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The impact of problem-solving skills in learning on the learning motivation of 9th grade students

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Abstract
The objective of this study is to assess the current state of problem-solving skills in learning among 9th-grade students and to verify its impact on students' learning motivation. The research design is quantitative, descriptive, cross-sectional, based on a sample of 811 students selected randomly and conveniently; data were collected through self-report questionnaires and processed using SPSS 27.0 statistical software. The survey results show that problem-solving skills in learning among 9th-grade students are still somewhat limited in both aspects: understanding the skill and proficiency in performing the skill. Students' learning motivation is at a "fair" level, and problem-solving skills have a positive impact on students' learning motivation. The research results provide further practical evidence on the current state of problem-solving skills in students' learning, as well as their impact on the learning motivation of 9th-grade students. The study also points out some solutions that need to be implemented to develop this skill in students, contributing to improving students' learning motivation and the effectiveness of general education in Vietnam.

Keywords: Problem-solving skills in learning, learning motivation, 9th - grade students

1. Introduction
In the context of globalization and the Fourth Industrial Revolution, science and technology are developing rapidly, and people's lives are increasingly improving thanks to many modern technological devices and diverse information channels. The Internet, social networks, and media have helped people access knowledge faster than ever before, contributing to the advancement of all areas of social life, including education (UNESCO, 2016) [22]. This context demands that the Vietnamese education sector constantly innovate to keep pace with global trends. The 2018 General Education Program (Vietnamese Ministry of Education and Training, 2018) [4] was created with the goal of "helping students develop harmoniously in terms of physical and mental health; becoming active, confident learners with a sense of career choice and lifelong learning; possessing good qualities and necessary abilities to become responsible citizens, cultured, diligent, and creative workers, meeting the requirements of national construction and defense in the era of globalization and the new industrial revolution". Teaching in the new era is not only a process of transmitting knowledge, but must also be a process of organizing and guiding learners to gradually acquire knowledge, forming core thinking abilities and skills (Loc, 2018; Hang & Tu, 2025) [12, 10]. Among the core competencies of 21st-century students, problem-solving skills are considered a key competency. This skill helps learners analyze situations, identify problems, develop solutions, and make appropriate decisions, thereby learning effectively and adapting flexibly to the changes of modern society (OECD, 2019) [18]. For middle school students, especially 9th-grade students - the transitional stage between middle school and high school developing problem-solving skills plays a crucial role in fostering independent thinking, initiative, self-learning ability, and creativity (Oanh, 2021) [17]. However, educational practice shows that middle school students in general, and 9th-grade students in particular, still face certain difficulties in identifying and handling learning problems (Nguyen, 2024; Dung, 2025) [14, 7]. Other life skills, such as communication, self-awareness, emotional management, goal setting, etc., have not yet been fully and systematically developed (Tran and Nguyen, 2019; Huyen, Nga, & Thang, 2024) [21, 9]. Although the Ministry of Education and Training has advocated integrating life skills education since 2010, implementation still has many

limitations. The reality of school violence and unfortunate incidents involving students in recent times shows that the lack of life skills, including problem-solving skills, remains a "gap" that needs attention (Nguyen, 2023; Nhung, 2024; Thống & Dũng, 2025) [15, 13]. Educating students in problem-solving skills from everyday learning and life situations will help them improve their flexibility, perceptiveness, and ability to choose the optimal solution for each specific situation (Huyen, Nga, & Thang, 2024) [9].

2. Methodology

2.1. Research objectives and hypotheses

The objective of this study is to assess the current state of problem-solving skills in learning among 9th-grade students and to verify the impact of these skills on students' learning motivation. In addition, the study proposes several solutions to develop problem-solving skills in learning for students.

The research hypotheses of this study include:

- **H_1:** Problem-solving skills in learning among 9th-grade students are at a quite high level.
- **H_2:** Learning motivation among students is at a fairly high level.
- **H_3:** Problem-solving skills have a positive impact on students' learning motivation.

2.2. Research design

This study employs both descriptive cross-sectional and quantitative research methods. A questionnaire was used to collect data at a single point in time from the research sample. SPSS 27.0 social statistics software was used to process the survey data and draw research conclusions.

2.3. Research sample

The sample size was estimated using Cochran's (1977) formula for estimating proportions: $n_0=Z^2p(1-p)/e^2$. With a 95% confidence level (Z = 1.96), p = 0.5 (assuming conservation), and an allowable error e = 0.035 (3.5%), the minimum sample size for the study was estimated to be n = 784. The sampling criteria were students currently in grade 9 who consented to participate in the survey. The research sample was selected using a convenient, stratified sampling method to ensure representativeness of the study area. A total of 811 valid responses were received from students of 7 secondary schools in different areas of Ho Chi Minh City, Vietnam; this data met the minimum sample size requirement for the study.

