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REFLECTIVE THINKING AND PROBLEM-SOLVING SKILLS AMONG UNIVERSITY STUDENTS: LEVELS, GROUP DIFFERENCES, AND ASSOCIATIONS

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ABSTRACT

This study examined levels of reflective thinking and problem-solving skills among undergraduate students and tested differences according to gender and academic specialization. A descriptive correlational-comparative design was used. The sample comprised 170 students from the Department of Psychology, College of Social Sciences, Imam Mohammad Ibn Saud Islamic University, including 94 males (55.3%) and 76 females (44.7%). Participants completed the Reflective Thinking Questionnaire developed by Kember et al. (2000) and an Arabic version of the Problem-Solving Skills Scale based on Heppner and Baker (1997). Descriptive statistics, Cronbach's alpha, Pearson correlations, and independent-samples t-tests were used. The findings showed a high overall level of reflective thinking (M = 3.51, SD = 0.40) and a moderate overall level of problem-solving skills (M = 2.89, SD = 0.46). Gender differences were not statistically significant in reflective thinking or problem-solving skills. However, statistically significant differences in reflective thinking were found according to academic specialization, favoring students in scientific specializations, with the strongest difference in the total reflective thinking score (d = 0.80). No statistically significant differences in problem-solving skills were found according to specialization. Reflective thinking was positively and significantly associated with problem-solving skills (r = .551, p < .001). The findings support the importance of embedding reflective thinking and problem-solving activities in university courses, particularly through active learning, inquiry-based tasks, and structured reflection.

KEYWORDS: Reflective Thinking, Problem-Solving Skills, University Students, Gender, Academic Specialization.

1. INTRODUCTION

Thinking has long occupied a central position in cognitive and educational psychology because it represents the mental basis through which learners interpret experience, organize knowledge, and respond to academic and life demands. Classical developmental accounts emphasized that learners construct increasingly complex mental structures as they interact with their environment, while contemporary educational approaches view thinking as a set of teachable, developable skills that can be strengthened through classroom practice, self-regulation, and purposeful learning experiences (Al-Rafou', 2017; Zimmerman & Schunk, 2011).

Within this broader framework, reflective thinking represents a particularly important form of higher-order cognition. Dewey's educational view of reflection emphasized purposeful inquiry, reconsideration of experience, and the disciplined search for meaning before action. Later educational research extended this view by describing reflective thinking as a metacognitive process through which learners revisit assumptions, examine evidence, evaluate alternatives, and reconstruct understanding (Ghanizadeh, 2017; Kember et al., 2000). Kember et al. (2000) conceptualized reflective thinking across four levels: habitual action, understanding, reflection, and critical reflection. This model is especially useful in higher education because it distinguishes routine learning from deeper reflective processing and transformative reconsideration of beliefs.

Reflective thinking has practical importance for university students. Students who engage in reflection are more likely to monitor their learning, link new knowledge with prior experience, evaluate the quality of their reasoning, and adjust their learning strategies. These processes are closely linked to academic maturity and to the learner's ability to deal with complex tasks rather than rely only on memorization.

Problem-solving skills are similarly central to university learning and to students' adaptation to academic and social challenges. Problem solving has been defined as a self-directed cognitive-behavioral process through which individuals identify problems, generate possible solutions, select appropriate strategies, implement decisions, and evaluate outcomes (D'Zurilla & Nezu, 2001). In educational contexts, problem-solving skills are not limited to mathematics or science. They represent a general competence required for decision making, self-learning, collaboration, and adaptation to rapid social and technological change (Care et al., 2016; Shaheen, 2013).

The theoretical link between reflective thinking and problem solving is strong. Reflection allows students to analyze the problem situation, examine assumptions, interpret information, and evaluate alternative solutions before acting. Problem solving, in turn, provides a practical context in which reflective thinking can be activated and tested. Accordingly, students who show higher reflective thinking may be expected to show stronger problem-solving skills, particularly in defining problems, generating alternatives, making decisions, and evaluating outcomes (Demirel et al., 2015; D'Zurilla et al., 2004).

