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Developing Teachers to Foster a Growth Mindset for Students

Saman Lamlong[1], Wirot Sanrattana[1] & Phrasrivajiravati[2]

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

[2] Mahamakut Buddhist University, Nakhon Pathom Province, Thailand

Correspondence: Saman Lamlong, Mahamakut Buddhist University, Isan Campus, Khon Kaen Province, Thailand.

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Abstract

This research aims to create an online training program for teachers that helps foster a growth mindset in their students. The main goal is to evaluate the effectiveness of this program using a research and development method. The training program consists of two projects. The first project helps teachers understand a growth mindset and why it is essential for students. It includes training modules that explain the theory behind the growth mindset and effective ways to encourage it in students. The second project gives teachers practical skills to apply this knowledge in the classroom. It includes hands-on activities, case studies, and real-life scenarios to help teachers use their knowledge. To measure the program's effectiveness, the researchers used an experimental design with a one-group pretest-posttest method at a randomly chosen school. The experimental group included 18 teachers and a selected number of students. Before the program started, teachers and students took pretests to gauge their initial understanding and attitudes toward growth mindsets. The findings showed that the online training program successfully met the goals outlined in the research. Statistical analysis revealed significant improvements in teachers' understanding of growth mindset concepts and positive student attitudes and engagement changes. These results indicate that the program could be widely used in schools nationwide, helping to create a growth mindset culture in education. This initiative supports the professional growth of teachers and enables them to impact their students' learning experiences positively.

Keywords: develop teachers, to foster a growth mindset, students' growth mindset, teachers bring learning results to student development

1. Introduction

1.1 Significant of Research Problem

The 21st century is marked by significant transformations, characterized by phenomena such as Digital Disruption, the VUCA World (Volatile, Uncertain, Complex, and Ambiguous), and the BANI World (Brittle, Anxious, Nonlinear, and Incomprehensible) (Maesincee, 2020). In this rapidly changing environment, individuals must cultivate skills that enable them to adapt, with a "Growth Mindset" emerging as a crucial competency. A growth mindset encourages continuous personal development, fosters the ability to learn from mistakes, and promotes viewing failures as opportunities for growth rather than setbacks (Phuwijit, n.d.).

The importance of a growth mindset in the 21st-century landscape cannot be overstated. Darragh (2018), Director of Corporate Citizenship at Blue Cross Blue Shield of Massachusetts, describes a growth mindset as believing that essential qualities can evolve through dedication, hard work, training, and various enhancements. This mindset is particularly valuable for children, motivating them to invest effort into improving their mental and physical capabilities, ultimately leading to positive emotional, physical, financial, and academic outcomes.

Furthermore, Muthoni (2021), an entrepreneur and founder of Deviate Agency in Los Angeles, emphasizes that a growth mindset aids individuals in overcoming challenges when learning new skills or concepts. Embracing a growth mindset fosters persistence and determination, leading to a transformative approach to learning. Recognizing that one's talents and intelligence can be developed empowers individuals to explore, experiment, and achieve greater heights.

Thailand is actively adapting to change by promoting a "Growth Mindset," as reflected in the Ministry of Education's policy to instill solid habits and a love for learning among children and youth. The 20-Year National

Strategy (2018-2037) involves enhancing human potential and resources to prepare Thai citizens to be capable, high-quality individuals ready to thrive in the 21st century. This strategy seeks to revolutionize education across all levels, from early childhood through lifelong learning, by developing a learning system that aligns with 21st-century demands. Key components of this reform include designing a new learning system, redefining the role of teachers, improving the efficiency of education management, and fostering lifelong learning opportunities (Office of the Basic Education Commission, 2023).

Despite these efforts, assessments from the Program for International Student Assessment (PISA) in 2018 revealed that only 43 percent of Thai students exhibited a Growth Mindset, significantly lower than the OECD average of 63 percent. This indicates a 20 percent deficit in the Growth Mindset among Thai students compared to their counterparts in OECD member countries (Institute for the Promotion of Teaching Science and Technology, 2022). This disparity underscores the need for continued focus on cultivating a Growth Mindset within the Thai education system to bridge this gap and better prepare students for the challenges of the modern world.