2.4. Measuring tools

Research data was collected through self-reported questionnaires containing the following scales:

The Learning Problem-Solving Skills Scale is built on a theoretical framework and expert consultation. The scale consists of 54 indicators/propositions, measuring 6 component skills: (1) Problem-identifying skills in learning, (2) Analyzing and identifying the nature of the problem, (3) Proposing solutions to the problem, (4) Selecting the optimal solution and planning to solve the problem, (5) Implementing the problem-solving plan, and (6) Evaluating and improving the effectiveness of problem-solving. Each skill is assessed through 2 criteria: Level of awareness/understanding of the skill and Level of proficiency of the skill. All indicators are measured on a 5-point Likert scale. The results of Cronbach's alpha analysis on a sample of 50 students show that all subscales have Cronbach's alpha > 0.70. Thus, the scale ensures reliability and can be used for formal surveys.

The Academic Motivation Scale AMS-C28 (College Version), was developed by Vallerand *et al*. (1992) [23]. This scale consists of 28 propositions, divided into 7 subscales, corresponding to three main motivational groups: (1) intrinsic motivation, (2) extrinsic motivation, and (3) lack of motivation. The propositions are evaluated on a 7-point Likert scale (1 = completely untrue to 7 = completely true). Quang *et al*. (2017) validated the AMS-C28 scale in Vietnam and reported high overall reliability (Cronbach's alpha = 0.983). The study by Duong *et al*. (2019) on this scale also reported an overall Cronbach's alpha of 0.89, and all subscales had coefficients $\alpha \geq 0.80$, indicating good reliability of the scale.

Scales measuring socio-demographic variables of participants: Gender scale (using a nominal scale with 2 values: Male and Female), academic achievement scale (measured through the student's academic performance rating in the most recent semester, with 4 levels: Excellent, Good, Average, and Fail), scale of orientation towards high school (using a nominal scale with 2 values: The field of natural sciences and The field of Social Sciences and Humanities).

2.5. Data collection process

Google Forms were designed to collect data. A survey link was sent to students in the study who agreed to participate. The survey data were then pre-checked, removing inappropriate responses before final processing to ensure accuracy. The result showed 811 valid responses, eligible for statistical analysis.

2.6. Data processing

The survey data were processed using SPSS 27.0 social statistics software. Statistical calculations and quantities were used to test the research hypotheses. The statistics used in this study include: descriptive statistics of frequency (N), percentage (%) of socio-demographic characteristics of the survey sample; mean (Mean) and standard deviation (SD) statistics; and inferential statistics such as One Sample T-Test and One-way ANOVA to test hypotheses H1 and H2; correlation analysis and regression analysis to test hypothesis H3.

3. Results and Discussion

3.1. Description of the research sample

Table 1: Characteristics of study participants

		N	%
Gender	Male	449	55.4
	Female	362	44.6
	Total:	811	100
Academic achievements	Excellent	219	27.0
	Good	388	47.8
	Average	204	25.2
	Below average	0	0
	Total:	811	100
Fields of study in high school	The field of natural sciences	495	61.0
	The field of Social Sciences and Humanities	316	39.0
	Total:	811	100

(**Source:** Results of data processing from field surveys, 2025)

The statistical results in Table 1 show that out of a total of 811 ninth-grade students participating in the survey, 449

(55.4%) were male and 362 (44.6%) were female. Regarding academic performance: the majority of students had a "Good" academic performance - 388 students (47.8%), 219 (27%) had an "Excellent" academic performance, the remaining students were classified as "Average" - 204 (25.2%), and no students had a "Below average" academic performance. The majority of students in the study sample intend to study in the Natural Sciences stream when entering high school - 495 (61.0%). In comparison, the remaining 316 (39%) will study in the Social Sciences and Humanities stream. These statistics show that the survey participants have a fairly diverse distribution of socio-demographic characteristics.