Previous findings regarding demographic differences remain mixed. Some studies have reported differences in reflective thinking or problem-solving skills according to gender or specialization, whereas others have found no statistically significant differences (Abdul Latif & Abdul Jawad, 2020; Bal, 2015; Darwish, 2016; Miller et al., 2010). These inconsistencies justify further investigation in specific university contexts. In Saudi higher education, the development of students' cognitive, reflective, and problem-solving abilities is particularly relevant to quality improvement, employability, and the broader emphasis on preparing graduates who can respond flexibly to academic, professional, and societal challenges.

1.1. Problem of the Study

The university stage is a formative period in which students encounter academic, personal, and professional challenges that require mature thinking, reflective judgment, and effective problem solving. Although universities increasingly emphasize active learning and skills development, students may still vary in the extent to which they practice reflective thinking and problem-solving skills. In addition, previous studies have not produced consistent findings regarding whether these skills differ according to gender or academic specialization.

The present study therefore addresses the need to determine the level of reflective thinking and problem-solving skills among university students, examine differences according to gender and specialization, and test the association between the two constructs. The study is expected to provide evidence that can inform curriculum planning, teaching strategies, academic advising, and student-development programs.

1.2. Research Questions

1. What is the level of reflective thinking among

undergraduate students?
2. What is the level of problem-solving skills among undergraduate students?
3. Are there statistically significant differences in reflective thinking according to gender and academic specialization?
4. Are there statistically significant differences in problem-solving skills according to gender and academic specialization?
5. Is there a statistically significant relationship between reflective thinking and problem-solving skills among undergraduate students?

2. METHOD

2.1. Design

A descriptive correlational-comparative design was used. This design was appropriate because the study aimed to describe levels of reflective thinking and problem-solving skills, examine group differences, and test the association between the two variables without manipulating any independent variable.

2.2. Population And Sample

The target population comprised undergraduate students regularly enrolled in the Department of Psychology, College of Social Sciences, Imam Mohammad Ibn Saud Islamic University, during the academic year 2026. A stratified sampling procedure was used to ensure representation according to gender and academic specialization. The final sample included 170 students: 94 males (55.3%) and 76 females (44.7%). The mean age was 19.9 years (SD = 2.6) for males and 19.8 years (SD = 2.3) for females. Table 1 presents the sample characteristics. Although stratification within the department ensured proportional gender and specialization representation, the restriction to a single department at one institution should be noted as a potential constraint on the generalizability of the findings.

Table 1: Characteristics of the Study Sample (N = 170).

Variable	Category	n	%
Gender	Male	94	55.3
	Female	76	44.7
Academic specialization	Scientific	67	39.4
	Theoretical	103	60.6
Cumulative GPA	Medium	84	49.4
	High	86	50.6
Total		170	100.0

Note: Percentages are based on the total sample. The low GPA category had no recorded cases.

2.3. Instruments

Reflective Thinking Questionnaire. Reflective thinking was measured using the questionnaire developed by Kember et al. (2000). The scale consists of 16 items distributed across four dimensions: habitual action, understanding, reflection, and critical reflection, with four items per dimension. Responses were scored on a five-point Likert-type scale. After reverse coding the designated negatively worded items, higher scores indicated higher reflective thinking.

Problem-Solving Skills Scale. Problem-solving skills were assessed using an Arabic version based on Heppner and Baker's (1997) Problem-Solving Inventory framework. The scale used in the present study included 40 items distributed across five dimensions: general orientation, problem definition, generating alternatives, decision making, and evaluation. Responses were scored on a four-point Likert-type scale ranging from low applicability to high applicability. After reverse coding the negatively worded items, higher scores indicated stronger problem-solving skills.

2.4. Validity And Reliability Procedures

Face validity was examined by 10 faculty reviewers from the Department of Psychology, College of Social Sciences, Imam Mohammad Ibn Saud Islamic University. The reviewers evaluated the clarity of the instructions, the suitability of item wording for the Saudi university context, and the relevance of items to their dimensions. Based on their feedback, the scales were retained for field application. Regarding the linguistic adaptation of the Problem-Solving Skills Scale, the items were translated from English into Arabic by a bilingual specialist and subsequently reviewed for semantic equivalence and contextual appropriateness for the Saudi university student population prior to submission to the faculty panel.