Teachers play a crucial role in fostering a Growth Mindset among learners by embodying this mindset. Patphol (n.d.) emphasizes that when teachers adopt a Growth Mindset, they can design learning environments that empower students to take ownership of their learning experiences. This approach can enhance behaviors that contribute to ongoing learning and personal development. Similarly, Kawinkamonrote (n.d.) argues that teachers must cultivate their students' belief in their abilities, helping them understand that they can change and improve. Teachers must create opportunities for all students, including those struggling with self-belief.

Given the significance of a Growth Mindset in today's rapidly changing world, our research team conducted a comprehensive study on this topic. We explored various aspects of the Growth Mindset, including its definition, characteristics of individuals who possess it, its importance, methods for development, challenges faced in the process, and practical strategies for cultivating it. We aimed to create learning modules that empower teachers to delve deeper into the Growth Mindset, enabling them to successfully implement these concepts in their classrooms. We utilized digital technology and extensive online resources to gather information, focusing on relevant articles that align with our research objectives.

1.2 Objectives

This research aims to establish an educational innovation titled "Online Self-Training Program for Developing Teachers to Foster a Growth Mindset for Students." The program's effectiveness will be evaluated based on the research hypothesis, utilizing the Research and Development (R&D) methodology.

The Online Self-Training Program comprises two main projects: Project 1 enhances teachers' understanding and Knowledge of students' Growth Mindset. This project will equip educators with the insights and tools necessary to recognize and nurture a Growth Mindset in their students. Project 2 is dedicated to enabling teachers to apply the learning outcomes from Project 1. In this phase, educators will implement strategies and activities that promote a Growth Mindset among their students, providing them with opportunities to develop resilience, adaptability, and a lifelong love for learning. By integrating these projects, the program aspires to create a sustainable framework for continuous professional development, helping teachers effectively support and inspire their students to develop a Growth Mindset.

1.3 Research Hypothesis

This research employed the R&D methodology based on the principle "Knowledge and Action are Power," focusing on modern knowledge application in the 21st century to create teacher development learning modules. Previous studies, including those by Hatsanmuang and Sanrattana (2023), Kratumnok and Sutheejariyawattana (2024), and Mopara and Sanrattana (2023), showed that educational innovations aligned with this approach were practical. We hypothesized that our project, "Online Self-Training Program for Developing Teachers to Foster a Growth Mindset for Students," would yield positive results. Specifically, we anticipated that: 1) Teachers in the experimental group would achieve post-experiment test scores meeting the 90/90 standard and significantly higher than pre-experiment scores. 2) Students in the experimental group would significantly improve their Growth Mindset assessment scores after the experiment.

1.4 Literature Review

Based on extensive internet research, we identified diverse expert perspectives on growth mindset from various regions. These were presented in articles and verified knowledge from reputable sources, offering up-to-date insights suitable for developing learning modules aimed at teacher development. Unlike traditional scientific Knowledge that often focuses on variables and indicators, our study prioritized practical applications for educators.

In exploring the literature on growth mindset, we examined the perspectives of experts from various parts of the world, delineated across several key topics:

1) Definition of Growth Mindset: Insights were gathered from Brown (n.d.), Morin (n.d.), Smith (2020), and Teachmint (n.d.).

2) Importance of Growth Mindset: All Together (2022), Darragh (2018), GoPeer (2020), Grand Canyon University (2020), and Muthoni (2021) articulated this significance.

3) Characteristics of Growth Mindset: Butler (2021), Charlotte Labee (n.d.), Heynderickx (2020), Mattiske (2022), Muthoni (2021), The Black Sheep Community (2022), and The Peak Performance Center (2021) addressed this.

4) Guidelines for Development: Developmental strategies were proposed by Chrysos (n.d.), Corie Chu Healing (2022), Dagher (2022), Davis (2019), Dixita (2020), Future Learn (2022), Good Grief (2022), Jonas (2021), My Online Therapy (2021), Prieur (2022), and Teach Thought (n.d.).

