Developing Teachers to Develop Students' 21st Century Skills

Raphiphan Mopara[1,*] & Wirot Sanrattana[1]

[1]Mahamakut Buddhist University, Isan Campus, Khon Kaen Province, Thailand

Correspondence: Mahamakut Buddhist University, Isan Campus, Khon Kaen Province, Thailand. Tel: 66-871-855-501

Abstract

The operation in the research project for developing teachers towards enhancing the 21st Century skills of students was one of the research projects on 21st Century Skills. It was a research operation that was based on the advancement of digital technology and a knowledge-based society in the 21st Century. Various international perspectives on developing the 21st century skills of students, which had been presented by experts, were gathered utilizing Research and Development methodology, with the aim of creating educational innovations that can be used to empower teachers' learning and subsequently promote students' development. This approach transformed the old belief of "Knowledge is Power" into the idea that "Knowledge and Action are power." It is believed that if teachers learn, they will put their knowledge into practice in the classroom, which, in turn, will lead to more effective results for their students. The research project resulted in an educational innovation called the "Online Self-Training Program for Developing Teachers to develop their Students' 21st Century Skills," which had been previously evaluated by those teachers, who were stakeholders in this educational innovation and who had already passed the experimental research in the field. The innovation has been found to be effective in accordance with the specified criteria. Therefore, it is possible for this educational innovation to be disseminated so that the teachers' skills can be developed in order to enhance their students' 21st Century Skills in secondary schools that are affiliated with the Basic Education Commission, which is the target group for the widespread dissemination of this research work.

Keywords: 21st century Skills, online self–training program, knowledge and action are power, Research and Development (R&D) methodology

1. Introduction

The 21st century world represents a period of numerous changes in various aspects, including Information Technology; communication; social and economic systems; and educational systems from countries and regions of the world. These changes have impacted the ways in which people worldwide conduct their lives as global citizens and have also affected the ways in which students learn and live in their daily lives. Developing individuals and countries to keep pace with the changes in the 21st Century requires life skills that everyone must learn ranging from kindergarten to university and throughout our lives. These skills help people to efficiently and effectively cope with the rapid and emerging unpredictable changes (Panich, 2012). Education must evolve, and students must acquire learning & innovation skills, information, media, and technological skills, as well as life and work skills. Therefore, preparing individuals to learn and live in the midst of change is an essential aspect that all parties must adapt appropriately (Chongkolklang, 2018). As a result, teachers must re-think their teaching methods and change them so that students can develop skills for the 21st Century, which will prepare them for further education and for the demands of the job market. Teachers must have professional learning experiences that can be brought into the classroom. Teacher-centered experiences can contribute to inspiration and can subsequently lead to student-centered experiences (Robb, 2016).

According to the research results, 21st century skills aim at helping students to keep up with the rapid changes in digital technology and to acquire a greater social base of knowledge and learning compared to the past. A variety of skills are involved, such as collaboration & teamwork, creativity & imagination, critical thinking skills, problem-solving skills, flexibility & adaptability, global & cultural awareness, information literacy, leadership, civic literacy & citizenship, oral & written communication, social responsibility & ethics, technological literacy, and initiative. (Breed, 2019;

Envision, 2020; Learning, n.d.; Roslaniec, 2018; and Stauffer, 2020)

Furthermore, multitudes of recommendations have been put forth to cultivate 21st century Skills among students. These include the following: 1) supporting students in establishing criteria for success via their design projects and utilizing the criteria to assess and enhance the designs and solutions that they have created; 2) incorporating constraints into design challenges to encourage students to generate innovative ideas and alternative approaches to problem-solving; 3) integrating technology into workflow; 4) fostering self-directed learning and self-evaluation; 5) demonstrating originality and inventiveness in work; 6) effectively communicating new ideas through creative expression; 7) applying sound reasoning in comprehending and making complex choices and decisions; 8) framing, analyzing, and synthesizing information to resolve issues and to respond to inquiries; 9) thinking creatively to foster innovation; 10) continuously evaluating and refining skills; 11) providing opportunities for student reflection; 12) promoting collaboration on projects; 13) collaborating to solve problems; 14) presenting real-world scenarios for students to identify potential issues or challenges; 15) leveraging learning beyond the classroom; 16) teaching tolerance and resilience; 17) instilling the values and skill sets for collaboration; 18) emphasizing digital literacy & digital citizenship, and 19) prioritizing critical thinking (Burt, 2020; Dimitriadis, n.d.; Oliver, 2016; Oxford University Press, 2013).