Internal consistency was examined in a pilot sample of 30 students who were not included in the main sample. Item-dimension and item-total Pearson correlations were statistically significant at $p < .01$. Because item-level internal-consistency tables were lengthy and did not add essential information to the main results, they were summarized rather than

retained as full tables. Cronbach's alpha coefficients are reported in Table 2.

Table 2: Reliability Coefficients for the Study Instruments in the Pilot Sample (N = 30).

Scale/Subscale	Number of items	Cronbach's alpha
Reflective thinking: Habitual action	4	.781
Reflective thinking: Understanding	4	.819
Reflective thinking: Reflection	4	.844
Reflective thinking: Critical reflection	4	.863
Reflective thinking total	16	.901
Problem solving: General orientation	8	.905
Problem solving: Problem definition	8	.911
Problem solving: Generating alternatives	8	.902
Problem solving: Decision making	8	.851
Problem solving: Evaluation	8	.838
Problem-solving skills total	40	.909

Note: Alpha coefficients of .70 or higher were considered acceptable for research purposes.

2.5. Data Analysis

Frequencies and percentages were used to describe the sample characteristics. Means and standard deviations were used to describe levels of reflective thinking and problem-solving skills. Cronbach's alpha was used to estimate internal consistency. Pearson correlation coefficients were used to examine associations between reflective thinking and problem-solving skills. Independent-samples t-tests were used to test differences according to gender and academic specialization. Statistical significance was evaluated at $p < .05$, and Cohen's d was reported as an effect-size estimate for group comparisons.

3. RESULTS

3.1. Level Of Reflective Thinking

To answer the first research question, means and standard deviations were calculated for the reflective thinking dimensions and total score. As shown in Table 3, the total level of reflective thinking was high (M = 3.51, SD = 0.40). Critical reflection ranked first, followed by reflection, understanding, and habitual action.

Table 3: Means And Standard Deviations for Reflective Thinking.

Dimension	M	SD	Level	Rank
Habitual action	3.23	0.54	Moderate	4
Understanding	3.43	0.49	High	3
Reflection	3.59	0.32	High	2
Critical refl.	3.78	0.78	High	1
Total RT	3.51	0.40	High	-

Note: Scores were interpreted on a five-point scale. RT = reflective thinking; refl. = reflection.

This result indicates that students generally reported frequent use of reflective thinking, especially at the critical reflection level. The relatively lower score for habitual action is conceptually consistent with the nature of the construct, because habitual action represents more routine learning behavior than deeper reflective processing.

3.2. Level Of Problem-Solving Skills

To answer the second research question, means and standard deviations were calculated for the problem-solving dimensions and total score. As shown in Table 4, the overall level of problem-solving skills was moderate (M = 2.89, SD = 0.46). Problem definition ranked first, followed closely by general orientation, evaluation, decision making, and generating alternatives.

Table 4: Means And Standard Deviations for Problem-Solving Skills.

Dimension	M	SD	Level	Rank
General orient.	2.91	0.48	Moderate	2
Problem def.	2.92	0.46	Moderate	1
Alternatives	2.84	0.53	Moderate	5
Decision	2.88	0.58	Moderate	4
Evaluation	2.89	0.55	Moderate	3
Total problem-solving skills	2.89	0.46	Moderate	-

Note: Scores were interpreted on a four-point scale. orient. = orientation; def. = definition.

The moderate level suggests that students possess an acceptable foundation in problem-solving skills,

but the results also indicate room for improvement, particularly in generating alternatives and making decisions. This pattern supports the need for teaching strategies that require students to compare possible solutions, justify selected strategies, and evaluate outcomes.

3.3. Differences In Reflective Thinking by Gender

To answer the third research question, independent-samples t-tests were first conducted to examine gender differences in reflective thinking. As shown in Table 5, no statistically significant gender differences were found in any reflective thinking dimension or in the total score. The effect sizes were small.

Table 5: Gender Differences in Reflective Thinking.

