Abstract
The dramatic, rapid and uncertain changes from the 20th to the 21st century are called global megatrends. Such trends are the emerging and re-emerging infectious diseases, an aging society, environmental hazards, behavioural risks, and more complicated lifestyles of humans in the digital age with advanced information technology (IT) that impact much on epidemiological transitions, health security and healthcare. Health professionals are the key persons for dealing with these challenging healthcare trends. The next generation of health professionals should be equipped with high professionalism especially for the components of humanism that artificial intelligence (AI) cannot replicate. Moreover, interprofessional collaborative teamwork among health professionals is a required skill for working in dynamic transitions such as the coronavirus disease 2019 (COVID-19) pandemic. Interprofessional education (IPE) is one of the essential strategies for enhancing teamwork skills in learners. Six previously reported trends in health profession education for the 21st century are summarized, including interprofessional education, longitudinal integrated clinical education, understanding partnerships and social determination of health in patients, life-long learning, competency-based skills changeable over time, and AI and IT integrated in education. The connection among megatrends, trends in healthcare, health professionalism and health professional's education will be important issues in academia for both health educators and health professionals.

Keywords
Megatrends, Health professionalism, Health profession education, Interprofessional education, 21st Century
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Introduction
The objective of this review is to explain healthcare changes on a global scale which are happening at the moment. These changes occur rapidly and have wide-reaching effects on personal and international issues, particularly regarding changes in people’s health and healthcare. There is a need to learn from such changes, especially in the age of the coronavirus disease 2019 (COVID-19) pandemic. Preparations must be made to ensure that these changes can be positively and constructively handled. A well-thought-out plan for health education in all aspects, such as politics and administration, laws and regulations, economic and social, would require an education and development system which can produce health personnel who are ready for the future. The review is written for those interested in issues in healthcare which will affect us in the future, especially regarding the aspect of education, and aims to provide guidance in planning an education which is suitable for health personnel of the future. This review discusses three main issues, with relevant summaries, as follows:

- Global megatrends in health and healthcare
- Health professionalism for health professions
- Health profession education in the 21st century

Global megatrends in health and healthcare
Important global megatrends, or the trend of healthcare changes on a global scale, are driven by technological advancement. We are currently in the age of digital transformation, and it has been accelerated by the COVID-19 pandemic. Population structures are changing as the number of elderly people increases as a proportion of the population, while the number of people of working age continues to decline (United Nations, 2019). Generation Y tends to move around and change jobs frequently, and is not inclined to have children. This phenomenon changes the shape of our society and the way people of different ages live together (Live Science, 2021). It also affects our way of life and culture. Social values are changing. People become more interested in seeking new knowledge continuously. Cities are also expanding. It is thought that within 30 years, 70% of the world’s population will live in cities (World Water Council, 2021). Attempts have been made to develop cities as “Smart” cities. Climatic conditions have fluctuated beyond expectations, resulting in higher risks of disaster and negative impacts on ecosystems. With these changes, important healthcare trends in the form of preventive care emerge, along with advanced medical services involving new types of long-distance health services (virtual care and remote medicine). Medicines have been used to prevent and treat disease at the genetic level of each individual, allowing more precise treatment (also known as precision medicine). Artificial intelligence (AI) is used to develop prediction tools by analysing big data and connecting the Internet of Things (IoT) in order to exchange information between computers or different systems via the Internet. Such rapid changes on a global scale in the 21st century surely affect the economic and social condition of human beings, as well as their health, healthcare systems, and health professions (Martin, 2021). This should also lead to new “jobs of tomorrow” being created in various fields, as well as in health services (National Science and Technology Development Agency, 2020). Figure 1 shows the global megatrends and trends in healthcare.

The aforementioned changes affect the desires and expectations of society towards the individuals of the future. A person needs to have at least three main important skills for the future. (Payton & Knight, 2018). These are: 1) learning skills consisting of crisis management ability while possessing critical thinking
skills and being able to analyse any issues with creativity, in order to solve complex problems and inadequacies, as well as possessing efficient communication skills to correctly and fully convey a message and collaborate with others; 2) literacy skills consisting of the ability to use technology and information technology as well as the media appropriately; and 3) life skills consisting of the ability to self-manage with resilience, being able to adjust to a particular situation and tolerate stress while applying leadership skills, and possessing emotional intelligence and the attribute of self-control.

