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An Online Program to Empower Teachers' Knowledge to Develop Students' Collaborative Skills

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Abstract
This research aimed at developing and implementing an online program to empower teacher's knowledge regarding students' collaborative skills development by using Research and Development (R&D) methodology. It is based on the concept of *"Develop teacher's learning and implement the outcomes into student development."* It consisted of two projects as follows: 1) Collaborative skills learning for the teacher development project, and 2) Implementing the teacher's collaborative skills learning outcomes with student project. The first project was created along with a set of six-manuals for teacher development including definitions, important aspects, qualifications, developmental approaches, developmental processes, and the assessment of collaborative skills manuals. The second project included an action manual for implementing the teacher's learning outcomes for student development. The online program was examined at the Pariyattidhamma School, which had been selected as research site. The findings revealed that after completing the first teacher development project, the teachers had achieved learning outcomes in accordance with the 90/90 standard. In addition, the learning outcomes after development had been statistically significantly higher than attending the project. Moreover, after the second project, the students' collaborative skills assessment results were found to be statistically significantly higher than before. Therefore, the online program produced in this study is an educational innovation that provides effectiveness and should be beneficial for learning at other Pariyattidhamma schools.

Keywords: Collaborative skills, Online program, Teacher learning, Pariyattidhamma

1. Introduction

Segar (2021) provided several supportive ideas on the topic of developing students' 21st century skills. Specifically, in order to develop the 21st century skills for learners, educators should be concerned the following ideas: 1) in order to prepare for change, students should have adaptability, resourcefulness, creativity, problem-solving skills, be able to work well under pressure, and be open-minded; 2) to prepare for navigating information, students should have inquiry skills, resourcefulness, problem-solving abilities, research skills, information literacy, critical thinking, and tech literacy skills; 3) to build character, students should understand the essence of what it means to be collaborative and social beings, who have empathy, compassion, ethics, and integrity, and who can work well with others; 4) to stay competitive in the workplace, students should be creative, have problem-solving skills, be ready and willing to collaborate, and have critical thinking skills and communication skills; and 5) to promote innovation, students should be creative, have critical thinking skills, be ready and willing to collaborate, be intelligent risk-takers, pursue lifelong learning, have curiosity, have an inquiring mind, and have good problem-

solving skills . From these suggested skills, collaborative skills are one of the crucial skills for the 21st century education.

According to Indeed Editorial Team (2022) *"collaboration' means working together and takes place when one or more people work cooperatively to complete a project/task or to develop ideas or processes. In other words, collaboration occurs when two or more people work together towards a common goal that benefits either a team or a company."* Therefore, it is essential for students to develop collaborative skills because these skills assist in the areas of problem-solving, adaptability, open communication and participation, skill-sharing, goal alignment, and engagement. (Ribeiro, 2020)

Several studies have attempted to create strategies for the development of collaborative skills. Boogaard (n.d.) suggested six ways to develop collaborative skills, which included being an active listener, refining communication skills, developing emotional intelligence, seeking out different perspectives, recognizing others, and being accountable. Meanwhile, Smart (2021) suggested another seven ways: 1) practicing core collaboration skills, 2) clarifying how to want to collaborate, 3) identifying obstacles and co-creating solutions, 4) learning from others, 5) exploring other perspectives, 6) learning how to navigate knowledge gaps, and 7) playing collaborative games with a team. Overall, the findings from every study indicated that collaborative skills could form desirable qualities within the students, including less egoity, generosity, curiosity, appreciation, the ability to listen in order to understand, flexibility, the ability to connect the dots or to create the dots, the ability to be trustworthy and to expect trust, as well as the abilities to be self-disciplined, self-motivated, inspired and inspiring, and to be respectful. (Hymes, 2015).

