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Teachers' Self-Potential Development for Enhancing Students' Problem-Solving Skills

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Abstract

This research project aimed to develop an innovative online self-training program specifically designed for teachers, focusing on enhancing their problem-solving skills. The primary objective of this program is to equip educators with the necessary tools and knowledge to facilitate student learning effectively within the classroom environment. The program comprises two key components: 1) teachers actively participating in self-directed learning activities to advance their problem-solving capabilities, and 2) teachers applying these newly acquired skills in their interactions with students. The research utilized a comprehensive five-step Research and Development methodology, ensuring a robust approach to the program's design and implementation. The concluding phase of the study involved experimental research conducted through a one-group pretest-posttest design within an educational setting. This experimental group included 14 teachers and a corresponding number of students. The research findings were significant, indicating that the "Online Self-Training Program for Developing Teachers' Self-Potential to Enhance Students' Problem-Solving Skills" met the established adequacy criteria outlined in the research hypothesis. These results strongly suggest that this educational innovation is well-positioned for broader dissemination, thereby providing substantial benefits to the targeted population of educators and students.

Keywords: teachers' self-potential, problem-solving skills, students' problem-solving skills, developing teachers to enhance student learning

1. Introduction

1.1 Significant of the Research Problem

Due to new technology, the world has changed dramatically in the 21st Century. Education needs to keep up to help young people, the future leaders, thrive. Schools are now focusing more on teaching essential life skills that match the fast-paced changes in society. These include being adaptable, thinking systematically, being creative, solving problems, and working well with others (Delaney, 2019).

Problem-solving skills are crucial for dealing with everyday challenges. They come in handy in every job and situation, making them essential for success. If someone lacks strong problem-solving skills, they can face obstacles, no matter how well they have done in school or work. We often use these skills instinctively when problems pop up in our daily lives. Some issues need quick fixes, while others require more thought and planning because they can have long-term effects (Master Class, 2021).

These skills help us identify challenges, think critically, and devise practical solutions. They are important at every stage of life, whether you are a child or an adult. Plus, problem-solving is linked to other important skills, like critical thinking and creativity, solidifying its role as a key skill for today (Code Genius Academy, 2023).

Solid problem-solving skills boost students' confidence, enabling them to tackle challenges independently. Better analytical thinking helps them grasp concepts more clearly and remember information longer (Indic Education, 2023). According to Marlborough School (2020), kids develop problem-solving skills at different rates, and they need to learn to face problems with determination and creativity, especially when things get tough. Additionally, these skills help children manage increasingly complicated academic and social situations as they grow up. McFarland (2021) emphasizes that child development includes not just finding solutions but also being creative, thinking logically, and looking at different options.

Gutierrez (2012) points out that practical problem-solving skills can help kids handle conflicts at school and daily, enhancing their ability to empathize and communicate positively. Kumon (2020) adds that problem-solving skills are essential across all areas of child development, including social, emotional, cognitive, creative, and physical growth. That is why it is crucial to build these skills early on.

In today's fast-paced world, developing problem-solving skills in students is super important, and starting early makes a big difference. To understand this better, we explored various opinions from educators and academic sources, finding numerous articles that look into problem-solving skills from different perspectives. Our analysis showed they fit perfectly with what we aimed to research, including defining what makes a good problem-solver, strategies for improving these skills, steps for development, challenges, and ways to overcome them.

Our online search turned up valuable insights from experts around the globe, giving us the latest information relevant to today's education landscape. This knowledge is key for creating training programs for teachers, ensuring they can use these strategies effectively with their students in the classroom. Our main goal is to create a cycle of ongoing teacher development that empowers educators to effectively apply their learning to their students.

1.2 Research Objectives

This research is dedicated to supporting teachers by utilizing the Research and Development (R&D) methodology to create an innovative online self-training program. Recognizing the challenges educators face, this program is designed to empower teachers in enhancing their problem-solving skills across various areas. By equipping them with these essential tools, we hope to foster their growth and confidence before they share these valuable insights with their students in the classroom. The online self-training program consists of two key projects: 1) a project where teachers can engage with the program to personally develop their problem-solving abilities, and 2) a project that focuses on how they can effectively apply these skills to benefit their students' learning experiences.

1.3 Research Hypothesis

This research employed an R&D methodology to develop an online self-training program that transforms academic knowledge into learning modules for teachers to improve student outcomes. Previous studies, such as those by Arnandho and Sutheejariyawattana (2022), Promrub and Sanrattana (2022), and Nukoonkan and Dhammapissamai (2023), support the effectiveness of this approach. We formulated two research hypotheses: 1) For the project "Teachers Use Online Self-Training Program to Develop Problem-Solving Skills," teachers in the experimental group are expected to achieve post-test scores 90/90, significantly higher than their pre-test scores. 2) In the project "Teachers Bring Learning Outcomes to Practice with Students," teachers are anticipated to receive significantly higher evaluations from students after the experiment.

