Scientific and Social Research
2022, Volume 4, Issue 9

The Need for Innovative Sustainable Development in Chinese, Mathematics and Science Subjects in China and Malaysia

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Abstract: 21st-century learning is seen as a huge transformation in education. It is a transformation that meets the needs of today's education in terms of sustainable development and has a huge impact on education. This article discusses a blend of interesting and impressive high–quality teaching and learning innovations based on three different subjects, such as Chinese, Mathematics, and Science. This innovative approach to sustainability will help students to understand the process or concept and increase their spirit and motivation to learn and promote their appreciation of educational innovation in China and Malaysia.

Keywords: Sustainable development; Education; Chinese; Mathematics; Science; Innovation

Online publication: September 26, 2022

1. Introduction

Sustainable development is defined as development that not only meets the needs of the present but also does not compromise the needs of future generations. Sustainable development is a goal promoted by the United Nations, and this includes the development of the educational field [1]. Sustainable development in teaching is a comprehensive and innovative education, which has innovated the learning content, and teaching methods and changed the learning environment [2]. It was originally proposed as a solution to our concern about the impact of human society on the natural environment. However, the concept of sustainable development can also be applied in the field of education. Education is a very important tool in sustainable development. Sustainable development in education promotes and facilitates knowledge, creates the right values, and creates a sustainable world for us as human beings. In the past time, a plethora of education sustainable development proposal has been rapidly developed in all aspects of society. Educators have developed models for curriculum innovation and integration of sustainability [3].

As a teacher, we can use innovative approaches in teaching and learning. For example, using recycled materials to create teaching materials to achieve the goal of sustainable development. In this article, we use innovative teaching and research applications in different subjects such as Chinese language subjects, mathematics, and science.

2. Innovation in education in China

Chinese education has evolved over the decades, and Chinese high schools and universities have begun to

focus on curriculum and instruction. However, the lack of innovation and creativity in teaching and learning in China has always affected education development. In 2016, nearly 80% of Chinese universities offered compulsory and elective courses on innovation and entrepreneurship. Today, innovative education and innovative activities are being adopted at all levels of teaching in China [4]. In 2020, the Chinese Ministry of Education reformed the existing education system. For example, community service and social practice. Innovative methods have been introduced in Chinese high schools and universities. When we were in high school, a method of teaching called "high-efficiency class" was used in classroom teaching. It replaces traditional teaching methods and uses a classroom structure that suits the teacher and the students, improves students' attention in class, maximizes their learning and, enhances their ability to learn [5].

2.1. Design thinking in teaching and learning

Design thinking can be seen as an innovative approach capable of generating creative and effective solutions. It emphasizes human-centered solutions. Teachers can use design thinking to design lessons and teaching methods. Design thinking can be used effectively in many subjects by making students plan and implement a project in the classroom. For example, designing a recyclable product for school students [6]. This involves designing something for others to use. In this type of project, students not only have to design a great recyclable product, but also had to consider the needs of the students, the materials that could be used, the budget, and the impact of the product on the school environment. Design thinking can be applied to different stages of teaching and curriculum in China. Design thinking can also be used in conjunction with teachers' teaching techniques, allowing students to investigate and collaborate on solutions to problems as they arise. Many teachers use design thinking to design their lessons to help students solve practical problems in the classroom [7].

2.2. Virtual reality technology for online classes

For chemistry, physics, and biology classes in high school, virtual reality technology is used for teaching and learning, especially during the Covid-19 pandemic. Virtual reality technology can increase student interest and engagement in learning. The start of virtual reality education is changing the way educational content is delivered. Virtual reality technology creates a virtual world that is close to reality—one in which students can see and practice. Compared to traditional online teaching, virtual reality teaching is innovative, interactive, immersive, and imaginative [8,9].