Therefore, the researchers were inspired to investigate additional relevant perspectives and to analyze them in a systematic study to determine further benefits. The foundation concept is to "Develop teachers' learning, and teachers implement the learning outcomes to develop students." Overall, the product of the study was "An Online Program to Empower Teachers' Knowledge to Develop Students' Collaborative Skills" using Research and Development (R&D) methodology. Sanrattana (2018) indicated that this research methodology creates educational innovations that can be beneficial in improving the quality of teachers' work. Recently, there have been numbers of ideas and theories related to educational innovations, which have highlighted the belief that teachers will apply their learning outcomes (Knowledge) to develop their students (Action), which will, in turn, lead to more effective work performance (Power). This process is based on the concept of "Knowledge + Action = Power. However, the past developments have placed emphasis on "Knowledge is Power" as defined by Azamfirei (2016), who stated: *"It is transmitting the idea that having and sharing knowledge is the cornerstone of reputation and influence, and (is), therefore, power*." At present, academics believe that not only should knowledge be focused, but it should also be active. As we can see this from several quotes: "The great end of knowledge is not knowledge, but action," "Knowledge is NOT power. Knowledge is only POTENTIAL power. Action is power." - *Tony Robbins*, and "Knowledge Is Power, But Knowledge Without Action Is Useless" (Ofpad, the School of Genius, n.d.).

2. Literature Review

The researchers investigated the various perspectives on the topic of collaborative skills from academics or agencies, with an emphasis on educational resources from the Internet. The reviewed perspectives consisted of the following six aspects: 1) the Definition of Collaborative Skills by Aiim (n.d.), Catherine (2021), Conoway (2021), Doyle (2020), Indeed Editorial Team (2021), and Noramon (n.d.); 2) the Important Aspect of Collaborative Skills by Dobos (2017), Editorial Team (n.d.), Guest Contributor (2018), Kashyap (n.d.), Moseley (n.d.), Ribeiro (2020), Versalink (2018), and Yan (2019); 3) the Qualifications of Collaborative Skills by Cran (2017), Goman (2017), Meinert (2017), Samdahl (2017), and Sampson (2010); 4) the Developmental Approaches of Collaborative Skills by Bogler (2016), Campbell (2017), Campbell (2021), Emergenetics International (n.d.), Gale (2019), Kashyap (n.d.), Kelle (2019), Lucco (n.d.), Stapper (2018), and Weller (2016); 5) the Developmental Processes of Collaborative Skills by Collaborative Outcomes (n.d.), Linton (n.d.), Team (2017) and Madsen (2021); and 6) the Assessment of Collaborative Skills by Archibald, Trumpower and MacDonald (2014), Kellerman (2007), Ofstedal and Dahlberg (2009), and Turning Point (n.d.).

3. Research Objective

The purpose of this study was to conduct research using R&D methodology that could effectively enable *"An Online Program to Empower Teachers' Knowledge to Develop Students' Collaborative Skills"* in accordance with the specified criteria. The created online program consisted of two projects: 1) a project for developing collaborative skills learning for teachers, and 2) a project for students in which the learning outcomes from the teacher's collaborative skills learning were implemented with the students. For each project, there were components consisting of learning manuals and an action manual with self-learning modules.

4. Research Hypotheses

In conducting the research, the researcher carried out research procedures in accordance with academic principles, research principles, and research ethics. The procedures included the following: 1) the process of creating the project manuals, 2) the two phases of quality inspection and revision, 3) the construction processes for the experimental instrument, and 4) the processes for the field experiment. All of these assured the quality of the study. Therefore, the created hypothesis of the study, "An Online Program to Empower Teachers' Knowledge to Develop Students' Collaborative Skills," was deemed to be effective. The online program was examined in two areas. Firstly, after the first developmental project, the results of teachers' learning outcome test had met the 90/90 standard, and the teachers' learning outcomes score had been statistically significantly higher after the experiment than before the experiment. Secondly, after the second developmental project, the mean score of the students' collaborative skills assessment was statistically significantly higher than before the experiment.