As for changes in the field of healthcare, during the transition from the 20th century to the 21st century, there have been and will be many rapid changes in health care services. These changes are dynamic and are not stable. There are emerging infectious diseases such as severe acute respiratory syndrome (SARS), avian influenza, Ebola, Zika virus, viral haemorrhagic fever and the recent 2019 outbreak of COVID-19 which has escalated into a pandemic. There are re-emerging diseases such as malaria, tuberculosis, cholera, and pertussis. (Bureau of Emerging Infectious Diseases et al., 2021) There are also environmental diseases such as hypersensitivity pneumonitis, silicosis, pneumoconiosis, and occupational diseases in the form of office syndromes among workers such as myofascial pain, tendinitis, carpel tunnel and cubital tunnel syndrome. Additional factors affecting a person’s health are risk behaviours such as drinking alcohol, smoking, low physical activity level, lack of sleep, and having a more complicated lifestyle. These types behaviours, together with receiving too much online information through too many media channels in a digital environment, affect levels of stress and anxiety, leading to mental health problems. These factors clearly affect public health and change the pattern of epidemiology. Apart from their physical ability and ready-to-be applied knowledge, the health personnel of the future need to acquire more skills in order to handle changes in health services and other changes which have an impact on health services. These are the type of skills that would make a person ready to become a health professional who is pleased to provide services with care and with a human touch or humanized care. Such a person would conduct their services with professionalism. They would have the physical abilities, the necessary skills, and the good attitude to provide such services with compassion that no AI could match or replicate.

Health profession graduates need training to become health personnel with humanistic attributes. Such attributes are: (1) having empathy, (2) being responsible and accountable, (3) striving for excellence and scholarship, (4) having respect, (5) having honour and integrity, (6) being caring/compassionate and willing to communicate, (7) having leadership skills, and (8) possessing the knowledge and skills that are necessary for their work (Karnieli-Miller et al., 2011). Such training needs to be conducted through an education process and practical work that instil professionalism and ethics in individuals. Professors should be a role model to their students and create opportunities, occasions and learning environments that connect those in the fields of medical sciences with those from social science and humanities backgrounds. Alternatively, students should be given an opportunity to be educated with people of other professions in order to widen the perspective of both the professors and the students that are involved in such interprofessional education (IPE). This process aims at creating health personnel who can work as a team with those from their own health service fields, as well as those from other social science and humanities backgrounds. Informal processes of socialisation within an institute, also known as institutional socialization, as well as extra-curricular activities are also important components in the creation of professionalism (Martimianakis et al., 2015). Thus, in the 21st Century, changes and complexities of various issues in the health professions are also “the complexities of professionalism”. The process of instilling professionalism in students who will be part of health services in the future focuses on the concepts of “hidden curriculum”, “informal”, “humanism”, “role modelling”, “tacit learning”, and “institutionalize professionalism” (Hafferty, 2018; Kirk, 2007).

Health professionalism for health professions

Professionalism is a key factor in the desirable characteristics of a health professional. It is a combination of having abilities, knowledge and skills which are sufficient to work and provide services to patients and those on the receiving end of the health service. This is in order to efficiently achieve good treatment results while ensuring safety in receiving such services. Health professionalism also means having a positive attitude towards the profession and possessing a good appreciation of its value. These attitudes affect the behaviour and motives of health personnel (Page et al., 2020). The Medical Professionalism Framework identifies eight components which are desirable characteristics of health professionalism. These are 26.4% humanism, 19.5% communication, 15.8% accountability, 14.1% ethics, 8.0% clinical competence, 7.0% altruism, 6.6% excellence, and 2.6% integrity (Ho et al., 2011).

The study on the development of a model of professionalism among pharmacy students and pharmacists in Thailand was conducted by Ploylearmsang in 2004. She developed the professionalism model among pharmacists and pharmacy students. It found that there were six components to pharmacy professionalism: 1) Using professional organizations as a major reference – meaning that professional organizations are an important source of ideas which can be used to support decision making while practicing the profession. Such organizations can also be referred to regularly in order to develop oneself in one’s own professional field. 2) Belief in public service – there must be a belief that practicing the profession is good for the public and that the benefits to those receiving the services should be given priority over one’s own personal benefit. 3) Belief in self-regulation – a practitioner in a profession needs to have self-control, be responsible, honest and transparent. Such self-control among practitioners, as well as their assessments, should be scrutinized by their own peers. 4) Sense of calling – there must be a determination in one’s work. A practitioner should be ready to provide service, and should practice their profession with pride. 5) Belief in autonomy – respect needs to be given to each other while working in a team environment. 6) Belief in continuing
competency – a practitioner needs to have a desire to keep on learning and develop their ability, competency, skills and conduct so that their profession can be of value to those receiving their services. They also need to be able to adjust to challenges brought about by changes. These six components can be used to explain 47.5% of the total variance of professionalism. From an analysis made of data provided by 1,440 pharmacy students all over Thailand, it was found that the factors affecting degrees’ professionalism among pharmacists were: 1) grade point average (GPA); 2) social and academic integration with four further sub-factors, which are group interaction, faculty interaction, academic development, and faculty concern; 3) moral reasoning; and 4) perception of public acceptance. Students who have developed professionalism well are also satisfied with their profession. The details are as shown in Figure 2.

The model of professionalism focuses on practitioner of the pharmacy profession. It stresses that the practitioner should have a good attitude which leads to good conduct, resulting in them being satisfied with their profession. The factors affecting professionalism are as shown in Figure 3. In order to encourage students to develop as practitioners who have a high level of professionalism, factors affecting professionalism need to be examined. These are positive social conditioning and academic development while the students are in an educational institution. Students need to be encouraged to think logically and ethically. They need to have experience with semi-professional activities that are conducted outside of the classroom. Examples include: providing academic support to the pharmaceutical needs of the community, or working with professional organizations. These activities allow students to be aware that their profession is of value to society, and that the community can benefit from their actions, which will, in turn, affect public awareness and acceptance of such professions in a positive manner.

