Mobilize the School to Become a 21st-Century School

Phrakhru Praditbuntham Issarathammo [1,*] & Phrakru Sutheejariyawattana[1]

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

*Correspondence: Mahamakut Buddhist University, Isan Campus, Khon Kaen Province, Thailand. Tel: 66-898-635-826

Received: April 26, 2023 Accepted: June 11, 2023 Online Published: July 17, 2023

doi:10.5430/wje.v13n4p1 URL: https://doi.org/10.5430/wje.v13n4p1

Abstract

The initiative to implement the "Mobilize Sarakulnawitaya School to Become a 21st-century School" project was part of a broader research program that aimed at improving education in the 21st Century by prioritizing active learning, integrating technology into learning, and by increasing the adoption of e-office solutions. The project was conducted using the Participatory Action Research (PAR) methodology, which involved a cyclical process of Planning, Acting, Observing, and Reflecting (PAOR), with two cycles scheduled to take place during the Academic Year of 2022. It was expected that the implementation of this project would result in the following outcomes: 1) improvement in both the research participants' practices and the school's performance as a 21st-century school by the defined focus areas; 2) learning from the actions taken at the individual, group, and school levels; and 3) the knowledge gained from the implemented actions, which could serve as a model for the continuous development of this school in the future. In this research project, there were 20 teachers, who participated as researchers, and 50 students, who were involved in the development process. The findings revealed the following outcomes: 1) there were significant improvements observed in both the research participants' practices and the school's performance as a 21st-century school, in accordance with the defined focus areas, after the completion of Cycle 1 and Cycle 2; 2) the research team, research participants, and Sarakulnawitaya school learned many aspects, particularly the importance of seeking new knowledge as a way to foster out-of-the-box thinking, which results in more efficient work practices; 3) the knowledge, gained from the implemented actions, demonstrated the cause-and-effect relationship between the driving forces that promoted change, the barriers that hindered it, and the strategies used to overcome those barriers.

Keywords: 21st-century education, 21st-century school, participatory action research, active learning, using technology for learning, e-office, Sarakulnawitaya school

1. Introduction

Due to globalization, a knowledge-based society, and a digital technology society, the impact on educational management in the 21st Century is vastly different from the previous 20th Century. As Duffy (n.d.) noted the primary difference between a school of the 20th Century and a school of the 21st Century is that in the previous century, a ‘one size fits all approach’ was considered to be sufficient. Most experts now agree that to get the most out of an educational experience, the institution needs to understand who is receiving their instruction and exactly how to make that instruction work for them. A 21st-century education will also impart knowledge and skills that had not previously been deemed to be important for all students, but now, the data has shown that they are essential for future success. This is in alignment with the point of view of Hallerman et al. (2019), who stated that a 21st-century education is not a bunch of students sitting quietly at desks, in neat rows, writing down every word that the teacher says or writes on the blackboard (or smartboard). Neither is it ‘teaching to the test,’ by telling students what they need to memorize to get an A+, by assuming every child is or should be on the same path, or by measuring schools or teachers solely by the average ACT scores and the college acceptance rates. In addition, it’s not something that ends at 3:00 pm every day or even in the spring of each year, but instead, it is a lifelong journey.

Since education for the 21st Century has become so important, there are those, who have expressed their views on the issues affecting 21st-century schools in the following dimensions: The role of the teacher in the 21st-century classroom is to ensure that the learning process is student-centered rather than teacher-centered. This sort of

student-focused learning has seven key characteristics: 1) personalized learning; 2) equity diversity, and inclusivity; 3) learning through doing, 4) rethinking the roles of learners and teachers, 5) community relationships, 6) technology, and 7) developing teacher professionalism (Drew 2022). With regard to changing the globalized world, the role of teachers is essential to improving sustainable education. At the same time, the prerequisite for a teacher is to inspire and guide the students and to assist them in increasing their employable skills with digital tools. A teacher in the 21st Century will be a digital teacher. Teachers are not only the facilitators for their students' learning, but they are now also responsible for training the students so that they can increase their employable skills, expand their minds, participate in growing their digital citizenships, and can think critically and creatively, as well as engage in sustainable learning. Therefore, the accomplishments of the students are the achievements of the teachers (Sardar 2018).

Jan (2017) stated that 21st-century teachers have many characteristics that distinguish them from traditional teachers: 1) teachers think globally; 2) teachers develop a sensitivity towards cross-cultural differences and diversity; 3) teachers are technologically knowledgeable; 4) teachers build partnerships and alliances beyond classrooms; and 5) teachers share learning inside the four walls. Palmer (2015) mentioned 15 characteristics of a 21st-century teacher as follows: 1) conducting a learner-centered classroom and personalized instruction; 2) having students as producers; 3) learning new technologies; 4) going global; 5) being smart and using smartphones; 6) making a blog; 7) going digital; 8) being collaborative; 9) using Twitter chats; 10) being connected; 11) conducting project-based learning; 12) building a positive digital footprint, 13) coding, 14) being innovative; and 15) learning.

Jones (n.d.) provided a perspective on 21st-century learners by stating that learners should acquire a set of skills and should adopt certain characteristics as follows: 1) creativity & innovation, 2) collaboration & communication, 3) critical thinking & problem solving, 4) global citizenship, 5) technological literacy, and 6) lifelong learning. Meanwhile, Heick (n.d.) outlined 8 characteristics of 21st-century learning as follows: 1) being learner-centered, 2) being media-driven (this doesn't have to mean digital media), 3) having personalization, 4) having transfer-by-design, 5) being visibly relevant, 6) being data-rich, 7) being adaptable, and 8) being interdependent.

In addition, there are also proponents of the development of 21st-century schools, such as Heick (n.d.), who suggested 5 ways of development as follows: 1) using a scale to your advantage, rather than choking from it; 2) insisting on innovation, even though there are struggles; 3) using the power of crowds, not policy; 4) playing nice with others–especially with the big boys; and 5) authentically embracing multiple forms of progress. Driscoll (2022) provided feedback on 9 strategies to create 21st-century schools: 1) adopting an entrepreneurial mindset, 2) creating the dream.; 3) recruiting, growing, and inspiring passionate teachers; 4) creating flexible learning spaces with flexible teachers; 5) simplifying the complexity of schools; 6) protecting your energy and that of your team; 7) being grateful; 8) being a cheerleader; and 9) believing and persisting.