5) Steps in Developing a Growth Mindset: Boomer (2022), Eusebe (2022), Guido (2022), Lu (2017), Marsh Jr. (2016), WGU (2019), and Woolley (2022) laid out practical steps.

6) Barriers to Development: Matthew Syed Consulting (n.d.), Price (2019), Samadi (2017), and Singer (2019) discussed issues inhibiting the growth mindset.

7) Assessment of Growth Mindset: This was explored by Aegarofalo (n.d.), Cullins (2022), Los Angeles Unified School District (n.d.), Nssd112 (n.d.), The American Bar Association (n.d.), The University of North Carolina (n.d.), and University of Illinois Chicago (n.d.).

This comprehensive review allows for a nuanced understanding of growth mindset theory and its practical implications.

The “developmental approaches” outlined by experts like Chrysos, Corie Chu Healing, Dagher, Davis, Dixita, Future Learn, Good Grief, Jonas, My Online Therapy, Prieur, and Teach Thought were particularly significant. These approaches provided essential principles, techniques, and methods for fostering a Growth Mindset. To distill this information, we synthesized a total of 30 developmental approaches, which include:

1) Find your WHY

2) Enjoy the journey

3) Be kind to yourself

4) Reflect and accept

5) Embrace challenges

6) Foster grit

7) Alter your attitude

8) Practice mindfulness

9) Pay attention to thoughts

10) Cultivate authenticity

11) Develop a sense of purpose

12) Redefine “genius”

13) Turn criticism into insights

14) Value the process

15) Learn from mistakes

16) Embrace “not yet”

17) Own your attitude

18) Acknowledge improvements

19) Seek feedback

20) Set realistic goals

21) Master concepts deeply

22) Enjoy challenges

23) Embrace imperfections

24) Celebrate growth

25) Reframe challenges as opportunities

26) Monitor your self-talk

27) Trust your abilities

28) Try something new daily

29) Celebrate successes

30) Reflect regularly

These approaches can serve as valuable resources for teachers to nurture a growth mindset in themselves and their students.

2. Research Methodology

2.1 Research Concept and Procedures

This research applied the Research and Development (R&D) methodology in creating an educational innovation called the "Online Self-Training Program for Developing Teachers to Foster a Growth Mindset for Students," designed to be effective according to the specified research hypothesis. This educational innovation aims to empower teachers by equipping them with Knowledge that they can translate into action and create impact. This aligns with the concept that "Knowledge and Action are Power."

According to Sanrattana (2023), the program emphasizes the importance of integrating contemporary Knowledge from various reliable sources to develop learning modules that initially focus on teacher development. This approach ensures that the Knowledge gained is not merely theoretical but is effectively applied in practice with students. The research methodology followed a structured RiDi (Research and Development) framework to ensure the seamless transition from teacher training to practical application in classrooms.

The application of the R&D methodology comprises several critical phases, including needs assessment, design and development of the training program, implementation of the program, and evaluation of its effectiveness. By following these structured steps, the research aims to provide teachers with the skills and understanding necessary to foster a growth mindset among their students, ultimately contributing to a more resilient and capable generation prepared for the challenges of the 21st century as follows:

R1D1 Process: The initial phase involved a comprehensive literature review on Growth Mindset encompassing seven essential topics: 1) Definition, 2) Importance, 3) Characteristics, 4) Development Guidelines, 5) Development Stages, 6) Obstacles to Development, and 7) Evaluation. These areas were examined through credible articles authored by reliable individuals and organizations. The insights gained were then organized into seven distinct modules to facilitate teacher learning.

R2D2 Process: In this stage, the manuscript for the "Online Self-Training Program for Developing Teachers to Foster a Growth Mindset for Students," was created for testing with the experimental group, as detailed in the R5D5 step. The program comprised two projects: 1) The Teacher Learning Development Project, featuring seven modules based on the topics identified in the R1D1 stage, and 2) The Project for Teachers to Apply Learning Outcomes with Students. This second project included content covering 1) the Definition of Growth Mindset, 2) A Summary of the Desired Characteristics of Growth Mindset that are expected from development, 3) A Summary of Development Approaches for Growth Mindset, 4) A Summary of Development Steps for Growth Mindset, 5) The Growth Mindset Assessment Form, 6) Teachers' Self-Evaluation Form regarding the level of implementation of Growth Mindset development approaches with students, 7) Teachers' Self-Evaluation Form on the selection of perspectives regarding the development steps of Growth Mindset, and 8) A reflection form for teachers to document the results of their initiatives concerning strengths, weaknesses, obstacles, and methods for overcoming challenges.

