

Impact of Innovative Educational Technologies on the SPICES Model in Medical Education

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Received: 15-12-2022

Revised: 06-01-2023

Accepted: 23-01-2023

Please cite this paper as:

Karimian Z. Impact of Innovative Educational Technologies on the SPICES Model in Medical Education. *Interdiscip J Virtual Learn Med Sci.* 2023;14(1):75-79. doi: 10.30476/IJVLMS.2023.98690.1223.

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Keywords: E-Learning, Educational technology, SPICES Model, Medical Education, Online learning

Introduction

Medical education is an important and multidimensional field. Students in the field of medical science experience various areas during their educational courses, including theoretical courses, laboratory and practical experiences, and work in clinical environments. All of these aspects help students to prepare for real-life work environments.

The SPICES model is a framework for medical education, and it is an acronym for six key characteristics that should be considered in the development and evaluation of medical education programs. These six characteristics are:

1. Student-centered: This approach focuses on the needs and interests of individual students, allowing them to take an active role in their learning and tailor their education to their needs and goals.

2. Problem-based: In this approach, students are presented with real-world problems or cases and are tasked with

working collaboratively to develop solutions. This approach promotes critical thinking and problem-solving skills, as well as collaboration and communication.

3. Integrated or inter-professional: This approach emphasizes the importance of interdisciplinary collaboration and communication in healthcare practice. Students from different healthcare professions work together to learn from each other and develop a shared understanding of patient care.

4. Community-based: This approach involves providing education and training in community settings, such as clinics, hospitals, and other healthcare facilities allowing students to gain real-world experience and develop a deeper understanding of the social and cultural factors that impact healthcare.

5. Elective: This approach allows students to choose from a variety of elective courses and experiences, allowing them to tailor their education to their interests and career goals.

6. Systematic or planned: This approach ensures that students receive a well-rounded education that prepares them for real-world clinical practice.

SPICES model aims to provide students with a comprehensive and effective education that prepares them for the challenges of real-world clinical practice (1) (Figure 1).

The emergence of innovative technologies has opened up new gateways in medical education, and the capabilities of these technologies are gradually influencing the methods, techniques, and even the nature of education (2). The question is, what impact will innovative technologies have on the development of the SPICES model? The purpose of this paper is to explain the effects and consequences of new emerging technologies on the SPICES model.

The Impacts of Innovative Technologies on the SPICES Model

The use of technology can play a significant role in improving the interactions between students, professors, and educational institutions. Technology can be a very useful tool in education, and can help to increase students’ engagement and improve academic outcomes. By using technology, teachers can create a more interactive and engaging learning environment that allows students to participate actively in their education (3).

Based on studies and predictions, it is expected that the future of education in

medical and health sciences will heavily rely on the integration of education, human, and machines. Technological advances such as artificial intelligence, the Internet of Things, and robotics have created new capabilities for education and learning in the fields of medical and health sciences. On the other hand, education and learning using new technologies such as virtual reality, medical simulations, and visual communications have improved, and students and physicians can gain new and greater experiences using these technologies (4).

These innovative technologies can have a significant impact on the six characteristics of the SPICES model in the following ways:

The first characteristic of the SPICES model is its student-centeredness innovative technologies can provide a more personalized learning experience for students, allowing them to learn at their own pace and focus on areas that they find challenging. Online resources and interactive tools can also be tailored to meet the needs of individual learners (5). Emergent technology can provide medical students with greater access to educational materials and resources. Mobile applications and online platforms can provide students with interactive learning materials, access to medical journals and textbooks, and opportunities for collaborative learning and communication with other students and healthcare professionals.

