

Problem Solving Ability of Adolescent Students in Relation to Their Mental Health

Sukrivinder, Professor (Dr.) Sushma Rani

Department of Education,

Ch. Devi Lal College of Education, Bhagwargarh, Buria Road (Jagadhri), Haryana, India

Abstract – Problem solving occupies a central place among the capacities that schooling is expected to cultivate, and a growing body of research suggests that an adolescent's confidence in their own capability, broadly termed Mental Health in the present study, is closely bound up with how well that capacity develops. The present paper reports the findings of a study undertaken to examine the relationship between Problem Solving Ability and Mental Health among adolescent students of Yamuna Nagar district, Haryana, and to determine whether male and female, and urban and rural, adolescents differ significantly on either variable. A sample of one hundred and twenty Class VI students was drawn through random sampling from four secondary schools, balanced across gender and locale. Data were gathered using two standardised tools — the Problem Solving Ability Test (Dubey) and the Mental Health Scale (Mathur & Bhatnagar) — and analysed using Pearson's correlation and the independent samples t-test at the 0.05 level of significance. Results showed a significant positive relationship between the two variables, a significant gender difference favouring females on Mental Health, no significant gender difference on Problem Solving Ability, and significant differences favouring urban students on both variables. The paper discusses these findings in the light of existing research and offers implications for teachers and schools.

Keywords – Problem Solving Ability, Mental Health, Adolescents, Gender Difference, Locale, Descriptive Survey.

I. INTRODUCTION

Education is expected to do more than transfer information; it is expected to sharpen the ways in which a student thinks, so that the student can face an unfamiliar situation and work out, unaided, what to do about it. This capacity is generally termed problem solving ability, and it draws jointly on reasoning, prior experience, and a willingness to persist when a solution is not immediately obvious. A closely related but conceptually distinct capacity is what the present study terms Mental Health: an adolescent's belief in their own capability to organise and carry out the actions needed to produce a desired outcome. Where problem solving ability is a skill, Mental Health is a belief about that skill, and the two are widely held to reinforce one another over the course of development.

Adolescence is the stage at which both capacities are still actively under construction, which makes it a natural point at which to examine how they relate to one another. Indian schooling in general, and rural Indian schooling in particular, continues to grapple with a gap between the quantitative expansion of access to education and the qualitative development of the thinking skills that access was meant to deliver. Against this background, the present study was undertaken to examine the relationship between Problem Solving Ability and Mental Health among adolescent students of Yamuna Nagar district, Haryana, and to test whether the two variables differ by gender or by locale.

The choice of Yamuna Nagar district as the setting for this enquiry is not incidental. The district contains a mix of urban centres and surrounding rural belts, government and private schooling, all within a comparatively small geographic radius, which makes it a useful setting in which to examine how locale, rather than distance or state-level policy variation, is associated with adolescent Mental

Health and Problem Solving Ability. Findings from a setting of this kind carry practical relevance well beyond the district itself, since similar semi-urban and rural contrasts recur across much of northern India.

II. REVIEW OF RELATED LITERATURE

A substantial body of research has examined the relationship between self-efficacy beliefs of the kind measured here and problem-solving performance. Zimmerman and Campillo (2013) argued that such beliefs are predictive of persistence and effort during problem solving because they reflect a learner's beliefs about their own competence, while Britner and Pajares (2016) reported that students with stronger self-efficacy beliefs make more efficient use of problem-solving strategies and persist longer in the face of difficulty. Mevarech and Kramarski (2007) and Halpern (2003) separately argued that metacognitive skill, closely allied to the constructs examined here, needs to be made explicit in the classroom rather than left to develop unassisted.

Closer to the present setting, Bhaker and Pasricha (2024) examined academic self-efficacy among senior secondary students of Haryana and reported a significant relationship with academic achievement, recommending that teachers work actively to strengthen such beliefs through mastery experience and encouragement. Rice, Barth, Guadagno, Smith, and McCallum (2020) documented gender disparities in self-efficacy for mathematics and science in other settings, a pattern the present study tests directly for problem solving ability. Kousar Perveen (2020) found that a structured problem-solving approach to teaching produced significantly better mathematics achievement than conventional expository instruction. Jackson (2012) argued more broadly that such beliefs depend heavily on the breadth of situations and resources a student is exposed to,

a proposition tested indirectly through the locale comparison reported below.