Another study of Ploylearmsang and colleagues in 2006 found that the professionalism and leadership skills of a student emerge when they are satisfied with their profession. It also depends on the institutional socialisation of their education establishment which leads to the development of their knowledge, good relationships with their peers and their lecturers, as well as the opportunity to train interprofessionally, as shown in Figure 4.

**Health profession education in the 21st century**

Various rapid changes in society affect a person’s wellness, way of life, and their health. These changes also affect the desires, expectations, and characteristics that a health profession graduate needs to have, in order for them to be fully effective health personnel in the 21st century (Institute of Medicine, 2003; Lipstein et al., 2016). This means that the direction in which health profession education is going can be summarised into six trends, which were initiated for health personnel in the USA by Thibault in the year 2020. Each of these trends are interconnected, as shown in Figure 5.

**Trend 1: The process of interprofessional education (IPE) to train the health personnel of the future to work together as a team (named interprofessional collaborative practice [IPCP] or interprofessional practice [IP])**

IPE was first defined in 1973 by The UK Centre for the Advancement of Interprofessional Education (CAIPE) (and the World Health Organisation, 2010a). At present, there are many types of IPE in the USA, including: interprofessional collaboration, interprofessional education, and interprofessional practice. IPE is an educational process that uses collaborative learning experiences to improve the competence of health professionals and their ability to work together as a team. It is important to note that IPE is not just about working together, but also about learning from each other and sharing knowledge and expertise.

**Trend 2: The need for interprofessional collaborative practice (IPCP)**

IPCP is a practice-based approach that focuses on improving the delivery of healthcare by promoting collaboration and communication between health professionals. It is based on the idea that healthcare professionals should work together as a team to achieve the best possible outcomes for their patients.

**Trend 3: The need for interprofessional education (IPE)**

IPE is an educational process that uses collaborative learning experiences to improve the competence of health professionals and their ability to work together as a team. IPE is important because it helps to improve the quality of healthcare by promoting collaboration and communication between health professionals.

**Trend 4: The need for interprofessional practice (IP)**

IP is a practice-based approach that focuses on improving the delivery of healthcare by promoting collaboration and communication between health professionals. IP is important because it helps to improve the quality of healthcare by promoting collaboration and communication between health professionals.

**Trend 5: The need for interprofessional education and practice (IEP)**

IEP is a practice-based approach that focuses on improving the delivery of healthcare by promoting collaboration and communication between health professionals. IEP is important because it helps to improve the quality of healthcare by promoting collaboration and communication between health professionals.

**Trend 6: The need for interprofessional education and practice (IEP)**

IEP is a practice-based approach that focuses on improving the delivery of healthcare by promoting collaboration and communication between health professionals. IEP is important because it helps to improve the quality of healthcare by promoting collaboration and communication between health professionals.
Figure 3. Professionalism model of Thai pharmacy students.

Figure 4. The relationship between institutional socialization, professionalism, and leadership.

Figure 5. Six trends of health profession education.
of such educational methods in numerous countries around the world, such as the United States (U.S.), Canada, the United Kingdom (U.K.), Denmark, South Africa, Australia, Japan, and India. It is also conducted in some South East Asian countries, namely Singapore, Malaysia, Indonesia, the Philippines, and Thailand. IPE means that students are given the opportunity to develop their potential and build up their skills to work with those from other professions before graduation. The expected benefits from IPE are that the students are able to apply their skills to work in their respective professions together in the future, after graduation (interprofessional collaborative practice: IPCP). This would result in better outcomes in terms of health treatments, and more safety for patients or those receiving health care services (Improved Health Outcomes) (International Federation of Medical Students’ Associations, 2020) as shown in Figure 6.

From the author’s viewpoint, the main objective of IPE is to produce health personnel for the future who have IPCP teamwork skills. Such interprofessional collaborative practice is desirable as it is an answer to many difficulties: 1. Everybody has a limit (human limitation), and thus needs a team of other professionals in order to acquire knowledge from other points of view to solve a problem. 2. There are many dimensions to healthcare (multi-dimensional health) which need to be considered. The physical, mental, social and intellectual needs in the field of healthcare require a team that can help to fulfil each of them. 3. There is a concept that healthcare constitutes an interconnection of many different arts and sciences (one health). This interconnection is between different fields of professions such as informatics, technology, engineers, architecture, and arts. These professions need each other in order to create one healthy and holistic approach for human, animals, and nature to live together in harmony. A person can be in good health, while animals and nature are also in good health. They can all have a good standard of living, together. 4. A person can make a mistake (to be human is to err). Thus, having a good system and a team would reduce the chances of a mistake, or would help to ensure that such a mistake does not pose a danger to others, especially those receiving health care services. 5. Various rapid changes in the world mean collaboration between interprofessional teams is needed to drive forward required developments.

