Enhancing Teacher Resilience: Innovative Coping Strategies for Flood Vulnerabilities

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Flood disasters have the potential to inflict substantial damage on infrastructure, homes and agricultural fields, leading to economic and societal vulnerabilities in the less affluent regions of Punjab, Pakistan. These floods also can displace communities, resulting in emotional distress and community disruption. During such challenging circumstances, educators play a pivotal role by providing education, solace, and guidance to farmers and students grappling with floods and potential mitigation measures. In 2022, flood disasters in Tehsil Taunsa Sharif, Punjab, Pakistan, caused significant harm to infrastructure, housing, and crops, exacerbating economic and social vulnerabilities within low-income communities. This study aimed to explore the effectiveness of teacher's coping strategies in flood-prone areas of Tehsil Taunsa Sharif in addressing these social vulnerabilities. For this research, a total of 25 high and higher secondary schools in Tehsil Taunsa Sharif were identified, from which a convenient sample of 10 schools were selected. The population consisted of 150 teachers and the sample included 85 school teachers, chosen using a confidence level of 95% and a confidence interval of 7%. Schools were selected through a convenient sampling technique, while respondents were randomly selected to ensure an unbiased sample. The findings revealed that the majority of teachers acknowledged using various coping strategies in flood-prone areas including efforts to establish a safe and inclusive learning environment (mean = 4.26), assisting students in developing problem-solving skills (mean = 4.26), encouraging students to express their feelings (mean = 4.25) and providing moral support (mean = 4.22). Furthermore, teachers employed various techniques to enhance the effectiveness of coping mechanisms, such as collaborating with local authorities (mean = 4.32), identifying student needs (mean = 4.28), and promoting mental well-being (mean = 4.28). Additionally, the study found that most teachers believed that flooding had a significant impact on the educational level (mean = 4.38). Public-private partnerships were perceived to enhance the well-being of the community (mean = 4.32). The flood's effects on student access to education (mean = 4.31) and mental health (mean = 4.28) were also evident. In light of these findings, the government needs to develop and implement effective early warning systems to alert communities about impending floods. This proactive approach can aid schools and families in preparing for potential disasters and taking necessary actions to minimize disruptions. Furthermore, the incorporation of flood-resistant features in the design of educational infrastructure, including schools, colleges, and universities is crucial for ensuring educational continuity during flood events.

Keywords: Flood Vulnerabilities, Coping Strategies, Disaster Mitigation, Educational Continuity, Adaptive Strategies

Authors Contribution:
Engineer Amjad Khuda Bakhsh and Rana Muhammad Amir Khan contributed to design the lay out the experiment along with supervising and guidance in collecting and manipulation of research data while Bushra Abbas Khan contributed data analysis and wrote the manuscript with editing and a thorough review of the proposed research article.

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Introduction:

Flood disasters have become a pressing global issue, causing severe damage to infrastructure, homes, and crops while triggering economic and social vulnerabilities. These events displace millions, leading to psychological distress and social upheaval. Notably, torrential rains and various types of flooding in Pakistan between June and August 2022 affected around 33 million people, causing nearly 8 million to be displaced and claiming more than 1,700 lives [1]. Preliminary estimates indicate that as a direct consequence of these floods, the national poverty rate will increase by 3.7 to 4.0 percentage points, pushing between 8.4 to 9.1 million people into poverty [2].

Understanding the global prevalence of flood disasters and their impact on infrastructure, homes, and crops is critical for policymakers, disaster management agencies, and communities. Effective preparedness, early warning systems, and adaptive strategies can help mitigate the devastating consequences of floods and enhance resilience in flood-prone areas. It is paramount to analyze the global prevalence of flood disasters comprehensively to develop evidence-based policies and strategies to minimize risks and build more resilient communities.

Floods pose a significant risk to residential homes, resulting in the loss of shelter and the displacement of families. Rising floodwaters inundate houses, causing water damage, mold growth, and structural instability, disrupting the lives of individuals and families and leading to the loss of personal belongings and cherished memories. The social and psychological toll is substantial, particularly among low-income communities [3].

In flood-prone areas, teachers play a crucial role in mitigating flood-induced vulnerabilities within communities [4]. They are frontline responders and educators, uniquely positioned to support and guide students, families, and the broader community during and after flood events.