5. Research Methodology

5.1. Concepts and Stages

Research was conducted to produce " An Online Program to Enhance Teacher Learning to Develop Students' Collaborative Skills", which was based on the concept: "Develop teachers' learning, and teachers will implement the learning outcomes to develop students." Furthermore, Research and Development (R&D) methodology were employed. Sanrattana (2018) indicated that this research methodology creates educational innovations that can be beneficial in improving the quality of the teachers' work. Recently, there have been numbers of ideas and theories that are related to educational innovations. These have focused upon the belief that teachers will apply their learning outcomes (Knowledge) to develop their students (Action), which will lead to more effective work performance (Power). In summary, it is based on the idea that "Knowledge and Action are Power." Another essential stage was to review the literature related to collaborative skills, which was considered to be the vital beginning of knowledge collection for the purpose of creating the manuals for two projects: 1) the project for learning collaborative skills for teacher development, and 2) the project for implementing the teacher's collaborative skills learning outcomes with the students. The literature review was conducted in a pattern of R1&D1...R2&D2...R3&D3...Ri&Di as follows.

R1&D1: A Study of the Related Literature The literature related to collaborative skills was used to compile the following six manuals for the teachers' collaborative skills learning: (1) the Definition of Collaborative Skills, (2) the Important Aspect of Collaborative Skills, (3) the Qualifications of Collaborative Skills, (4) the Development Approaches of the Collaborative Skills, (5) the Developmental Processes of the Collaborative Skills, and 6) the Assessment of the Collaborative Skills. The data from literature review also assisted in the creation of the action manual for implementing the teacher's learning outcomes for student development.

R2&D2: Detecting the Flaws: The First Step Making the initial improvements is a vital step in creating a quality product. Therefore, a thorough check for errors was conducted. During this process, reviewers closely examined the conciseness of language used, as well as its usefulness and appropriateness. Attention was also paid to how appealingly the content had been presented. Focus group discussions were conducted with 10 teachers in a non-experimental school known as Prapassornwittaya Wat Srinual School.

R3&D3: Detecting the Flaws: The Second Step To make further improvements to the manual, the manual was re-checked for any errors that were not found in the first step. Once again, the conciseness, usefulness, and appropriateness of language were scrutinized. Further examination explored whether the content of the presentation would be appealing to the target audience. The focus group discussions were conducted with 16 teachers in two non-experimental schools known as Pali Demonstration Wat Khe-Udom School (8 teachers) and Wat Bhodisomparn School (8 teachers).

R4&D4: Studying the Literature for Further Information Information, which was related to the collaborative skills assessment, was utilized for the study to create two research tools: 1) the Teachers' learning outcomes test and 2) the students' collaborative skills assessment form.

R5&D5: Examining the Manuals in the Pre-experimental Research Step with a one group Pre-test/Post-test design The experimental area consisted of the general education classes in the Pariyattidhamma Demonstration Pali School (Grades 7-12) under the Division of Buddhist Studies National Buddhism Office, which is located in the Mueang District of Nong Khai Province. This study adopted purposive sampling to select the experimental group. The target consisted of 11 teachers, 91 lower secondary school students, and 113 upper secondary school students (204 in total). The field experiment took place during the Second Semester of the Academic Year of 2021. The experimental course was divided into following two phases:

Phase 1: The development of the teachers' learning using an online self-learning module The activities and time used in this phase were as follows: Firstly, the researchers met with the target teacher group to explain the research details and to conduct the teacher's pre-test. This step took two days. Secondly, in order to further develop the teachers' skills, online manuals and self-learning modules were employed. The teachers were able to download them from the website that the research team had created. The learning had to be completed without intervention from the research team or anyone else. This step took one month. Thirdly, to improve the manuals, the target teacher group worked to check for flaws, and then they took a post-test. This step took two days. Finally, the researchers analyzed the post-test results and compared them using the standard criteria of 90/90. The researchers then made a comparative analysis of the average scores from the pre-test and the post-test using the t-test dependent. This step took two days.

Phase 2: Implementing the teacher's learning outcomes to develop the students The activities and schedule in this phase consisted of the following steps: 1) the researchers met the target teacher group to explain the research details and to evaluate the collaborative skills of the students in the target group by using the pre-test (This step took one day.); 2) the target teacher group implemented the learning outcomes to develop the students' collaborative skills without receiving any intervention from the research team or anyone else (This step took two months.); 3) in order to improve the manuals, the target teacher group worked to check for any flaws and evaluated the students' collaborative skills using a post-test (This step took two days.); and 4) the research team conducted a comparative analysis of the average scores from the pre-test and the post-test using a t-test dependent (This step took two days.).