R3D3 Process: This phase focused on verifying the accuracy, appropriateness, and usefulness of the content presented in the "Online Self-Training Program for Developing Teachers to Foster a Growth Mindset for Students," This was achieved through focus group discussions with target teachers in two stages. The first stage, "Preliminary Field Testing and Revision," involved five teachers from a school not associated with the experimental research. The second stage, "Main Field Testing and Revision," included ten teachers from a similar independent school.

R4D4 Process: In this stage, two sets of instruments for experimental research were developed: 1) A Teacher

Learning Outcome Test and 2) A Student Growth Mindset Assessment. The specifics of these instruments will be addressed in the Research Tools section.

The R5D5 Process was designed to evaluate the "Online Self-Training Program for Developing Teachers to Foster a Growth Mindset for Students" through a structured experimental research approach. Specifically, it utilized a one-group pretest-posttest design at a randomly selected school for its representativeness in the educational landscape. This comprehensive study involved a cohort of 18 dedicated teachers who participated alongside approximately 648 students during the second semester of the academic year 2024.

The research unfolded in two distinct yet interconnected phases. The first phase lasted one month and concentrated on the Teacher Learning Development Project, which aimed to enhance teachers' competencies through targeted professional development workshops significantly. During this phase, educators engaged in intensive training sessions designed to instill a growth mindset within themselves, thus preparing them to inspire the same attitude in their students.

Following this, the second phase, which lasted two months, was dedicated to the Teachers Putting Learning Outcomes into Practice Project. In this phase, educators applied the strategies and insights gained from the previous training in real classroom settings, emphasizing practical implementation strongly. Through this initiative, teachers learned to design and facilitate lessons that accommodate various learning styles and promote student resilience and adaptability.

Our overarching goal in executing these carefully planned approaches is to significantly enhance educational outcomes for all students, ensuring that those with diverse needs, including learners with lower confidence or special educational requirements, receive the tailored support necessary for their success. We recognize that in implementing our teaching strategies, it is crucial to customize our approaches to foster an inclusive environment, ensuring that every student can thrive academically and personally.

2.2 Research Tools

The Teacher Learning Outcome Test was designed as a 4-choice multiple-choice assessment, targeting the evaluation of teachers' learning outcomes before and after an experimental teacher learning development project. This test was structured according to cognitive domains, addressing skills that range from lower to higher levels of thinking as outlined in Bloom's Taxonomy (Krathwohl, 2010).

To ensure the quality of the test, a two-stage process was employed. In the first stage, content validity was assessed by five educational experts using the Indexes of Item-Objective Congruence (IOC) method developed by Rovinelli and Hambleton (1977). The analysis revealed that all questions yielded an IOC value exceeding 0.50, confirming their appropriateness for the intended measurement (Chaichanawirote & Vantum, 2017).

In the second stage, the overall quality of the test was evaluated through a pilot study involving 30 teachers from a school not participating in the experimental area. The data analysis produced several key findings: 1) every test item met the difficulty index criteria, ranging from 0.20 to 0.80, and exhibited a power of discrimination within the acceptable range of 0.20 to 1.00; 2) the KR-20 value, which indicates the test's reliability, was reported at 0.90, surpassing the minimum threshold of 0.70; and 3) the overall difficulty of the test was calculated at 66.20.