Variable	Male	Female	t	df	p	d
Habitual action	3.26 (0.57)	3.20 (0.47)	0.678	168	.499	0.10
Understanding	3.41 (0.52)	3.47 (0.39)	-0.883	168	.378	-0.14
Reflection	3.58 (0.33)	3.62 (0.29)	-0.845	168	.399	-0.13
Critical refl.	3.77 (0.85)	3.80 (0.54)	-0.270	168	.788	-0.04
Total RT	3.50 (0.44)	3.53 (0.27)	-0.613	168	.541	-0.09

Note: Values in group columns are M (SD); male n = 94 and female n = 76. RT = reflective thinking; refl. = reflection. Cohen's d was calculated as male minus female; a negative value indicates a higher mean among females.

3.4. Differences In Reflective Thinking by Academic Specialization

Independent-samples t-tests were also conducted to examine specialization differences in reflective thinking. As shown in Table 6, statistically significant differences were found across all reflective thinking dimensions and in the total score, favoring students in scientific specializations. The effect size for the total score was large (d = 0.80), while subscale effects ranged from small to medium.

Table 6: Academic Specialization Differences in Reflective Thinking.

Variable	Scientific	Theoretical	t	df	p	d
Habitual action	3.49 (0.46)	3.18 (0.59)	3.708	168	< .001	0.58
Understanding	3.61 (0.36)	3.31 (0.52)	4.096	168	< .001	0.64
Reflection	3.67 (0.32)	3.54 (0.31)	2.722	168	.007	0.43
Critical refl.	3.96 (0.73)	3.67 (0.80)	2.336	168	.021	0.37
Total RT	3.73 (0.31)	3.42 (0.43)	5.105	168	< .001	0.80

Note: Values in group columns are M (SD); scientific n = 67 and theoretical n = 103. RT = reflective thinking; refl. = reflection. Cohen's d was calculated as scientific minus theoretical; positive values indicate higher means among students in scientific specializations.

3.5. Differences In Problem-Solving Skills by Gender

To answer the fourth research question, independent-samples t-tests were conducted to examine gender differences in problem-solving skills. As shown in Table 7, no statistically significant differences were found across the problem-solving dimensions. The effect sizes were small.

Table 7: Gender Differences in Problem-Solving Skills.

Variable	Male	Female	t	df	p	d
General orient.	2.93 (0.50)	2.89 (0.41)	0.560	168	.576	0.09
Problem def.	2.94 (0.49)	2.90 (0.40)	0.629	168	.530	0.10
Alternatives	2.90 (0.56)	2.77 (0.44)	1.625	168	.106	0.25
Decision	2.89 (0.58)	2.84 (0.56)	0.544	168	.587	0.08
Evaluation	2.90 (0.57)	2.88 (0.48)	0.279	168	.780	0.04

Note: Values in group columns are M (SD); male n = 94 and female n = 76. orient. = orientation; def. = definition. Cohen's d was calculated as male minus female.

3.6. Differences In Problem-Solving Skills by Academic Specialization

Independent-samples t-tests were also conducted to examine specialization differences in problem-solving skills. As shown in Table 8, no statistically significant differences were found across the dimensions. The effect sizes were small, indicating that academic specialization did not meaningfully differentiate students' problem-solving skills in the present sample.

Table 8: Academic Specialization Differences in Problem-Solving Skills.

Variable	Scientific	Theoretical	t	df	p	d
General orient.	2.89 (0.45)	2.87 (0.53)	0.249	168	.803	0.04
Problem def.	2.87 (0.45)	2.92 (0.48)	-0.739	168	.461	-0.12
Alternatives	2.78 (0.54)	2.80 (0.52)	-0.175	168	.861	-0.03
Decision	2.68 (0.59)	2.79 (0.56)	-1.190	168	.236	-0.19
Evaluation	2.84 (0.53)	2.87 (0.58)	-0.338	168	.736	-0.05

Note: Values in group columns are M (SD); scientific n = 67 and theoretical n = 103. orient. = orientation; def. = definition. Cohen's d was calculated as scientific minus theoretical.

3.7. Relationship Between Reflective Thinking and Problem-Solving Skills

To answer the fifth research question, Pearson correlation coefficients were calculated between reflective thinking and problem-solving skills. As shown in Table 9, total reflective thinking was positively and significantly associated with total problem-solving skills (r = .551, p < .001). All reported associations were positive and statistically significant, indicating that students with higher reflective thinking tended to report stronger problem-solving skills.