5.2. Research Tools

1. **The Teacher's Learning Outcomes Test** consisted of multiple-choice questions with four answers. It was used to evaluate teachers' knowledge both as a pre-test and a post-test. The test was an online Google Form. The researchers created this test using the content in the teacher's learning manuals, which consisted of definitions, sets of important aspects, characteristics, developmental approaches, developmental procedures, and assessments. The test theory was drawn from cognitive domain by Benjamin S. Bloom, who classified thinking skills from low to high as follows: remembering, understanding, applying, analyzing, evaluating, and creating. (Sanrattana, 2018) Finally, its validity was examined by carrying out the following steps:

1.1 The test validity was examined by five experts in the fields of curriculum, teaching, and measurement using Rovinelli and Hambleton's (1977) Indices of Item-Objective Congruence (IOC). The results illustrated that every question had an IOC value higher than 0.50. (Chaichanawirote & Vantum, 2017)

1.2 The test was tried out with 30 teachers in three non-experimental schools: Phrathat Witthaya School, PhraPariyattidhamma School Wat Ban Bon, and Phra PhraPariyattidhamma School Wat Amphawan. The analysis of the results showed the following: 1) the index of difficulty of the questions was between 0.20 - 0.80, and the power of discrimination was between 0.20-1.00, which conformed to the specified criterion; 2) the reliability of the test was examined using the Kuder – Richardson's method, and it had a KR - 20 coefficient of 0.889, which was greater than the specified criterion (equal to or greater than 0.70); and 3) the test difficulty, the mean scores of all samples were employed as a criterion. It is considered fairly difficulty if the average score is between 30 and 50 per cent of the total score. If the lower average score is 30, the test is considered more complex. If the higher average score is 50, the test is considered easier. Data analysis revealed that the average score for all samples had been 17.73, which was equal to 49.25 percent of the total score. Therefore, the test had had an appropriate degree of difficulty.

2. The Student's Collaborative Skills Assessment Form The form employed a 5-level rating scale: the most, very, medium, less, and the least. The researchers created the form using the studies related to the characteristics of a person, who demonstrates collaborative skills based on the perspectives of: Cran (2017), Goman (2017), Meinert (2017), Samdahl (2017), and Sampson (2010), and from studies related to collaborative skills assessment based on the perspectives of: Archibald, Trumpower, and MacDonald (2014), Kellerman (2007), Ofstedal and Dahlberg (2009), and Turning Point (n.d.). The assessment form was an online Google form. Finally, it was examined for validity by using the following steps.

2.1 The test validity was examined by five experts in the fields of curriculum, teaching, and measurement using Rovinelli and Hambleton's (1977) Indices of Item-Objective Congruence (IOC). The results illustrated that every question had had an IOC value of higher than 0.50. (Chaichanawirote & Vantum, 2017)

2.2 The Assessment Trial was conducted in a non-experimental school. At Prapassornwittaya Wat Srinual School, 30 students joined the assessment. In order to analyze the alpha coefficient of reliability using Cronbach's method. The results of the data analysis revealed that the alpha coefficient of confidence for the entire questionnaire had been 0.95. The examination of each feature illustrated the following: 1) 'Having vision and action' had been 0.75, 2) 'Building trust' had been 0.85, 3) 'Sharing energy and motivating' had been 0.76, and 4) 'Building relationships' had been 0.75, 5) 'Self-reflection' had been 0.75, and 6) 'Making decisions' had been 0.86. The alpha coefficient of confidence had been higher than the specified criterion, which was equal to or higher than 0.70. (UCLA: Statistical Consulting Group, 2016)

5.3. Data Analysis

1. The 90/90 Standard was employed to analyze the data and to compare the post-experiment of the teachers' learning outcomes. The first 90 represented the percentage of the mean scores, which had been obtained from the teachers' knowledge test. The second 90 represented the percentage of teachers, who had passed the test in accordance with all the objective criteria. (Yamkasikorn, 2008)
2. The t-test dependent statistic was employed to analyze the data and to compare the results from the teacher's learning outcomes and the student's collaborative skills assessment in the pre-experimental test and the post-experimental test.