Many educators have developed several educational applications for virtual reality technology. ThingLink, for example, offers virtual reality courses that include languages and science. The downside of these courses is that it is not possible to conduct experiments in science subjects such as chemistry. However, virtual reality technology fills this gap by allowing simulated experiments to be carried out, which also reduces the potential risk that it is safe and stable. The biggest problem with virtual reality technology is the cost, which is why it is not commonly used around the world. However, we believe that in the future more schools will use this method or technology.

2.3. Creativity, innovative, and critical thinking skill subject

By offering subjects involving creativity, innovation, and critical thinking, students can develop their thinking, innovation, and creativity skills [10]. In Chinese schools, students only listen to the ideas of their teachers when dealing with problems and do not think for themselves. This will limit students' imagination and creativity. This results in students are not being able to look at problems from multiple perspectives [11]. Both teachers and students can eliminate old ways of thinking and gradually develop new ways of thinking and explore new things to get different results. Critical thinking enables students to look at things rationally and improve their thinking skills. During our undergraduate studies, we were asked to make things out of

recycled materials. For example, cabinets, juicers, school supplies, teaching aids and so on [12,13].

2.4. Storyboard teaching strategy

A storyboard can be used while reading the text aloud. The purpose of a storyboard is to give a visual representation of how the teacher's teaching experience will unfold step by step [14]. Storyboarding in the classroom can guide teachers on how to achieve their goals, prepare content, break large goals into smaller goals, assess their students, etc. In high school history, Chinese and politics classes, storyboards are used to engage students in a creative and visual learning process that brings history to life [15].

Storyboards can be used to help students by providing templates or designing their drawings. Students describe the main points of the story by drawing pictures and giving short explanations. The storyboard can then be shared and compared to help students understand as much as possible the ideas in the text and to help them analyze which ideas are important [14]. As students and teachers alike know, innovation in teaching and curriculum is not an easy process and it takes time and effort over a long period to achieve.

2.5. Innovation in mathematics subject

Learning the concepts and skills of Mathematics subject is a process that is not only about calculating or remembering all the formulas, but also about being innovative and creative in problem-solving. Mathematics is an important and challenging subject for most students. Innovative, strong contributions and moral support from teachers in the teaching and learning process will encourage students to enjoy their learning and to improve their skills in the subject. Sustainability in the subject of Mathematics, therefore, needs to be achieved in line of 21st-century learning. Besides, sustainability is essential to help students construct certain topics in the classroom to solve problems creatively. Examples include integer topics, and addition and subtraction calculations [16].

3.1. Innovative learning in integers

Integers are commonly used in our daily lives. For example, temperature. The temperature of the water boiling is 100℃ and the cold or freeze level is 0 ℃. Then the temperature below 0 ℃, for example, 5 degrees below 0, is written as –5 ℃. Meanwhile, in Mathematics subject, integers are whole numbers, where numbers greater than zero are called positive integers, and numbers less than zero are called negative integers. number 0 is located between –1 and 1. It can be understood as shown below (**Figure 1**):

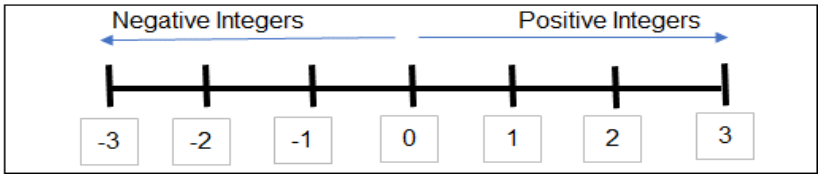

Figure 1. Negative integers and positive integers

This concept is related to integer operation, especially for addition and subtraction exercises and how students can develop this concept using their cognitive domain such as remember (basic addition and subtraction), understand (the concept), apply (once understood, how they use it) and create (to create the solution in an innovative way). Without these features, it cannot be expected that they will further understand the content and subject matter. Students always have difficulty in understanding the basic formula like this:

