medical conditions and treatment options.

DrawMD [46] developed by a team from the Harvard medical school including surgical oncologists and other health care professionals is another example of a patient education application that provides visual guides about patient's treatments and surgeries. It includes the different surgical procedures in the specialties of paediatrics, urology, orthopaedics, female pelvic surgery, cardiology, transplant surgery, thoracic surgery, and many others.

Psychological distress, depression and anxiety are common in most physical diseases and self-help inter–ventions might potentially improve the treatment results of physical conditions. SAM [47] developed by Uni–versity of the West of England is a self-help anxiety management that help patients learning to manage their anxiety. This application includes user guidance and 25 self-help options with information about anxiety, phy–sical relaxation, mental relaxation and health and a closed social network for SAM users.

Patients with chronic disease frequently need to monitor their blood pressure and often search about tips on how to keep it under control. Acc. Blood Pre–ssure (BP) Monitor [48] developed by Lab Experiments Inc. Calculates blood pressure (systolic and diastolic blood pressure) based on pulse rate and selected gender It also provides and tips to help patient to control blood pressure.

Drugs and medication information

Problems that involve drug knowledge are one of the most common causes for medication errors. Patients often look for drug information and create their own medication records. Several studies indicate that drugs and medication written information can be effective in the improving of patient treatments. Patient knowledge about precautions, side effects and special directions is frequently increased by written information [49].

In Portugal drug prescription by active substance is obligatory, therefore most of the patients only have access to information about the different drug alternatives in the pharmacy. *ORKOS Medicamentos* [50] is an example of an application that allows patients to search on Portuguese pharmacy drugs database, by brand or active substance to learn more about generic, non-prescription or simply alternatives to their medication.

Drugs.com [51] is an organization that has a medicine information website with trusted drug and medication information that can be used both by patients and healthcare professionals. The main goal of Drugs.com is to empower patients and caregivers to manage their health and get more informed. Recently this organization developed four mobile application of patient education: Medication Guide, Pill Identifier, Pill Reminder and Drug References for Consumers.

The Pill Identifier is searchable database that contains more than 10.000 medications of the USA. The application also includes some additional health in–formation about description and indication of use pills during pregnancy. Pill Reminder is a medication mana–gement system that allow patient to add their medi–cations, to choose pill reminders and notification and to have access to important information about side ef–fects, dosage and safe use of pills that were pres–cribed.

Drug References for Consumers is an offline data–base that provides drug information about medication that is commonly prescribed in USA. It includes infor–mation about side effects, boxed warnings, precaution, administration instructions and drug classification.

2.3 Mobile Applications for General Health Education

Mobile communication technologies have been an emerging way to bring health services to all citizens even in developing countries. With low-cost handsets of mobile phone networks in the world, millions of people that never had regular access to computer now use their mobile device frequently. This fact is a greater opportunity to health professionals transmits knowledge to the general population on a daily basis.

This section presents several examples of appli–cations used to learn emergency and first aid actions and information, healthy human lifestyles and parent and paediatric education.

Emergency and first aid information

First aid and treatment guide are essential for timely assistance of injured or sick persons before professional medical treatments are provided. Mobile applications in this area are a valuable help and commonly include visual information guides, manuals or videos that provide specific information for first aid skills training. Some organizations like the Red Cross pro–vide mobile aid courses to teach users some basic first aid and life-saving skills to emergency life support.

First aid [52] developed by the British Red Cross is an example of an application that teach users to respond to emergencies with videos, interactive quizzes, and simple advice systems. This application has simulta–neously a guide and course format.

First Aid & Treatment Guide [53] developed by Phoneflips is another example of a complete guide to help people handle the common emergencies. This guide is

divided in emergencies, fear and panic, choking, CPR, rescue breaths, defibrillators, bleeding and bru–ises, nosebleeds, heart attack/stroke, asthma attack, burns, shocks, factures and sprains, splinting, general injuries, convulsions, diabetic emergencies, fainting, cold emergencies, bites and stings, fever temperatures, drowning, emergency births, crash injuries, knife wounds and gunshot wounds.