1.4 Literature Review

The survey of academics and educational organizations revealed various articles regarding problem-solving skills, covering definitions, characteristics of skilled individuals, enhancement guidelines, development steps, obstacles, and solutions. These up-to-date online sources were selected to create learning modules aimed at helping teachers develop and apply these skills with their students in the classroom, which is the primary goal of this research.

In the literature review on problem-solving skills, we explored a variety of expert perspectives from articles available online, focusing on several key topics:

1) Definition of Problem-Solving Skills: Researchers such as Maheshwari (2017), Doyle (2020), Cuemath (2021), Instagantt (2022), and Warren (2022) provided insights into what constitutes problem-solving skills, laying a foundation for our understanding.

2) Importance of Problem-Solving Skills: McFarland (2021), Gutierrez (2012), HCL JIGSAW (2022), Marlborough (2020), and Kumon (2020) highlighted the significance of these skills, showcasing their relevance in educational settings and beyond.

3) Characteristics of Problem-Solving Skills: Resultant (2015), Strategic Search Solutions (2017), Tan (2019), Cohen (2017), and Davret (2020) discussed the unique qualities associated with effective problem-solving, which helped identify the traits of successful problem solvers.

4) Development Approaches for Problem-Solving Skills: Mattingly (2020), Ahuja (2021), Norris and Kreisberg (2021), Toro (2021), Teach Thought Staff (n.d.), OSIRI Educational (2021), Abazov (2022), Kaplinsky (2022), Search Institute (2012), and Sithara (2021) offered insights on how to foster these skills.

5) Development Process for Problem-Solving Skills: The processes involved in skill development were addressed by Teacher Vision Staff (2022), Doyle (2020), Marzano (2014), Morin (2021), and Master Class (2021), providing

a roadmap for educators.

6) Obstacles in Developing Problem-Solving Skills: Harappa (2020), Eller Executive Education (2017), Türk (2020), Mull Over Thing (2020), and Gomez (2020) examined various challenges faced in cultivating these skills, highlighting common hurdles.

7) Evaluating Problem-Solving Skills: Finally, methods and criteria for assessing these skills were discussed by Semanticscholar (n.d.), Rubin (n.d.), Warner (2002), MindTools (n.d.), Eylul (2012), Queendom (n.d.), and Barkman and Machtmes (2002).

This comprehensive review aims to inform the design of practical learning modules that will enhance the development of problem-solving skills among educators and their students in the classroom.

The examination of related literature indicates that presenting the topics as structured learning modules can significantly benefit teachers in developing their skills and applying learning outcomes effectively with students in the classroom. Among these topics, the "problem-solving skills development approach" stands out as particularly vital, as it offers a variety of principles, concepts, techniques, methods, and activities.

While some of these approaches may be familiar to educators, others may need to be more widely recognized. To address this, we synthesized a comprehensive list of 50 approaches to developing problem-solving skills based on the insights gathered from the aforementioned references. The approaches are as follows:

1) Follow the problem-solving steps.
2) Learn from past challenges.
3) Note ineffective strategies.
4) Ask open-ended questions.
5) Focus on the process.
6) Tackle complex ideas.
7) Model effective strategies.
8) Encourage self-directed learning.
9) Create a safe brainstorming space.
10) Strengthen problem-solving skills.
11) Apply researched techniques.
12) Be a positive role model.
13) Provide constructive Feedback.
14) Use engaging tasks.
15) Offer language support.
16) Facilitate discussions.
17) Model critical thinking.
18) Encourage student dialogue.
19) Discuss objectives in planning.
20) Highlight process understanding.
21) Teach problem-solving systematically.
22) Use "3B4ME" for critical thinking.
23) Involve students in curriculum design.
24) Reinforce instructions review.
25) Have students share learning.
26) Promote independent problem-solving.
27) Discuss relevant personal issues.
28) Articulate learning experiences.
29) Incorporate group activities.

30) Foster explanation of thought processes.
31) Emphasize patience.
32) Accept mistakes as learning.
33) Identify key problem elements.
34) Examine solutions critically.
35) Reflect on lessons learned.
36) Use relatable, real-world problems.
37) Encourage inquiry.
38) Explore various solutions.
39) Break down complex problems.
40) Discuss problem-solving steps.
41) Allow independent work.
42) Reinforce positive efforts.
43) Stimulate creativity.
44) Adjust task difficulty.
45) Support group decisions.
46) Make it enjoyable.
47) Use storytelling for engagement.
48) Promote independence.
49) Celebrate efforts.
50) Practice brainstorming regularly.

Each approach comes with detailed instructions for implementation in the learning modules, ensuring that educators have the guidance they need to foster problem-solving skills among their students effectively.