The previous statement highlights the importance of 21st century Skills for students and suggests various approaches for their development from numerous experts. While some skills and methods have already been acknowledged and implemented by some educators, there were still some skills and approaches that have not been recognized or applied. These need to be recommended or presented in order to improve learning outcomes and practical application for students. In the context of society, digital technology is rapidly changing, and the knowledge-based society has a diverse range of knowledge that is available worldwide on the Internet. Therefore, there is an opportunity to utilize this knowledge to benefit the development of Students' 21st century Skills with the concept that "Knowledge and Action are power." Applying this concept to "teachers" is particularly essential because they play a vital role in enabling students to keep pace with the rapid social changes.

Therefore, during this research, the research team placed emphasis on the importance of research and development in order to create an educational innovation called the "Online Self-Training Program for Developing Teachers to Develop Students' 21st century Skills." By following the Research and Development (R&D) methodology, the result was an effective educational innovation that can be disseminated for the benefit of strengthening teachers' learning capabilities. In turn, the innovation could have a positive impact on students in secondary schools under the Office of Basic Education Commission, which was the target population for this research. According to the principles of R&D methodology, any educational innovation, which can be developed and then tested in an experimental research area (representative of the population) and in which the results of the experiment can meet the specified criteria, can be disseminated for the benefit of the reference population in the research. Furthermore, since Online Self-Training Programs have been developed in the digital age and are not the document-based programs of the past, the benefits will be multiplied *after the programs hav*e been widely disseminated, making them more efficient, cost-effective, and effective than in the past.

1.1 Research Objectives

This research placed emphasis on the importance of various perspectives and recommendations for developing the students' 21st century Skills through R&D methodology. The goal was to create an educational innovation called "Online Self-Training Program for Developing Teachers to Develop their Students' 21st-Century Skills". This program can be disseminated to strengthen learning for teachers, who can, in turn, apply the acquired knowledge to their teaching practices for students under the underlying principle of "Knowledge and Action are power." The Online Self-Training Program consisted of two parts: 1) the project aimed at enhancing the teachers' learning in the areas of definitions, significance, characteristics, developmental approaches, developmental steps, and the assessment of the students' 21st century Skills, and 2) the project aimed at enabling teachers to apply the results of their learning to the development of 21st century Skills for their students, which was the main focus of this research, namely learning skills, creative thinking skills, collaboration skills, communication skills, and technological skills. The first project consisted of six sets of online self-training modules for teachers, while the second project incorporated one teacher's manual as a practical guide.

1.2 Research Hypothesis

In this research, the research team examined the literature review on students' 21st century Skills, covering various topics beyond the previous phase of the study, in order to develop an Online Self-Training Program. The program was then made available to those teachers, who were stakeholders so that they could review and assess its quality. Tools were created for use in research, and the program was tested in a randomly selected school for experimental research. It

was believed this research would lead to efficient educational innovations. Therefore, it could be expected that the "Online Self-Training Program for Developing Teachers to Develop their Students' 21st Century Skills" would be effective in accordance with the following criteria: 1) the Post-test scores from the teacher's learning outcomes would meet the standard criterion of 90/90, and the Post-test scores would be significantly higher than the Pre-test scores, and 2) the Post-test scores from the assessment of the students' 21st century Skills would be significantly higher than the Pre-test scores.

1.3 Literature Review

In this research, the research team studied the literature on the students' 21st century Skills to provide a more greatly diverse range of academic recommendations from various perspectives. This was conducted to develop the content to create an Online Self-Training module for teachers, which consisted of six sets of materials. These materials consisted of the following:

• The definitions of the students' 21st century Skills from the perspectives of Academy (n.d.), ESP Solutions Group (2014), Glossary of Education Reform (2016), Innove Edu (n.d.), Rich (2010), and the West Shore School District (n.d.).

• The importance of the Students' 21st century Skills from the perspectives of Canvas Instructure (n.d.), Gerstein (2014), Planeteers (2019), Ross (2017), and Simply Learning Tuition (n.d.).

• The students' 21st century Skills from the perspectives of Anzac Park Public School (n.d.), Powhatan School (2019), Cruz (2019), Envision (n.d.), Mugabi (2019), Breed (n.d.), Educational technology & mobile learning (2015), Roslaniec (2018), the Savremena International School (n.d.), and Stauffer (2022).

• A developmental guide to the students' 21st century Skills (principles, ideas, techniques, methods, and activities) from the perspectives of the Administrator of the Transform Educational Consulting (2019), Burt (2020), Dimitriadis (n.d.), Oliver (2016), Oxford University Press (2013), Robb (2016), Ross (2019), William and Bates (n.d.), and Willis (n.d.).