Taken together, this literature establishes a reasonably consistent expectation of a positive relationship between Mental Health and Problem Solving Ability, alongside evidence that both constructs are sensitive to gender and to the breadth of a student's social and educational environment — both propositions examined directly in the present study.

A close reading of this literature also reveals a persistent gap: the great majority of studies examining self-efficacy and problem solving jointly have drawn on urban or metropolitan Indian samples, with comparatively little research addressing the semi-urban and rural districts of Haryana specifically. Where locale has been examined at all, it has typically been treated as a background variable rather than a central point of comparison. The present study responds directly to this gap by treating locale as a primary variable of interest, alongside gender, in its own right.

III. PROBLEM SOLVING ABILITY AND MENTAL HEALTH: A CONCEPTUAL LINK

Bandura's (1986) Social Cognitive Theory situates self-efficacy beliefs at the core of human functioning, arguing that possessing the requisite skill is not, by itself, sufficient; a person must also believe that they can actually deploy that skill under difficult or unfamiliar conditions. Applied to the present constructs, this suggests that Problem Solving Ability and Mental Health are bound together by a shared developmental pathway: successful problem solving builds the belief that one is capable, and that belief, in turn, makes a student more likely to attempt and persist with the next difficult problem rather than avoiding it. It is this reciprocal relationship that the present study sets out to test empirically.

Objectives of the Study

- To assess the level of Mental Health among adolescent students.
- To assess the level of Problem Solving Ability among adolescent students.
- To study the relationship between Mental Health and Problem Solving Ability among adolescent students.
- To compare the Mental Health of male and female adolescent students.
- To compare the Problem Solving Ability of male and female adolescent students.
- To compare the Mental Health of urban and rural adolescent students.
- To compare the Problem Solving Ability of urban and rural adolescent students.

IV. HYPOTHESES OF THE STUDY

- **H01:** There exists no significant relationship between Mental Health and Problem Solving Ability among adolescent students.
- **H02:** There exists no significant difference between male and female adolescent students with respect to Mental Health.
- **H03:** There exists no significant difference between male and female adolescent students with respect to Problem Solving Ability.
- **H04:** There exists no significant difference between urban and rural adolescent students with respect to Mental Health.
- **H05:** There exists no significant difference between urban and rural adolescent students with respect to Problem Solving Ability.

Delimitations

The study is delimited to students studying in Class VI, drawn from four secondary schools of Yamuna Nagar district, Haryana, during the academic session 2024–26. The sample is restricted to one hundred and twenty respondents, selected from two government and two private schools. The study is confined to the two variables of Problem Solving Ability and Mental Health, measured through standardised tools only; other related variables such as intelligence, socio-economic status, or teaching method fall outside its scope.

V. METHOD

The Descriptive Survey Method was employed, since the study is concerned with describing the naturally occurring levels of, and relationship between, Problem Solving Ability and Mental Health, rather than manipulating either variable experimentally. This method is well suited to psychological constructs of this kind, which develop gradually through years of lived experience and cannot ethically or practically be induced or withheld for an experimental design.

Sample

The random sampling technique was used to draw a sample of one hundred and twenty Class VI students from four secondary schools of Yamuna Nagar district, proportionately balanced across gender (60 male, 60 female) and locale (60 urban, 60 rural). Thirty students were selected from each of the four schools — two government and two private — in order to guard against a sample skewed disproportionately toward any single school or subgroup.