Based on the rationale of the importance of being a 21st-century school, the perspectives of experts and scholars on the characteristics of a 21st-century school in various dimensions, and the challenging proposals for development that are in line with the concepts of "To make it happen" and "To Make a Change," the researchers studied the relevant literature on the development of 21st-century schools covering a wide range of issues and perspectives (as discussed in the literature review section). This knowledge has been utilized to benefit the practical implementation of the project, "Mobilize Sarakulnawitaya School to Become a 21st-century School," which is the school at which one of the researchers (identified as researcher #1) serves as an administrator. The Participatory Action Research (PAR) methodology is believed by the research team to be effective in achieving successful outcomes since it emphasizes the importance of participation and democracy in actions, as well as the resulting changes, learning, and knowledge generation. This research was collaboratively conducted by both the researchers and the participants, who had been equally involved in the Planning, Acting, Observing, and Reflecting (PAOR) process. This spiral cycle was continuously implemented to achieve the expected changes that were sustainable, since they arose at every step from the commitment and participation of all involved (Sanrattana, 2018).

2. Objectives

The objective of this research was to carry out the project "Mobilize Sarakulnawitaya School to Become a 21st-century School", which is one of the research plans or research projects related to 21st-century education in the Doctoral Program in Educational Administration at the Isan Campus of Mahamakut Buddhist University. This research aimed at implementing the project "Mobilize Sarakulnawitaya School to Become a 21st-century School" by emphasizing more active learning, more technology for learning, and more e-office. Participatory Action Research (PAR) methodology was utilized, and this research prioritized the study of the relevant academic literature to gain an

explicit knowledge of the development of a 21st-century school, which encompasses diverse topics and perspectives. This knowledge was then integrated with the tacit knowledge that had been gained from the experiences and opinions of the research participants. The research approach was guided by the principle that "theory and practice should be interwoven, and for this reason, it is useful to think of the process as braiding a rope, in which the two aspects are continually connected together" (Flinders University, 2022). This research project involved 20 teachers and 50 students, who had been involved in the development process. The expected outcomes of this development project were as follows: 1) improved changes at the level of the participating teachers' practices and the characteristics that demonstrate the school's adherence to the focus areas of 21st-century schools, 2) learning from actions that were taken by the research team, the research participants, and by Sarakulnawitaya school, and 3) acquiring knowledge from practical experiences that could be used as a model for the continuous development of this school in the future.

3. Literature Review

As stated in the research objectives, this study placed emphasis on the importance of studying the literature related to the development of 21st-century schools in order to acquire explicit knowledge about how to develop a school that encompasses diverse issues and perspectives from the internet. The research team examined those academic perspectives that had concentrated on the development of 21st-century schools by focusing on more active learning, more technology for use in learning, and more e-office. The study covered the following three areas:

1) The characteristics of 21st-century schools were derived from the perspectives of Carter (2012), Driscoll (2020), Education Rickshaw (2017), India Today (2019), Kenan Foundation Asia (2018), Mercer (2013), Samuel (2020), Shaikh (2016), Shaw (2018), Solomon (2017), and Watson (2012).
2) The approaches used to develop 21st-century schools (i.e., the principles, ideas, techniques, methods, or activities) were derived from the perspectives of Abdoh (2017), Academyfront (2020), Andriotis (n.d.), Berkeley University of California (2021), Chandramouli (2020), CoTalent (n.d.), Cross (n.d.), England (n.d.), Guido (2017), Honeycutt (2018), Jodha (n.d.), Lathan (n.d.), Menten (n.d.), Morpus (2019), Murali (2020), Nina (2019), Rajpoot (2019), Reed (n.d.), Reissman (2017), TeachThought Staff (n.d.), and Whenham (2020).
3) The evaluation of 21st-century schools was derived from the perspective of the Organization for Economic Co-operation and Development (OECD) (2018).

Based on the findings from the literature review in these three areas, the study concluded that having knowledge of the approaches that can be used for development (i.e., the principles, ideas, techniques, methods, or activities) is crucial. Therefore, the following approaches to development have been proposed:

More Active Learning:

- Think-pair-share
- Concept mapping
- Jigsaws
- Game-based learning
- Questioning
- Polling
- Placing focus on process, not content
- Integrating technology and multimedia
- Problem-based learning
- Project-based learning
- Cooperative learning
- Thinking-based learning
- Competency-based learning
- Creating positive learning environments
- Student’s reflections

- Collaborative learning groups
- Individual plus group quizzes
- Analysis of or reactions to videos
- Turning and talking
- Brainstorming, and having learning spaces

Additional technology for learning:

- Gamified learning
- Digital field trips
- Connected classroom forums
- Online activities for students, who finish work early
- Using online sign-ups
- Using a shared, online classroom calendar
- Reviewing and critiquing webpages
- Having slideshow presentations with multimedia
- Creating digital content
- Basing assignments on technology-focused subjects

More e-office:

- Having online admissions
- Having online class management
- Having online employee/teacher management
- Having online student demographics
- Having online attendance tracking
- Having online library management
- Having online assessments

4. Research Methodology

4.1 The Levels and Format of PAR

Carr and Kemmis (1992) classified action research into three levels. The first level is Technical Action Research, which involves the researcher taking on the role of an outside expert, who can develop ideas, plans, or projects for the research participants to carry out. The second level is Practical Action Research, in which the researcher has a more collaborative role and serves as a consultant, who stimulates and guides the group in identifying and addressing issues. The third level is Emancipatory Action Research, also known as Participatory Action Research, which places emphasis on collaboration between researchers and participants, who work together as equal partners. This study employed the Participatory Action Research (PAR) methodology, which was informed by the analytical and synthetic study of Sanrattana (2018), as well as the works of Arhar, Holly and Kasten (2001), Carr and Kemmis (1992), Coghlan and Brannick (2007), Creswell (2008), James et al. (2008), Kemmis and McTaggart (1992), McTaggart (1991), McTaggart (2010), and Mills (2007). The literature suggested that PAR methodology is a process of inquiry that is rooted in critical social science or pragmatism and that combines scientific methods with participatory practices in a collaborative partnership between researchers and participants, who are equally involved in the research process. The methodology involves a spiral cycle of Planning, Acting, Observing, and Reflecting, in which both researchers and participants play an active role in each phase.

4.2 The Principles, Codes of Conduct, and Roles

The PAR methodology used in this research adheres to the 10 following principles: 1) specific contexts; diverse skills; 3) being focused on change; 4) being action-oriented; 5) listening to all research participants; 6) analyzing, interpreting, and reflecting on one's self; 7) being aware of the potential expertise and contributions of individuals

within the community; 8) learning from both the successful and unsuccessful actions that result from systemic learning processes; 9) keeping the records of all research participants, and 10) taking actions that lead to sustainable practices or development.