• The steps for developing the students' 21st century Skills from the perspectives of Admin of Transform Educational Consulting (2019), Esters (2021), William and Bates (n.d.), and Willis (n.d.).

• The processes of evaluating the students' 21st century Skills from the perspectives of Bukidnon State University (2018), Pinterest (n.d.), Ravitz (2014), and Sean (2012).

With regard to developing the students' 21st century Skills; which encompass principles, concepts, techniques, methods, and activities; the guidelines represent crucial information since they offer alternatives for teachers to enhance their students' abilities. The research team has synthesized the following 40 guidelines:

• creating an inquiry-based classroom environment

• encouraging creativity

• allowing students to lead the learning

• encouraging collaboration

• setting the appropriate learning goals

• designing course structure and learning activities

• supporting students to develop the criteria for success for their design projects and to use these to evaluate and improve the designs and solutions that they develop

• adding constraints to design challenges that encourage students to come up with new ideas and alternative ways to solve problems

• applying technology to work flow

• developing critical thinking skills

• being self-directed and being capable of self-assessment

• demonstrating originality and inventiveness in work

• being able to communicate new ideas to others through creative movement

• acting on creative ideas to make them more tangible

• exercising sound reasoning in understanding and making complex choices and decisions

• framing, analyzing, and synthesizing information in order to solve problems and to answer questions

• thinking creatively to create innovations

• evaluating and innovating

• assessing the skills multiple times

• allowing for student reflection

• encouraging constructive comments

• cooperating on the projects

• solving problems together

• presenting real-world scenarios for students to identify possible issues or problems

• using learning beyond the classroom

• teaching tolerance and resilience

• teaching collaboration as a value and a skillset

• highlighting digital literacy & digital citizenship

• placing emphasis on critical thinking

• teaching through the disciplines

• simultaneously developing lower and higher order thinking skills

• encouraging the transfer of learning

• teaching students to learn how to learn

• promoting teamwork as a process and an outcome

• making full use of technology to support learning

• getting started with student-led discussions

• having small group discussions

• having paired discussions

• developing a question wall in class to guide the students' thinking

• having the students explain the processes that they followed during the design process.

2. Research Methodology

2.1 Concepts and Processes

In conducting the research for the innovation called " The Online Self-Training Program for Developing Teachers to Develop their Students' 21st Century Skills", Research and Development (R&D) methodology was used in accordance with the perspective of Sanrattana (2018), who believes that educational innovations, which are developed through R&D methodology, aim at developing "people" towards the development of "work." The expectation is that if people have the knowledge and become stimulated to take action, they will generate power in their work, thereby making their work more effective. This is in line with the concept that "Knowledge and Action are power." This concept led to the idea of this research: 'Start with empowering teachers to learn, and then allow teachers to bring the results of their learning into their teaching in order to make an impact on students.'

Therefore, this research placed emphasis upon the importance of studying the literature on the topic of Students' 21st century Skills in various topics as mentioned above. This was to acquire knowledge based on diverse perspectives and topics, which highlighted the development of Online Self-Training Modules that are believed to effectively enhance the learning of teachers. Hence, the R&D methodology process for this research began with a study of the literature on Students' 21st century Skills, which was divided into R1&D1...Ri&Di as follows:

R1&D1: Importance was placed on the study of the literature related to the Students' 21st century Skills on the following topics: 1) Definitions, 2) Significance, 3) Characteristics, 4) Developmental approaches (i.e., principles, ideas, techniques, methods, and activities), 5) Developmental processes, and 6) Assessments. The purpose was to develop an online self-training program, which would be comprised of 6 sets of online self-training modules for teachers and one teacher's manual for practical guidance. (*Please see the original Thai version of the modules from*

https://bit.ly/3ntwwPA)

R2&D2: The quality of the developed Online Self-Training Program was evaluated in the two following phases by having focus group discussions: 1) the Preliminary Field Testing and Revision was conducted with 5 teachers from a non-experimental school, and 2) the Main Field Testing and Revision was conducted with 13 teachers from another non-experimental school.

R3&D3: Two experimental tools were developed, consisting of the following: 1) a test to evaluate the teachers' learning outcomes, and 2) an assessment form to determine the students' 21st century Skills.

R4&D4: The Online Self-Training Program was implemented in a real-world setting at Baan Pai School, which was selected through purposive sampling as the experimental site for the one-group Pre-test and Post-test experimental design. The experiment was conducted during the second semester of the Academic Year of 2022 and involved a group of 16 teachers and 652 students. The experiment was divided into two phases. In **Phase I**, the 'Strengthening Teacher Learning Project' was implemented, which lasted for one month, using the Online Self-Training modules that had been developed in 6 sets, with Pre-test and Post-test assessments for teachers. In **Phase II**, the 'Teacher-led Learning Outcomes Project' was implemented to develop the students' learning, which lasted for two months and had both Pre-test and Post-test assessments for students.