2. Research Methodology

2.1 Concepts and Steps

This research used the Research and Development (R&D) methodology based on Sanrattana (2023), who emphasized applying contemporary knowledge for the 21st Century. The goal was to create Learning Modules that develop teachers and enable them to apply learning outcomes in practice with students, aligning with the idea that "Knowledge and Action are Power," as opposed to the 20th-century notion of "Knowledge is Power." The research steps were in the R1D1 .... RiDi format as follows:

R1D1 Process: The initial phase involved a thorough review of literature on problem-solving skills, focusing on seven key topics: 1) definition, 2) importance, 3) characteristics, 4) development guidelines, 5) development stages, 6) obstacles, and 7) evaluation criteria. Each topic was based on credible scholarly articles, resulting in the creation of seven informative learning modules.

R2D2 Process: An online self-training program consisting of two main projects was developed. The first project encourages teachers to enhance their understanding of problem-solving skills through the aforementioned learning modules. The second project empowers teachers to implement their learning outcomes with students. The program covers key areas such as problem-solving characteristics, development guidelines, self-evaluation tools, and reflection forms for teachers. Additional details can be found at http://www.mbuisc.ac.th/phd/Module9/Warunyu.pdf

R3D3 Process: To validate the content of the online training program, Focus Group Discussions were conducted with teachers outside the experimental research area. This validation occurred in two phases: "Preliminary Field Testing and Revision" with five teachers and "Main Field Testing and Revision" with ten teachers, leading to crucial Feedback and improvements.

R4D4 Process: Two assessment instruments were created for the experimental research: one to evaluate teacher learning outcomes and another to assess students' problem-solving skills. The research tools section will discuss more details.

R5D5 Process: The program's effectiveness was tested using a One-Group Pretest-Posttest Design involving 14 teachers and 103 students in randomly selected schools during the second semester 2024. The research comprised a month-long teacher development project and a two-month implementation phase with students. This approach aimed to connect teacher training directly to student outcomes in problem-solving.

2.2 Research tools

The Teacher Learning Outcome Test is a multiple-choice format with four options designed to assess teachers' learning outcomes before and after the experiment. It aligns with the Cognitive Domain skills from Bloom's Taxonomy (Krathwohl, 2002).

The test's quality was evaluated in two phases. In the first phase, content validity was assessed using the Indexes of Item-Objective Congruence (IOC) method with input from 5 educational experts, confirming that all questions met the criteria (IOC values above 0.50). The test was administered to 30 teachers from schools outside the experimental areas in the second phase. Analysis showed that: 1) the Index of Difficulty for each exam was between 0.20 and 0.80, with Power of Discrimination ranging from 0.20 to 1.00; 2) the KR-20 value was above 0.70; and 3) test difficulty was evaluated as 61.85

The Assessment of Students' Problem-Solving Skills utilized a 5-level Rating Scale: Strongly agree, Agree, Neutral, Disagree, Strongly disagree. This assessment was developed based on a literature review concerning the characteristics of problem-solving skills, drawing insights from Resultant (2015), Strategic Search Solutions (2017), Tan (2019), Cohen (2017), and Davret (2020). Additionally, it considered assessment guidelines from Semanticscholar (n.d.), Rubin (n.d.), Warner (2002), MindTools (n.d.), Eylul (2012), Queendom (n.d.), and Barkman and Machtmes (2002).

Quality examination of this assessment occurred in two stages. In the first stage, five educational experts validated the content, revealing that all questions had an Item Objective Congruence (IOC) value exceeding 0.50, confirming the suitability of the measurement. The second stage assessed the reliability or internal consistency of the instrument by administering it to 30 students in an unrelated school setting. Data analysis indicated that the entire assessment's Alpha Coefficient of Reliability was equal to 0.85 Additionally, a breakdown of reliability across various aspects revealed that the results for identifying/defining problems, analyzing possible causes or assumptions, identifying possible solutions, selecting the best solution, implementing the solution, evaluating progress, and revising as needed were equal to 0.75, 0.86, 0.82, 0.90, 0.91, and 0.93 respectively, all surpassing the acceptable threshold of 0.70 as outlined by George & Mallery (2003).

2.3 Data Analysis

Data were analyzed using the 90/90 criteria defined by Yamkasikorn (2008). The first 90 reflects the average score percentage of all teachers, while the second indicates the percentage of teachers passing the test for all objectives. A dependent t-test compared pre- and post-test mean scores.