Table 9: Correlations Between Reflective Thinking and Problem-Solving Skills.

Reflective thinking variable	General orient.	Problem def.	Alternatives	Decision	Evaluation	Total problem-solving skills
Habitual action	.482**	.421**	.570**	.586**	.550**	.594**
Understanding	.326**	.320**	.221**	.331**	.283**	.332**
Reflection	.396**	.385**	.436**	.259**	.237**	.210**
Critical refl.	.395**	.373**	.366**	.422**	.376**	.414**
Total RT	.477**	.463**	.422**	.562**	.508**	.551**

Note: ** p < .01.

4. DISCUSSION

The findings showed that undergraduate psychology students reported a high overall level of reflective thinking. This finding is consistent with the educational expectation that university learning encourages students to analyze information, reconsider assumptions, and connect academic content with prior experience. The highest mean appeared in critical reflection, which may reflect students' exposure to courses that require analysis, discussion, and evaluation of psychological concepts and human behavior.

By contrast, students' problem-solving skills were moderate rather than high. The moderate level suggests that students may be able to identify and define problems, but they may need more structured opportunities to generate alternatives, compare solutions, make evidence-based decisions, and evaluate outcomes. This interpretation is consistent with the view that problem solving develops most effectively through repeated practice, feedback, and authentic tasks rather than through theoretical instruction alone.

Gender differences were not statistically significant for either reflective thinking or problem-solving skills. This finding may be explained by the similarity of students' academic environment, curriculum requirements, and learning experiences within the same department. It also suggests that cognitive-skill development in the present context is more closely related to learning opportunities than to gender.

Academic specialization differentiated reflective thinking but did not differentiate problem-solving skills. Students in scientific specializations scored higher on all reflective thinking dimensions and on the total score. This may be due to the nature of scientific coursework, which typically requires systematic analysis, experimentation, evidence evaluation, and justification of conclusions. However, the lack of specialization differences in problem-solving skills suggests that the problem-solving demands experienced by students may be broadly similar across specializations or that existing university learning experiences do not yet produce strong specialization-based differences in this skill area.

The positive association between reflective thinking and problem-solving skills supports the theoretical connection between the two constructs. Reflection helps students define a problem, inspect assumptions, generate alternatives, and evaluate outcomes. Conversely, problem-solving situations provide a practical context in which reflective thinking can be activated. The moderate positive correlation between the total scores indicates that the constructs are related but not identical, supporting the need to develop both through integrated educational activities.

4.1. Limitations

Several limitations should be considered. First,

the study used a cross-sectional design; therefore, the results should be interpreted as associations and group differences rather than causal effects. Second, the sample was drawn from one department at one university, which limits generalizability to other disciplines and institutions. Third, the study relied on self-report measures, which may be affected by response style and social desirability. Fourth, the pilot sample used for reliability and internal consistency checks was relatively small. Future studies should use larger and more diverse samples, examine measurement invariance across gender and specialization, and consider longitudinal or intervention designs to test whether structured reflective-learning activities improve problem-solving skills over time.

4.2. Recommendations

1. University programs should include explicit learning outcomes related to reflective thinking and problem-solving skills.
2. Course instructors should use active-learning strategies such as case analysis, guided reflection journals, problem-based learning, and structured classroom discussion.
3. Student-development units should organize workshops that train students to define problems, generate alternatives, evaluate options, and reflect on decision outcomes.
4. Assessment practices should include tasks that require justification of answers, comparison of alternatives, and reflective evaluation rather than relying only on recall-based questions.
5. Future research should examine whether interventions designed to improve reflective thinking led to measurable improvement in students' problem-solving skills.

5. CONCLUSION

The study concluded that reflective thinking was high among the participating university students, while problem-solving skills were moderate. Gender did not produce statistically significant differences in either construct, whereas academic specialization was associated with significant differences in reflective thinking favoring scientific specializations. Reflective thinking was positively associated with problem-solving skills. These findings highlight the need to design university learning environments that deliberately connect reflection with practical problem-solving tasks.

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