2.2 The Research Tools

- The first research tool was an online assessment form, which used Google Forms and consisted of 36 multiple-choice questions that had been designed to test the knowledge of teachers. The purpose of the assessment was to evaluate the learning outcomes of the teachers before and after the experiment. The research team created the questions based on the content that had been presented in the online self-training module, which covered the definitions, importance, characteristics, developmental processes, and the evaluation of cognitive domains according to Benjamin S. Bloom's Revised Taxonomy 2001. The questions were designed to progress from lower-order thinking skills, such as remembering and understanding, to higher-order thinking skills, such as applying, analyzing, evaluating, and creating, as stated by Armstrong (2010).

The questions were subjected to quality control by utilizing two methods. In the first method, the content validity was measured in accordance with Rovinelli and Hambleton's (1977) Indices of Item-Objective Congruence (IOC) using five qualified experts in Curriculum and Instruction and Educational Measurement and Evaluation, which showed that all the questions had exceeded the IOC threshold of 0.50 (Chaichanawirote & Vantum, 2017).

In the second method, experimental testing was conducted with 30 non-research experimental school teachers, which revealed the following: 1) all the questions had had an index of difficulty ranging from 0.20-0.80 and a power of discrimination from 0.20-1.00; 2) the KR-20 value, which measures the confidence coefficient, had been 0.89, which exceeded the minimum threshold of 0.70; and 3) the level of difficulty of the test had been measured at 54.35.

- The second research tool was the Students' 21st century Skills assessment form, which had been made online using Google Form and consisted of 30 rating scale questions with the five following levels: "the highest," "high," "moderate," "low," and " the lowest." The researchers developed this assessment based on the study of the students' 21st century Skills from the perspectives of Anzac Park Public School (n.d.), Powhatan School (2019), Cruz (2019), Envision (n.d.), Mugabi (2019), Breed (n.d.), Educational technology and mobile learning (2015), Roslaniec (2018), Savremena International School (n.d.), and Stauffer (2022). Additionally, the study also incorporated the concept of assessing the students' 21st century Skills from the perspectives of Bukidnon State University (2018), Pinterest (n.d.), Ravitz (2014), and Sean (2012). These sources were evaluated for quality utilizing two methods.

Firstly, a content validity analysis was conducted by using Rovinelli and Hambleton's method of utilizing five qualified experts in the fields of Educational Administration and Educational Measurement & Evaluation. It was found that all questions had shown an item-objective congruence (IOC) score higher than the standard of 0.50, which indicated that the questions in the students' 21st century Skills assessment, which was used in this study, had been appropriate for measuring the intended objectives (Chaichanawirote & Vantum, 2017).

Secondly, a reliability analysis using Cronbach's method was employed to determine the alpha coefficient of reliability of the assessment of 30 students in a non-research experimental school. It was found that the overall alpha coefficient of reliability had been 0.83. After being analyzed by skill areas, the reliability coefficients had been 0.73 for Learning skills, 0.86 for Creative thinking skills, 0.84 for Collaboration skills, 0.84 for Communication skills, and 0.87 for Technology skills. When comparing the reliability coefficient with the criterion of being equal to or greater than 0.70 (UCLA: Statistical Consulting Group, 2016), it was found that the value had been higher than the specified criterion, indicating that the items had exhibited relatively high internal consistency.

2.3 Data Analysis

- Data analysis was carried out to compare the Post-test results of teachers with the 90/90 standard, in which the first 90 refers to the percentage of the average scores of the teachers from the knowledge test, and the second 90 refers to the percentage of teachers, who passed the test in accordance with all the objectives (Yamkasikorn, 2008).

- The data was analyzed to compare the Pre-test and Post-test results in both cases of teachers and students using dependent t-test statistics.

3. Research Results

Based on the results of the teacher's learning assessment after implementing the first project, "Teachers' Learning Development Project," the goals were to determine the following: 1) whether the developed online self-training modules had resulted in the experimental group of 16 teachers achieving learning outcomes that met the 90/90 standard and 2) whether there had been an increase in the statistical significance of the teachers' learning outcomes after the experiment. Additionally, the reason was also to determine if there had been any improvements in the students' scores from the assessment after the experiment with the experimental group of 652 students, which was in accordance with the second project, the "Teacher-led Learning Outcomes Project." The results were as follows:

The research findings from the "Teachers' Learning Development Project for Students' Success" were as follows:

- The first experiment was the "Teacher Learning Development Project," the goal of which was to determine whether the online self-training modules had led to significant improvements in the learning outcomes of those teachers, who had been a part of the trial group of 16.From the results, it was found that their average score had been 34.19 out of 36 points, which translated into a percentage of 94.97. This percentage was higher than the standard set at 90 percent.

