Discovering Science
Name:
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Course
Date

Scientific knowledge, skills, and understanding are essential for students to be effective citizens in the 21st century

Introduction

One of the many subjects offered in different school curricula is the Science subject. This argumentative essay seeks to enlighten the reader on the significance of Science to students towards becoming effective citizens in the Twenty-first Century. The article will explore the concepts of twenty-first-century learning, scientific knowledge, skills, and understanding, as well as what is meant by a productive citizen (Saavedra, & Opfer, 2012). Further, the essay will narrow down to the importance of scientific knowledge to the Australian curriculum from Foundation years to year six students.

21st Century Learning

Donovan & Green (2013) define 21st-century learning as the recognition that students need both knowledge and skills to succeed in a diverse world that is technology-centric. Further, the authors acknowledge the prevalence of computer-based technology in modern society. The

two scholars note that the availability of the technology is not sufficient; rather, the users of the technology require adequate preparation to cope with the changing trends in technology (Donovan & Green 2013). In the context of school learning, students in the 21st century are reported to have access to technological learning devices such as smartphones, tablets, and laptops. In the 21st century, teaching and learning revolve around critical thinking, problem-solving, innovative ideas, and teacher-student communication (Ravenscroft, 2012).

The current perception of education is gradually changing. The difference is attributed to knowledge about ongoing socio-economic and technological reforms. There is also the view that policymakers should reconfigure the school system into more knowledge-centered ways to prepare young people for future learning (Bolstad, Gilbert & McDowall, 2012). The teachers' work has been made easier as they are only required to facilitate the learning process, while the greater input is left to the students. Research mechanisms further simplify the students' work. Unlike the traditional learning method that required a student to flip through numerous pages to look for content, the 21st century offers a broad range of internet databases for instant research. Scientific data and analytical statistics are readily available on the web (Ravenscroft, 2012). About this essay's topic, it is clear that students require a scientific background to cope with the 21st-century learning technics.

Effective Citizen

The term effective is relative. That is, what is effective to one person may appear to be ineffective to another. However, there are common grounds that may have universal acceptance of the idea of effectiveness. According to the National Council for the Social Studies based in the U.S, a productive citizen is defined by some characteristics. One, an effective citizen abides by core democratic values within the society (Ravenscroft, 2012). Second, he or she takes collective responsibility for themselves, their family, and the community. Third, they are knowledgeable about social, political, and cultural issues within their communities and in the world. Fourth, an

effective citizen can question existing information and analyze it critically. Fifth, he or she makes rational decisions and demonstrates the ability to solve problems in their private life, as well as in public. Lastly, an effective citizen is described as one who can work collaboratively with others in a group setting, as well as actively participates in civic and community matters ("Creating Effective Citizens," 2016).

In the context of this essay, the focus is on nurturing competent citizens through science education. Ravenscroft (2012) argues that all students are entitled to knowledge and skills that empower them to gather relevant information and become active citizens. Imray & Hinchcliffe (2013) noted that it is essential for young people to become flexible problem solvers, thus shaping the future of the subsequent generations. This theoretical proposition can only be realized through adequate exposure to relevant knowledge, skills, and experiences. In the Australian context, Science has been viewed as a potential driver of success among students in the 21st century. In the following sections, this essay seeks to prove the hypothetical statement that scientific knowledge is necessary for producing effective citizens (Imray & Hinchcliffe, 2013).

Scientific knowledge, skills, and understanding

According to the Australian Curriculum (2014), Science is a broad subject arising from the desire of human beings to explore the unknown, investigate universal mysteries, predict, and solve problems. Science forms the basis for understanding the biological, physical, technological aspects of the world (Australian Curriculum 2014). Scientific knowledge is ever growing since innovations and discoveries are continually presenting new evidence.

An understanding of science is based on the knowledge of the physical world, Earth and Space, Living World and Chemical World. In addition, scientific understanding incorporates the nature, development, use, and effect of science (Wartofsky, 2012). The knowledge of science makes a student gain a better perception of how and why various phenomena exist. Science can

explain a broad range of issues ranging from physiological processes in human beings to modern technology. Scientific knowledge facilitates an understanding of new concepts, improved decision-making, and development of new interests (Fetzer, 2012).

The basis of Science is attributed to science lessons and the general learning process. In the Australian context, the science curriculum forms a strong foundation for students to acquire relevant scientific knowledge and skills. Additionally, the students are enlightened on science-related careers. The practical application of science provides a platform for students to develop different innovations (Wartofsky, 2012). Science knowledge is also regarded as easy to retain, thus providing tangible proof, which the students can recall quickly.