The PAR methodology, used in this research, adhered to 10 ethical principles: 1) taking responsibility for maintaining confidentiality, 2) ensuring equal access to data among all researchers, 3) collectively making decisions regarding what the research direction and expected outcomes are, 4) ensuring the maximum involvement of all researchers in the design of the research processes, 5) consulting and receiving approval of the suggestions and getting feedback from all the parties involved in the research, 6) requiring prior authorization for observations or the verification of documents that would be used for other purposes, 7) making certain that the results of the research remain visible and open to the opportunity for feedback from others, 8) making sure not to infringe upon the copyright or opinions of others, 9) making sure that the researchers explain the nature of the research process from the outset, and 10) being aware that non-participating individuals must be acknowledged, respected, and granted permission if they are affected by the research.

The PAR methodology, used in this research, adhered to the roles of researchers as follows: 1) being a teacher, 2) being a leader, 3) being a good listener, 4) being a planner, 5) being a designer, 6) being an analyzer, 7) being a synthesizer, 8) being an observer, 9) being a reporter of results, and 10) being a promoter of support and facilitation.

4.3 Cycles, Steps, and Activities

As stated, the PAR methodology is a research approach that involves collaborative participation between the researchers and research participants with equal status throughout the stages of Planning, Acting, Observing, and Reflecting (PAR) and in a continuous spiral cycle. However, due to time constraints imposed by the curriculum, the research team designated two cycles for this study, each consisting of one academic semester during the Academic Year of 2022. The research activities for each cycle and stage were as follows:

Cycle 1

Step 1: Preparation consisted of three activities. Firstly, Clarifying the research methodology to the research participants was carried out to ensure that their decisions to participate in the research had been made with informed consent and in accordance with ethical principle: "The researcher must inform the collaborators of the nature of the research process and its benefits from the beginning, and those, who do not wish to participate, must be accepted and respected for their personal rights." Secondly, designing the collaborative work processes was carried out in accordance with ethical principles: "Collaborators should participate in the design of the research process and should consult and propose suggestions that are approved by all parties." Thirdly, extracting the lessons learned was conducted based on the principles of "analysis, interpretation, self-evaluation, and learning from both successful and unsuccessful actions, resulting in a systematic learning process."

Step 2: of the planning process consisted of four activities. Firstly, brainstorming was conducted with the research participants in order to determine the developmental direction of tacit knowledge according to the principle of "recognizing the potential, expertise, and participation of all research collaborators," in order to answer the question: *"What should be done to mobilize Sarakulnawitaya school to become a 21st-century school with a focus on more active learning, more technology for learning, and more e-office?"* Secondly, the research team presented the developmental direction based on a review of the relevant literature, which was considered to be explicit knowledge and which all research participants should understand and comprehend, based on the principle of "equal access to information for all research collaborators." Thirdly, an action plan was created by consolidating "Tacit knowledge + Explicit knowledge" through collaborations and discussions, following the principle of "listening to feedback from all research collaborators," and in accordance with the ethical guideline: "all parties have had the opportunity to consult and provide feedback on the proposed plan." The results of the action plan led to the direction of systematic development, ideas, techniques, methods, and activities, which were aligned with the research question, and which consisted of 48 directions as shown in Table 1. Finally, the lessons learned were derived in accordance with the aforementioned principles.

Step 3: of the process involved four activities: 1) the development of three sets of assessment forms, including a self-assessment form for the research participants regarding their levels of implementation of the 48 developmental strategies, an assessment form for evaluating the school's active learning and their practices for learning with technology, and a form for checking the e-office system; 2) a pre-assessment prior to the first cycle using the three assessment forms; 3) the implementation of the Action Plan based on the principles of "context-specific skills, goal-oriented change, and sustainable development", and in accordance with the ethical principle: "research

participants have an influence on the work"; and 4) lesson extraction, which was based on the aforementioned principles.

Step 4: Observing involved collecting data from various activities and practices by using tools, such as observation forms, in-depth interviews, group discussions, and examining records or journals, maps, audiotapes and videotapes, artifacts, and field notes. This process adhered to the principle that "all research participants document their activities and practices," and took into consideration the ethical principle that "prior consent must be obtained before observing or examining documents to be used for other purposes."

Step 5: Reflecting consisted of three activities: 1) evaluating the first cycle using three assessment forms; 2) reflecting on the results of the work by brainstorming together to reflect on the progress at each stage of the first cycle, which was in accordance with the principle of "listening to feedback from all researchers; analyzing, interpreting, and self-evaluating; learning from both successful and unsuccessful actions; and creating a systematic learning process together," and which was in accordance with the ethical consideration of "the results of the work will continue to be visible and open to feedback from others," for which the researchers used Kurt Lewin's Force-Field Analysis technique (Lunenburg & Ornstein, 2000), and 3) extracting the lessons learned according to the principles mentioned above.

Cycle 2

Step 6: Planning was comprised of two activities: 1) developing an action plan and 2) extracting the lessons learned.

Step 7: Acting consisted of two activities: 1) implementing the action plan and 2) extracting the lessons learned.

Step 8: Observing consisted of collecting data from the various activities using observations, in-depth interviews, or group interviews, as well as checking or recording. This was similar to what had been done in Step 1.

Step 9: Reflecting was comprised of the three following activities: 1) evaluating performance in the second cycle by using the three assessment sets, 2) reflecting on the work results by gathering ideas to reflect on the operation's progress at every step of the second cycle, and 3) extracting the lessons learned.

Step 10: Summarizing the research results involved holding a practical seminar to summarize the research results by combining the observations, lessons learned, assessments, and reflections from Steps 5 and 9. This was in accordance with the principle of "specific context; listening to comments from all research participants; analyzing, interpreting, and self-evaluating; learning from successful and unsuccessful actions; and creating a systematic learning process together." It also followed the ethical principles of: "consultation and joint discussions are accepted by all parties," and "the work's results will continue to be visible and will open opportunities for others to provide feedback."

4.4 The Research Site and the Participants

The research area was Sarakulnawitaya school in Thailand, which was selected based on a specific criterion that took into consideration the participating researchers' convenience and their willingness to cooperate. The research participants consisted of 20 teachers, who were actively involved in the research, and 50 students, who were involved in the development process.

4.5 Research Tools

- The research team considered using various high-quality **data collection tools** to capture activity data across different stages. These tools were chosen based on their appropriateness and the situation at hand, as per the concept proposed by Mills (2007), which consisted of: 1) an observation form, 2) in-depth interviews and group discussions, and 3) the examining, recording, or journaling of maps, audiotapes, videotapes, artifacts, and field notes, among others.