Tools Used and Collection of Data

Two standardised tools were used for data collection. The Problem Solving Ability Test (Dubey) consists of twenty multiple-choice problems, each with four alternatives, only one of which is correct, with reliability of .78 (Spearman-Brown split-half method) and .76 (Kuder-Richardson

rational equivalence method), and validity of .68 and .85 against the Group Intelligence Test and a Test of Reasoning Ability respectively. The Mental Health Scale (Mathur & Bhatnagar) consists of twenty-two items across eight factors, rated on a five-point continuum, with reliability ranging from .73 to .86 and validity ranging from .73 to .83 across the two genders.

Formal permission was obtained from school principals prior to data collection. Both tools were administered together in a single classroom sitting under the investigator's direct supervision, with confidentiality assured to all respondents, and completed response sheets were scored on the same day according to the procedure laid down in the respective manuals.

Statistics Used

Descriptive statistics (Mean, Standard Deviation) were used to address the first two objectives. Pearson's product-moment correlation coefficient was used to test the relationship between Mental Health and Problem Solving Ability, calculated as $r = \frac{\sum(X-\bar{X})(Y-\bar{Y})}{\sqrt{[\sum(X-\bar{X})^2 \times \sum(Y-\bar{Y})^2]}}$. The independent samples t-test was used to compare sub-groups on each variable, calculated as $t = \frac{(M_1 - M_2)}{\sqrt{[(n_1 - 1)SD_1^2 + (n_2 - 1)SD_2^2] / (n_1 + n_2 - 2)}} \times \sqrt{(1/n_1 + 1/n_2)}$. All tests were conducted at the 0.05 level of significance, with the corresponding null hypothesis rejected wherever the calculated value equalled or exceeded the relevant critical value (1.98 for $df = 118$).

As an illustrative working, the t-test computation for the gender comparison on Mental Health (Table 3) is shown here. With $M_1 = 72.8$ (female), $M_2 = 66.37$ (male), $SD_1 = 9.24$, $SD_2 = 10.33$, and $n_1 = n_2 = 60$, the pooled variance works out to approximately 96.05 and the standard error of the difference between means to approximately 1.79. Dividing the mean difference (6.43) by this standard error yields $t \approx 3.596$, matching the value reported in Table 3.

VI. ANALYSIS OF DATA

Table 1 presents the descriptive statistics obtained on both variables for the sample as a whole.

Table No. 1: Descriptive Statistics of Mental Health and Problem Solving Ability Scores

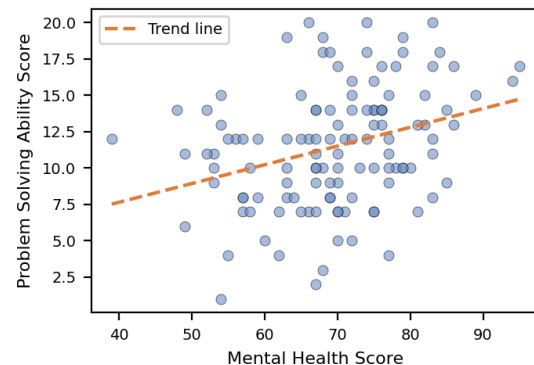
Variable	Mean	SD	N
Mental Health	69.58	10.28	120
Problem Solving Ability	11.46	4.14	120

Table 2 presents the correlation obtained between the two variables, testing Hypothesis H01.

Table No. 2: Correlation between Mental Health and Problem Solving Ability (* $p < 0.05$, $df = 118$)

Variables	N	r	Result
MH & PSA	120	0.32*	Sig.

Graph No. 1: Relationship between Mental Health and Problem Solving Ability ($r = 0.32$)



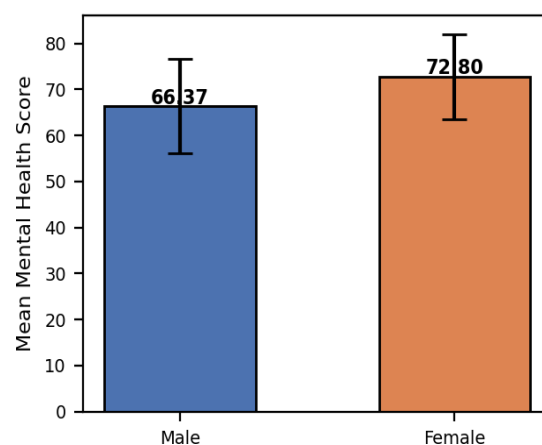
Graph No. 1: Scatter Plot showing Relationship between Mental Health and Problem Solving Ability

Table 3 presents the comparison of male and female adolescents on Mental Health, testing Hypothesis H02.