The Growth Mindset Assessment for Students utilized a 5-level rating scale of Strongly agree, Agree, Neutral, Disagree, and Strongly disagree. This evaluation was developed based on the characteristics of a Growth Mindset as identified in studies by Butler (2021), Charlotte Labee (n.d.), Heynderickx (2020), Mattiske (2022), Muthoni (2021), The Black Sheep Community (2022), and The Peak Performance Center (2021). Additionally, it drew from the literature on Growth Mindset from researchers and organizations such as Aegarofalo (n.d.), Cullins (2022), the Los Angeles Unified School District (n.d.), Nssd112 (n.d.), The American Bar Association (n.d.), The University of North Carolina (n.d.), and the University of Illinois Chicago (n.d.).

The assessment underwent two quality checks. The first phase involved evaluating content validity through five educational experts. Data analysis indicated that every question achieved an IOC value exceeding the 0.50 benchmark, confirming its suitability for the intended assessment purposes.

In the second phase, the focus shifted to checking the reliability or internal consistency of the evaluation. This was executed with 30 students from a school outside the experimental area. The results indicated that the assessment's overall alpha reliability coefficient was 0.90. When dissected into specific categories, the reliability values were 0.89 for Cognition, 0.85 for Emotion, and an impressive 0.96 for Behavior, all surpassing the 0.70 threshold, which is considered acceptable (George & Mallery, 2003).

2.3 Data Analysis

Data were analyzed using the 90/90 criteria defined by Yamkasikorn (2008). The first 90 refers to the average score percentage of all teachers, while the second 90 indicates the percentage of teachers meeting the test criteria across all objectives. Mean scores from pre- and post-tests were compared using the dependent t-test.

3. Research Results

The results of the research to test the specified research hypothesis were as follows:

3.1 Results of Testing the Research Hypothesis No. 1

After the first experimental research phase of the "Teacher Learning Development Project," 18 teachers in the experimental group assessed their outcomes using the "Teacher Learning Outcome Test" to evaluate the educational innovation against the 90/90 standard criteria. The results showed that 1) the average post-experiment test score for the experimental group was 25.89 points, representing 94.14 percent of the total 36 points, meeting the first 90 standards; and 2) 100 percent of teachers in the experimental group passed all objectives, fulfilling the last 90 standards.

Additionally, comparisons of average scores revealed that the 18 teachers had a pre-test average score of 25.89 (SD = 4.11) and a post-test average score of 33.89 (SD = 1.49). Data were analyzed using the dependent t-test, and at a 0.05 significance level, post-test scores were significantly higher than pre-test scores after the experimental research under the second project, "The Teachers Bring Learning Outcomes to Practice with Students," in the R5D5 step, the students in the experimental group, numbering [insert number], were given a self-assessment using the "Growth Mindset Assessment Form." The results of the mean and standard deviation values for both the pre-and post-experiment cases, both overall and classified by each aspect, were analyzed to determine the effectiveness of the intervention. This comprehensive evaluation aimed to highlight shifts in students' mindsets and their implications for learning outcomes, as shown in the data analysis results in Table 1.

Table 1. Compare the average scores from the teacher learning test before and after the experiment using a dependent t-test

Testing	Sample size	Mean	Standard Deviation	t
Pre-test	18	25.89	4.11	12.46*
Post-test	18	33.89	1.49	

*Significant at ($p<0.05$).

Table 1 presents a comparative analysis of the mean scores on the teacher learning test administered before and after the experiment's implementation, utilizing a dependent t-test for accuracy. The results indicate a significant improvement in the scores following the intervention, suggesting that the "Teachers' Learning Development Project" not only enhances educators' Knowledge and skills but also possesses substantial quality and effectiveness. Given these positive outcomes, the project demonstrates strong potential for wide-scale dissemination within educational settings to foster continuous professional development among teachers.

3.2 Results of Testing the Research Hypothesis No. 2

After the experimental research under the second project, "The Teachers Bring Learning Outcomes to Practice with Students" in the R5D5 step, the students in the experimental group, numbering 648, were given a self-assessment using the "Growth Mindset Assessment Form." The results of the mean and standard deviation values for both the pre-and post-experiment cases, both overall and classified by each aspect, are shown in Table 2 as follows.