The general difficulty is the recognition and understanding of the symbols (+ and -), the differentiation of calculation operation function (addition and subtraction) with integer marks, and the replacement of

negative numbers [17]. For example, −7−(−3) = −4. How to solve this problem? By using normal calculation:

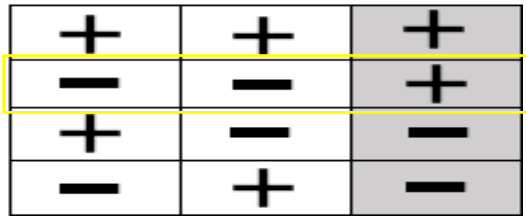

Figure 2. Normal calculation step one

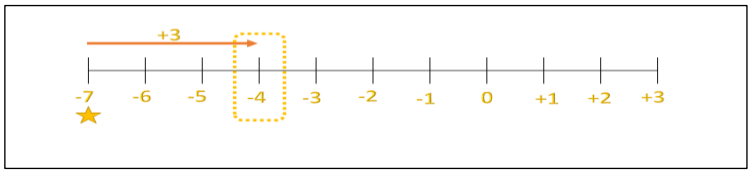

Figure 3. Normal calculation step two

Thus, the answer is −4.

The above solutions are not interactive and students don't enjoy solving the problem as there are too many procedures to draw to find the answer. To make the integer concept more interactive and innovative, we strongly recommend that teachers create an alternative way of solving problems and develop innovative solutions, such as using emoji emojis to solve problems. Students will still need to calculate integer problems but in a more interactive and enjoyable way. The introduction to integer problem solving can be divided into three stages as follows:

(1) Use symbolic formulas to analyze problems.
(2) Through creative concepts and ideas shown here, students categorize when the emoji smile can be used to represent a positive integer and the sad emoji can be used to represent a negative integer.
(3) Matching between two emojis and then students get the answer. Take the same example as mentioned above, −7 −(−3).

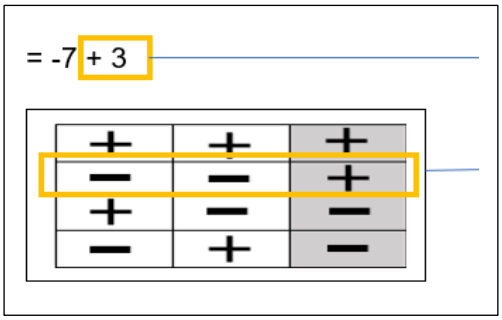

Figure 4. Emoji calculation step one

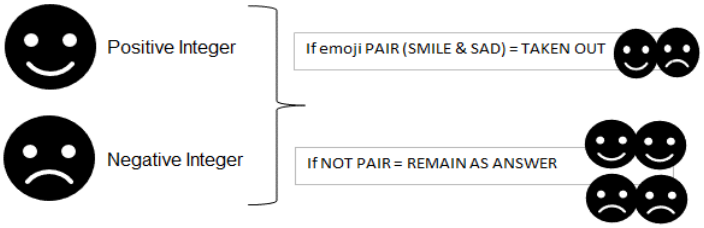

Figure 5. Emoji calculation step two

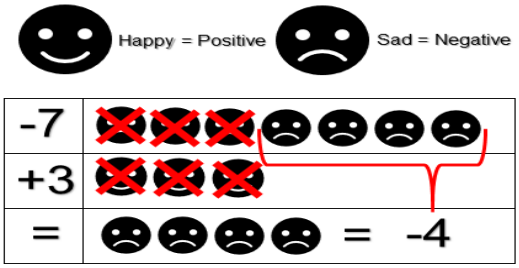

Figure 6. Emoji calculation step three

This innovative approach is simple and fun, meaningful and relatable. This approach can be described as below:

(1) Simple and fun. Apply simpler and more interesting techniques based on the rules of emojis. Now that the rules are in place, the concept of integers can be understood and conveyed by the students. This approach can also be achieved by playing games. Use recycled items such as boxes and paper to draw emojis to create a meaningful and fun learning experience.