Table No. 3: Gender-wise Comparison of Mental Health Scores (*Sig. at 0.05, $df = 118$)

Group	N	Mean	SD	t
Male	60	66.37	10.33	3.596*
Female	60	72.8	9.24	

Graph No. 2: Gender-wise Comparison of Mean Mental Health Scores



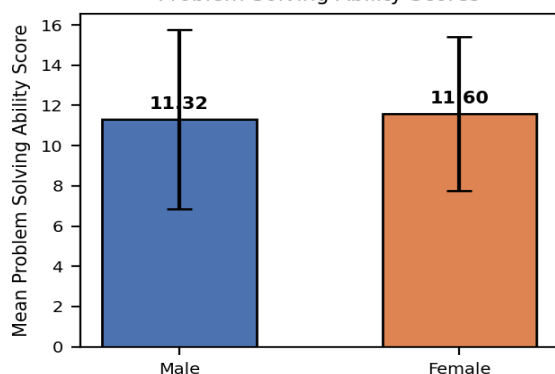
Graph No. 2: Gender-wise Comparison of Mean Mental Health Scores

Table 4 presents the comparison of male and female adolescents on Problem Solving Ability, testing Hypothesis H03.

Table No. 4: Gender-wise Comparison of Problem Solving Ability Scores (NS = Not Significant at 0.05, $df = 118$)

Group	N	Mean	SD	t
Male	60	11.32	4.46	0.373
Female	60	11.6	3.83	(NS)

Graph No. 3: Gender-wise Comparison of Mean Problem Solving Ability Scores



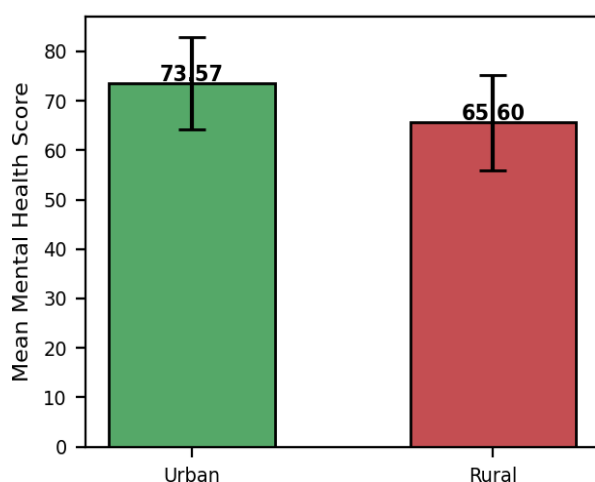
Graph No. 3: Gender-wise Comparison of Mean Problem Solving Ability Scores

Table 5 presents the comparison of urban and rural adolescents on Mental Health, testing Hypothesis H04.

Table No. 5: Locale-wise Comparison of Mental Health Scores (*Sig. at 0.05, df=118)

Group	N	Mean	SD	t
Urban	60	73.57	9.4	4.589*
Rural	60	65.6	9.61	

Graph No. 4: Locale-wise Comparison of Mean Mental Health Scores



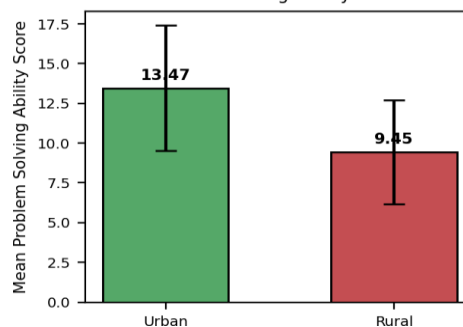
Graph No. 4: Locale-wise Comparison of Mean Mental Health Scores

Table 6 presents the comparison of urban and rural adolescents on Problem Solving Ability, testing Hypothesis H05.