Table 2. Mean and standard deviation of growth mindset assessment results of students before and after the experiment

Growth Mindset of Students	Evaluation			
	Pre-test		Post-test	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Cognition	3.59	0.98	4.52	0.68
1. I realize that people can learn new things.	3.69	1.02	4.65	0.56
2. I realize that our intelligence can be developed and changed.	3.63	0.98	4.60	0.62
3. I realize that any talent we have can be improved.	3.78	1.03	4.55	0.65
4. I realize that effort is the path to success.	3.28	0.89	4.51	0.67
5. I recognize that mistakes are valuable learning opportunities.	3.73	1.03	4.53	0.68
6. I realize that even small progress can make a difference.	3.33	0.93	4.43	0.73
7. I know I'll keep practicing when I'm not good at something.	3.60	0.99	4.52	0.68
8. I understand that as long as people are not born with brain injuries or disabilities, they have the same learning capacity.	3.67	1.00	4.48	0.73
9. I realize that intelligence can be increased significantly.	3.27	0.88	4.44	0.77
10. I know some people are kind, and some are narrow-minded, but people can change themselves.	3.75	0.97	4.57	0.64
11. I realize that the harder I work, the more skilled I become.	3.73	1.04	4.44	0.72
Emotion	3.54	0.98	4.48	0.71
12. I am happy despite receiving negative feedback about my performance.	3.76	1.01	4.52	0.67
13. I am pleased with everyone who suggested I develop my potential.	3.46	0.83	4.52	0.65
14. I feel happy when others do something better.	3.59	0.99	4.49	0.70
15. I feel good about stepping out of my comfort zone.	3.54	1.09	4.44	0.78
16. I feel good when I am assigned new tasks.	3.35	0.87	4.42	0.78
17. the success of others inspires me.	3.48	0.98	4.56	0.67
18. I understand and accept my mistakes.	3.62	1.14	4.47	0.72
19. The feeling of frustration motivated me to try harder.	3.67	1.09	4.41	0.75
20. I enjoy doing challenges or unfamiliar tasks.	3.54	0.96	4.54	0.67
21. I like to try new things.	3.38	0.84	4.47	0.75
Behavior	3.48	0.97	4.49	0.71
22. Even talented people need to put in a lot of effort.	3.53	0.91	4.53	0.70
23. People who want to progress are fearless in starting over.	3.54	0.87	4.52	0.69
24. When faced with something challenging, I will try harder and not give up.	3.40	1.06	4.47	0.73
25. I like learning new things because it challenges me.	3.58	0.95	4.48	0.72
26. If I make a mistake, I will try to learn from it.	3.40	0.93	4.47	0.72
27. I am this kind of person, but I can change.	3.35	1.03	4.41	0.74
28. Trying new things is very easy for me.	3.49	1.11	4.48	0.74
29. If I encounter a situation I have never experienced, I will learn more about that situation.	3.53	0.95	4.54	0.70
30. I view challenges as part of learning and development.	3.35	0.89	4.44	0.77
31. I express my uniqueness and self-worth.	3.59	0.96	4.53	0.67
32. I show positivity in every situation.	3.63	0.96	4.60	0.63
33. I am flexible in any situation or event that arises.	3.53	0.95	4.53	0.70
34. I dare to put my thoughts and feelings into practice.	3.29	0.99	4.43	0.73
Total	3.53	0.97	4.50	0.70

Table 2 shows that the overall average score from the assessment of the Growth Mindset of students before the experiment (pre-test) is equal to 3.53 with a standard deviation of 0.97. In contrast, the average score from the assessment after the experiment (post-test) is equal to 4.50 with a standard deviation of 0.70. When analyzed and compared using the dependent t-test, it was found that the average score from the post-test was higher than the pre-test, with statistical significance at the 0.05 level. This indicates a noteworthy improvement in the student's growth mindset following the intervention, as shown in the data analysis results in Table 3.

Table 3. The mean scores of students' self-assessments before and after the experiment were analyzed using a dependent t-test

Evaluating	Sample size	Mean	Standard Deviation	t
Pre-test	648	3.53	0.97	68.67*
Post-test	648	4.50	0.70	

*Significant at ($p<0.05$).

The findings from testing our research hypotheses indicate that the initiative "The Project of Teachers Applying Learning Outcomes to Practice with Students" is both effective and practical, aligning with our initial research assumptions.