Firstly, teachers act as key communicators and disseminators of critical information during flood events. They play a crucial role in implementing early warning systems and ensuring that students and their families receive timely and accurate information about potential threats and necessary actions to take. Effective communication, coordination, and information dissemination are key coping strategies in this context [5].

Secondly, teachers are instrumental in developing and implementing emergency preparedness plans within schools. They work closely with school administrators and local authorities to establish protocols and procedures that ensure the safety of students and staff during flood events. These plans may include evacuation routes, designated assembly areas, and strategies for managing and minimizing risks within the school environment. Proactive disaster preparedness and risk management are essential coping strategies here [6].

Furthermore, teachers adapt their teaching methods to accommodate and support students affected by flood-induced vulnerabilities. They demonstrate flexibility and resilience in delivering educational content despite disruptions caused by floods. By employing innovative teaching techniques, such as distance learning or alternative instructional approaches, teachers help ensure that students can continue their education even during challenging times. Innovative teaching, adaptability, and continued learning are vital coping strategies in this aspect [7].

In addition to their immediate roles within schools, teachers engage with the wider community to address flood-induced vulnerabilities. They actively collaborate with local stakeholders, community leaders, and relevant organizations to coordinate efforts, share resources, and support recovery initiatives. Teachers serve as advocates for the needs of students and families affected by floods, ensuring their voices are heard and their concerns addressed in the post-disaster recovery process. Community engagement, advocacy, and support represent crucial coping strategies in this regard [8].

By fulfilling these critical roles, teachers contribute to the overall resilience and well-being of individuals and communities affected by flood disasters. Their dedication and commitment exemplify the importance of education in building resilience to natural disasters. Teacher's efforts not only mitigate the immediate impacts of floods but also lay the foundation for long-term recovery, empowerment, and sustainable development within flood-prone areas.

Objectives:

The major objectives of this study were to assess teachers coping strategies, identify training needs, evaluate strategy effectiveness, explore perceptions, and suggest training programs for social vulnerability in flood-prone areas of Taunsa Sharif, Punjab, Pakistan.

Novelty Statement:

In light of the escalating frequency and severity of floods, it has become increasingly imperative to explore unconventional coping strategies for educators contending with flood vulnerabilities. While prior studies have predominantly concentrated on the physical and infrastructural dimensions of flood management, our research takes a unique approach by delving into the often neglected psychological and emotional resilience of teachers in flood-prone areas. This study ventures into uncharted territory, investigating how teachers adapt, persist, and cultivate resilience when faced with recurring flood-related challenges. By unearthing these inventive coping strategies, the objective of this research is to provide valuable insights that can influence policy development, enhance support systems, and ultimately augment the overall resilience of educators in regions susceptible to flooding, especially Tehsil Taunsa Sharif, Punjab, Pakistan.

Materials and Methods:

This study examines the training needs of teachers dealing with social vulnerability in flood-prone areas of Taunsa, Punjab, Pakistan, using a quantitative approach. This study adopted a descriptive research design, focusing on observation, documentation, and description without manipulating variables. It offers an accurate understanding of the research topic, aligning with the study objectives. Taunsa Sharif, Punjab, is chosen due to its susceptibility to floods, offering insights into coping strategies, disaster management, and the impact of flooding.

The study's target group consists of 150 teachers from 25 high and higher secondary schools in Tehsil Taunsa Sharif. A convenient sample of 85 teachers from 10 schools is drawn to ensure statistical reliability and validity, based on a confidence level of 95% and a confidence interval of 7% [9]. A structured questionnaire, designed by the researcher, aligns with the research objectives, covering socio-economic characteristics, flood damage, training needs, and stakeholders. A panel of supervisory committee members evaluated the questionnaire's content and validity and their feedback was incorporated to enhance the instrument.

The questionnaire was pre-tested on 10 high and higher school teachers to assess its clarity, identify issues, and refine the questions accordingly. Cronbachs alpha coefficient, with a value of .845, indicates a high level of reliability among the questionnaire items [10]. Data were collected using Google Forms from 85 respondents in flood-affected areas of Taunsa Sharif. Collected data were checked, coded, and entered into Microsoft Excel for analysis. MS Excel and SPSS were used for analysis, employing statistical measures such as frequency, percentage, mean, and weighted score to summarize and interpret the dataset [11].