6. Research Results

The results indicated that the R&D methodology had definitely and effectively assisted in the creation of "An Online Program to Empower Teachers' Knowledge to Develop Students' Collaborative Skills." The created online program consisted of the following two projects:

1. The Teachers' learning skills development project Data from the literature review was collected to create six teachers' learning manuals, which were based on a variety of perspectives from academicians and from agencies as follows:

1.1 The Definition of the Collaborative Skills Manual presented perspectives of Aiim (n.d.), Catherine (2021), Conoway (2021), Doyle (2020), Indeed Editorial Team (2021), and Noramon (n.d.).

1.2 The Important Aspects of the Collaborative Skills Manual presented perspectives of Dobos (2017), Editorial Team (n.d.), Guest Contributor (2018), Kashyap (n.d.), Moseley (n.d.), Ribeiro (2020), Versalink (2018), and Yan (2019).

1.3 The Qualifications of the Collaborative Skills Manual presented perspectives of Cran (2017), Goman (2017), Meinert (2017), Samdahl (2017), and Sampson (2010).

1.4 The Developmental Approaches of Collaborative Skills Manual presented perspectives of Bogler (2016), Campbell (2017), Campbell (2021), Emergenetics International (n.d.), Gale (2019), Kashyap (n.d.), Kelle (2019), Lucco (n.d.), Stapper (2018), and Weller (2016).

1.5 The Developmental Processes of the Collaborative Skills Manual presented perspectives of Collaborative Outcomes (n.d.), Linton (n.d.), Team (2017), and Madsen (2021).

1.6 The Assessment of Collaborative Skills Manual presented perspectives of Archibald, Trumpower and MacDonald (2014), Kellerman (2007), Ofstedal and Dahlberg (2009), and Turning Point (n.d.).

2. Implementing the Teachers' collaborative skills learning outcomes for the students' development project There was an Action Manual with instructions, which focused on the following: 1) The Desirable Collaborative Skills Qualifications, 2) The Developmental Approaches for Collaborative Skills, and 3) The Developmental Procedures of Collaborative Skills. With the manual, teachers' self-assessment form was attached so that the teachers could assess the process of implementation and could reflect upon strengths and weakness of the manual.

The research, which had been conducted through the R2&D2 to R5&D5 steps, resulted in the following: 1) the creation of six teachers' learning manuals, 2) a manual implementing the teachers' learning outcomes to student development, 3) the teacher's learning outcome test, and 4) the students' collaborative skills assessment form, which can be found on the websites that follow.

1) The Self-Learning Module used in the online program was from: https://online.anyflip.com/okgwj/segl/mobile/
2) The Teacher Practice Level Assessment Form was from: https://docs.google.com/forms/d/e/1FAIpQLSfy46-ACC_vIr3hN3Lle86u1HsgTqeIF0MEbtoekhMW_c-0uw/viewform
3) The Teacher's Learning Outcome Test was from: https://docs.google.com/forms/d/e/1FAIpQLSfqssQspTQyr5BMDV2iPEivk1cxj_TlLhZotWJxliEfktRbhg/viewform
4) The Collaborative Skills Assessment Form of students was from: https://docs.google.com/forms/d/e/1FAIpQLSfeB0oGSrI9JHzX14hWiuQ0Mgb7D_8sqn9y2MGIJbakks3jLw/viewform

The manuals, test, and assessment form, which had been created through the phases of R2&D2 to R5&D5, were examined in the field experiment using the pre-experimental research with a one group pre-test/post-test design. The experimental area was the general education section at the Pariyattidhamma Demonstration Pali School (Grades 7-12), which was under the Division of Buddhist Studies National Buddhism Office. The school is located in the Mueang District of Nong Khai Province. To select the experimental group, this study adopted purposive sampling. The target consisted of 11 teachers, 91 lower secondary school students, and 113 upper secondary school students (204 in total). The findings demonstrated that the results of the research had been in accordance with the set of assumptions because 'An Online Program to Enhance Teacher Learning to Develop Students' Collaborative Skills' with two projects and manuals proved to be effective according to the specific criteria. The detail of the findings is shown below.