- The research team and research participants developed **a self-assessment questionnaire** to assess their levels of implementation of the 48 development strategies. The questionnaire was designed to allow the research participants to assess themselves at three different stages: before the first cycle of implementation, after the first cycle of implementation, and after the second cycle of implementation. The questionnaire used a 5-point rating scale: "the most," "very," "neutral," "a little," and "the least." Content validity was not examined by qualified experts, nor was the questionnaire subjected to try-out with a sample group in order to determine the alpha coefficient of reliability. This was due to the fact that the questions in the questionnaire reflected the development strategies that had been jointly formulated by the research team and the research participants during the planning phase of Cycle 1.

- The researchers created **an assessment for active learning and for using technology for learning** in schools

based on the findings of Carter (2012), Driscoll (2020), Education Rickshaw (2017), India Today (2019), Kenan Foundation Asia (2018), Mercer (2013), Samuel (2020), Shaikh (2016), Shaw (2018), Solomon (2017), and Watson (2012). They also incorporated an assessment framework for using active learning and for using technology to learn from the Organization for Economic Co-operation and Development (OECD) (2018). The assessment, which consisted of 28 questions, used a 5-point rating scale: "the most," "very," "neutral," "a little," and "the least."

This assessment tool underwent content validity testing using the Indices of the Item-Objective Congruence (IOC) method, as per Rovinelli and Hambleton (1977). Five qualified experts in the fields of Educational Administration and Educational Measurement & Assessment found that all 28 items of the assessment had had IOC values exceeding the threshold of 0.50, which indicated that the items had been aligned with the developmental objectives according to Chaichanawirote and Vantum (2017).

To assess the reliability of the assessment tool, it was administered to 30 students in a different school setting that was not part of the research. The Cronbach's alpha or coefficient alpha was calculated as a measure of internal consistency, and the overall reliability coefficient was found to be 0.92. After the reliability coefficient was examined by dimension, the score for active learning had been 0.89 and the score for using technology for learning had been 0.83. The reliability coefficient had exceeded the threshold of 0.70, as recommended by UCLA Statistical Consulting Group (2016), which indicated the relatively high internal consistency of the items.

4.6 Data Collection and Analysis

The research team and the research participants were responsible for collecting the data at every stage of the research process using various tools, based on the principle of "recording the activities and practices of every researcher." The quantitative data from both self-assessment questionnaires was analyzed using descriptive statistics, specifically means and standard deviations. For the qualitative data, the following data analysis processes were conducted: 1) checking the completeness of data to ensure that it had met the intended objectives; 2) verifying the credibility of the data to ensure that it had corresponded to the actual situation, which was accomplished by comparing the recorded results of each individual and by comparing the recorded results of different data collection methods; and 3) presenting the data in the form of thick, critical descriptions, which involved narrating the story based on reality and impartiality. Evidence, such as numerical statistics, tables, graphs, photographs, and unedited statements or conversations from the data provider, were used to reveal a variety of thoughts and feelings, all of which were related to the same issue, and which may have supported or contradicted each other.

5. Results

In order, the research findings were as follows: 1) the expected changes that had occurred, 2) the unexpected changes that had occurred, 3) the Lessons that had been learned from practice, and 4) the Knowledge that had been gained from practice.

5.1 The Expected Changes

5.1.1 The Research Participants had Exhibited a Higher Degree of Implementation of the 48 Developmental Strategies

This was indicated from the self-evaluations by the 20 research participants at three different stages: before and after implementing strategies in Cycle 1, and after implementing strategies in Cycle 2. The evaluations showed a significant improvement in the implementation of strategies, as evidenced by the increased mean scores of 2.41, 2.60, and 2.93, respectively. The standard deviations were low for all three stages, with values of 0.11, 0.09, and 0.13, respectively. The results of the data analysis are presented in Table 1.

Table 1. Compares the Self-assessed Level of Proficiency of the Research Participants in Implementing the 48 Development Approaches across Three Stages: before Cycle 1, after Cycle 1, and after Cycle 2

The approaches that the participants were expected to implement.	Before Cycle 1		After Cycle 1		After Cycle **2**	
	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.
More Active Learning						
• The students learned through brain-based learning techniques in the classroom.	2.45	0.76	2.65	0.75	3.20	0.52
• The students were capable of solving problems using innovative methods.	2.30	0.47	2.45	0.51	3.05	0.60
• The students were able to think of cause & effect relationships.	2.45	0.60	2.55	0.60	3.10	0.45
• The students exhibited a sense of courage.	2.70	0.47	2.75	0.44	3.35	0.59
• The students were able to use technology for information retrieval.	2.85	0.37	2.85	0.37	3.50	0.51
• The students were able to submit assignments online.	2.80	0.62	2.90	0.55	3.40	0.68
• The students comprehended the use of new technologies.	2.85	0.59	2.95	0.51	3.00	0.56
• The students possessed creative thinking skills.	2.30	0.47	2.50	0.51	3.20	0.77
• The teacher employed the Think-Pair-Share teaching method for knowledge exchange.	2.10	0.31	2.35	0.49	3.10	0.45
• The teacher employed the Jigsaw teaching method.	2.30	0.47	2.45	0.51	2.90	0.85
• The teacher used games as a medium for teaching and learning (Game-based Learning).	2.30	0.47	2.45	0.51	3.10	0.72
• The teacher surveyed students' opinions (Polling).	2.80	0.41	2.90	0.31	3.15	0.49
• The teacher focused on the process of learning rather than the content (Focus on the process, not content).	2.70	0.47	2.80	0.41	3.05	0.51
• The teacher employed Problem-based Learning.	2.70	0.47	2.80	0.41	3.25	0.64
• The teacher employed Project-based Learning.	2.40	0.50	2.55	0.51	3.20	0.77
• The teacher taught through collaborative learning.	2.10	0.31	2.35	0.49	3.35	0.81
• The teacher used thinking as the basis for teaching and learning (Thinking-Based Learning).	2.30	0.47	2.45	0.51	3.20	0.77
• The teacher used competency-based learning.	2.30	0.47	2.45	0.51	3.25	0.72
• The students were able to reflect on their thoughts in the classroom (Student's Reflection).	2.10	0.31	2.35	0.49	3.05	0.39
• The students engaged in collaborative learning groups in the classroom.	2.40	0.68	2.50	0.61	2.95	0.60
• The students were able to take both individual and group quizzes in the classroom setting.	2.70	0.47	2.80	0.41	3.10	0.64
• The students learned to analyze and react to videos as part of their classroom learning.	2.70	0.47	2.80	0.41	3.00	0.46
• The students were given opportunities to role-play hypothetical situations in the classroom setting.	2.90	0.31	2.90	0.31	3.05	0.22
• The students were able to engage in brainstorming activities as part of their classroom learning.	2.80	0.41	2.85	0.37	3.15	0.67
• The school provided suitable learning spaces for students.	2.30	0.47	2.50	0.51	2.90	0.45
More Technology for Learning						
• The teacher employed questioning techniques in teaching.	2.20	0.41	2.40	0.50	3.05	0.60
• The teacher utilized teaching strategies that focused on the learning process.	2.60	0.50	2.70	0.47	3.15	0.49
• The teacher integrated technology and multimedia in teaching.	2.65	0.67	2.80	0.41	3.30	0.57
• The teacher created a positive learning environment.	2.70	0.47	2.80	0.41	3.35	0.49
• The teacher encouraged students to present multimedia projects.	2.40	0.50	2.55	0.51	3.10	0.55
• The teacher employed gamified learning in teaching.	1.85	0.37	2.25	0.44	3.25	0.64
• The teacher used digital field trips as a teaching tool.	2.30	0.47	2.45	0.51	3.05	0.60
• The teacher employed connected classroom forums as a teaching tool.	2.30	0.47	2.45	0.51	3.15	0.49
• The teacher provided online activities for students, who had finished their work early.	2.10	0.31	2.30	0.47	2.85	0.37
• The teacher used online sign-ups to check attendance in class.	2.70	0.47	2.90	0.31	3.25	0.44
• The teacher utilized a shared, online classroom calendar using Google.	2.70	0.47	2.90	0.31	3.15	0.37
• The teacher instructed students to review and critique web pages.	2.30	0.47	3.00	0.56	3.20	0.52
• The teacher guided students in creating digital content and processes online.	2.60	0.50	2.70	0.47	3.30	0.47