- The second experiment was the "Teachers Leading Learning Outcomes Project," the goal of which was to determine whether the teachers, who had used the learning outcomes to develop their students, had achieved higher assessment scores than before the experiment. It was found that 100% of the teachers had been able to pass all the set learning objectives, which was higher than the standard set at 90 percent.

- The statistical analysis, comparing the significant differences between the mean scores before and after the experiment, showed the following: out of a full score of 36 points, teachers had a Pre-test score of 431 (the equivalent of a mean score of 25.81), and a Post-test score of 547 (the equivalent of a mean score of 34.19). When analyzed using a dependent t-test, it was found that those teachers in the experimental group had had significantly higher mean scores on the Post-test compared to the Pre-test, with the level of statistical significance at 0.05. The data is shown in the following data analysis table (Table 1).

Table 1. The Results of the Comparison of the Means from the Teachers' Pre-test and Post-test using the Dependent t-test

Testing	Sample size	Mean	Standard Deviation	t
Pre-test	16	25.81	3.69	14.014*
Post-test	16	34.19	1.38	

* $p < 0.05$

The research results from the project: "Teacher-led Learning Outcomes Project for Students' Success" Based on the assessment of the 21st century Skills of 652 students before and after the experiment, the results are shown in Table 2.

Table 2. The Results of the Students' 21st Century Skills Assessment before and after the Experiment

The Characteristics that demonstrated the Students' 21st Century Skills	Assessment Results			
	Pre-test		Post-test	
	$\overline{\chi}$	S.D.	$\overline{\chi}$	S.D.
Learning Skills				
• Showing a desire to learn	3.39	1.20	3.99	0.94
• Being able to reflect on meaningful learning experiences	3.81	1.05	4.00	0.91
• Being able to search for the meaning and importance of various things on their own	3.74	1.05	4.17	0.87
• Being able to explain logically and clearly	3.51	1.04	4.13	0.87
• Being able to create diverse options for one's self	3.44	1.02	4.12	0.93
• Being able to find other options for everyday life	3.57	1.04	4.43	0.71
Creative Thinking Skills				
• Having the ability to generate new and innovative ideas	3.67	1.13	4.28	0.79
• Having thoughts that flow	3.34	1.05	4.18	0.95
• Having the appropriate thinking for situations	3.60	1.09	4.35	0.93
• Having analytical or meticulous thinking	3.74	1.09	4.07	1.02
• Having a high level of imagination	3.64	1.12	4.14	1.03
• Having diverse thinking or imagination	3.47	0.97	4.18	0.92
Collaborative Skills				
• Being capable of working in pairs or small groups to collaborate	3.68	1.09	4.42	0.80
• Being capable of collaborating with other students to set goals and create plans for the team	3.54	1.04	4.10	1.01
• Being capable of collaborating to present group work in the classroom.	3.54	1.10	4.14	1.06
• Being capable of working as a team to gather opinions on group work	3.91	1.04	4.23	1.01
• Being capable of providing feedback to friends or evaluating the work of other students	3.83	1.07	4.11	1.07
• Being capable of attempting to adapt to working with friends	3.63	1.07	4.10	0.98
Communication Skills				
• Being able to present ideas effectively through various forms of communication, such as speaking, writing, and taking action in diverse ways	3.58	1.03	4.10	1.00
• Being able to clearly answer questions in front of a large group of people	3.61	1.00	4.13	0.95
• Being able to utilize media and technology effectively and impactfully	3.69	1.04	4.09	1.00
• Being able to communicate effectively in various situations	3.63	1.07	4.11	1.00
• Being able to communicate for different purposes, such as informing, teaching, motivating, and inviting others	3.72	1.01	4.16	0.95
Technological Skills				
• Using technology or the internet for self-learning	3.44	1.06	4.28	0.92
• Choosing the appropriate technological tools to successfully accomplish tasks	3.26	1.00	4.16	0.98
• Evaluating the reliability and relevance of online sources of information	3.43	1.06	4.14	0.91
• Using technology to track the assigned tasks	3.47	1.07	4.24	0.95
• Using technology to help share information (such as presenting in multi-media formats, audio, or video)	3.49	1.03	4.16	0.95
• Using technology to support teamwork or collaboration	3.20	1.01	4.11	1.04
• Using information wisely and creatively	3.28	1.05	4.10	1.04
Totals	3.56	1.06	4.16	0.95

In accordance with the two phases of the assessment results from the students' 21st century Skills, when the data was analyzed using the dependent t-test, it was found that the average scores of the students after the experiment had been significantly higher than the scores before the experiment with a statistical significance level of 0.05, as shown in Table 3.