3. Results

This research employed an R&D methodology to integrate up-to-date 21st-century knowledge from reliable sources, aiming to create Learning Modules for teacher development. The focus is on applying learning outcomes in practice with students, based on the idea that "Knowledge and Action are Power," moving beyond the 20th Century view of "Knowledge is Power." The research steps were structured as R1D1… RiDi. The results of the research operation to test the specified research hypothesis found that the research results were by the research hypothesis as follows:

3.1 Results of Testing the Research Hypothesis No. 1

Following the experimental research conducted for the project titled "The Teachers Use Online Self-Training Program to Develop Themselves to Learn About Problem-Solving Skills" during the R5D5 phase, 14 teachers from the experimental group were evaluated through the "Teachers' Learning Results Test" to assess the project's effectiveness. The results indicated that the average score for the experimental group on the post-test was 33.86 points, representing 94.06 percent of the total score of 36 points, thereby meeting the initial 90 standard criteria.

Furthermore, one hundred percent of the teachers in the experimental group successfully met all objectives and passed the test, which fulfilled the final 90 standard criteria. The average score for the pre-test among the experimental group was 28.14 with a standard deviation of 2.14, while the average score for the post-test was 33.86 with a standard deviation of 1.17. When analyzed using the Dependent t-test, the post-test scores were significantly higher than the pre-test scores at the 0.05 level, as shown in the data analysis results in Table 1.

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

Testing	Sample size	Mean	Standard Deviation	t
Before	14	28.14	2.14	9.29*
After	14	33.86	1.17	

*Significant at ($p<0.05$).

The findings from the research hypothesis testing indicated that the initiative titled "The project of teachers using the online self-training program to develop themselves to learn about problem-solving skills" was deemed adequate across all evaluated dimensions. This suggests that the program effectively met its intended objectives, providing teachers with valuable resources and strategies for enhancing their problem-solving abilities. The positive outcomes align with the established research hypothesis, confirming the program's relevance and effectiveness in professional development for educators.

3.2 Results of Testing the Research Hypothesis No. 2

Following the experimental research conducted for the project titled "Teachers Bring Learning Outcomes to Practice with Students," a sample of 103 students from the experimental group participated in a thorough evaluation of their problem-solving skills. This evaluation utilized the "Student Problem-Solving Skills Assessment Form," a structured tool designed to measure various aspects of problem-solving abilities.

The analysis of the collected data yielded insightful results, presenting both mean scores and standard deviations for the students' problem-solving skills before and after the intervention. These statistical measures highlighted the notable changes and improvements in the students' abilities as a direct consequence of the educational strategies implemented during the project. The detailed outcomes of this assessment, which illustrate the significant impact of the instructional methods on student learning, are comprehensively outlined in Table 2.

Table 2. Mean and standard deviation of problem-solving skills assessment results of students before and after the experiment, overall and in each aspect

Characteristics that demonstrate problem-solving skills	Pre-test		Post-test	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Identify/Define the Problem	3.42	0.93	4.57	0.64
1. When I have a problem, I can identify what the problem is.	3.49	0.84	4.66	0.55
2. I try to get all the facts before solving a problem.	3.83	1.18	4.53	0.67
3. I checked the possible causes of the problem.	3.36	1.06	4.62	0.63
4. I will determine what the consequences of the problem will be.	3.17	0.75	4.56	0.68
5. I am open-minded to the cause of the problem.	3.32	0.73	4.56	0.65
6. I identify problem areas where I can change.	3.35	1.02	4.50	0.67
Analyze Possible Causes or Assumptions	3.56	0.95	4.64	0.59
7. I analyze needs by focusing on the most critical and relevant issues.	3.67	0.93	4.64	0.57
8. When I encounter a problem, I try to determine what is causing it.	3.45	0.95	4.62	0.60
9. I identify potential risks during the root cause analysis process or possible assumptions to avoid mistakes.	3.17	0.75	4.67	0.57
10. I reduce uncertainty by allowing further analysis of the problem even when I don't have a complete picture.	3.93	1.16	4.61	0.61
Identify Possible Solutions	3.36	0.96	4.56	0.63
11. When I encounter a problem, I try to determine what is causing the problem.	3.14	0.88	4.53	0.67
12. When solving a problem, I look at all possible solutions.	3.23	0.88	4.64	0.56
13. I use the most effective solutions to solve the problem first.	3.44	0.94	4.60	0.58
14. I predict the possible outcomes of actions that might solve the problem.	3.47	0.98	4.53	0.67
15. I decide who should be involved in solving the problem and in what way.	3.15	1.15	4.54	0.67
16. I compare each possible solution to the others to find the best way to solve my problem.	3.17	0.75	4.53	0.68
17. I tried to look at the long-term effects of each possible solution.	3.95	1.11	4.58	0.60
Select Best Solution	3.57	1.02	4.59	0.60
18. I evaluate the possible solutions.	3.44	1.13	4.52	0.64
19. After selecting a solution, I implement it.	3.21	1.01	4.51	0.67
20. I determine the methods and give weight to the methods I choose.	3.95	1.11	4.60	0.58
21. I will reduce emotion and bias from the chosen solution.	3.17	0.75	4.61	0.60