The approaches that the participants were expected to implement.	Before Cycle 1		After Cycle 1		After Cycle **2**	
	x̄	S.D.	x̄	S.D.	x̄	S.D.
More Paperless Office						
• Learning outcomes were recorded in an electronic system.	2.40	0.50	2.55	0.51	3.15	0.67
• Work assignments were electronically signed by the staff members.	1.90	0.64	2.25	0.64	2.90	0.31
• Student attendance was checked through an online system.	2.25	0.55	2.45	0.60	2.85	0.37
• The school utilized an online admissions system.	2.25	0.79	2.70	0.47	3.00	0.32
• The school employed an online class management system.	2.38	0.58	2.58	0.59	2.99	0.56
• The school used an online employee/teacher management system.	2.30	0.46	2.50	0.51	3.15	0.49
• The school employed an online student demographic management system.	2.41	0.61	2.61	0.60	2.96	0.61
• The school used an online attendance tracking system for classes,	1.80	0.52	2.30	0.47	2.80	0.41
• The school utilized an online library management system.	1.85	0.59	2.35	0.49	2.61	0.51
• The school utilized an online assessment database system	2.31	0.49	2.51	0.52	2.85	0.37
Totals	2.41	0.11	2.60	0.09	2.93	0.13

5.1.2 The Expectation was to have Higher Levels of Active Learning, and Using Technology for Learning, Which was based on the Results of the Assessment of 50 Students' Perceptions Related to Development

The assessment was conducted in three phases: before and after the implementation of Cycle 1, and after the implementation of Cycle 2. The findings showed improvements, as evidenced by the increasing mean values of 2.34, 2.54, and 3.02, respectively, and the low standard deviation values of 0.13, 0.09, and 0.11 across all three phases. These results are presented in Table 2 as the data analysis.

Table 2. A Comparison of the Results from the Assessment of the Students' Perceptions Regarding the Development of the School as a 21st-century School with the Dimensions of more Active Learning and more Technology for Learning across Three Time Periods: before Cycle 1, after Cycle 1, and after Cycle 2

The expected characteristics of students	Before Cycle **1**		After Cycle **1**		After Cycle **2**	
	x̄	S.D.	x̄	S.D.	x̄	S.D.
More Active Learning	**2.30**	**0.15**	**2.47**	**0.08**	**2.95**	**0.09**
• Learning through the paired exchange of ideas with peers	2.40	0.64	2.56	0.64	3.14	0.35
• Learning through the collaborative creation of mind maps with peers	2.28	0.45	2.42	0.50	2.84	0.55
• Learning through game-based approaches	2.30	0.54	2.44	0.58	2.92	0.67
• Using questioning techniques in learning	2.38	0.73	2.56	0.70	2.88	0.56
• Emphasizing process-oriented learning over content-based memorization	2.28	0.73	2.50	0.61	2.96	0.64
• Being given opportunities to practice problem-solving skills through simulated situations	2.22	0.74	2.52	0.58	2.98	0.59
• Assigning real-world tasks as part of project-based learning	2.84	0.42	2.88	0.39	3.14	0.64
• Performing collaborative work with peers in the classroom	2.12	0.33	2.28	0.45	2.88	0.59
• Engaging in activities that develop thinking skills through hands-on experience	2.12	0.33	2.30	0.46	3.02	0.43
• Having opportunities to express opinions in the classroom	2.32	0.55	2.50	0.54	3.10	0.42
• Learning through video-based approaches in the classroom	2.20	0.57	2.42	0.50	2.88	0.59
• Having opportunities to assume hypothetical roles in the classroom	2.36	0.60	2.52	0.58	2.94	0.59
• Having opportunities to brainstorm on topics of interest in the classroom	2.12	0.33	2.28	0.45	2.90	0.58
• Having opportunities to develop creative thinking skills	2.28	0.76	2.54	0.58	2.88	0.56
• Having opportunities to engage in activities that foster innovation and invention	2.26	0.44	2.40	0.49	2.80	0.45
More Technology for Learning	**2.39**	**0.11**	**2.61**	**0.09**	**3.10**	**0.07**
• Mobile phones and/or tablets can be used in the classroom.	2.30	0.46	2.52	0.50	3.08	0.70
• Facebook or Twitter can be used without restrictions from teachers.	2.30	0.46	2.54	0.50	3.10	0.68
• High-quality Wi-Fi is available for research purposes.	2.32	0.59	2.56	0.61	3.10	0.74
• Teachers regularly use computers to aid in teaching.	2.36	0.53	2.60	0.53	3.10	0.71