Importance of Parameters:

The below parameters are crucial in this research for assessing and understanding data, model fitness, and the reliability of measurements, ultimately contributing to the quality and validity of the research findings. The significance of the parameters employed in this research cannot be overstated, as they collectively contribute to the precision, reliability, and validity of the study outcomes. Each parameter serves a unique purpose, addressing various aspects crucial for robust research methodology and accurate interpretation of results. Their careful

incorporation is essential for ensuring the quality of findings and the overall success of the research endeavor. Important parameters and their brief definitions are given below.

Mean:

Mean is the average value of a set of data points. It is essential for understanding the central tendency of the data, providing insights into the typical value.

S.D (Standard Deviation):

Standard Deviation measures the dispersion or spread of data. It is crucial in assessing the data variability, indicating how data points deviate from the mean.

T Value:

T-value is a statistical measure used in hypothesis testing. It indicates the significance of a variables effect in the context of research, helping determine if the results are statistically significant.

P Value:

P-value is a statistical measure that helps assess the significance of research results. It indicates the probability of observing results as extreme as those obtained if the null hypothesis is true.

Cronbachs Alpha:

Cronbachs Alpha is a measure of internal consistency reliability. It is vital in research to assess the reliability of a scale or a set of related items in a questionnaire.

rho_A:

Rho_A is an alternative measure of reliability. It is valuable in research for assessing the reliability of measurements and ensuring that the results are consistent and dependable.

Composite Reliability:

Composite Reliability measures the reliability of a latent construct in structural equation modeling. It is crucial to ensure that the construct is accurately represented by its indicators.

Average Variance Extracted (AVE):

AVE assesses the amount of variance captured by a latent variable to the variance due to measurement error. It helps confirm the validity of the construct in the research context.

W.S (Weighted Score):

Weighted Score is a measure used for ranking items or criteria. In research, it is beneficial to prioritize and compare different elements or factors.

Rank:

Rank signifies the position or order of an item to others. It is valuable for understanding the relative importance or performance of elements in the research context.

SRMR (Standardized Root Mean Square Residual):

SRMR is a measure used in structural equation modeling. It helps assess the model's goodness of fit. It is essential to evaluate how well the model fits the data.

d_ULS (Determination of Unweighted Least Squares):

This parameter is used in structural equation modeling. It aids in model estimation and is important for determining the model's suitability for the research.

d_G (Determination of Geodesic):

In the context of research, this parameter helps in understanding the geodesic path and its significance in modeling and analysis.

Chi-Square:

Chi-square is a statistical test used for assessing the independence of variables. It is crucial for understanding relationships between variables in the research.

NFI (Normed Fit Index): NFI is a measure of goodness of fit in structural equation modeling. It is valuable in research for assessing how well the model fits the data.

PW (Parsimonious Goodness-of-Fit Index): PW is a measure used to evaluate the goodness of fit in structural equation modeling. It is essential to ensure that the model is parsimonious and not overly complex.

EC (Explained Common Variance):

EC measures the proportion of common variance explained by a construct in the research. It is important to understand how well a construct represents the data.

PC (Predictive Consistency):

PC assesses the consistency of predictions made by a model. It is crucial for evaluating the accuracy and reliability of predictions in the research.

SSC (Suggested Scale Constructs):

SSC signifies the proposed constructs or elements in the research. It is valuable for outlining and defining the key components of the study.

AT (Adjusted Threshold):

AT is an adjustment made to the threshold values in modeling. It is important to ensure that the model aligns with the research objectives.

AC (Adaptive Criteria):

AC relates to the criteria that can adapt to changing conditions or needs in the research. It is essential for ensuring flexibility and relevance in the study.

PPW (Pathway of Parameter Weights):

PPW refers to the pathway or route of parameter weights in the research. It helps in understanding the flow and impact of various parameters in the study.

Influence of Parameters on Research Conduct:

The chosen parameters exert a profound influence on the conduct of this research across multiple dimensions. The mean and standard deviation illuminate the central tendency and dispersion of data, providing essential insights into the dataset characteristics. T and p-values guide hypothesis testing, underpinning the statistical significance of observed differences. Cronbachs alpha and rho_A contribute to the internal consistency of measurement scales, instilling confidence in the reliability of the study's constructs.