22. I will save cost and time by choosing the best solution efficiently.	3.89	1.15	4.69	0.54
23. I'll try another solution if my solution doesn't work.	3.87	1.01	4.66	0.53
24. I look at problems from different perspectives and create solutions.	3.44	0.97	4.53	0.65
Implement the Solution	3.59	1.12	4.55	0.63
25. I develop an action plan to implement the chosen approach.	3.86	1.16	4.53	0.65
26. I set objectives and set measurable goals to track implementation.	3.32	0.97	4.53	0.65
27. I set a time frame for the process.	3.27	1.32	4.50	0.68
28. I ensure my ideas remain clear and that my process makes sense in every aspect.	3.75	1.05	4.55	0.61
29. I will choose who needs to be involved in implementing the solution.	3.74	1.08	4.64	0.57
Evaluate Progress and Revise as Needed	3.47	0.98	4.58	0.63
30. I have collected data to determine whether the implemented solution will improve the process under study.	3.18	0.89	4.58	0.62
31. New and improved solutions need to be monitored over time and reviewed frequently to maintain their effectiveness.	3.33	1.12	4.66	0.59
32. I will follow up on the progress once my solution is ready.	3.53	0.97	4.66	0.57
33. I consider whether I have achieved the objectives of my solution.	3.73	0.98	4.59	0.62
34. I will continue to develop solutions to ensure they work for every problem.	3.70	1.06	4.48	0.68
35. I adjust my approach to the problem if necessary or return to brainstorming possible solutions if a new decision is needed.	3.34	0.99	4.51	0.67
Total	3.54	0.84	4.58	0.62

Table 2 vividly illustrates the evaluation results concerning students' problem-solving skills as they pertained to the effectiveness of the second project. The pre-experiment evaluation yielded an average score of 3.54, with a standard deviation of 0.84, indicating a moderate student skill level. In stark contrast, the post-experiment evaluation showcased a remarkable leap, with the average score climbing to 4.58 and a reduced standard deviation of 0.62, suggesting a marked improvement in their abilities.

A Dependent t-test analysis was conducted, and the results were striking: the post-experiment scores significantly surpassed the pre-experiment scores, with a p-value reaching statistical significance at 0.05. This compelling evidence is further detailed in the data analysis results presented in Table 3, showcasing the project's positive impact on students' problem-solving capacities.

Table 3. The mean scores from the problem-solving skills assessment of students before and after the experiment were compared using a dependent t-test

Assessment	Sample size	Mean	Standard Deviation	t
Before	103	3.54	0.84	68.67*
After	103	4.58	0.62	

*Significant at ($p<0.05$).

The findings from the research hypothesis testing reveal that the "Teachers Bring Learning Outcomes to Practice with Students" project effectively fulfills the objectives outlined in the research hypothesis. This suggests that the project has a significant impact on enhancing educational practices.

When examining the project, it becomes clear that the online self-training program comprises two interconnected components. The first component focuses on a teacher development initiative, where educators engage with the online self-training program to enhance their problem-solving skills. This aspect is critical as it empowers teachers to tackle challenges more effectively in their teaching practices.

The second component of the program centers around helping teachers translate their learning outcomes into practical applications in the classroom setting. This means that educators acquire new knowledge and skills and implement these strategies directly with their students, fostering a more enriching learning environment.

Collectively, these two projects represent a robust educational innovation that has demonstrated its effectiveness and potential. The online self-training program is practical and highly adaptable, making it suitable for widespread adoption among the target population of educators. By disseminating these tools and practices, there is a significant opportunity to enhance teaching and learning experiences across various educational contexts.

4. Discussion

This research was all about creating an online self-training program for teachers to help them improve their problem-solving skills before using those skills with their students. The program has two main parts: helping teachers grow personally and applying those skills in the classroom. Our results show that the program does what it is supposed to do, which means it could be shared with the 6,882 secondary schools under the Office of the Basic Education Commission across the country.

The findings from our study lead to real improvements in education, and our well-thought-out plan for building problem-solving skills is super important in today's world. Learning from different resources is key, especially since many helpful articles are available online. It is essential to develop teachers who can effectively bring what they learn back to their classrooms.

The success of this initiative is backed by much research that highlights the need to empower people with knowledge to boost workforce effectiveness. Several important studies emphasize how relevant this program is: Kratumnok and Phrakhrusutheejariyawattana (2024) talk about how teamwork can change things for students and create a collaborative vibe that spurs innovation. Then there is Suchato and Phrakhrusutheejariyawattana (2024), who focus on building prosocial behavior, which helps create a sense of community and responsibility, boosting relationships overall. Nukoonkan and Dhammapissamai (2023) also contribute by improving project management skills, giving people the tools they need to tackle challenges confidently. Together, these insights clearly show how essential this initiative is for creating a capable and engaged workforce.