The expected characteristics of students	Before Cycle **1**		After Cycle **1**		After Cycle **2**	
	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.
• Teachers encourage students to research topics of interest through the Internet.	2.30	0.71	2.58	0.61	3.08	0.75
• Teachers often organize online activities for students.	2.16	0.71	2.56	0.58	3.04	0.75
• Teachers provide activities for students to check and evaluate web pages.	2.36	0.56	2.58	0.57	3.08	0.72
• Teachers encourage students to present reports using computers.	2.28	0.50	2.52	0.50	3.04	0.73
• Teachers assign work to be done using computers.	2.80	0.40	2.86	0.35	3.22	0.55
• The school utilizes technology for teaching and learning purposes.	2.80	0.40	2.88	0.33	3.22	0.55
• There are no limitations on the use of computers in the classroom.	2.40	0.49	2.54	0.50	3.06	0.71
• The school provides an environment that is conducive to the use of technology for learning.	2.36	0.69	2.62	0.57	3.12	0.69
• The school develops technology for the purposes of student learning.	2.34	0.48	2.56	0.50	3.08	0.70
Totals	2.34	0.13	2.54	0.09	3.02	0.11

5.1.3 The Expectation for Schools to become more e-office Oriented was Assessed Based on the Progress Report of the School Operations in Line with the Goal of Having a Larger e-office Presence

The findings revealed that the school had previously only utilized Facebook and Line for internal communication, without utilizing software that would demonstrate e-office functionality. However, after conducting research in both Cycle 1 and Cycle 2, e-office software was found, which consisted of the following: 1) the school's website (https://bit.ly/3mOFzL2); 2) the E-Citizen Management Studio, a student personal data storage system (https://rb.gy/r9ub4u); and 3) the SISA Smart School Management System (http://sarakun.sisacloud.com/). The latter program covers 15 work areas, including user authorization management, school information, student recruitment, finance, student management, academics, performance evaluation, student care, Student ID cards, electronic correspondence, class teachers, subject teachers, students & parents, staff members, and announcements.

5.2 Unexpected Changes

The results of this study not only led to expected changes, but also to unexpectedly improved changes. Specifically, 1) the teacher group, which had participated in the research briefing to make an informed decision to join, found that all teachers had willingly participated as research collaborators; 2) research participants were actively involved in each stage of the activity planning process because they recognized the benefits that would accrue for their students; 3) this was an opportunity for teachers to engage in active learning and technology for learning instead of utilizing traditional teaching practices; 4) the management team and teachers were aware of the importance of combining their efforts to achieve successful outcomes; and 5) this was an opportunity for students to learn how to use technology so that they could conduct high-quality research.

5.3 The Lessons that had been Learned from Practice

The research team learned about the importance of analytical and synthetic thinking after participating in intense brainstorming activities with fellow researchers. They also recognized the significance of participating in appropriate work planning, performing work based on individual differences, creating electronic media documents, exchanging technology-related knowledge, and working collaboratively. Regarding the research participants, they had realized the importance of working together to establish good relationships by using techniques to bring out the potential of fellow researchers, creating a comfortable work environment, being responsible for both routine work and research tasks, and by respecting and listening to the opinions of others. As for the Sarakulnawitaya School, they had become aware of the importance of teamwork by building work cohesion, developing personnel, and by promoting a learning-oriented workforce, who had been observant and inquisitive, as well as capable of finding answers to their own questions.

5.4 The Knowledge That Had Been Gained from Practice

The research aimed at transforming Sarakulnawitaya School into a 21st-century school over the course of two semesters in the Academic Year of 2022. The study utilized Kurt Lewin's Force-Field Analysis framework, which enabled the researchers to gain knowledge through practical application. The results were presented as a model of causal relationships between the various components: 1) the driving forces, 2) the restraining forces, 3) the methods to overcome the restraining forces, and 4) the resulting outcomes. The knowledge, gained from this research, was specific to the context of Sarakulnawitaya School and has been referred to as the "Prototype Model for Developing

Sarakulnawitaya School into a 21st-century School," as detailed in the four components in Figure 1.

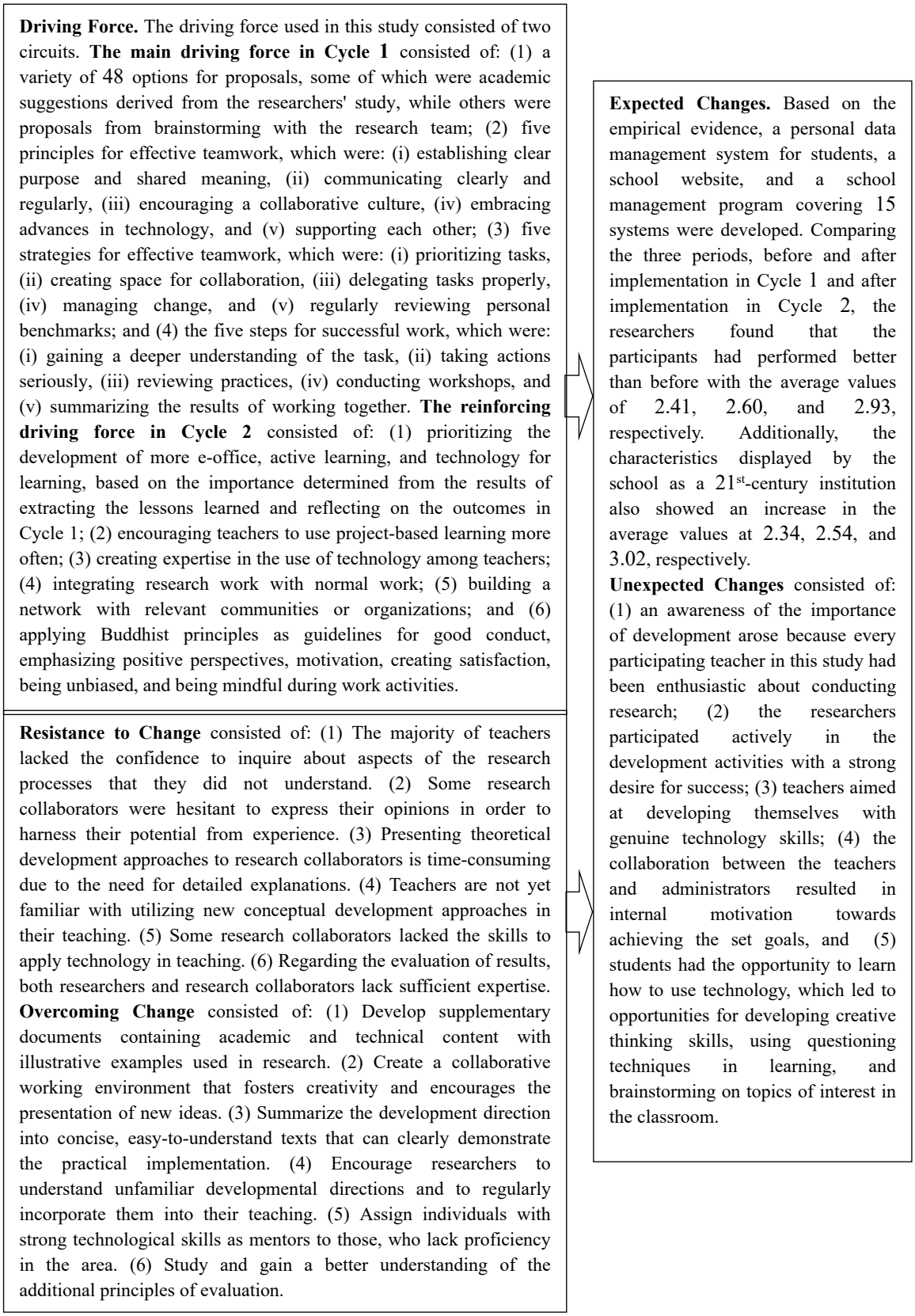

Figure 1. The Prototype Model for Developing Sarakulnawitaya School into a 21st-century School