Table 3. Shows the Results of the Analysis Comparing the Average Scores of the Students' Pre-test and Post-test Using Dependent t-test

Evaluating	Sample sizes	Means	Standard Deviations	t
Pre-test	652	3.56	1.06	60.644*
Post-test	652	4.16	0.95	

* $p < 0.05$

The results from the aforementioned research supported the beliefs of the researchers, which were presented in the "Introduction" section. By conducting the R&D methodology to create an "Online Self-Training Program to Develop Teachers to Develop their Students' 21st Century Skills," the researchers believed that it would result in effective educational innovations that would meet the established criteria. Furthermore, the researchers believed that this innovation could be disseminated to benefit the secondary schools under the Basic Education Commission, which is the target population for this research when conducted in accordance with the R&D methodology.

4. Discussion

The report and recommendations, based on the perspective of Sanrattana (2018), indicated that educational innovations, which have been developed using R&D methodology, should aim at helping to develop "people" towards the improvement of the "work." The expected outcome would be that when people possess knowledge and are motivated to act, power is created to increase work efficiency. This concept is in accordance with the idea that "Knowledge and Action are power." The concept, which was applied in this research project, proposed starting the process by empowering the teachers to learn, so that they can then transfer this knowledge to their students. This approach emphasizes the importance of studying the literature related to Students' 21st century Skills, in order to provide various perspectives and knowledge that can be compiled into an online self-training module, which is believed to effectively enhance the learning capabilities of teachers. Therefore, "action" is crucial, since it is believed to be the key to success, as stated in the sayings: "Knowledge is power, but without action is useless." (Ofpad, the School of Genius, n.d.), and "Knowledge" is equally important, as it is the foundation that leads to "action." Good knowledge can lead to taking good actions, which, can, in turn, result in successful and effective work. This serves as a warning to teachers to never become complacent by solely relying on their previous knowledge and experiences, because doing so would result in performing work in a stagnant manner that would perpetuate old patterns. To avoid this, teachers need to constantly develop new and innovative ideas, and should avoid acting like a blind person, who walks in circles and operates without adding any new knowledge to their repertoire. This concept is consistent with the concept mentioned in the research on Developing Teachers to Enhance Project Management Skills for Students by Nukoonkan and Dhammapissamai (2023), on Developing Teachers to Enhance Students' Effective Teamwork Skills by Saysin and Dhammapissamai (2023), on An Online Program to Enhance Teacher Learning to Develop Students' Self-Directed Learning Skills by Arnandho and Sutheejariyawattana (2022), Online Program to Develop Teachers to Enhance Students' Adaptability Skills by Athan and Thacha (2022), Online Program to Enhance Teacher Learning. to Develop Students' Information Literacy Skills by Chobjai and Sanrattana (2022), and An Online Program to Empower Teachers' Knowledge to Develop Students' Collaborative Skills by Dhanapañño and Sutheejariyawattana (2022).

5. Conclusion and Recommendations

From the idea that even "Action" is important because it is the key to success. However, "Knowledge" is also important because it is the initial factor that leads to "Action". If knowledge is good, it will lead to good actions and lead to the success of effective work. Therefore, to develop any subject in schools, teaching and learning should be especially managed so that the good qualities of students can be enhanced. To accomplish this goal, teachers must become lifelong learners. Teachers must not stop learning, especially in our 21st century world, in which the phenomenon of fast-paced technological changes are taking place worldwide. These rapid technological changes have led to changes in learning methods for students, which have been seen from the emergence of online PDFs, online classes, smart boards, and other digital devices that can replace physical classrooms, pens, and notebooks. It has also been recommended that teachers should change their teaching methods, incorporate academic teaching, and should teach subjects, such as moral values and discipline. The teacher must learn various strategies to handle students and teach them since their mindset is not the same as earlier students (MeritHub, n.d.). Teachers should consider the following saying: "We always need to grow more and more, get new ideas because 'Old ways won't open new doors', we need to knock on the new door to open it" (Maxwell, 2020). As stated by Queens University of Charlotte (n.d.), the benefits of not stopping the learning of teachers consist of: 1) the students having better learning outcomes, 2) the teachers discovering better ways to teach, 3) the teachers developing better skills in organization and planning, 4) the teachers gaining knowledge and industry insights, and 5) the teachers desiring to continue their education.