(2) Meaningful. Learning becomes more meaningful when students recognize amounts to support this alternative approach to problem-solving. It also helps students to recognize and remember useful ideas that they have learned in the classroom through innovative ways of learning.

(3) Relatable. This innovative concept can be related to a student's way of life by imagining the feeling of the emoji either a happy or sad situation. There are always ups and downs in life, easy and difficult situations, and so on; these situations or emotions can be utilized in teaching students to solve problems regarding positive and negative integers.

In short, problem-solving skills are fundamental in our lives. It enables students to learn various ways of solving problems and helps students transfer their knowledge gained in the classroom into real situations.

3.2. Sustainable learning of simple addition and subtraction

One of the initiatives to implement sustainable development is through the learning process of using recycled items. Students innovate by using several recycled items, such as straws, paper cups, boxes, and more. These recycled materials are an essential step towards sustainability as a way to protect the environment and the environmental, social, and economic concerns are unparalleled. This method is applied to simple mathematical addition and subtraction as shown in the diagram below (**Figure 7**).

Figure 7. Application of recycled items in mathematical addition and subtraction

In class, the teacher can instruct students to bring in recycled materials to build things using their creativity and innovation. The teacher will then give a simple question and ask them to find the answer through these "magic box" math.

(1) Addition: What is the correct answer of 5 + 4? First, students can pick 5 straws and put them in the correct cup, which is cup number 5; do the same for 4. Then, students count all the straws and put the final answer in the correct cup, the answer is 9.
(2) Subtraction: What is the correct answer if 7 – 2? Again, students can pick 7 straws and put them in cup number 7, then pick up only 2 straws and put them back in their original place, count the remaining straws which is 5, and then move 5 straws to the correct cup.

The emphasis on the concept of sustainable development becomes the main focus and needs to start from the early stages of education; at home and school [18,19]. Therefore, this awareness will be indirectly present and improved if students are exposed to such innovative and creative activities, as well as understanding and manifesting them in the form of proactive and positive behaviors, especially through more sustainable development practices in their lives.

4. Innovation in teaching science subjects

The Standards Document for Curriculum and Assessment (DSKP) for primary science subjects emphasizes the cross-curricular elements or EMK. the DSKP states that EMK refers to value-added elements applied in the teaching and learning process, rather than those specified in the content standards. These elements are applied to enhance desired human capital skills and competencies as well as to be able to address current and future challenges. One of the elements of EMK is innovation. It is the application of creativity through the modification, refinement, and practice of ideas. Creativity and innovation are intertwined and are necessary to ensure the development of human capital that can face the challenges of the 21st-century [20,21]. Expressions about innovation are not only concerned with seeing innovation in the work of students. Innovation also emphasizes the teaching methods implemented by teachers. Teachers themselves need to be innovative, creating effective teaching methods or improving the existing ones to make learning more interesting for their students.

In this article, teachers' innovations in teaching methods are linked to sustainable development. In addition to innovation, another element of the DSKP science subject known as EMK is environmental sustainability. Sustainable development is defined as development that is implemented to avoid the abandonment of resources and to ensure minimal damage to nature [3]. According to the DSKP Science statement, the elements of environmental sustainability are described as a sense of love and care for the environment that should be fostered in the souls of students through the teaching and learning of all subjects. Knowledge and awareness of the importance of the environment and global sustainability are important in shaping an ethic

of appreciation for nature in students.

4.1. The importance of sustainability in innovation in science teaching

The importance of sustainability in innovation in science teaching and learning was discussed earlier in this paper. What follows is that the application of sustainability in education innovation is important. One aspect of sustainability in innovation in teaching methods is recycling. Creating teaching aids for science teaching by recycling waste materials. The thematic content of science subjects focuses heavily on the application of available materials. In science subjects, students are expected to use science process skills such as making observations by seeing, touching, hearing, smelling, or feeling an object. In addition, students are expected to use science process skills through experimentation and manipulation of tools.