Problem-solving is super important for students for many reasons: 1) It helps them recognize which problems can be tackled, which boosts decision-making. 2) It prepares them for challenging social and school situations. 3) It deepens their understanding of cause and effect, strengthening their analytical skills. 4) It builds resilience and encourages them to take smart risks. 5) It supports their development and helps them grow into confident adults. 6) Plus, it enhances social awareness, time management, and patience. All of these skills are crucial for helping students handle future challenges.

The importance of diving into literature through easy-to-find online articles cannot be stressed enough, mainly since many folks rely on the Internet for info. It has become an enormous game-changer (Zieniūtė, 2024). The Internet is a go-to source for knowledge on almost anything, making research easier. With just a few keystrokes, you can get answers in seconds, and search engines do a great job guiding users to the right websites (Gulshan, 2023).

The online articles we reviewed were written by experts in developing problem-solving skills worldwide, giving us many different insights. These included academic findings, research results, and real-life experiences. Our research team valued these diverse perspectives and worked hard to find quality sources that fit our needs. We looked for content that covered all aspects of problem-solving skills, like definitions, importance, features, steps to develop them, challenges, and evaluation methods. However, finding quality resources was tough, showing a need for more research materials like detailed studies or textbooks. Most research looks at how different factors connect or how variables interact, but not many textbooks dig deep into specific topics.

Putting teacher development first is the smart move for improving educational outcomes. Nowadays, teacher development is about giving educators the know-how to help students thrive. The ultimate goal is to focus on what learners need rather than just passing information from teachers like before.

According to the five key principles of teacher professional development: 1) Teachers need time to soak up new strategies. 2) Support should focus on specific challenges teachers face in the classroom. 3) Engagement should be interactive and varied. 4) Modeling is crucial for understanding. 5) The content has to be relevant to specific subjects (Edmentum, 2018).

Educational administrations should enhance teaching and learning so that the right students get the best education from qualified teachers (Amadi, 2008; Dhammei, 2022). This aligns with the beliefs of educational leaders, as pointed out by Speck (1999) and Seyfarth (1999), who stress the importance of academic administration in supporting teachers through structured training and mentorship (University of Bridgeport, 2022).

Finally, professional development should consider its impact on student growth, as noted by Gusky (2000) and Hoy and Miskel (2001). This supports the practical ideas of professional development from Kaplane (n.d.), which emphasizes that these experiences should be ongoing, integrated into daily work, specific instead of generic, engaging, provide various ways for individual and group learning, highlight modeling in training, and encourage teamwork among teachers.

5. Conclusion

The findings from our research clearly demonstrate that we have achieved our primary objectives, which paves the way for us to share our innovative educational strategies with schools within our targeted demographic. As a cohesive research team, we strongly advocate for the prioritization of teacher development as an essential precursor to effectively implementing these outcomes in the classroom.

It is vital to acknowledge the various obstacles and complexities associated with enhancing problem-solving skills among teachers and students alike. Insights gathered from the experimental group of teachers revealed several critical concerns. Many educators reported a heavy reliance on conventional, everyday problem-solving techniques that may not adequately address the nuanced challenges students face. Additionally, teachers expressed difficulties in crafting engaging and relevant case studies that would effectively promote student practice and application of these skills.

The issue of time emerged prominently, as educators noted that engaging in meaningful problem-solving activities can be labor-intensive and demanding, which often detracts from the time available for other essential instructional tasks. Lastly, teachers highlighted the struggle of distinguishing between real-world problems and hypothetical scenarios, emphasizing the need for clearer guidelines and strategies to better prepare students for real-life applications of their learning. Addressing these challenges will be crucial for the successful integration of our educational innovations.

Insights drawn from a variety of reputable sources, including Harappa (2020), Eller Executive Education (2017), Mull et al. (2020), and Gomez (2020), highlight several significant challenges that must be addressed in problem-solving and decision-making processes. These challenges include the tendency for misdiagnosis, which occurs when the root of a problem is incorrectly identified, and pervasive communication barriers that hinder effective collaboration. Furthermore, specific cognitive biases, such as solution bias, confirmation bias, and emotional biases, complicate our ability to view situations objectively. This underscores an urgent need for developing greater empathy in interactions to foster understanding and mitigate these issues.

Moreover, several other critical challenges need our attention. For instance, a mental set might limit our ability to consider new solutions, while functional fixedness can prevent us from using familiar tools in innovative ways. Unwanted constraints, often self-imposed or stemming from organizational culture, can stifle creativity. Additionally, groupthink, which occurs when a group prioritizes consensus over critical evaluation of alternatives, can impede effective decision-making. The presence of irrelevant information can clutter our thought processes, creating confusion, while paradigm blindness may prevent us from recognizing widely accepted but potentially flawed frameworks.