Composite reliability and average variance extracted (AVE) play pivotal roles in structural equation modeling, gauging the reliability and convergent validity of latent constructs. Weighted score (W.S) and rank offer mechanisms for prioritizing factors, reflecting their impact on the research outcomes. SRMR evaluates the fit of the structural equation model, while d_ULS and d_G contribute to assessing model fit and latent variable scores in PLS-SEM.

Chi-square tests the goodness of fit in structural equation modeling, providing an overarching assessment of the model's compatibility with observed data. Fit indices such as NFI, PW, EC, PC, SSC, AT, AC, and PPW collectively contribute to evaluating the overall model fit, predictive capability, system structure, and explanatory power.

These parameters collectively shape the methodological framework, guide statistical analyses, and validate the research model. Their judicious application ensures a comprehensive and rigorous approach to data analysis, allowing for meaningful and reliable conclusions in the context of the research objectives.

Mechanism to Compute Weighted Scores:

1. **Define Variables:**

   Identify and define the variables assessed in this study.

2. **Assign Weights:**

   Assign weights to each variable based on its perceived importance and contribution to the overall objective of the study. Weights are typically assigned on a numerical scale (e.g., 1 to 5), where a higher weight indicates greater importance.

3. Normalize Weights:

To ensure consistency and comparability, normalizing the weights is necessary. This step involved adjusting the weights so that collectively sum to a specific value, often 1 or 100%. This normalization allowed for a standardized interpretation of the weighted scores.

4. Calculate Weighted Scores:

Multiply the assigned weight of each variable by its respective score or value. The formula for calculating the weighted score (WS) for a variable variable I is

$$WSi = Weighti \times Score\ i$$

Repeat this calculation for each variable.

5. Summation:

Summing up the weighted scores for all variables to obtain the overall weighted score for an observation or entity was also calculated.

6. Interpretation:

Analyze the computed weighted scores. Higher weighted scores indicated variables that have a more significant impact on the overall outcome of the study.

Now consider a hypothetical study assessing employee performance, where three variables were identified: "Productivity," "Communication Skills," and "Teamwork." The weights assigned to these variables were 0.4, 0.3and0.3, respectively.

If an employee's scores for these variables are 80, 90 and 85, the weighted scores would be calculated as follows:

$$\mathbf{W\ S}\ \text{Productivity} = 0.4 \times 80 = 32$$
$$\mathbf{W\ S}\ \text{Communication Skills} = 0.3 \times 90 = 27$$
$$\mathbf{W\ S}\ \text{Teamwork} = 0.3 \times 85 = 25.5$$

The overall weighted score for the employee would then be the sum of these weighted scores: 32+27+25.5=84.5. This mechanism allows for a nuanced evaluation of diverse factors, accounting for their relative importance in the context of the study.

Model Fitness Evaluation Mechanism:

In our Materials and Methods section, we implemented a rigorous mechanism to evaluate the fitness of our model, ensuring the integrity and reliability of our research findings. This process involved the following key steps:

Data Preparation:

We initiated the assessment by meticulously preparing our dataset. This included data cleansing to eliminate errors, handling missing values, and ensuring data quality. Proper data preparation is fundamental to achieving an accurate model fitness evaluation.

Dataset Splitting:

To establish the model's fitness, we divided our dataset into two distinct subsets: a training set and a testing set. The training set was exclusively used for model development, while the testing set was reserved for assessing the model's performance.

Model Selection and Training:

We carefully selected an appropriate machine learning or statistical model tailored to our research objectives. This model was rigorously trained on the training dataset, taking into account the various parameters and features under consideration.

Cross-Validation:

To safeguard against overfitting and ascertain the model's generalization ability, we performed cross-validation using techniques such as k-fold cross-validation. This step is crucial in evaluating the model's fitness.

Performance Evaluation: We employed a battery of performance metrics, including but not limited to accuracy, precision, recall, F1 score and area under the ROC curve (AUC), contingent on the nature of our research. These metrics played a pivotal role in assessing the model's fitness.