Table No. 6: Locale-wise Comparison of Problem Solving Ability Scores (*Sig. at 0.05, df=118)

Group	N	Mean	SD	t
Urban	60	13.47	3.96	6.055*
Rural	60	9.45	3.27	

Graph No. 5: Locale-wise Comparison of Mean Problem Solving Ability Scores



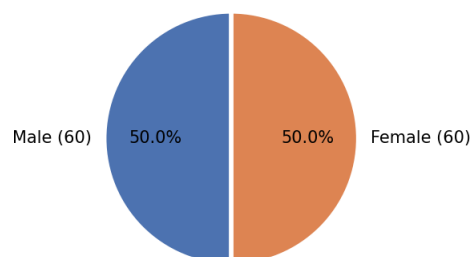
Graph No. 5: Locale-wise Comparison of Mean Problem Solving Ability Scores

Table 7 and Graph 6 summarise the demographic composition of the sample described in Section VIII.

Table No. 7: Demographic Profile of the Sample (N = 120)

Category	Sub-Group	N
Gender	Male / Female	60 / 60
Locale	Urban / Rural	60 / 60
School Mgmt.	Govt. / Private	60 / 60

Graph No. 6: Gender-wise Distribution of the Sample



Graph No. 6: Gender-wise Distribution of the Sample

To probe the relationship documented in Table 2 further, the correlation between Mental Health and Problem Solving Ability was also computed separately for each gender and locale sub-group; the results are presented in Table 8.

Table No. 8: Sub-group-wise Correlation between Mental Health and Problem Solving Ability

Sub-group	N	r	Result
Male	60	0.327	Sig.
Female	60	0.325	Sig.
Urban	60	0.313	Sig.
Rural	60	-0.015	NS

Findings Based on Hypotheses

- There is a significant positive correlation between Mental Health and Problem Solving Ability scores ($r = 0.32$, $N = 120$, significant at 0.05 level, $df = 118$), indicating that adolescents with higher Mental Health tend also to score higher on Problem Solving Ability, with Mental Health accounting for approximately 10

per cent of the variance in Problem Solving Ability scores ($r^2 = 0.10$). H01 is rejected.

- There is a significant difference between male and female adolescents on Mental Health ($t = 3.596$, $df = 118$, significant at 0.05 level), with female adolescents ($M = 72.8$) scoring significantly higher than male adolescents ($M = 66.37$). H02 is rejected.
- There is no significant difference between male and female adolescents on Problem Solving Ability ($t = 0.373$, $df = 118$, not significant at 0.05 level), with male ($M = 11.32$) and female ($M = 11.6$) adolescents scoring nearly identically. H03 is accepted.
- There is a significant difference between urban and rural adolescents on Mental Health ($t = 4.589$, $df = 118$, significant at 0.05 level), with urban adolescents ($M = 73.57$) scoring significantly higher than rural adolescents ($M = 65.6$). H04 is rejected.
- There is a significant difference between urban and rural adolescents on Problem Solving Ability ($t = 6.055$, $df = 118$, significant at 0.05 level), with urban adolescents ($M = 13.47$) scoring significantly higher than rural adolescents ($M = 9.45$) — the largest sub-group difference obtained in the study. H05 is rejected.
- The positive relationship between Mental Health and Problem Solving Ability held separately for male, female, and urban adolescents, but was negligible and not significant among rural adolescents, suggesting that this relationship depends partly on the breadth of opportunity available to a student to exercise problem-solving skill.

Table No. 9: Summary of Hypothesis Testing

Hyp.	Statistic	Decision
H01	$r = 0.32$	Rejected
H02	$t = 3.596$	Rejected
H03	$t = 0.373$	Accepted
H04	$t = 4.589$	Rejected
H05	$t = 6.055$	Rejected

VII. DISCUSSION

The significant relationship obtained between Mental Health and Problem Solving Ability is consistent with Bandura's Social Cognitive Theory and with the specific literature reviewed above. Zimmerman and Campillo (2013) and Britner and Pajares (2016) had both argued that such beliefs are closely tied to problem-solving persistence and strategy use, and the present finding lends locally grounded support to that view among adolescents of this district.