3.2. The current state of problem-solving skills in learning among 9th-grade students

The problem-solving skills of 9th-grade students were assessed across six aspects or six component skills, linked to two criteria: the students' level of understanding of the skill and their level of proficiency in problem-solving. The results are as follows:

Table 2: Levels of problem-solving skills demonstrated by students

No	Manifestations	(1) Skill understanding		(2) Skill proficiency		((1)+(2))/2		Rank
		M	SD	M	SD	M	SD	
1	Skills in identifying learning problems	3.48	*.33*	3.75	*.59*	3.62	*.34*	6
2	Skills in analyzing the nature of a problem	3.86	*.46*	3.77	*.55*	3.81	*.36*	3
3	Skills in proposing solutions to problems	3.94	*.53*	3.60	*.56*	3.77	*.38*	4
4	Skills in selecting optimal solutions and planning problem-solving	3.75	*.47*	3.91	*.35*	3.83	*.29*	2
5	Skills in implementing plans to solve problems	3.64	*.36*	3.84	*.34*	3.74	*.24*	5
6	Skills in evaluating and improving problem-solving effectiveness	4.29	*.32*	4.08	*.38*	4.19	*.26*	1
Problem-solving skills in the learning of students in general		3.83	*.17*	3.83	*.20*	3.83	*.13*	
* Note: The lowest average score is 1.00; the highest is 5.00. The higher the average score, the higher the skill level.								

Considering the entire scale, the statistics in Table 2 show that students' problem-solving skills have an average score (M) of "Fair" (M = 3.83/5.0). The mean for the two criteria, Level of understanding and Level of proficiency in problem-solving, is the same (both have M = 3.83). This result indicates that 9th-grade students in Ho Chi Minh City currently possess problem-solving skills in their studies, but at a not-yet-high level, still limited in both understanding the skills and proficiency in performing the steps of the problem-solving process. Considering each aspect individually, students' self-assessment means for the six component skills in problem-solving showed slight differences but were all at a Fair level (M from 3.64 to 4.19). Specifically, students rated their problem-solving assessment and improvement skills with the highest mean (M = 4.19), while problem identification in learning had the lowest mean (M = 3.62). The level of understanding and proficiency in performing the six component skills associated with the six steps of the problem-solving process was also self-assessed at a Fair level ($M_{Understanding}$ = 3.48 to 4.29; $M_{Proficiency}$ = 3.60 to 4.08). Thus, the limitations in problem-solving skills among 9th-grade students occurred across all six component skills and at a fairly similar level.

Table 3: Problem-solving skills of students by percentage

No.	Các mức độ	N	%
1	Low	17	2.1
2	Average	82	10.1
3	Quite high	687	84.7
4	High	25	3.1
Total:		811	100

Analyzing students' problem-solving skills across four levels, the statistical results in Table 3 show that the majority of 9th-grade students currently possess this skill at a "Quite high" level (687 students - accounting for 84.7%), 25 students (3.1%) have a "High" level, and a significant proportion of students have a "Average" or lower level (99 students - accounting for 12.2%). This data indicates that the percentage of students with "High" skills is still very modest, and many students still lack this basic skill in their studies. This survey suggests that teachers and schools need to pay more attention to improving problem-solving skills in 9th-grade students.

Table 4: Problem-solving skills of students compared by gender

Criteria	Male		Female		T-Test
	M	SD	M	SD	
Skill understanding	3.83	.17	3.82	.16	F= 0.118 Sig. = 0.731
Skill proficiency	3.82	.20	3.84	.19	F= 0.958 Sig. = 0.328
Problem-solving skills in the learning of students in general	3.83	.13	3.83	.12	F= 1.208 Sig. = 0.272

Comparing the problem-solving skills of 9th-grade students by gender, the data in Table 4 shows no statistically significant difference in the level of this skill between male and female students. In general, male and female students have similar skill levels, both at a "Quite high" level (M_{Male} = 3.83, M_{Female} = 3.83). Considering the two evaluation criteria, the statistical analysis also shows no statistically significant difference in the level of understanding of the skill and the level of proficiency in problem-solving between male and female students. Thus, gender does not affect the problem-solving skills of students.

Table 5: Problem-solving skills of students compared to academic achievement

Criteria	Ranking						One-way ANOVA Test
	Excellent		Good		Average		
	M	SD	M	SD	M	SD	
Skill understanding	3.81	.16	3.84	.17	3.82	.16	F= 1.710 Sig. = 0.182
Skill proficiency	3.85	.18	3.81	.21	3.83	.17	F= 2.431 Sig. = 0.089
Problem-solving skills in the learning of students in general	3.83	.12	3.82	.14	3.82	.12	F= 0.163 Sig. = 0.850

The results of the analysis of differences in problem-solving skills among groups of 9th-grade students with different academic abilities, aimed at verifying the influence of academic achievement on this skill, showed no statistically significant difference. The data in Table 5 confirm that problem-solving skills in learning are the same among groups of students with different academic abilities ($M_{Excellent}$ = 3.83, M_{Good} = 3.82, $M_{Average}$ = 3.82).