Prevention and healthy lifestyles

Health games offer an opportunity to encourage the process of reinforcement management. Several rese–arch works have shown that rewarding people in mobile health applications can successfully contribute to the growth of physical activities in real life [54].

Lu and Lemonde developed an iOs prototype app–lication called *UOIFit* [55] that includes a variety of fitness game that focus on engaging youth via social networks to provide continuous fitness activities.

Health games also help participants to understand and learn how health food habits can contribute to a better quality of living. *OrderUP!* [54] is an example of an application when the player assumes the role of a server in restaurant. The main goal of this game is to make healthy meal recommendations to the customers the faster possible.

Parent and paediatric education

Parent education has a direct influence on behaviours and positive outcomes for children and youth. Paediatric edu–cation and behaviour management can result in sig–nifi–cant improvements on the adaptive behaviour of babies.

MyPregnancy and MyBabyToday developed by Baby Center [56] are two examples of mobile appli–cations to parent education. My pregnancy Today is a truthful pa–rent application that is supporting by 25 mil–lion women worldwide. This application provides an expert guide for better understand each day of preg–nancy and visualize baby's growth. It also includes some advice and answers for most common questions of pregnancy. MyBabyToday is an application for parent education that contains a personalized daily calendar of baby's development, a checklist and reminders for baby needs, a photo album for chronicling baby's growth, answers about baby health and safety and suggestions of activities to baby.

4. MOBILE APPLICATIONS FOR MEDICAL STUDENTS AND JUNIOR DOCTORS

4.1 Methodological approach

A central issue in this research is to know the usage and acceptance of the currently most used mobile applica–tions by medical students and junior doctors. For this purpose, it was designed a questionnaire to classify with 6 options: "I know", "I know, I use", "I know, I intend to use", "I know, I use, I trust", "I know, I trust" and "I know, I don' trust", the 31 most used applications.

The questionnaire was tested with two junior doctors who validated an ease of understanding of the questions.

4.2 Data collection and survey context

The data collection was conducted by targeting the most probable users of m-Health apps and avoiding misunderstanding of the classifications to attribute to each app. The information was collected locally from medical students and junior doctors in two distinct universities, Biomedical sciences Institute Abel Salazar, and Medicine Faculty of Oporto University, the two public universities of medical sciences in the city of Porto, Portugal, in different periods of the day, from 12th to 14th April 2021.

Participants were briefed on the study's purpose at the beginning of the questionnaire and given the option to participate or not. Only participants familiarized with at least one app were inquired.

Data collection was supported with the Google Forms tool and answers where filled by the inquirer in a tablet.

A total of 133 inquires were made. As the inquiry was face-to-face, all the questionnaires were valid.

4.3 Data analysis and discussion

The number of answers with "I Know" given by the 133 participants to the 31 applications totalized 1171.

Table 1 summarises the results obtained, with the number of answers obtained for the options "I know", "I know, I use", "I know, I intend to use", "I know, I use, I trust", "I know, I trust" and "I know, I don' trust", per application. The total number of answers was 1171, and participants only evaluated the applications they knew.

Data was treat with IBM® SPSS® Statistics 26.0.

Table 2 sumarises the number of answers per question and per participant. The number of answers with "I know" totalized 1171, which means that each participant knows, in average, 8.80 applications. Figure 1 presents the distribution of the number of apps known by participant.

It is also important to highlight the number of applications known and used by the participants in this study. Concerning the analysis per application, each one is known in average by 28.4% of the participants, and 41.0% of those who know an application also use it.