The significant gender difference obtained in Mental Health, favouring female adolescents, is consistent with Bhaker and Pasricha (2024), whose Haryana-based study similarly linked academic self-efficacy to achievement. The absence of a comparable gender difference in Problem Solving Ability, however, is a more encouraging finding

relative to the gender disparities reported by Rice, Barth, Guadagno, Smith, and McCallum (2020) in other settings, and suggests that whatever confidence gap exists between the sexes in this sample has not translated into an actual gap in problem-solving performance.

The urban–rural differences obtained on both variables, and particularly the size of the difference on Problem Solving Ability, echo Jackson's (2012) argument that such beliefs and abilities depend heavily on the breadth of a student's exposure to varied situations and resources. They are also consistent with Kousar Perveen (2020), whose finding that structured problem-based teaching outperforms conventional instruction suggests that the urban–rural gap documented here may reflect differences in instructional exposure rather than any inherent difference in ability between the two groups of students.

The sub-group correlations reported in Table 8 add a further layer of nuance to this picture. The relationship between Mental Health and Problem Solving Ability held for male, female, and urban adolescents alike, but was negligible among rural adolescents specifically. Read alongside the significant urban–rural gap on both variables, this suggests that the pathway from Mental Health to problem-solving performance, while reliable elsewhere in the sample, may be constrained among rural students by the same resource and exposure limitations that depress their scores on both variables in the first place — a possibility that the present cross-sectional design cannot confirm directly but that future research, discussed in Section XV, is well placed to examine.

Educational Implications

The findings carry several practical implications. Since Mental Health and Problem Solving Ability are significantly related, classroom activities that build mastery experience — graded, achievable problems, worked through with visible success — may be expected to carry benefits for actual problem-solving performance as well. Teachers might also model problem-solving strategies aloud, so that students see the reasoning process rather than only the final answer, and offer specific, credible encouragement rather than generic praise, since mastery experience and verbal persuasion were identified in the literature as the two most reliable sources of such beliefs.

Given the substantial urban–rural gap documented on both variables, rural schools in particular may benefit from targeted enrichment in problem-based learning and from teacher training aimed specifically at narrowing this gap, rather than treating it as an unavoidable feature of a rural setting. School administrators could periodically screen students using tools of the kind employed here, so that students with low Mental Health are identified and supported before the gap compounds further. Since no gender gap emerged in Problem Solving Ability despite a real gender gap in Mental Health, teachers and counsellors should be cautious about reading a student's expressed confidence, in either direction, as a reliable proxy for actual

capability, and should extend problem-solving opportunities equally to boys and girls.

Limitations and Suggestions for Further Research

The present study is subject to certain limitations. The sample, though adequate for the statistical techniques employed, was restricted to one hundred and twenty Class VI students from a single district, limiting the generalisability of the findings beyond Yamuna Nagar. The cross-sectional design permits conclusions about association but not about the causal direction between Mental Health and Problem Solving Ability, and the study did not control for other plausible influences such as intelligence or socio-economic status.

Future research could usefully replicate the present design across multiple districts of Haryana and across other class levels to test the consistency of the patterns reported here, or adopt a longitudinal design to clarify how the relationship between the two variables develops as students move through adolescence. An intervention study introducing structured problem-based learning in rural schools, with pre- and post-measurement of both variables, would help establish whether the urban-rural gap documented here can be narrowed through instructional change alone.

VIII. CONCLUSION

The present study concludes that Mental Health and Problem Solving Ability are significantly related among adolescent students of Yamuna Nagar district, that locale exerts a more consistent influence than gender on both variables, and that school-based programmes strengthening Mental Health through mastery experience are likely to carry benefits for students' problem-solving performance as well. These findings hold relevance for teachers, school administrators, and policy planners seeking to strengthen problem-solving capacity among adolescents within this region and comparable settings.

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