Comparative Analysis:

In certain instances, we conducted comparative analyses, pitting our model performance against other existing or baseline models. This allowed us to gauge the effectiveness and efficiency of our chosen model.

Data Visualization:

Data visualization techniques were utilized to present the results comprehensibly. Visual aids such as ROC curves and confusion matrices were instrumental in elucidating the models fitness.

Statistical Validation:

We subjected the model's predictions to rigorous statistical tests to establish their significance. This step was paramount in ascertaining the statistical and practical relevance of the model's fitness to our research objectives.

Interpretation:

Finally, we meticulously interpreted the results and contextualized the implications of the model's fitness within the scope of our research.

Importance of Model Fitness Evaluation Mechanism:

This comprehensive mechanism for model fitness evaluation underpins the credibility and trustworthiness of our research outcomes. It empowers us to make informed decisions, draw meaningful conclusions, and contribute valuable insights to our specific field of study. Importantly, this methodology aligns with the unique demands of our research, rendering it a robust and valid approach to assessing model fitness.

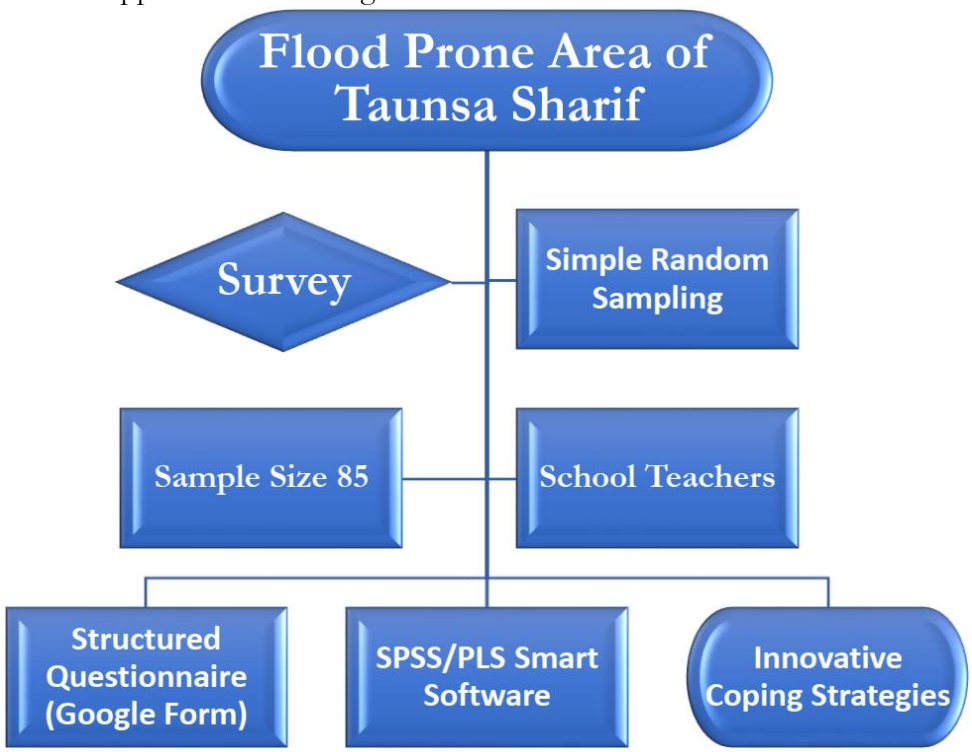

Figure 1. Illustrates a step-by-step flowchart that presents the research process

Results:

Demographic features are utilized to assess their impact on the decision-making behavior of various individuals [12]. The demographic factors of the survey respondents encompassed age, level of education, source of income, and professional experience [13]. These attributes play a significant role in carrying out diverse responsibilities and influencing decision-making processes [14]. Therefore, it is essential to explore the socioeconomic characteristics of the participants. The following discussion introduces and explores the data related to these

demographic attributes [15]. Table 1 displays the results of the demographic profile of the respondents.