In Thailand, the importance of IPE became clear when it appeared in the strategic plan on the development of Health Workforce Education in the 21st century (2013–2017) in 2013. The Thai National commission for strategic movement on the development of Health Workforce Education in the 21st century and a sub-committee on Interprofessional Education (IPE) from nine health profession organisations drove forward the policies and movements in the direction of having IPE in educational establishments. IPE can be arranged in many forms, depending on the circumstances of each educational establishment. For example, it may be arranged for students in their pre-professional years, or for those in their professional years just before they graduate. It can be an activity under one subject, as an elective, or a compulsory subject. It can also be an extra-curricular activity. The objective of IPE according to the WHO Framework for Action (2010b) is the development and preparation of undergraduates to work as a team which possesses knowledge, abilities, skills, and good attitudes. It is expected that these will emerge from learning from each other and experiencing team work together while the students are studying (National Health Professional Education Foundation, sub-committee on Interprofessional Education, 2016).

**IPE and important outcomes for learners**

Learners of IPE in the 21st century are expected to solve increasingly complex difficulties for patients. Learners of IPE in this generation should therefore consist of students from all of the different disciplines of the health profession, such as medicines, pharmaceuticals, nursing, physiotherapy, occupational therapy, public health, and other professions such as engineering, architecture, information technology, communications, fine and applied arts, and humanities and social studies (Ploylearnsang et al., 2020) The World Health Organisation (WHO, 2010a) indicates that the expected results from IPE which learners should acquire in the forms of knowledge, skills or actions, as well as attitudes, consist of six main areas: 1) Teamwork – the learners should be able to lead and follow well. They should be able to identify the obstacles faced by the team and find solutions to manage obstacles. 2) Roles and responsibilities – the learners should have the necessary skills and knowledge to understand their own roles and responsibility for their profession and recognise those of others. 3) Communication – the learners should be able to communicate with their team and create

![Figure 6. The connection between interprofessional education (IPE) and interprofessional collaborative practice (IPCP, IPP) for the benefit of patients.](Image)
an understanding among themselves in order to make the right decision and work properly. 4) Learning and critical reflection – the learners should be able to learn well and reflect on their experience between themselves. This includes having a good relationship within the team. They should be able to pass on and exchange knowledge between themselves and those from other professions. 5) Relationships with and recognizing the needs of the patient – the learners should ensure participation from the patient’s relatives, carers and community. 6) Ethical practice – the learner should have an ethical mind and understand the points of views of other professions, as well as one’s own. They should ensure that everyone is treated with the same importance. Examples of studies on IPE in different countries showing the results of conducting IPE on different learners are shown in Table 1.

For Thailand, the Thai sub-committee on interprofessional education (2015) indicates results which are consistent with those from the WHO. There are five main factors: 1) teamwork, 2) roles & responsibility and respect – learners should know the roles and responsibilities of each profession and respect each other, 3) learning and reflection – learners should be able to learn together and reflect on each other’s roles within the team; 4) team leadership – learners should acquire leadership skills in a team environment and learn about decision making processes, and 5) ethical concern – learner should adhere to ethical standards while working together.

Benefits of IPE on health professions in the future Illingworth & Chelvanayagam (2017) stated that IPE helps with building confidence on a personal and professional level. It encourages common understanding between professions and allows for easier communication both within a particular profession, and between different professions. Moreover, Freeth et al. (referred to in Illingworth & Chelvanayagam, 2017) identified the benefits of IPE for health service providers of the future; it may reduce the risk of unsuccessful communication, increase ethical practice and efficiency in interprofessional work processes, and might prevent discrimination between professions. The interconnections between IPE, IPP (interprofessional practice) and relevant outcomes are shown in Figure 7.

Steps of interprofessional education implementation: lesson learned from Thailand
Ploylearmsang et al. (2021b) created a six-step process of IPE implementation that aimed to develop students’ knowledge, skills and attitude in interprofessional teamwork and home-based care competence among six disciplines in Mahasarakham University, Thailand. It is shown in Figure 8.

Trend 2: Longitudinally integrated clinical education is a process of education arrangement which focuses on continuous integration
This trend shows the direction of education arrangement in two principles. The first principle is that the integration of education is in the form of horizontal integration. This is an integration of the same level across many disciplines, which usually occurs from trend 1 as stated above. The second principle is vertical integration. This is an integration of knowledge from basic sciences to clinical skills. It is so that learners can provide efficient services. Such vertical integration requires co-operation between lecturers of pre-clinical level and clinical level. A plan needs to be created together continuously in that there is continuity in the service, continuity in the curriculum, and continuity in the studying of the learners. The learners should be able to provide continuity of care, with the lecturers providing continuous guidance and supervision (continuity in supervision). Horizontal integration is the application of trend 1 as a guidance mechanism to create a learning environment of interprofessional education (IPE) between different professions. This opens further opportunities for different disciplines, other than those directly involved in medicine, to learn about each other, learn together, and learn from each other. It creates team-based skills which also consist of important knowledge for future inter-disciplinary work. It also encourages learners to think about patients and their family in a bigger picture, and build a better partnership and relationship between the learners and the patients, as well as their family (National Health Professional Education Foundation, 2016).