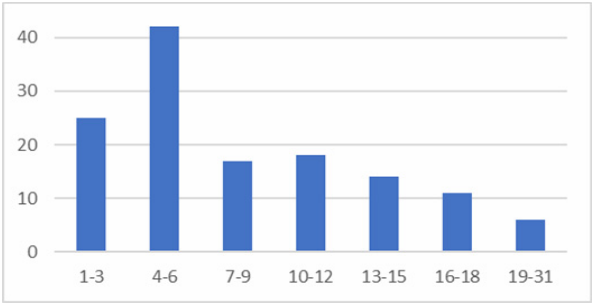

Figure 1. Number of apps known by participant

Those who use and trust represent 28,8% of those who know an app and 70.2% of those who use ((b)/(a) in table 2).

Nearly each respondent intends to use a new platform (more precisely 0.95platforms).The difference between the answers "I know of it" and "I know of it and I use it" is 691, meaning that 59% of the respondents who know don't use; 126 (18%) of those mentioned "I intend to use".

Table 1. Number of answers per app

Applications \ No. of answers	I know of it	I know & I use	I know & I intent to use	I know & I use & I trust	I know & I trust	I know & I don't trust it
Oxford Handbook for Clinical Medicine	130	54	8	42	34	0
Maryland Medical Centre Medical Encyc.	124	53	5	36	29	0
Medscape	99	44	2	30	21	0
PubMed	88	38	8	28	18	0
MyMedicalTutor	49	21	9	10	10	0
OSCE Trainer	35	17	9	10	2	0
Speed muscles MD	35	8	12	7	0	0
Speed bones MD	26	13	10	9	0	0
Speed Angiology MD	21	1	7	1	6	0
Speed Anatomy quiz	29	3	6	2	16	0
RealWord Radiology	34	10	5	8	12	0
Radiology 2.0	31	17	7	15	1	0
iCXR	23	11	8	10	1	0
MedCalc	34	18	0	15	11	0
Epocrates	17	8	1	8	5	0
OnExamination	30	14	1	11	6	5
PastTest	19	5	2	5	10	0
Symptom Navigator	26	14	3	10	0	0
Symptom Guide	26	12	0	0	9	0
Merk Manual Home Symptoms	19	9	1	7	0	0
HealthClips	30	12	2	6	8	0
INform	11	3	1	0	0	0
DrawMD	33	16	4	13	0	0
SAM	35	14	4	5	6	0
ORKOS Medicamentos	29	16	4	16	0	0
Drugs.com	32	13	2	12	3	4
Pill Identifier	22	11	3	7	0	5
Pill Reminder	16	3	0	0	4	4
Drug References for Consumers	21	3	2	0	0	0
First Aid - RED Cross	26	12	0	12	12	0
First Aid & Treatment	21	7	0	2	3	2
Total number of answers	1171	480	126	337	227	20

Table 2. Summary of answers

	No. of. answers	% of total no. of answers	No. answers / participant
I know of it	1171	100%	8,80
I know of it, I intent to use it	126	10.8%	0,95
I know of it, I use it	[(a)] 480	41.0%	3,61
I know of it, I use it, I trust it	[(b)] 337	28.8%	2,53
I know of it, I dont trust it	20	1.7%	0,15
I know of it, I don't use it	691	59.0%	5,20
I know of it, (don't use), I trust it	227	19.4%	1,71

The 20 answers "I know of it, I dont trust it" are equivalent to 0,15 answers per participant.

Figure 2 illustrates the distribution of the answers related to the 31 applications, and let us see that the first 4 applications – Oxford Handbook for Clinical Medi–cine, Maryland Medical Centre Medical Encyclopedia, Medscape and PubMed – are far more known and used than the others. More than 90% of the respondents know the first two platforms, and around 40% use them.

Figure 3 presents the evaluation of the four most known and used apps and allows comparing them with the average answers

Table 3. Pearson Correlation Coefficients

	I Know of it	I Know of it, I use it	I Know of it, I use it, I trust it	I know of it, I intend to use it
I Know of it	1.000	0.646	0,6245	0.499
I Know of it, I use it	0.646	1.000	0.821	
I Know of it, I use it, I trust it	0,6245	0.821	1.000	
I know of it, I intend to use it	0.499			1.000

A Pearson Correlation Coefficient (r) of 0.82 was identified between the answers 'I know of it, I use it' and 'I know of it, I use it, I trust it', classified in the literature [57] as a strong correlation.