In examining the broader context of the project, it has become evident that the "Online Self-Training Program for Developing Teachers to Foster a Growth Mindset for Students," comprises two key components: the "Project for Developing Teachers' Learning" and the "Project for Teachers to Apply Learning Outcomes to Students." Together, these components represent a significant educational innovation that has the potential for widespread implementation among the target demographic.

This program adheres to research and development (R&D) methodology principles, which involve systematically innovating and refining educational practices. This process typically starts with pilot testing conducted in a specific area that closely resembles the broader population we aim to serve. The pilot evaluation not only assesses the effectiveness of the innovation but also measures its alignment with established criteria for quality and impact.

The experimental results have indicated that the innovation meets the necessary standards for effectiveness and practicality. As such, we can extend its reach, facilitating its dissemination to the larger population targeted by the research. This step marks a significant milestone in our efforts to enhance teacher training and promote a growth mindset among students, ultimately contributing to more effective educational practices.

4. Discussion

The growth mindset is crucial in navigating the challenges of the 21st century, characterized by rapid changes and uncertainties. As highlighted by Darragh (2018), the belief that essential qualities can be developed through dedication and effort is key to personal and professional growth. Recognizing this, our research team delved deeply into various aspects of the growth mindset—its definition, characteristics of individuals who possess it, significance, developmental approaches, steps for enhancement, potential challenges, and practical techniques.

Our goal was to gather the comprehensive Knowledge necessary for creating targeted learning modules to empower teachers to develop their understanding of growth mindsets. This foundational Knowledge is critical before they can effectively foster a growth mindset among their students.

In light of the advancements in digital technology and the growth of the knowledge society, we found a wealth of online information. Extensive research revealed numerous articles and resources from various countries, contributing to the development of an educational innovation called the "Online Self-Training Program for Developing Teachers to Foster a Growth Mindset for Students," This program was systematically designed using a Research and Development (R&D) methodology and tailored to meet the objectives outlined in our research hypothesis. The Online Self-Training Program comprises two main projects: 1) A project focused on enhancing teachers' understanding of students' growth mindsets. 2) A project aimed at enabling teachers to apply their learning outcomes to promote and nurture students' growth mindsets.

Using the R&D methodology, we meticulously followed a structured research process—comprising multiple research and development cycles—culminating in experimental research conducted in a selected school setting. Our findings indicated that the educational innovation developed was practical and aligned with the research hypothesis. This suggests a strong potential for broader dissemination within the educational community, enabling widespread adoption across target populations.

The research outcomes reinforced the reliability and effectiveness of our research design. We successfully demonstrated that teachers benefit most when they first engage in personal learning, allowing them to launch continuous developmental efforts alongside their students. Moreover, our emphasis on leveraging online resources ensured that we gathered valuable perspectives and insights from experts, tailoring the learning modules to meet teachers' needs and enhancing their ability to implement effective strategies with students.

"Develop teachers to learn first, and apply learning outcomes to develop continuously with students." This guiding principle reflects the insights of Sanrattana (2023), who advocates for leveraging modern Knowledge from various

reliable sources to create Learning Modules designed to initiate teacher development. This approach emphasizes that Knowledge is not merely an end but a foundation for action, resonating with the concept that "Knowledge and Action is Power." Unlike the 20th-century notion of "knowledge is power," today focuses on applying Knowledge to yield tangible outcomes.

This perspective aligns with Oppong's (2019) assertion that while Knowledge is abundant and accessible, its true power lies in wisdom—the ability to act on information to achieve the best results. Merely acquiring Knowledge without applying it diminishes its value. The transformative impact of teacher professional development is further highlighted by Mizell (2010), who noted that the most effective development engages teams of teachers to address student needs collaboratively. The ultimate aim of any professional development should be to enhance student achievement, as emphasized by Prodigy (2019).

Our research findings underscore the significance of translating Knowledge into practice. This aligns with the notion that action underpins success; if Knowledge remains unutilized, it serves little purpose. Scholars like Ofpad from the School of Genius (n.d.) illustrate this with the analogy that "Knowledge is power, but without action, it is useless." Margot (2019) quotes Napoleon Hill, stating that Knowledge is only potential power until it is systematically organized and directed toward achieving specific objectives.