In addition to becoming lifelong learners, teachers must be aware that the 21st century is the "digital age" or "digital society." Due to the phenomenon of fast-changing technology worldwide, teachers play a significant role in

developing learners to keep up with changes. Therefore, teachers must consider inspiring and guiding learners in order to enhance their learning experiences with digital tools as necessary. Therefore, teachers must be "Digital Teachers," who can efficiently and effectively use Information Technology and communication to elevate and improve their students' learning outcomes. This will result in the creation of "Digital Students," who can use technology and communication to improve their own learning or academic achievements. Over time, they will become "Digital Citizens," who can effectively use Information Technology and communication in their lives and their work. In accordance with the idea that "the success of learners is the success of teachers, "the role of teachers is to train learners and to improve their 21st century Skills, such as critical thinking, creativity, collaboration, flexibility, leadership, initiative, productivity, and social skills."

References

Academy, K. (n.d.). *An introduction to 21st century skills: What they are and why they matter.* Retrieved from https://bit.ly/3RSEXz9

Admin of Transform Educational Consulting. (2019, March 16). *Four- step process to develop 21st century skills in your students*. Retrieved from https://bit.ly/3luqWvm

Anzac Park Public School. (n.d.). *21st century learning*. Retrieved from https://bit.ly/3JS0oMT

Armstrong, P. (2010). *Bloom's taxonomy*. Vanderbilt University Center for Teaching. Retrieved from https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

Arnandho, P., & Sutheejariyawattana, P. (2022). An Online Program to Enhance Teacher Learning to Develop Students' Self-Directed Learning Skills. *Education Quarterly Reviews, 5*(2), 588-599. https://doi.org/10.31014/aior.1993.05.02.516

Athan, M., & Thacha, W. (2022). Online Program to Develop Teachers to Enhance Students' Adaptability Skills. *Education Quarterly Reviews, 5*(3), 97-109. https://doi.org/10.31014/aior.1993.05.03.528

Breed, C. (n.d.). *Characteristics of 21st century learners.* Retrieved from https://bit.ly/2G2IVTD

Bukidnon State University. (2018, June 1). *Questionnaire-for-teachers-practices-on-the-21st-century-skills*. Retrieved from https://bit.ly/3HUi2Pi

Burt, S. (2020, March 19). *Activities to develop your learners' 21st century skills.* Retrieved from https://bit.ly/3E0UBmh

Canvas Instructure. (n.d.). *Importance of 21st century learning and innovation skills.* Retrieved from https://bit.ly/3jNiQNM

Chaichanawirote, U., & Vantum, C. (2017). Evaluation of content validity for research instrument. *Journal of Nursing and Health Sciences*, *11*(2), 105-111.

Chobjai, N., & Sanrattana, W. (2022). Online Program to Enhance Teacher Learning to Develop Students' Information Literacy Skills. *Education Quarterly Reviews, 5*(2), 484-495. https://doi.org/10.31014/aior.1993.05.02.507

Chongkolklang, S. (2018). A study of learning skills in the 21st century of high school students in Cao Bang Province, Vietnam. *KKU Research Journal (Graduate Studies)*, *6*(2), 14-24.

Cruz, A. (2019, June 10). *21st century skills every student must have*. Retrieved from https://bit.ly/3E3Ffxr

Dhanapañño, P. A., & Sutheejariyawattana, P. (2022). An Online Program to Empower Teachers' Knowledge to Develop Students' Collaborative Skills. *Education Quarterly Reviews, 5*(2), 496-506. https://doi.org/10.31014/aior.1993.05.02.508

Dimitriadis, M. (n.d.). *12 ways to help students develop 21st century skills with makers empire*. Retrieved from https://bit.ly/3E4E9Bj

Educational Technology and Mobile Learning. (2015, January 11). *The 6 major skills for 21st century students.* Retrieved from https://bit.ly/3XhHVhy

Envision. (n.d.). *13 Essentials 21st century skills for today's students*. Retrieved from https://bit.ly/3YKkG0N

ESP Solutions Group. (2014, January 03). *21st century skills*. Retrieved from https://bit.ly/3M3Txmi

Esters, M. (2021, March 4). *4 Steps to teach 21st century skills in middle school*. Retrieved from

https://bit.ly/3YKDjS9

Gerstein, J. (2014, February 9). *The other 21st century skills: Why teach them*. Retrieved from https://bit.ly/3xfdT3C