The second dominant feature in this model

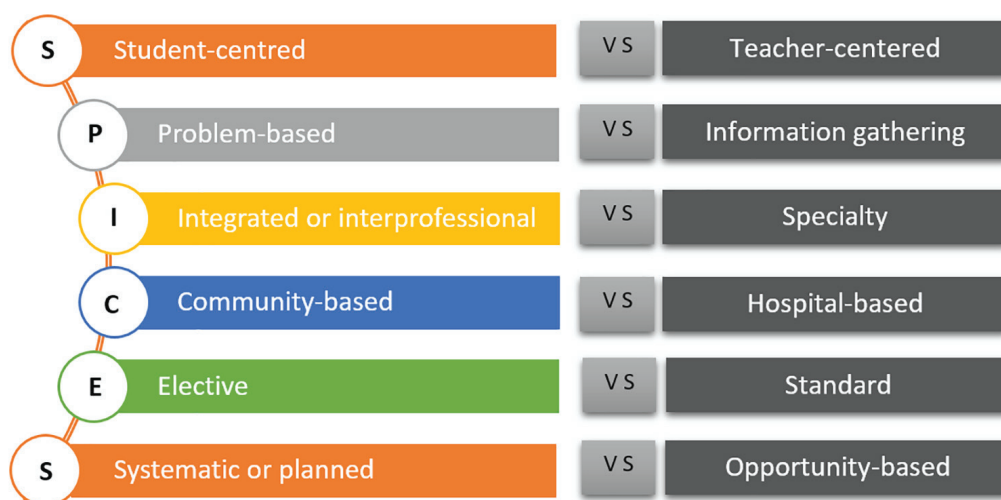


Figure 1: Comparison between the SPICES model and the traditional one

is problem-based learning. Technologies can facilitate problem-based learning by providing access to a wide range of computer-based learning, 3D visualizations such as virtual reality and augmented reality, case studies, simulations, and other interactive learning activities that encourage students to think critically and apply their knowledge in real-world scenarios (6).

SPICES is an integrated and inter-professional model. New technologies can help integrate different aspects of medical education by providing a centralized platform for accessing and sharing resources, as well as facilitating communication and collaboration between students and teachers (7). For example, Learning Management Systems (LMS) are one of the key infrastructures in teaching, which create better learning conditions by integrating all aspects of student engagement, including course content delivery, discussion forums, quizzes, and more (8).

Another characteristic of the SPICES model is the focus on community-based education and learning. Innovative technologies can support community-based learning by providing access to virtual communities and online discussion forums, social media and so on where students can engage with peers, mentors, and experts from around the world. Also, e-Learning has had a significant impact on patient education, allowing for increased access to education, self-care, and self-management in treatment. Additionally, with web-based patient education, E-content, and multimedia delivery platform, and many patient education programs can now be delivered electronically and reach a much wider audience (9).

SPICES is an elective model and emphasizes flexibility and adaptability of learning to student conditions. New technologies can provide greater flexibility in terms of course delivery, scheduling, and access to resources, which can be particularly beneficial for students and all interested learners who have other commitments or who live in remote areas. For example,

MOOCs have the potential to be an effective and long-term solution for increasing public engagement in global issues and health-related concerns and high-quality content can be delivered to a large audience and can be regularly updated with the latest scientific studies, which may not be possible through traditional face-to-face instruction. Overall innovative technologies offer a learning experience that is tailored to the interests and needs of learners, without the limitations of time and place (10).

Finally, the SPICES model is systematic. Medical education in clinical settings is mostly based on opportunities; meaning that an ideal and standardized education is not always available to all students. Various factors such as unexpected events, diversity or lack of hospitalized or outpatient patients, differences in the expertise of educators, resource constraints, etc. can affect the quality of clinical education (2).

Emerging technologies such as virtual reality, augmented reality, virtual simulated patients, and videos can help address some of these challenges by providing students with access to educational resources that may not be available in traditional clinical settings. However, the use of technology in clinical education must be carefully balanced with traditional teaching methods to ensure that students receive a comprehensive and complete education that prepares them for clinical practice in the real world.

Conclusion

Overall, the goal of clinical education should be to provide students with a comprehensive and effective education preparing them for the challenges of real-world clinical practice. The SPICES model can provide a useful framework for achieving this goal by emphasizing the importance of setting, participants, inter-professional education, and collaboration in medical education.

As mentioned the SPICES educational model is one of the most educational frameworks that has become popular

worldwide, especially in recent decades. However, like other elements of medical education, this concept has also been affected by the impacts of innovative technologies.

Emerging technologies, such as virtual and augmented reality, artificial intelligence, games and mobile applications, are increasingly being incorporated into medical education. These technologies have the potential to revolutionize the way medical education is delivered and improve the quality of training for medical students. However, the impact of technology on medical education has both strong advantages and limitations. Also it can be mentioned that:

Advantage: New technologies such as virtual simulations provide a safe and controlled environment for medical students to practice clinical skills without the risk of harm to patients. It can be repeated as many times as needed, allowing students to gain confidence and proficiency in their skills. For example, simulations can provide a range of scenarios that may not be feasible in real-life clinical settings, allowing for exposure to a wider range of experiences. Simulations can be used to teach rare or complex procedures that students may not have the opportunity to observe or perform in real-life situations. Virtual simulations can also provide immediate feedback and assessment to students, allowing for continuous improvement of skills.

Limitations: Virtual education may not completely replicate the complexity and unpredictability of real-life clinical situations. It may not fully capture the emotional and interpersonal aspects of patient care, such as communication and empathy. Furthermore, virtual simulations require significant initial investment in technology and resources. There may be limitations in the availability of virtual simulations for all medical students, particularly those in resource-limited settings.

Also, virtual education may not fully replace the need for hands-on experience and communicational skills in real-life clinical settings.

Conflict of Interest: None declared.

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