Additionally, "the importance of searching for information from the Internet" was a focal point in our research. The team aimed to explore various aspects of knowledge essential for developing practical learning modules for teachers, including the definition and characteristics of a growth mindset, its importance, developmental approaches, and the challenges faced during the development process. By synthesizing this knowledge, we aim to create a framework that empowers teachers to learn and implement their learning in ways that promote continuous development for themselves and their students.

Moreover, exploring various approaches is essential in enhancing our understanding of educational development. The type of knowledge we seek often proves to be elusive in traditional research, which primarily investigates the relationship between independent and dependent variables. Academic textbooks can also be restrictive, as they may need more detailed discussions on specific issues or information that one can find through broader Internet searches.

The quest for information online is fueled by our transition into a knowledge-based society, which emphasizes the generation, sharing, and utilization of Knowledge for the enrichment and well-being of its members (Rahman, 2009). This shift makes the Internet an invaluable tool for learning and research, providing significant advantages such as ease of communication, rapid dissemination of information, a vast pool of resources, and the ability to exchange emails for feedback (Bastis Consultores, 2021).

However, only some information found online is reliable. Therefore, we apply a discerning approach to our searches, prioritizing credible sources. This means selecting references authored by reputable individuals, typically those with a solid educational background or professional experience in schools, universities, or educational organizations. This ensures that the knowledge we gather is both relevant and trustworthy.

5. Conclusion

The research highlights that the educational innovations developed are practical and can be broadly disseminated among the target population. However, several considerations must be taken into account during implementation:

1) Translation Limitations: Translating materials from English to a local language presents inherent challenges. High-quality translations may still need more depth and essence of the original content. As a result, resources that focus primarily on reading comprehension might not yield optimal outcomes. It is recommended that individuals proficient in English refer to the original materials when possible, as links to these resources will be provided.

2) Challenges Faced by Teachers: Feedback from teachers participating in the experimental group surfaced numerous challenges that should be acknowledged. These include limited time for implementation, an overwhelming number of alternatives to consider, uncertainty regarding the effectiveness of their approaches, and the burden of additional responsibilities beyond teaching. Moreover, it is crucial to recognize potential issues related to applying a Growth Mindset in education, as Singer (2019) highlighted. These issues include:

- Lack of evidence supporting a significant impact on student academic achievement.
- Misalignment with current educational policies.
- Neglecting student needs and available resources.
- There is potential for making students feel disrespected or demeaned.

- Inapplicability for all students.
- It is viewed as an intervention for students rather than a foundational pedagogical principle for educators.

Furthermore, Price (2019) discusses barriers to pupils' developing a growth mindset from two perspectives: 1. Pupil Perspective: A confident mindset is essential for students to engage with the principles of a growth mindset. Key aspects include self-belief, resilience, valuing personal opinions, and participating actively in the learning environment. Noting the lack of self-esteem in students, Price developed the acronym CUPPA, which encapsulates five facets crucial for achieving a confident mindset: Challenge, Uniqueness, Positivity, Perception, and Action. 2. Teacher Perspective: To promote a Growth Mindset effectively, classroom environments must address and dismantle existing barriers. This involves ensuring that verbal and non-verbal feedback is fair, consistent, and accurate. For instance, if teachers fail to address negative behaviors from' students directed toward their peers, it may lead to an environment that perpetuates these detrimental patterns instead of fostering a supportive learning atmosphere.

By considering these factors, educators can better navigate the complexities of fostering a Growth Mindset, ultimately leading to more effective teaching and learning experiences.

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Authors contributions

Saman Lamlong, Ed.D. student, handled all research steps: problem study, method design, innovation creation, fieldwork, results summary, and reporting. Associate Professor Dr. Wirot Sanrattana provided guidance on methodology and content, while Assistant Professor Dr. Phrasrivajiravati consulted on research design and manuscript structure. Saman Lamlong drafted and revised the manuscript. His advisors approved the final version.

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