For the answers 'I know of it' and 'I know of it, I intend to use it', a moderate correlation of 0.50 was found, as well as for the answers 'I know of it' and 'I know of it, I use it', a moderate correlation of 0.625 (see Table 3).

These results indicate a good acceptance and satis–faction with this 31 most download apps available for m-Health education.

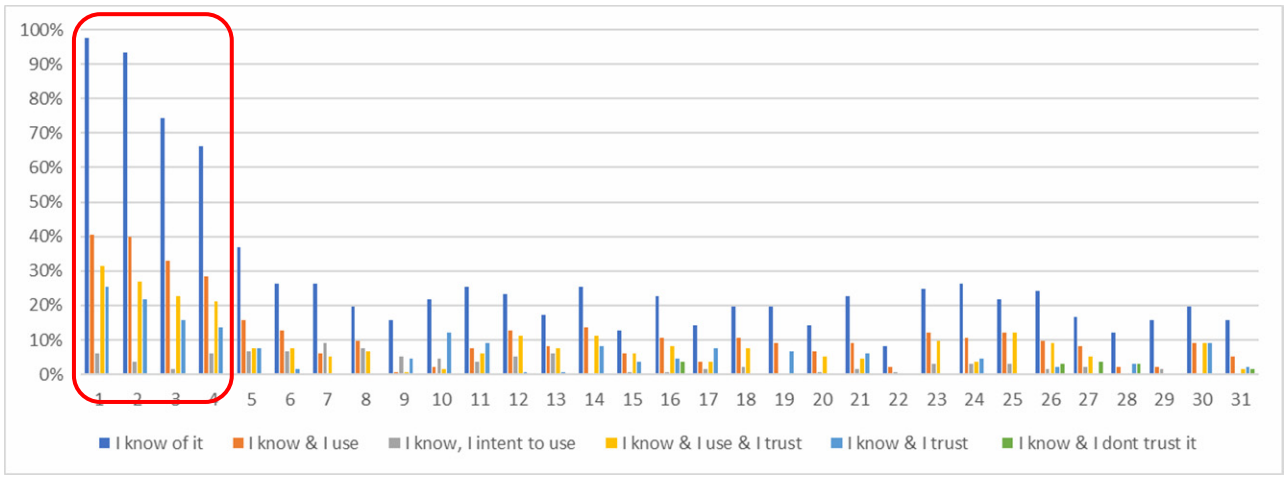

Figure 2. Number of answers by application

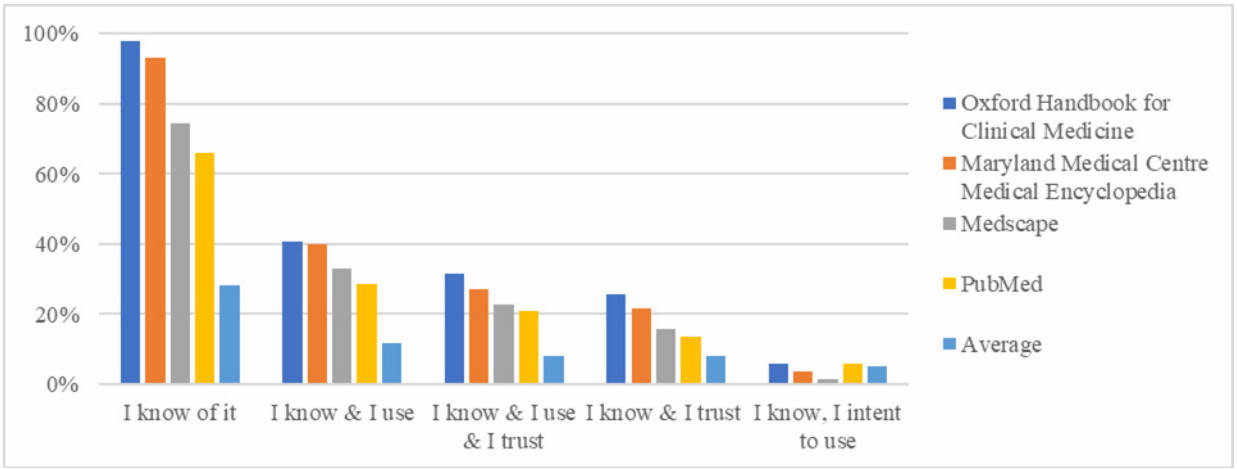

Figure 3. Most known and used apps

5. CONCLUSIONS AND FUTURE WORK

In a moment that the world is now trying to overcome the SARS COvid-19 pandemic and universities close their doors in order to control the spreading of the disease in their campus, this research analysed the most prominent state of the art on mobile health education platforms, with particular regard to areas of medical students' education, patient education and general population education, within an area in much need of persistent, secure and updated information.

The transformations of our technologic communi–cation have led to great changes in the way we teach, learn and practice medicine. E-Learning and more in particular, m-Learning and their increasing integration with information systems of hospitals could significantly change the way health care knowledge is delivered in the future. If mobile applications continue to evolve, the integration of mobile devices in heal–thcare increases which consequently conduce to a better health education.

The results indicate that improving m-Health education may mean more that transmitting knowledge, information and developing skills to be able to develop new concepts and successfully make new applications.

This research reveals that m-Learning, and more spe–cifically, mobile applications can be integrated in health professionals' practices to promote a better health edu–cation and have a significant impact in the academic field. Recurring to this technologies students and medical staff can act fast and securely hence they have literally in their hands, a shaped tool that only possesses medical accurate information, shortening the gap between the necessity and that actual moment where the precise data is used in favour of patients, students, or general population.