The main objective of the arrangement of both horizontal and vertical integration in education, to the level that a spiral of integration is formed, is for the learners and the lecturers to establish all three principles of continuity. These are curriculum continuity, supervision continuity and continuity of care. They should be derived from practical training at the level of clinical training in the higher years of education, and achieve continuity goals which are the concept of professionalism, as shown in Figure 9.

Trend 3: Education which focuses on social determinants of health to ensure that those in the health profession understand integrated health issues while keeping the principle of humanism in mind
An important component of professionalism is the principle of humanism. This is especially true in the 21st century. Education for those in health professions should therefore have social and humanistic missions as their objectives. Education should be conducted in such a way that learners are ready to provide health services to patients or those in need, physically and mentally. Learners must first understand that ‘health is more than healthcare’. Healthcare as a component of achieving good health among a population only amounts to 20% of the big picture. The most significant component, which also has the most impact on health, is the social determinants of health (SDOH). This is a group of determining factors as to why certain individuals are in better health than others. The WHO (2010b) defines SDOH as the circumstances in which an individual is born into, stays, grows, works, and lives. Age is another factor. These factors affect the well-being of a person and
| Study                      | Type of learners                                                                 | n    | Outcomes                                                                 |
|---------------------------|----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------|
| Tucker et al., 2003 (UK)  | - Medicine (3rd Year Student) - Nursing (3rd Year Student) - Nursing (Diploma)     | 113  | ✓ ✓ ✓ ✓                                                                   |
| McNair et al., 2005 (Australia) | - Medicine (5th-6th Year Student) - Nursing (3rd-4th Year Student) - Physiology (4th Year Student) - Pharmacy (4th Year Student) | 91   | ✓ ✓ ✓ ✓ ✓                                                                  |
| Cooper et al., 2005 (UK)  | - Medicine (1st Year Student) - Nursing (1st Year Student) - Occupational Therapy (1st Year Student) - Physiotherapy (1st Year Student) | 237  | ✓ ✓ ✓                                                                      |
| Jacobsen et al., 2009 (Denmark) | - Occupational Therapy - Physiotherapy - Medicine - Nursing (Clinical) | -    | ✓ ✓ ✓ ✓ ✓ ✓                                                                  |
| Janson et al., 2009 (USA) | - Medicine (2nd and 3rd Year Resident) - Nursing (2nd Year Student) - Pharmacy (4th Year Student) | 221  | ✓ ✓ ✓ ✓ ✓                                                                  |
| Chua et al., 2015 (Singapore) | - Medicine (1st Year Student) - Nursing (1st Year Student) | 352  | ✓ ✓ ✓                                                                      |
| Harada et al., 2019 (Japan) | - Medicine (2nd Year Student) - Nursing (2nd Year Student) - Physiotherapy (2nd Year Student) - Occupational Therapy (2nd Year) - Radiology (2nd Year Student) | 42   | ✓ ✓ ✓                                                                      |
| Groessl & Vandenhouten, 2019 (USA) | - Nursing (RN-to-BSN) - Social Welfare (Master’s Degree) | 137  | ✓ ✓ ✓ ✓ ✓                                                                  |
| Sethasathien, 2015 (UdonThani Hospital, Thailand) | - Medicine (4th Year Student) - Nursing (4th Year Student) - Occupational Therapy (4th Year Student) - Physiotherapy (4th Year Student) | 86   | ✓ ✓ ✓ ✓                                                                      |
| Study                          | Type of learners                                                                 | n   | Teamwork | Roles and responsibility | Communication | Learning and Critical reflection | Relationship with / and recognizing the need of patient | Ethical practice |
|-------------------------------|----------------------------------------------------------------------------------|-----|----------|--------------------------|---------------|---------------------------------|--------------------------------------------------------|-----------------|
| Janwitayanuchit et al., 2017 (Thailand) | -Medical Technology  
-Nursing  
-Pharmacy  
-Physiotherapy  
-Social Work and Welfare  
-Communication  
-Science and Technology | n/a | ✓        | ✓          | ✓                        | ✓              | ✓                              | ✓                          | ✓               |
| Tongsiri et al., 2016 (Mahasarakham University, Thailand) | -Medicine (2nd, 3rd Year Student)  
-Pharmacy (2nd, 3rd Year Student)  
-Architecture (2nd, 3rd Year Student) | 232 | ✓        | ✓          | ✓                        | ✓              | ✓                              | ✓                          | ✓               |
| Ploylearmsang et al., 2019b (Mahasarakham University, Thailand) | -Medicine (2nd Year Student)  
-Pharmacy (2nd Year Student)  
-Nursing (2nd Year Student)  
-Veterinary (2nd Year Student)  
-Informatics (2nd Year Student)  
-Architecture (2nd Year Student) | 492 | ✓        | ✓          | ✓                        | ✓              | ✓                              | ✓                          | ✓               |
| Yuenyow et al., 2019 (Thailand) | -Nursing (2nd Year Student and above)  
-Public Health (2nd Year Student and above)  
-Engineering (2nd Year Student and above) | 90  | ✓        | ✓          | ✓                        | ✓              | ✓                              | ✓                          |                 |
**Figure 7.** The interconnection between interprofessional education (IPE), interprofessional practice (IPP) and outcomes.