Glynn, Britton, & Yeany (2012) highlight the three top areas of science, namely life processes and living things, materials, and their properties and physical methods. These areas are simplified into scientific disciplines known as biology, chemistry, and physics respectively. However, these are not the only categorizations of Science. Preferably, there are many complex and diverse features of science (Glynn, Britton, & Yeany 2012). Primary school-aged children are said to enjoy science when it is student-centered. That is, their voices are heard, and they can ask questions wherever they encounter challenging concepts. An understanding of Science gives students an opportunity to make sense of the environment around them, as well as the world at large (Mansour & Wegerif, 2013).

Teachers have the responsibility of evaluating the learning ability of each student. Doing so will help the teachers to tailor the curriculum in such a way that it suits the individual needs of the students. Teachers should encourage students to engage actively in ideas and evidence, so they develop meaningful and lasting understandings (Glynn, Britton, & Yeany 2012). Science should help the students relate to their daily lives and experiences.

Verstynen (2013) outline “the 5Es” of the teaching sequence for teaching and learning which are represented in five stages. These are Engage, Explore, Explain, Extend (or Elaborate),

and Evaluate. This model is relevant to the science curriculum as it allows students to gain a better understanding based on their experiences and new ideas in and out of class. According to the Australian curriculum, Science builds knowledge of scientific concepts and processes, as well as the methods that are used to generate scientific knowledge (Verstynen 2013). In addition, Science is regarded as a significant influence on particular cultures and societies.

In the Australian curriculum, there are three main features attributed to Science. These are Science Understanding, Science as a Human Endeavour, and Science Inquiry Skills (Australian Curriculum, 2014). The three elements act as a pillar of the science curriculum by providing students with the knowledge, skills, and understanding, thereby giving them an elaborate scientific view of the world. The Australian curriculum further highlights six distinct ideas that underpin the logic and developmental sequence of science knowledge. The six concepts are patterns, order and organization, form and function, stability and change, scale and measurement, matter and energy, and systems (Australian Curriculum, 2014).

In summary, patterns, order, and organization entail the recognition of patterns in daily life, followed by an ability to predict outcomes through pattern behavior. For example through Science, one understands that vapor evaporates when liquids are subjected to heat. Similarly, morning dew diminishes when the sun shines (Glynn, Britton, & Yeany 2012). The cause and effect criteria form the basis of this phenomenon. Form and function imply that students will gain a better understanding of the nature of an aspect, object or organism and the use of that element. For example, science explains the mechanism behind tools that make work more accessible, such as the pulley system (Australian Curriculum, 2014). At the primary school level, pupils learn that the pulley system simplifies the process of drawing water from the well.

Stability and change imply that students learn how to describe and predict stability and change of phenomena. For example, the 21st-century scientific innovations are growing by the day (Exposure science in the 21st century, 2012). Science studies, therefore, enlighten the

students on such innovations, the stability of existing innovations, as well as changes made in the modern era (Cogan, Derricott, & Derricott, 2014). Scale and measurement enable a comparative analysis of observations in everyday life. For instance, the population growth rate is measured scientifically. The quantitative data is scientific in nature. Matter and energy facilitate the students' ability to explain the concepts of flow and power throughout primary school. That is, the students will understand different components that make up an object (matter), as well as the ability of objects to perform (energy). Finally, the idea of systems implies that students will be able to explore and analyze complex systems such as computer hardware and software. These underlying ideas represent the typical scientific view of the world (Australian Curriculum 2014). Scientific knowledge and understanding are essential for students to be effective citizens

To this end, the essay has elaborated on the key concepts regarding the topic: Discovering Science. Clearly, it is essential for 21st century students to have a strong knowledge of science. The experience is helpful in the modern world and even in the future. A thorough understanding and involvement in science will help the student to be inquisitive (Cogan, Derricott, & Derricott, 2014). Furthermore, the student will desire to explore the changing world, with interest in the various forms of varying phenomena. Some of the essential skills that science instills into learners include planning, experimentation, explanation, and prediction of events. Additionally, students gain communication skills, data collection, and analysis, as well as elaboration and evaluation of concepts (Saavedra, & Opfer, 2012).

Students need resilience in problem solving to achieve the goal of becoming competent future citizens. Excellent problem-solving skills will enable the students to view a problem from all angles to develop a suitable solution (Saavedra, & Opfer, 2012). The Australian Curriculum of Science has embraced these skills even at primary school level. By offering quality science education through the school system, there is a possibility of extending the students' practice and

knowledge of science, thus allowing them to become more citizens that are active in the 21st century.

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