Mobile Health applications are an important issue when medical staff and medical professors are una–vailable during pandemic moments like the Covid-19. Given the high number of applications known, used and trusted by medical professors and students, this analysis open doors to a deeper study to evaluate at which extent improving mHealth education means not only to transmit knowledge but also developing skills and better practices.

ACKNOWLEDGMENT

This work was funded by the project "NORTE-01-0145-FEDER-000045", supported by Northern Portugal Regional Operational Programme (Norte2020), under the Portugal 2020 Partnership Agreement, through the European Regional Development Fund (FEDER). It was also funded by national funds, through the FCT – Fun–dação para a Ciência e Tecnologia and FCT/MCTES in the scope of the project UIDB/05549/2020 and UIDP/05549/2020.

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ПРИМЕНА ТЕХНОЛОГИЈА ИНДУСТРИЈЕ 4.0 ЗА МОБИЛНИМ АПЛИКАЦИЈАМА ЗА УЧЕЊЕ У ЗДРАВСТВЕНОМ ОБРАЗОВАЊУ

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Такозвана четврта индустријска револуција донела је револуционарну промену у начину на који су комуникацијске технологије, дистрибуирани сис–теми, интелигентно управљање подацима, аналитика и рачунске способности и друге технологије интегрисане како би омогућиле нове функције и побољшале способности не само производних система, већ и у многим другим доменима, као и у образовању. Образовање за „мобилно здравство" (м-здравство) је једно од њих, где је велики број апликација и алата за образовање за м-здравство. Пандемија САРС-Ков2 (Ковид-19) изазвала је огромне изазове у образовању, технологији и симбиози са медицином. Овај рад представља 31 од најновијих апликација за образовање за м-здравство и анализира резултате испитивања студената и млађих лекара током ограничења (затварања), осмишљеног тако да разуме њихово знање, употребу и поверење у вези са овим апликацијама. Резултати показују да су корисници добро схватили неколико апликација и заслужили њихово повјерење и потврђују добар однос између употребе и поверења у анализиране апликације. Ова анализа подстиче детаљније студије како би се проценило у којој мјери побољшање образовања за м-здравство значи не само преношење знања већ и развој вештина и бољих пракси.