6. Discussion and Suggestions

The aforementioned discussion stated that the initiative to mobilize resources for the transformation of Sarakulnawitaya school into a 21st-century school was one of the projects within a diverse range of research projects that focused on 21st-century education. This research encompassed various dimensions, such as curriculum development; pedagogy; learning environments; classroom facilities and equipment for teaching and learning; effective school leadership and management; and teacher development for the 21st Century. However, the scope of this research was limited to the development of three aspects: more active learning, more technology for learning, and more e-office. The research results have demonstrated successful outcomes as stipulated in the research objectives, both in those cases, in which positive changes were expected and unexpected. The research findings included the learning experiences of individuals, groups, and schools, as well as the knowledge that had been gained from the implementation of the "The Prototype Model for Developing Sarakulnawitaya School into a 21st-century School "

About successful results of this research. In the view of the researchers, there is an effect of the driving force applied to achieve the change in both Cycles 1 & 2, especially the driving force resulting from the study of relevant literature in six issues. Namely, definition, importance, characteristics, development direction, development process and the evaluation that leads to the synthesis of "37 development paths", which is considered an academic development path as detailed in the section “Literature Review”. When the 37 development paths were integrated with the existing development paths of the research participants, resulting in “48 development paths” that the research participants used to develop Sarakulnawitaya school into a 21st -century School as shown items in Table 1.

In addition, the research team also views that it results from the principles and concepts of the PAR methodology, as described by Sanrattana (2018), which is a bottom-up research approach, in which both researchers and co-researchers have equal participation in expressing opinions and in taking action. Therefore, there is a high level of democracy. Both parties play active or leadership roles, with the research subjects changing from passive recipients of actions to active participants or by changing their research methods from being conducted on them to being conducted by and for them. This meant that the research subjects had participated in every step of the research process by acting as decision-makers, implementers, and beneficiaries of the actions taken. The role of the researchers had also changed from being outside experts to being collaborative researchers. Furthermore, the research was not just aimed at gaining an understanding or knowledge of the phenomena at hand, but it also aimed at creating desirable changes that would be expected to be sustainable due to the sense of commitment resulting from the role of being involved in every step of the process. Therefore, there are suggestions for anyone, who intends to develop any subject using this approach.

The importance of using the driving force that arises from the integration of academic development approaches with the existing experiences of the research participants and the emphasis on the principles and concepts of the PAR methodology applied in the study. This research is corroborated by other researchers who used similar propulsion in their research. For example, the research on “Cooperative Practices to Enhance the Quality of Work Integrated Learning at Nong Khai Technical College” of Sarapoom and Phrakrudhammapissamai (2021), “Participatory Practice “Teach Less, Learn More”: A Case of Srikranuanwittayakom School” by Rooptam and Sanrattana (2021), “Practicing Collaborative Teachers to Strengthen Student's Visionary Leadership Skills” by Poonvichaen and Sutheejariyawat (2022), “Teachers and Participatory Action Research for Developing Learning Environments” by Thawinwong and Sanrattana (2022), “Collaborative Practices to Empower Teachers' Capacities for the 21st Century” by Soipimai and Sanrattana (2023), and “Development of Learning by E-Learning System: A Case of Mahamakut Buddhist University, Mahavajiralongkorn Rajaviyalaya Campus” of Uttamadhammo and Phrakrusutheejariyawattana (2021).

Therefore, it is suggested that the Participatory Action Research (PAR) methodology involves research, management, development, and problem-solving activities that take place all at the same time. Researchers and collaborators worked together to analyze the current situation regarding the need for change, and then formulated a plan to achieve the desired state. Objectives and methods were established to achieve these goals, and the plan was put into action during the implementation phase. Results were monitored and evaluated periodically for improvement, and at the end of the implementation phase, an overall summary and feedback were provided. This process shared similarities with general management/development/work practices that involved four key steps: (1) collaborative planning, (2) the implementation of the plan, (3) the joint monitoring of results, and (4) collaborative feedback to enter the cycles of the various stages of operation.

References

Academyfront. (2020, September 3). *How to manage your school from home with online school management software.* Retrieved from https://rb.gy/f2sict

Andriotis, N. (n.d.). *10 Active learning methods for super engaged corporate learners.* Retrieved from https://rb.gy/qx04jw

Arhar, J. M., Holly, M. L., & Kasten, W. C. (2001). *Action research for teachers.* Merrill Prentice Hall.

Carr, W., & Kemmis, S. (1992). *Becoming critical: Education, knowledge, and action research* (3rd ed.). Falmer Press.

Carter, G. (2012, March 19). *What's the purpose of school in the 21st century?* Retrieved from https://bit.ly/2Rn1khC

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

Chandramouli, D. (2020, March 30). *8 Ways to use technology to engage students in distance learning.* Retrieved from https://rb.gy/ydlhjl

Coghlan, D., & Brannick, T. (2007). *Doing action research in your own organization* (2nd ed.). Sage.

CoTalent. (n.d.). *How to stimulate active teaching and learning.* Retrieved from https://rb.gy/ofzfcj

Creswell, J. W. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research,* (3rd ed.). Merrill Prentice Hall.