Glossary of Education Reform. (2016, August 25). *21st century skills.* Retrieved from https://bit.ly/2JxHbQQ

Innove Edu. (n.d.). *21st century skills*. Retrieved from http://innoveedu.org/trends

Maxwell, A. (2020, June 24). *Never stop learning because life never stops teaching.* Retrieved from https://bit.ly/3mFVbQo

MeritHub. (n.d.). *Why do teachers need to be lifelong learners.* Retrieved from https://bit.ly/3JhmBUw

Mugabi, T. (2019, October 24). *How to incorporate 21st century skills into the classroom.* Retrieved from https://bit.ly/3jZO6ZU

Nukoonkan, C., & Dhammapissamai, P. (2023). Developing teachers to enhance project management skills for students. *World Journal of Education, 13*(1), 58-67. https://doi.org/10.5430/wje.v13n1p58

Ofpad, the School of Genius. (n.d.). *Knowledge is power but knowledge without action is useless.* Retrieved from https://bit.ly/3YHga2H

Oliver, B. (2016, December). *Strategies that promote 21st century skills.* Retrieved from https://bit.ly/3xkXmuF

Oxford University Press. (2013, October 9). *5 Ways to prepare your students for the 21st century.* Retrieved from https://bit.ly/3Yl1B5q

Panich, W. (2012). *Ways of creating learning for students in the 21st century*. Sodsri-Saritwong Foundation.

Pinterest. (n.d.). *Twenty-first century skills checklist for students.* Retrieved from https://bit.ly/40GoQYu

Planeteers. (2019, June 26). *The importance of developing 21st century skills in the classroom.* Retrieved from https://bit.ly/3DYFjhB

Powhatan School. (2019, October 2). *Exploring the 5 c's of 21st century learning*. Retrieved from https://bit.ly/3RNN8g1

Queens University of Charlotte. (n.d.). *The importance of professional development for educators.* Retrieved from https://bit.ly/3yC40xu

Ravitz, J. (2014, January). *A survey for measuring 21st century teaching and learning: West Virginia 21st century teaching and learning survey [WVDE-CIS-28].* Retrieved from https://bit.ly/3uU9Kjb

Rich, E. (2010, October 11). *How do you define 21st century learning?* Retrieved from https://bit.ly/3XrX4Na

Robb, L. (2016, November 11). *Student-led discussions develop 21st century learning skills.* Retrieved from https://bit.ly/3Xw8AHw

Roslaniec, A. (2018, May 11). *7 essentials 21st century skills for secondary learners*. Retrieved from https://bit.ly/3K3ahZT

Ross, D. (2017, April 24). *Empowering our students with 21st century skills for today*. Retrieved from https://bit.ly/2XQs4IP

Ross, D. (2019, March 25). *Developing 21st century skills and content knowledge through dance.* Retrieved from https://bit.ly/3E1u4Fc

Rovinelli, R. J., & Hambleton, R. K. (1977). On the use of content specialists in the assessment of criterion-referenced test item validity. *Dutch Journal of Educational Research*, *2,* 49-60.

Sanrattana, W. (2018). *Research in educational administration: Concepts, practices and case studies* (4th ed.). Thiphawisut.

Savremena International School. (n.d.). *8 Skills a 21st century student should master at school*. Retrieved from https://bit.ly/3Xob8Hy

Saysin, S., & Dhammapissamai, P. (2023). Developing teachers to enhance students' effective teamwork skills. *World Journal of Education, 13*(2), 1-11. https://doi.org/10.5430/wje.v13n2p1

Sean, H. (2012, September 26). *Twenty-first century skills checklist for students*. Retrieved from https://bit.ly/3XobAWt

Simply Learning Tuition. (n.d.). *21st century skills for children.* Retrieved from https://bit.ly/3YM65C4

Stauffer, B. (2022, January 10). *What are 21st century skills*. Retrieved from https://bit.ly/40J5zWh

UCLA: Statistical Consulting Group. (August 22, 2016). *What does Cronbach's alpha mean?* Retrieved from https://bit.ly/3O1ySxK

West Shore School District. (n.d.). *21st century skills*. Retrieved from https://bit.ly/40FycUo

William, A., & Bates, T. (n.d.). *Nine steps to quality teaching in a digital age*. Retrieved from https://bit.ly/3IdL0Lo

Willis, J. (n.d.). *Five steps to developing students' skills for tomorrow's challenges*. Retrieved from https://bit.ly/3YJZd7Z

Yamkasikorn, M. (2008). How to use efficiency criterion in media research and development: The difference between 90/90 standard and E1/E2. *Education Journal Burapha University, 19*(1), 1-16.

Copyrights