3.3: Learning motivation of 9th-grade students

Students' learning motivation is measured through three aspects: intrinsic motivation, extrinsic motivation, and lack of motivation. The survey results on these aspects are presented in the table below:

Table 6. Statistical results of students' learning motivation

Aspects		M	SD
1. Intrinsic motivation	To know	5.97	.57
	Toward accomplishment	6.25	.47
	To experience stimulation	5.46	.52
2. Extrinsic motivation	Identified	5.82	.54
	Introjected	5.55	.60
	External regulation	5.79	.40
3. Amotivation	Amotivation	6.08	*.37*
The overall level of student motivation for learning:		5.84	***.23***

***Note:** The lowest average score is 1.00; the highest is 7.00. The higher the average score, the higher the motivation.

The survey results in Table 6 show that the learning motivation of 9th-grade students is generally at a fairly high level (M = 5.84/7.00).

Within the intrinsic motivation group, the highest average score belonged to achievement-oriented motivation (M = 6.25; SD = .47), indicating that students tend to set goals and aspire to achieve specific academic accomplishments. Motivation for understanding was quite high (M = 5.97; SD = .57), reflecting the need to expand knowledge and satisfy intellectual curiosity. Motivation for seeking stimulation was lower (M = 5.46; SD = .52), suggesting that some students found less intense interest or excitement in the learning process.

Regarding external motivation, Extrinsic motivation-Identified (M = 5.82; SD = .54) and external regulation (M = 5.79; SD = .40) were quite high, reflecting students' learning being linked to value orientation and demands from the surrounding environment. Motivation due to self-pressure was lower (M = 5.55; SD = .60).

Notably, the average score of the lack of motivation scale was quite high (M = 6.08; SD = .37), suggesting a paradox: students were both motivated to complete and achieve results, yet also experienced fatigue, lack of direction, and felt that learning was meaningless.

Thus, it can be seen that 9th-grade students mainly study to achieve specific results, while simultaneously lacking motivation. This is a warning sign that educational measures are needed to help students connect learning with intrinsic joy and interest, instead of focusing solely on results or external pressure.

3.4. The impact of problem-solving skills on students' learning motivation

The impact of learning skills on students' motivation and academic achievement has been confirmed in many recent studies by domestic and foreign authors (Chinh *et al*., 2020; Nur'azizah *et al*., 2020; Linh, 2020; Binh & Thuy, 2021; An *et al*., 2022; Adawiyah *et al*., 2023) [5, 16, 11, 2, 1, 24]. Most studies indicate that students with learning skills tend to have better motivation and academic achievement, and vice versa. To verify the impact of problem-solving skills on the learning motivation of 9th-grade students in Ho Chi Minh City, we conducted an analysis based on actual survey data and obtained the following results:

Table 7: Relationship between problem-solving skills and student learning motivation

Variables	M	SD	Correlation analysis		Regression analysis		
			r	Sig.	β	t	Sig.
Problem-solving skills	3.83	0.13	0.096	0.006	0.096	2.734	0.006
Learning motivation	5.84	0.23					

The results of the analysis in Table 7 indicate that problem-solving skills have a positive impact on students' overall learning motivation, explaining 9.6% of the variation in learning motivation (β = 0.096, p<0.01). Although the impact is not significant, it confirms that enhancing problem-solving skills in learning among students will contribute to increased learning motivation. Thus, the findings of this study are consistent with many previous studies (Nur'azizah *et al*., 2020; Adawiyah *et al*., 2023) [16, 1].

3.4. Some solutions for developing problem-solving skills in learning for 9th-grade students: The survey results presented above reveal certain limitations in students' problem-solving skills today. Ninth-grade students currently have a fairly good understanding of problem-solving skills, but their proficiency in these skills is limited. Motivation and learning styles have only a low impact on students' problem-solving skills, reflecting that the skill itself is more heavily influenced by educational conditions and the learning environment. These findings provide an important basis for developing solutions focused on bridging the gap between awareness and action, enhancing practical experience, and fostering problem-solving skills in learning for students. To develop problem-solving skills in learning for ninth-grade students, we propose the following solutions to be implemented simultaneously:

Solution 1. Develop and effectively organize skills clubs for students in schools: According to the new general education curriculum guidelines, problem-solving and creative skills are among the core competencies that need to be developed in students. However, most current programs mainly focus on general skills such as communication, cooperation, teamwork, etc., without paying adequate attention to developing problem-solving skills in learning. In general secondary schools, life skills education is implemented in various forms, such as integration into regular lessons, organizing separate skills lessons, or incorporating them into experiential activities and thematic activities. The form of organizing skills clubs to train students' skills has not been widely exploited. Developing problem-solving skills in learning for students through the organization of skills clubs in schools needs to be considered:

- The program of activities should be developed based on the principles of psychology and education, and linked to the goals of developing qualities and competencies according to the new general education curriculum.
- The club activities focus on specific problem-solving skills, following a cognitive-attitude-behavioral structure, ensuring both theoretical depth and practical application.
- The design duration is tailored to fit the schedule of the second session or extracurricular club activities, facilitating full student participation.
- The program is open and flexible, and can be adapted to the educational conditions of each school.
- During implementation, teachers should focus on organizing practical activities such as group discussions, case studies, simulation games, presentations, and debates. Students are required to keep learning journals, provide feedback, and self-adjust to maximize effectiveness.

Through club activities, students will achieve the basic requirements of problem-solving skills in their studies. They will not only master knowledge and develop a positive attitude towards problem-solving, but also practice specific skills such as identifying problems, analyzing causes, selecting optimal solutions, implementing, and evaluating solutions. As a result, students develop initiative, creativity, and independent learning abilities, contributing to improved academic performance and better preparation for the next stage of their education.

Solution 2: Strengthen the organization of specialized training courses on problem-solving skills in learning for students: Problem-solving skills in learning are a core skill that helps students better adapt to the increasingly demanding requirements of the curriculum, while also fostering independent and creative thinking. However, the reality in many junior high schools over the past three years shows that training programs specifically for this skill are still limited, and in some cases, no specialized programs are focusing on problem-solving in learning. Training activities on life skills and learning skills have a positive effect in equipping students with knowledge and developing practical skills. Through these training sessions, students not only access theory but also participate in simulated situations, discussions, and practical exercises to improve their problem-solving skills. Developing problem-solving skills in learning for students through specialized training programs requires attention to the following:

- The thematic content must stem from students' learning experiences and be closely related to the difficulties they commonly encounter during their studies.
- The timing and format should be appropriate and engaging to encourage active student participation.
- Ensure the quality of speakers and presenters, prioritizing experts in the fields of education, school psychology, and life skills training.
- During the training process, group activities, situational games, open discussions, and critical thinking are organized to give students opportunities to practice their skills.
- Collect feedback from students after each module to assess effectiveness and adjust content as needed.

Solution 3. Strengthen psychological counseling activities to support students in solving learning problems

School psychological counseling is a professional activity aimed at supporting students' holistic development in cognitive, emotional, behavioral, and social skills, helping them adapt to the learning environment and life (Oanh, 2010; Duc, 2006) [25, 26]. Studies have shown that school counseling not only plays a role in soothing emotions but, more importantly, guides students to develop essential skills to proactively cope and thrive in their studies and in life (Binh, 2014) [27].

In practice, many middle school students, especially those in their final year, often struggle with academic challenges such as a large volume of knowledge, exam pressure, and limitations in analyzing and choosing learning strategies. Without appropriate support, they can easily become stressed, discouraged, or choose ineffective learning solutions. Therefore, applying psychological counseling to support the development of problem-solving skills in learning is necessary and has practical significance. To effectively implement this solution, the following points should be considered:

- The psychologist/counselor has expertise in school psychology and a thorough understanding of the problem-solving skills training process.
- There is a specific consultation plan, clearly defining the objectives, content, and progress of each consultation session.
- Ensure the principles of voluntariness, confidentiality, and cooperation throughout the consultation process.

- When necessary, mobilize coordination from subject teachers, homeroom teachers, and parents to agree on a support strategy.
- Throughout the counseling process, students are required to participate in discussions, role-playing, journaling, and personal feedback to develop habits of self-monitoring and improvement.

Psychological counseling aimed at supporting the development of problem-solving skills in learning not only helps students improve their understanding of the problem-solving process in learning, but also trains them in specific behaviors for practicing problem-solving.

4. Conclusion

Based on the survey results from a sample of 811 randomly selected 9th-grade students from 7 junior high schools in Ho Chi Minh City regarding problem-solving skills in learning and their impact on student motivation, the study draws the following conclusions: 9th-grade students' problem-solving skills are still limited in both aspects: understanding the skill and proficiency level; students' learning motivation is at a moderate level; and problem-solving skills have a positive impact on students' learning motivation. Teachers and schools need to pay attention to and strengthen the implementation of appropriate solutions to further develop students' problem-solving skills in learning. Recommended solutions to be strengthened in the future include: Developing and effectively organizing skill-based clubs for students in schools; strengthening the organization of training workshops on problem-solving skills in learning for students; and enhancing psychological counseling activities to support students in solving learning problems.

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