**Figure 8.** Six Steps of achievement interprofessional education implementation. IPE=interprofessional education; IPP=interprofessional practice.

**Figure 9.** Continuity and integrated curriculum.
the functioning of their body, mind, feelings, society, and spirituality. All of these factors are recognised together as the quality of life.

Examples from the information of the U.S. Department of Health and Human Services (2019) are given in order to better understand the principle. SDOH consists of six factors: 1) having a safe home to live in, with good transportation networks and good neighbours; 2) no racial discrimination, violence and discrimination between social classes; 3) education, chances of employment, and income; 4) access to nutritious food and opportunities for physical activities; 5) living in places with water and which are free from air pollution, and 6) language and literacy skills, as well as general knowledge. A type of education which focuses on good understanding of SODH would greatly affect the learning process of students. At the very least, three main issues would be brought to the learners’ attention: 1. The learners will realise why there needs to be interprofessional education in the 21st century. There is a need for everyone to learn alongside their colleagues from other interprofessional disciplines outside of the health professions, such as those from architecture, engineering, law, and public health policy backgrounds. Learners will understand that SODH represents multiple sets of elements that influence the well-being and health of a human-being. This will also have an effect on the manner which such learners adopt in their future practice. They will understand that health professionals need to employ a collaborative approach. 2. Understanding SDOH means the learner will also understand that there needs to be both vertical and horizontal integration in their education, in order to ensure continuous learning and to build up knowledge and skills for their future in professional practice. Learners will be keen to learn from communities, living sources of knowledge, and acquire their experience from real life cases. It is expected that such practice will result in health personnel having the skills to approach people, and to having communication skills that allow them to effectively communicate with groups of people who are different to them. This is in accordance with trend 2 of education for health personnel. It will also affect the lifelong learning process of the earners as SDOH is made up of various components which lead to its complexity. The problem-solving skills gained from this type of education could therefore allow learners to better solve complex problems in health management systems, and difficulties faced by patients, as shown in Figure 10.

This is in accordance with the objectives of “Healthy People 2030”. The reference to SDOH was that in order for the population to be in good health by 2030, management involving SDOH needs to be the focus of the process that is the creation of a good social environment, good physical infrastructure, and a good economy, since these are the factors that encourage people to develop to their maximum potential and optimize their well-being.

Trend 4: Education for health personnel which focuses on encouraging continuous life-long learning as well as ensuring health personnel's own well-being

The practices of health professionals in the future are interconnected with various other issues such as law and regulations, patients’ rights, state welfare, health insurance, public health economy, new health policies, professional associations, new technology, and AI. In order to provide forward looking health services, those in the health professions need to regularly update their knowledge and their skills in order to be in line with changes in diseases, health problems, and rapidly changing situations around the world. Professionalism also means having a positive attitude towards continuing education which will increase, reaffirm, and maintain the learners’ abilities and skills.
to practice their professions. The education of health professionals is a life-long learning process. An education system for our future health personnel therefore needs to ensure trend 4 exists.

There are three elements of education management which ensure that the health personnel of the future will keep this in mind and carry on with their life-long learning process: 1) instilling in the learners a good attitude towards always learning new things, and encouraging them to believe that they should investigate new knowledge to apply to their work or decision-making process. Such practice is commonly referred to as evidence-based medicine (EBM). This type of teaching aims at ensuring that learners have the skills to research and create different ways of gaining new knowledge by themselves. Learners should be able to analyse data, databases, and data sources in order to assess the reliability of data. Through such acquisition, data shall be converted into ready to communicate information. 2) The creation of a good learning environment and professional training of the learners such as building a community of learning and community of practice, creating an institutional culture that allows for flexibility and learning of new things, as well as ensuring that there are places, databases, and learning sources that are conducive to new knowledge being acquired continuously. 3) Apart from instilling good attitudes and skills in the learners towards continuous learning while creating a good environment for learning, another important element is the support given to the students and their lecturers who are health personnel, in order for them to have good health and well-being. They need to be happy and feel connected with their own professional work in order to avoid being burned-out.

A study by Jessica and colleagues (2020) found that there are six factors that affect the well-being and engagement of learners in the learning process, and their readiness to continue their education (Figure 11): 1) The workload – a curriculum with appropriate hours of teaching allows learners to be able to study by themselves. They can also undertake extra-curricular activities which will encourage their learning process while not having it taking over too much of their time. 2) Learning atmosphere – the size of the classroom, the support of the educational institution, and their personal tutor, as well as their classmates, all have an impact on the learning process of the pupils. 3) Meaningful experiences – having creative and meaningful experiences encourages learners to have a ‘personal sense of meaning’. This can be achieved through having ‘IPE friends’ who can open up a new point of view in the learning and working process for the learner. Having experienced patient and community care, students will also feel valued for working in their professions. This also supports trend 1. 4) Optimal social connectedness – as everyone needs some private time and their own sense of self, having a sense of self outside of schools or having other friends, or being able to communicate with family members or life partners helps to support learners’ well-being which is good for their learning process, and their determination to continue their education. 5) Personal traits – each learner is different as they may be coming from different SODH. An education which focuses on SODH would allow learners to learn about themselves and open their mind up to learn about others (Ploylearmsang et al., 2013). This supports trend 3 of education for health personnel. 6) Life circumstance – each learner would be in different circumstances which affect their characteristics, emotional management mechanisms and their ability to adapt when they are under stress or are facing a crisis.