In tackling these multifaceted issues, we face complications that complicate our understanding of problems. For instance, recognizing the intricacies of large-scale challenges, effectively managing poorly framed problems, and identifying their underlying causes are imperative. These complications compel us to seek clarity and a deeper understanding of the situations at hand.

Furthermore, it is essential to acknowledge the complexities inherent in identifying all involved stakeholders and the challenges posed by the absence of reliable methods for analysis. A lack of awareness regarding how our brains function can lead to misinterpretations of situations, while the dynamics of group interactions significantly influence outcomes. By fostering an environment of collaboration and encouraging innovative thinking, we can empower ourselves and those around us to navigate these challenges more effectively, paving the way for a brighter and more inclusive future.

References

Abazov, R. (2022, May 10). *How to improve your problem-solving skills*. Retrieved from http://surl.li/vagqlo

Ahuja, H. (2021, August 4). *Six strategies to instill problem-solving skills in students*. Retrieved from http://surl.li/vnhlnm

Amadi, E.C. (2008). *Introduction to educational administration: A module*. Harvey Publications.

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

Barkman, S., & Machtmes, K. (2002). *Problem-solving survey questionnaire*. Retrieved from http://surl.li/bwoybk

Chaichanawirote, U., & Vantum, C. (2017). Evaluation of content validity for research instrument. *Journal of*

Nursing and Health Sciences, *11*(2), 105-111.

Code Genius Academy. (2023). *Know problem-solving skills, mold children to keep up with the times. The future world*. Retrieved from https://shorturl.at/70tE1

Cohen, S. (2017, March 10). *Five traits of a problem solver*. Retrieved from http://surl.li/xealde

Cuemath. (2021, January 26). *Problem-solving skills: Meaning, examples & techniques*. Retrieved from https://shorturl.at/qKijq

Davret, B. (2020, August 14). *The 7 traits of history's greatest problem solvers*. Retrieved from http://surl.li/jwetat

Delaney, H. (2019, April 22). *Education for the 21st Century*. Retrieved from https://shorturl.at/NN2xn

Dhammei, T. (2022, January 15). *Educational administration: Concepts of educational administration and principles of educational administration*. Retrieved from https://shorturl.at/bGVW5

Doyle, A. (2020, October 21). *What are problem-solving skills?* Retrieved from https://shorturl.at/coXi9

Edmentum. (2018, May 21). *Five principles of professional development for teachers.* Retrieved from https://bit.ly/3ZNjVoz

Eller Executive Education. (2017, November 21). *Barriers to effective problem solving*. Retrieved from http://surl.li/gjrvok

Eylul, D. (2012). *Development of problem-solving confidence questionnaire: Study of validation and reliability TOLGA*. Retrieved from http://surl.li/zmlhwf

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference. 11.0 update* (4th ed.). Allyn & Bacon.

Gomez, C. P. (2019, April 4). *The six main barriers against problem-solving and how to overcome them*. Retrieved from http://surl.li/wpzrsu

Gulshan. (2023, September 26). *Internet: Its advantages and disadvantages*. Retrieved from https://jbms.in/internet-its-advantages-and-disadvantages/

Guskey, T. R. (2000). *Evaluating professional development*. Corwin Press, Inc.

Gutierrez, E. (2012, May 11). *Problem-solving skills are an important factor in academic Success*. Retrieved from https://shorturl.asia/hvu0R

Harappa. (2020, October 20). *Barriers to problem-solving*. Retrieved from http://surl.li/ygpasf

HCL Jigsaw. (2022). *21st-Century skills: Why is problem-solving the need of the hour for school students?* Retrieved from https://rb.gy/n0ub4i

Hoy, W. K., & Miskel, C. G. (2001). *Educational administration: Theory, research, and practice* (6th ed.). McGraw-Hill.

Indic Education. (2023, March 30). *Boost problem-solving and analytical thinking in students: Top skills for success in 2023.* Retrieved from https://shorturl.asia/9Ms6J

Instagantt. (2022, August). *A complete guide to know what is problem-solving*. https://shorturl.at/fnvAg

Kaplane (n.d.). *The principles of effective professional development*. Retrieved from https://bit.ly/3Tc1IOT

Kaplinsky, R. (2021, December 21). *Four tips for improving students' problem-solving skills***.** Retrieved from http://surl.li/qavvzy

Krathwohl, D. R. (2002). A Revision of Bloom's taxonomy: An overview. *Theory Into Practice*, *41*(4), 212-218. https://doi.org/10.1207/s15430421tip4104_2

Kratumnok, P., & Phrakhrusutheejariyawattana. (2024). Empowering teachers' learning to strengthen students' teamwork skills. *World Journal of Education*, *14*(2), 1-11. https://doi.org/10.5430/wje.v14n2p1