1) The post-test results in the teacher's learning outcome test were in line with the standard of 90/90. The first 90 represented the percentage of the mean post-test scores, which was 33.27 points out of 36 (or 92.42 percent) and was higher than the specified criterion (90). The latter 90 was the percentage of the teachers, who had been able to complete all objectives. The result showed that 95.45% of 11 teachers had been able to pass all objectives on the exam. The number was higher than the specified criterion (90).

2) The results of the pre-experimental test mean score from the 11 teachers had been 27.09, and the standard deviation had been 3.50, while the post-experimental test mean score had been 33.27 and the standard deviation had been 2.05. Therefore, when analyzing the data by t-test dependent, the mean score of the post-experimental test was found to be statistically significantly higher than the mean score of the pre-experimental test at 0.05. This is shown in Table 1.

Table 1: The t-test dependent results upon comparing the teachers' learning outcomes before and after the experiment

Evaluations	Sample sizes	Means	Standard Deviations	t
Before	11	27.09	3.50	12.805*
After	11	33.27	2.05	

*p < 0.05

3) The assessment results from the collaborative skills with the 204 students before the experiment indicated that the mean had been 3.50 with a standard deviation of 0.09. Meanwhile, the results from the assessment after the experiment had shown a mean of 4.50 with a standard deviation of 0.08. Therefore, when analyzing the data by using a t-test dependent, the mean score from the post-experimental assessment had been statistically significantly higher than the mean score from the pre-experimental assessment at 0.05, which is shown in Table 2.

Table 2: The t-test dependent results when comparing the students' collaborative skills before and after the experiment assessments

Evaluations	Sample sizes	Means	Standard Deviations	t
Before	204	3.50	0.09	121.136*
After	204	4.50	0.08	

* p < 0.05

7. Discussion

According to the criteria of the research hypothesis, the findings showed that "An Online Program to Empower Teachers' Knowledge to Develop Students' Collaborative Skills" or the production of the R&D methodology had been effective. Therefore, it indicated that having knowledge about collaborative skills, which had been obtained from various Internet sources and had included academic articles and research studies, had been beneficial and worthwhile when employed in a systematic research study. This correlated with the concept of knowledge management which states that *"Knowledge must be improved, challenged, and increased, or knowledge will be lost."* Prabhakaran (2022) pointed out that ***explicit knowledge*** is tangible and as such, it can be clearly documented, stored, straightforwardly expressed, and shared with others. Furthermore, this type of tangible knowledge ***(explicit knowledge)*** can empower and leave an impression upon ***tacit knowledge,*** which represents the internalized knowledge that an individual may not be consciously aware of. It is derived from learned experiences, personal wisdom, intuition, and from insights. This interaction has a strong impact upon learning.

Moreover, the findings exhibited how profitable the Internet can be in helping to instantly access the desired information. Both Aydemira, Benzerb, Karahanc, and Akmençed (2013) and Essential Education (2019) gave agreed that "*The Internet has become indispensable and (it can be) used for work, study, research, entertainment – the list is endless and the most important thing is unlimited access to information." This is the main advantage for both teachers and students since information about any subject, course, formula, date, and/or famous person can be accessed from verified and updated sources*. However, with regard to the search engines, there is a suggestion from the researchers. Not only did the researchers rely on Google, but they also relied on other search engines, which assisted in their academic research. Some examples included Google Scholar, Microsoft Academic, Educational Resources Information Center, ResearchGate, Bielefeld Academic Search Engine, Connecting Repositories, and Semantic Scholar. (Post University, 2020)