The practice of recycling can therefore protect the environment from pollution. Teaching aids made from recycled materials are also more helpful in stimulating students' interest in the subject being taught. The use of recycled teaching aids can help improve the quality of teaching and learning for both teachers and students. Another benefit of producing recycled teaching aids is of course the costs saved for not having to spend more money on aids. In addition, depending on the creativity of the teacher, they can be made easily and quickly, without any difficulty, using only recycled materials that are available at home [22]. When it comes to saving, the use of recycled materials in teachers' teaching indirectly helps to save money on waste disposal costs. This method is more economical than maintaining the country's ever-growing landfills.

What is the importance of this sustainable development for innovative approaches to teaching science? Through the subject of science, students use inquiry to satisfy their curiosity about the world around them. One of the attributes or values that pupils should embody is the appreciation of the balance of nature. Teachers should therefore plan and develop their teaching strategies wisely with the concept of sustainability in mind. The theme of sustainability is not emphasized in the content of every DSKP science syllabus. However, teachers can diversify their teaching and learning activities with the concept of sustainability in the teaching of each topic. The concept of sustainable development in education, especially in science education, emerged as a way of developing awareness of the importance of protecting and preserving the old environment. Sustainable development in education is an educational mission [23]. The importance of innovation in creating appropriate teaching aids and sustainable concepts is an important factor in ensuring that teaching is delivered perfectly and effectively increases students' understanding of the subject matter being taught.

Every implementation is sure to have challenges and problems. Similarly, there are challenges and obstacles as far as the application of sustainable development in this educational innovation is concerned. The focus on digitalization in teaching and learning has to some extent reduced the interest of teachers in achieving sustainability in teaching and learning innovation. Teachers are more interested in using media tools, such as interesting, usable, and fast animated videos [24]. Teachers can download any teaching aid from the internet or create videos or quizzes using applications that offer a variety of templates. Even students enjoy animated videos featuring the content of the topics they are studying. In addition to the disastrous situation that befell the country, the Covid-19 pandemic forced the closure of schools and forced teachers and students to use the Internet medium to receive the teaching and learning process at home. As a result, these factors made teachers less interested in innovating or developing teaching strategies related to sustainable development [25]. Due to the requirement of the Malaysian Ministry of Education that the teaching and learning process must follow the new norms of being conducted online, teachers and students are more interested in quiz-based exercises such as Wordwall, Kahoot, quizzes, and learning through video programs on Youtube [26,27].

The challenges can be overcome to develop sustainability in teaching and learning. Teachers can use

used materials during online teaching by recycling them. Students can still use their senses to see and try to understand what the teacher is presenting through online learning. Therefore, sustainability in education is still possible even with online teaching.

5. Conclusion

In conclusion, there are ample areas for innovation to be applied in the classroom process. The creation of innovation requires the interconnection of one element with another to gain a powerful impact. Using Information and Communications Technology (ICT) and combining it with natural elements allow innovations to be translated more widely and be more easily understood by students. Innovation needs to be developed in action, slang, and language that can be easily understood. However, it is often taught in a way that is difficult to be understood, let alone apply. Sustainable development in education is an important requirement for China and Malaysia. Education about the environment cannot be separated from the preservation of nature in the pursuit of becoming a technologically sophisticated nation. For the sake of future generations, the environment must be safeguarded and preserved. Most significantly, without sufficient environmental education, today's youth would not understand the need of preserving the environment. Without understanding the importance of environmental preservation, the environment might be destroyed by the technological prowess of future generations. Therefore, it is the responsibility of educators to create and improve instructional strategies through work on sustainable development thus achieving balance in terms of technological advancement and environmental growth.

Disclosure statement

The authors declare no conflict of interest.

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