The team of lecturers needs to be understanding towards the learners and apply an appropriate management plan for each learner. This will strengthen their relationship and the learners’ determination to keep learning. Figure 10 summarises the factors which affect a student’s well-being and engagement. ‘Burn out’ should be minimized, while available free time to learn should be maximized. This is especially important in terms of creating the student’s abilities, competency, skills and good

**Figure 11. Factors affecting students’ well-being and engagement (less burn out).**
an attitude in them towards their own profession, which are all the foundations of professionalism and the student’s future satisfaction with their own conduct in the health profession.

**Trend 5: Education for health personnel which focuses on the ability of the learners in cases in which timing can be flexibly re-arranged as appropriate, to suit the needs and learning process of the learners**

Education in the 21st century is responsive to learners’ needs. It focuses on individualized learning that each learner can develop at their own pace and in line with their own strengths. However, education for health personnel in trend 5 focuses on two principles of education: 1) competency-based education – this is a type of education aiming to produce health personnel of the future who can respond to society’s needs. Such personnel would have abilities in accordance with their professional standard and be able to perform their duties accordingly, alongside those from other professions (multidisciplinary approach). Such results may derive from interprofessional education. 2) A time-variable approach – this is a new type of educational management system which re-adjusts the rules of the learners and their lecturers. The learners have to control their determination and push themselves forward so as to learn new things continuously. They need to be keen to go further than traditional teaching-based education. Lecturers are their coaches or supporters that help them to develop at appropriate levels, through advice, constructive reflections, observation, and continued assessments.

**Trend 6: The integrated use of artificial intelligence (AI) and new educational and information technologies (IT) for the education and practice of health personnel**

Changes in technologies today have significant effect on our daily lives, from education at all levels, particularly during the COVID-19 pandemic, to work, daily routine, communication and decision-making process. Education for health personnel of the future needs to be adapted in order for new technologies to be used in the learning process. This will help allow a student to learn better and helps them achieve good results. Important literacy skills for life in the 21st century will also be acquired. New technology, and AI, need to be applied for students to study and train for their professional practice in the health services as summarised by Thibault (2020) below:

1) The use of simulation in order to improve learning skills without having to practice on real patients can increase clinical skills while reducing students’ anxiety. They do not have to worry too much about treatment plans in which they may make mistakes which negatively affect their patients. They are therefore able to gain expertise, acquire more clinical skills, and become more confident in making the clinical decisions which are required of health personnel. The use of a simulation model can be beneficial to IPE as well.

2) Computerized models can be used to learn about topics which require hard to maintain materials or require complex management of materials, such as learning about human anatomy.

3) A database may be created which allows the students to see connections between big databases. This may also be connected to patients’ medical records. It will allow the students to use the information to acquire necessary skills and make clinical decisions from real patients’ data. AI may also be used to assess clinical results with repetitive information if there is access to sufficient big data analytic tools. It may be used to detect, monitor, predict, or developed further into a prediction tool in uncomplicated cases.

4) Distance learning and learning through online applications (online learning) can be used to increase opportunities for learning and open up more channels of education, creating further varieties of access to education. This also includes the use of telemedicine or telehealth to train students in the provision of long-distance health services. Students can practice and gain experience in such an environment and still develop a good patient-clinician relationship through a long-distance health care system.

**Health profession education trends in the U.S and Thailand**

From the examination of education trends for the education of health personnel in the USA in the year 2020 (Thibault, 2020) and the development of education for health personnel in Thailand, it has been found that the relevant trends are consistent and are heading in a similar direction. The details of the trends in the US and Thailand are shown in Table 2.

An overall summary of the trends for the education of health personnel is that interprofessional education focuses on preparing health personnel to provide services using a team-based care approach. The provision of services needs to include humanized care for patient safety and better health outcomes. Health personnel should be able to work in partnership or patient-oriented care, creating a patient-family-community engagement. Health personnel should also be primary care providers within a collaborative network whose learning environment allows them to learn from real-life cases. Their education should be integrated and continuous so that they continue to self-learn and develop throughout their lives (longitudinal integrated learning). In order for health personnel to understand their patients, their education should focus on the social determinants of health. They should learn directly from experience outside of hospitals, in their communities, in order to learn more about different factors affecting a person’s health (Beyond Hospital, Toward Community). In order to encourage further learning and access to updated information, learners should be supported in the use of AI and IT, so as to increase their learning potential (student-driven Learning with AI and IT). Education with these characteristics is created to instil professionalism in learners and to ensure that their well-being and engagement are preserved. It is also to ensure that they are ready to practice their professions in changing,
Longitudinal integrated clinical learning

Institutional reform towards learning society for health

A shift to competency-based time-variable health professions education in the social determinants of health and the social environment.