If you are a teacher of English teaching in a country where English is the native language or if you are teaching in a former British colony where English is the official or second language, it may not be necessary to conduct the systematic and methodical application of the knowledge that is widely distributed on the Internet. Teachers in those countries can search for new knowledge directly from English language sources, and as a result, they are the teachers, who are constantly seeking new knowledge. The situation in Thailand is different because English is a foreign language, and most teachers in Thailand are not good at English (Promrub & Sanrattana, 2022). Thai teachers still have many problems that affect their pursuit of new knowledge. In particular, the teacher workload affects teachers and students because teachers are expected to be and do everything for the school. Thai teachers have to be responsible for other tasks in the school and are, therefore, unable to focus solely on teaching. (Nattatiti, 2021) Teachers have to spend enormous amounts of their time on completing documentation for assessment or quality assurance, on organizing projects and/or on activities for competitions. This type of burden requires exploring too much information, which is not relevant to the development of teaching and learning as it should be. (Kraichit, 2021) Therefore, the online program, which was created for this study, is a platform that can transfer English knowledge content that has been translated into Thai for teachers in schools. It is easy for teachers to use this knowledge in the manner of: *Anyplace, Anywhere, Anytime*. Furthermore, it is an online innovation that provides a lot of benefits, such as added flexibility and self-paced learning, better time management, demonstrated self-motivation, improved virtual communication and collaboration, a broader, global perspective, refined critical-thinking skills, and new technical skills. (Miller, 2019)

8. Recommendations

As mentioned at the beginning, the 21st century skills are essential for modern education in the digital era because they are tools that can be universally applied to enhance ways of thinking, learning, working, and living in the world. The 21st skills include critical thinking/reasoning, creativity/creative thinking, problem solving, metacognition, collaboration, communication and global citizenship, and literacies, such as reading literacy, writing literacy, numeracy, information literacy, ICT [information and communications technologies] literacy, digital literacy, and communication. (Vivekanandan, 2019) Moreover, the supportive reasons were as follows: 1) *explicit knowledge can empower the tacit knowledge of teachers; 2) Internet information is instantly accessible; and 3) for the Thai teachers, there was a limitation regarding their use of the English language.* All together, these reasons led the researchers to believe that research and development of an online program, which could focus on other skills, should be conducted. Attention could be placed upon one skill set per project, which could consist of research and development for 21st century skills learning of teachers and student development.

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Appendix

The Student's Collaborative Skills Self-Assessment Form

Collaborative Skills Qualifications	Levels of Opinion				
	5	4	3	2	1
Visionary and Action					
1) I support the effective process in seeking the motivation from the steak holders.					
2) I support jointed vision development by every steak holder.					
3) I create working framework using systematic thought.					
4) I encourage building a team of stakeholders to help each other develop an operational strategic plan and promote diversity					
5) 5) I create an action plan with time limits and duties assigned to meet the vision.					
Building Trust					
6) I am "truthful" means I do what I say.					
7) I protect the group from those who take advantage of others in working together.					
8) I create a reliable, collaborative process.					
9) I believe that partnerships arise from individuals and organizations from various sectors.					
10) I have the necessary knowledge and skills to work that attract others to work with me.					
11) I firmly believe that trust is the cornerstone of working effectively with others.					
Sharing Power and Influence					
12) I use my powers responsibly.					
13) I share the power to increase the power and knowledge sharing					
14) I share my strength with others whenever I can.					
15) When practicing leadership, I always rely on solving problems for friends.					
16) I show my confidence to others.					
17) The collaborators in each group have the appropriate level of knowledge, skill and decision-making authority.					
Building Relationships					
18) I believe that building trust in an organization and providing trust takes time.					
19) I believe that the people who work together show each other a great respect.					
20) I am committed to creating a sense of shared ownership among individuals participating in the organization.					
21) I have an open conversation. And different perspectives are what we value.					
22) I believe conflict is acceptable by making conflict a source of innovation.					
23) I can handle different ideas very well in a way that facilitates everyone's participation					
Self-Reflection					
24) I recognize the impact of emotions on work and the creation of “mental safety.”					
25) I can tell you my strengths and weaknesses					
26) I work to understand the point of view of others.					
27) I understand the changes within the group.					
28) I create a safe environment for open communication.					
29) I take time for self-reflection and practice improvements.					
Decision-making					
30) All members of my team have a clear understanding of the scope of responsibilities and roles.					
31) My team members are eager to participate in making important decisions.					
32) My team meeting process is efficient.					
33) My team has a clear operational and decision-making process.					
34) My team members are flexible and compromise when decisions are made.					
35) My team fosters creativity, innovation and fosters risk tolerance.					