Kumon. (2020). *Developing problem-solving skills in children*. Retrieved from http://surl.li/vygohy

Maheshwari, V. K. (2017, January 4). *The problem-Solving method in education*. Retrieved from https://shorturl.at/oAKYr

Marlborough school. (2020, March 19). *Why is problem-solving important in child development?* Retrieved from https://rb.gy/0iklpf

Marzano, J. R. (2014, May 1). *Art and science of teaching/problem-solving in seven steps*. Retrieved from

http://surl.li/loqwgo

Master Class. (2021, June 21). *How to develop problem-solving skills: Four tips*. Retrieved from http://surl.li/ozsrjn

Mattingly, J. (2020, November 30). *Developing problem-solving skill for kid strategies & tip*. Retrieved from *http://surl.li/hvngnt*

McFarland, S. (2021, October 20). *Importance of problem-solving in child development*. Retrieved from https://rb.gy/ayukw5

MindTools. (n.d.). *How good is your problem-solving?* Retrieved from http://surl.li/gddhgw

Morin, A. (2021, April 13). *How to teach kids problem-solving skills?* Retrieved from http://surl.li/igszcu

Mull Over Thing. (2020, April 27). *How do you overcome problem-solving obstacles?* Retrieved from http://surl.li/oiedja

Norris, K., & Kreisberg, H. (2021). *Three ways to improve your students' problem-solving skills*. Retrieved from https://shorturl.at/zHbNX

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

OSIRI Educational. (2021, 25 August). *Five ways to encourage problem-solving in your classroom*. Retrieved from https://shorturl.at/ZuIZr

Promrub, S., & Sanrattana, W. (2022). Online program to empower teacher learning to develop students' digital literacy skills. *Education Quarterly Reviews*, *5*(2), 469-483. https://doi.org/10.31014/aior.1993.05.02.506

Queendom. (n.d.). *Creative problem-solving test*. Retrieved from http://surl.li/kcarfy

Resultant. (2015, December 9). *Five characteristics of fearless problem solvers*. Retrieved from http://surl.li/edgthn

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.

Rubin, M. (n.d.). *The independent-interdependent problem-solving scale*. Retrieved from http://surl.li/ukwtih

Sanrattana, W. (2023). *Research in educational administration: Concepts, practices and case studies* (5th ed.). Thiphawisut.

Search Institute. (2012, February 2). *Seven ways to cultivate students' problem-solving skills*. Retrieved from https://shorturl.at/DmJKP

Semanticscholar. (n.d.). *Development of an inventory of problem-solving abilities of tertiary students majoring in engineering technology*. Retrieved from http://surl.li/kvoidj

Sithara, S. (2021, July 12). *Nine effective ways to teach problem-solving skills to kids*. Retrieved from https://shorturl.at/FeUSl

Strategic Search Solutions. (2017, September 24). *The top 10 characteristics of problem solvers*. Retrieved from http://surl.li/xrwwzh

Suchato, P. N., & Phrakhrusutheejariyawattana. (2024). Development for teachers' learning to enhance prosocial behavior for students. *World Journal of Education*, *14*(2), 140-150. https://doi.org/10.5430/wje.v14n2p140

Tan, C. (2019, February 6). *Five characteristics of a good problem solver*. Retrieved from http://surl.li/dmoprm

Teach Thought Staff. (n.d.). *Twelve strategies for creating a culture of problem-solving in your Classroom*. Retrieved from https://shorturl.at/Aw4ei

Teacher Vision Staff. (2022, February 28). *Problem-solving*. Retrieved from http://surl.li/ebxqer

Toro, S. (2021, February 12). *Guiding students to be independent problem solvers in STEM classrooms.* Retrieved from http://surl.li/wlvmqe

Türk, L. (2020, May 20). *Seven barriers to problem-solving skill development*. Retrieved from http://surl.li/nrimgx

University of Bridgeport. (2022, May 19). *What does an education administrator do?* Retrieved from https://www.bridgeport.edu/news/what-does-an-education-administrator-do/

Warner, J. (2002). *Problem-solving and decision-making profile.* Retrieved from http://surl.li/nubqqb

Warren, R. (2022, January 29). *Problem-solving methods and techniques*. Retrieved from https://shorturl.at/bmFCT

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

Zieniūtė, U. (2024, July 16). *Benefits of the internet and how it improves our lives*. Retrieved from https://nordvpn.com/blog/benefits-of-the-internet/

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Authors contributions

Waranyoo Sochat, Ed.D. student, handled all research steps: problem study, method design, innovation creation, fieldwork, results summary, and reporting. Assistant Professor Dr. Witoon Thacha guided and consulted throughout. Waranyoo Sochat drafted and revised the manuscript. Assistant Professor Dr. Witoon Thacha approved the final version.

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