Interprofessional education towards Thai health team

Life-long learning and long-term well-being of health professionals

Interprofessional education (IPE) (Thibault, 2020)

Synergized partners or partnership with patient, family and community

Creative accreditation for health profession education and leadership response on VUCA in education

Thailand's pharmacy education

Changes in pharmacy practice and different needs of societies which vary in accordance with global circumstances mean certain types of abilities and skills are needed in the future for those undertaking pharmacy professions in hospitals. For example, there needs to be a system of drug management, clinical skills for the advanced health education (Runguang et al., 2011), primary care skills with a holistic mindset i.e. elderly patient home visits (Manadee et al., 2014), services in smoking cessation clinics, and soft skills e.g. systematic thinking, critical thinking, leadership, and lifelong learning. Pharmaceutical education in Thailand has therefore been adjusted to a great extent in order to produce graduates with competency, skills and attitudes which are ready for change (Ploylearmsang et al., 2019a). Such adjustments are: 1) increased hours for professional skills training and other skills training such as primary care, medication management, consumer protection, community pharmacy, ambulatory care, acute care, and elective clerkships; 2) having special tracks to train in pharmacotherapy in more depth; 3) changing teaching methods from lecture-based teaching to outcome-based education (OBE) with experiential learning (Saramunee et al., 2019); interprofessional education (IPE) (Ploylearmsang et al., 2021a); 4) increased opportunity to study at a master’s degree level, and short-term professional skills training.

In the digital age in which the use of AI and technology is common in health services, one of the most important skills that health personnel could possess that AI cannot replicate is the ability to provide humanized care. This is the main skill of providing service at the level of primary care which focuses on a patient’s heart, belief and well-being, in ways that are appropriate to each patient. The process of such education management should ensure that different ideas are explored along with skills training. Learners must be able to learn outside of the classroom and go forward in the community (community learning). They need to directly see the community’s ways of life, thoughts, belief, and culture for themselves. They also need to co-operate with the community in order to promote healthcare and the prevention of diseases within the community, by the community, for the community. From previous research (Page et al., 2020), it was found that a ‘7-day health promotion camp’ can help students gain further skills to learn about a community, foster understanding, compassion, gentleness, and acceptance. These all lead to the acquisition of new skills to provide services by humanized care (Saramunee et al., 2019). Students are ready to provide service to the community by playing the role of a partnership with members of the community so as to allow them to better look after their own health (Ploylearmsang et al., 2012). This is the type of service that no AI could ever replace.

Conclusion

Through this review, the author intends to make readers aware of changes today which will continue in the near future. No one can escape the megatrends discussed. This is especially the case in the digital era where technology and AI play an increasingly important role in the 21st century. Such an environment affects people’s health, the healthcare system as well as the expectations and needs of the of those receiving services from the health professions of the future. In order to work in accordance with these various changes, the health professionals of the future need to have stronger concept of professionalism, above and beyond having clinical competence. They
need to follow the concept of humanism and possess effective communication skills while having good ethics in their professions. This will lead to services in the form of humanized care being provided. This type of care is much needed in an age where the majority of the population spend a lot of time using technology and only seeking information that they are interested in. Such practice leads to a decrease in communications between people, which, in turns, can lead to misinformation and misunderstanding.

Technology and AI, no matter how advanced, do not have the concept of humanism. Therefore, the health profession education, tasked with producing healthcare personnel of the future, need to adapt to and understand changes that are occurring. An education plan is needed in order to strengthen the concept of professionalism and produce graduates who have service minds, learn to use technology appropriately and know how to work as a team in an interprofessional practice (IPP). The need to respect each other and be ready to learn together in order to ensure maximum safety of the patient or those receiving their services. It may be concluded that there are six trends of changes for education of health profession in order to produce graduates who are ready for the future in the 21st century. These are: 1) interprofessional education to prepare for IPP; 2) organisation of integrated and continuous education, with focus on the patient and the community, in order to acquire knowledge, good attitude and clinical skills for the students’ professional practice; 3) education on social determinants of health (SDOH), in order to understand the complexity of the people and create a relationship of partnership between the patient, their family and their carer to achieve holistic health management; 4) creating positive attitudes towards life-long learning while supporting the students’ own well-being; 5) organisation of education with focus on competency as stated on the curriculum which may be changed with time; and 6) the integrated use of information technology and AI to support the students’ learning and skills training for their future professional practice. Education for health profession needs to change. It needs teachers, curricula and learning supports that are in line with the above trends. It needs to be flexible and adaptable in order to create healthcare providers with high level of professionalism. Such health professions need to follow humanism in order to serve the public with empathy. They need to see the benefits of those receiving services from them to be greater than their own. They also need to effectively work as a team in an environment of interprofessional practice.

Data availability
No data are associated with this article.

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