Cross, K. P. (n.d.). *4 Techniques to encourage active learning online.* Retrieved from https://rb.gy/he4lqe

Drew, C. (2022, July 5). *7 Key features of 21st century learning*. Retrieved from https://bit.ly/3nsLqWh

Driscoll, M. (2020, January 19). *7 Design elements of a 21st century school*. Retrieved from https://rb.gy/jbytpk

Driscoll, M. (2022, August 14). *9 Strategies to create 21st century schools.* Retrieved from https://bit.ly/3lPHkqJ

Duffy, J. (n.d.). *What is a school of the 21st century*? Retrieved from https://bit.ly/3TTxbpA

Education Rickshaw. (2017, September 21). *What does a 21st century classroom look, sound, and feel like?* Retrieved from https://bit.ly/2RkzMtl

England, A. (n.d.). *5 Active learning strategies.* Retrieved from https://rb.gy/kgqj8p

Flinders University. 2022). *Linking theory and practice*. Retrieved from https://bit.ly/40mrRxx

Guido, M. (2017, August 18). *25 Easy ways to use technology in the classroom.* Retrieved from https://rb.gy/97clgd

Hallerman, S., Lewis, C., & Dresbach, B. (2019, April 23). *What is a 21st century education?* Retrieved from https://bit.ly/3KfvvmX

Heick, T. (n.d.). *8 Characteristics of 21st century learning*. Retrieved from https://bit.ly/3Kduqv1

Heick, T. (n.d.). *How any school can be a 21st century school.* Retrieved from https://bit.ly/3KfC7BP

Honeycutt, B. (2018, April 23). *Three active learning strategies you can do in 10 minutes or less.* Retrieved from https://rb.gy/9ehbmt

India Today. (2019, September 9). *Moving towards 21st century school education: Changes required.* Retrieved from https://bit.ly/3irQeDZ

James, E. A., Milenkiewicz, M. T., & Bucknam, A. (2008). *Participatory action research for educational leadership: Using data-driven decision making to improve schools.* Sage.

Jan, H. (2017). Teacher of 21st century: Characteristics and development. *Research on Humanities and Social Sciences, 7*(9), 50-54.

Jodha, R. (n.d.). *Innovative ways to encourage active learning in the classroom.* Retrieved from https://rb.gy/mk84cw

Jones, G. (n.d.). *Characteristics of a 21st century learner*. Retrieved from https://bit.ly/2G2IVTD

Kemmis, S., & McTaggart, R. (1992). *The action research planner* (3rd ed.). Deakin University.

Kenan Foundation Asia. (2018, March 9). *Kenan's model of 21st century education.* Retrieved from https://bit.ly/2Rn1x4o

Lathan, J. (n.d.). *10 Ways to use technology in the classroom*. Retrieved from https://rb.gy/lloigm

Lunenburg, F. C., & Ornstein, A. C. (2000). *Educational administration: Concepts and practices* (3rd ed.). Wadsworth Thomson Learning.

McTaggart, R. (1991). Principles for participatory action research. *Adult Education Quarterly. 41*(3), 168-187.

McTaggart, R. (2010). *Participatory action research or change and development.* James Cook University.

Menten, A. (n.d.). *Five ways to use technology and digital media for global learning.* Retrieved from https://rb.gy/wbvunt

Mercer, E. (2013, September 28). *Characteristics of an effective 21st century school*. Retrieved from https://bit.ly/3hq9wbA

Mills, G. E. (2007). *Action research: A guide for the teacher researcher* (3nd ed.). Merrill Prentice Hall.

Murali, S. (2020, March 15). *10 Innovative ways to use technology in education.* Retrieved from https://rb.gy/vet2ya

Nina, W. (2019, March 11). *9 Unique ways to use technology in the classroom.* Retrieved from https://rb.gy/n8x721

Organization for Economic Co-operation and Development. (2018). OECD *school user survey improving learning spaces together.* Retrieved from https://rb.gy/t7obnx

Palmer, T. (2015, June 20). *15 Characteristics of a 21st-century teacher: A teacher reflects on our changing society and how change informs what teaching is like today*. Retrieved from https://edut.to/42NkLDG

Poonvichaen, J., & Sutheejariyawat, P. (2022). Practicing Collaborative Teachers to Strengthen Student's Visionary Leadership Skills. *Education Quarterly Reviews, 5*(3), 231-245. DOI: 10.31014/aior.1993.05.03.541

Rajpoot, A. (2019, July 17). *Effective school management techniques.* Retrieved from https://rb.gy/1mnsla

Reed, V. M. (n.d.). *10 Ways technology can inspire in the classroom.* Retrieved from https://rb.gy/leknpi

Reissman, H. (2017, September 13). *7 Smart ways to use technology in classrooms.* Retrieved from https://rb.gy/go3gws

Rooptam, S., & Sanrattana, W. (2021). Participatory practice "Teach Less, Learn More": A case of Srikranuanwittayakom school. *Education Quarterly Reviews, 4*(2), 578-592. https://doi.org/10.31014/aior.1993.04.02.302

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.

Samuel, R. (2020, September 3). *What does a 21st century classroom look like?* Retrieved from https://bit.ly/32qrruw

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

Sarapoom, C., & Phrakrudhammapissamai. (2021). Cooperative practices to enhance the quality of work integrated learning at Nong Khai Technical College. *International Journal of Educational Methodology, 7*(3), 387-400. https://doi.org/10.12973/ijem.7.3.387

Sardar, I. T. (2018, August 20). *Changing role of teachers in the 21st century!* Retrieved from https://bit.ly/2HsDKLD

Shaikh, S. (2016, November 1). *What is a 21st century school supposed to look like?* Retrieved from https://bit.ly/3mehVSR

Shaw, A. (2018, February 25). *Why change? a paradigm shift.* Retrieved from https://bit.ly/2Fske3U

Soipimai, W., & Sanrattana, W. (2023). Collaborative practices to empower teachers' capacities for the 21st Century. *World Journal of Education*, *13*(1), 30-44. Retrieved from https://doi.org/10.5430/wje.v13n1p30

Solomon, J. (2017, May 7). *Redesigning school for the 21st century*. Retrieved from https://bit.ly/3iqK86x

Teach Thought Staff. (n.d.). *5 Common uses of technology in the classroom and the problem with each.* Retrieved from https://rb.gy/akosy0

Thawinwong, C., & Sanrattana, W. (2022). Teachers and participatory action research for developing learning environments. *World Journal of Education, 12*(3), 17-28. https://doi.org/10.5430/wje.v12n3p17

UCLA: Statistical Consulting Group. (2016, August 22). *What does Cronbach's alpha mean?* Retrieved from https://bit.ly/40qGJe5

Uttamadhammo, P. P., & Phrakrusutheejariyawattana. (2021). Development of Learning by E-Learning System: A Case of Mahamakut Buddhist University, Mahavajiralongkorn Rajaviyalaya Campus. *World Journal of Education, 11*(3), 47-59. https://doi.org/10.5430/wje.v11n3p47

Watson, A. (2012, May 25). *What does 21st century learning look like in an elementary school?* Retrieved from https://bit.ly/32podHu

Whenham, T. (2020, April 2). *15 Active learning activities to energize your next college class.* Retrieved from https://rb.gy/okpqiq

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).