Table 1. Demographics distribution of respondents

Distribution of Respondents According to their Gender		
Gender	**Frequency (f)**	**Percent (%)**
Male teachers	68	80.0
Female teachers	17	20.0
Total	**85**	**100.0**
Distribution of the respondents concerning their academic education		
Academic education	f	%
Graduation	17	20.0
Masters	35	41.2
M.Phil	29	34.1
Ph.D.	4	4.7
Total	**85**	**100.0**
Distribution of the respondents concerning their professional education		
Professional Education	f	%
B.Ed.	36	42.4
M.Ed.	28	32.9
M.Phil.	17	20.0
Ph.D.	4	4.7
Total	**85**	**100.0**
Distribution of the respondents concerning their residence		
Residence	f	%
Rural	47	55.3
Urban	38	44.7
Total	**85**	**100.0**

The data in Table 1 demonstrates a clear gender distribution among the respondents. The majority of the participants were male teachers, comprising 80% of the total, while female teachers represented the remaining 20%. The highest proportion of teachers held a master's degree (41.2%), followed closely by those with an M.Phil. degree (34.1%). A smaller percentage held a Ph.D. (4.7%) and 20% had completed their graduation. These findings suggest that the majority of teachers in the sample have attained advanced degrees, which can have implications for the quality of education in the institutions where they work, the professional education of the respondents is also depicted in the above table. The largest group of teachers held a Bachelor of Education (B.Ed.) degree, constituting 42.4% of the sample. The second most common qualification was a Master of Education (M.Ed.), at 32.9%, followed by M.Phil. (20%) and Ph.D. (4.7%). This distribution is essential in understanding the background and expertise of the teachers in the study, which can influence their teaching methods and effectiveness. The table also indicates the distribution of respondents based on their residence. The data reveals that 55.3% of the teachers in the sample resided in rural areas, while the remaining 44.7% lived in urban areas. This discrepancy in residential location may have implications for the accessibility of educational resources and teaching conditions for teachers in different regions. The marital status of the respondents is presented in Table 1. A substantial proportion of teachers were married (62.4%), while 37.6% reported being single. Marital status can have an impact on the personal and professional lives of teachers, including their availability for extra responsibilities

and work-life balance. It also categorizes the respondents by age group. The majority of teachers fell within the age group of 25 to 35 (78.8%). Only a smaller percentage of teachers were in the older age groups, such as 36 to 45 (16.5%), 46 to 55 (3.5%) and 56 to 65 (1.2%). These age group proportions shed light on the generational diversity among teachers and may have implications for their teaching styles and experiences.

Table 2. Ranking of participant's views about the coping strategies used by teachers in flood-prone areas

Coping Strategies	W.S.	Mean	S.D.	Rank
Strive to create a safe and inclusive learning environment	362	4.2	1.0	1
Help students to develop problem-solving skills	362	4.2	1.0	2
Encourage students to express their feelings	361	4.2	1.1	3
Apply relaxation techniques to reduce stress	361	4.2	0.98	4
Attend workshops and training sessions	360	4.2	1.0	5
Keep up a moral support system	359	4.2	0.98	6
Actively involve parents and guardians	358	4.2	1.0	7
Cooperate with community groups and agencies	357	4.2	1.0	8
Talk to parents about their kid's educational importance	352	4.1	1.0	9
Look for social help from co-teachers and friends	351	4.1	1.0	10
Encourage students to take part in discussions	351	4.1	1.0	11
Address pupils needs	350	4.1	1.0	12
Measure professional help	347	4.0	0.9	13
Disruption of classes caused by frequent flooding	340	4.0	0.9	14

Table 2 presents the ranking of participant's views regarding the coping strategies employed by teachers in flood-prone areas. The coping strategies are ranked based on the weighted score (W.S.), mean, standard deviation (S.D.), and their respective positions. The top-ranked coping strategy, with a mean score of 4.26, is the endeavor to establish a safe and inclusive learning environment. Teachers in flood-prone areas recognize the importance of a secure space for their students, which is fundamental for effective teaching and learning. The high mean score indicates the significance attributed to this strategy. second-highest ranked strategy, also with a mean score of 4.26, involves aiding students in developing problem-solving skills. This underscores the role of teachers as facilitators of critical thinking and adaptability, which are essential in flood-prone areas. Encouraging students to express their emotions ranks third, with a mean score of 4.25. Acknowledging and addressing the emotional needs of students in such areas is a compassionate approach that can positively impact their mental well-being and learning experience. The application of relaxation techniques to alleviate stress is ranked fourth, with a mean score of 4.25. Managing stress is vital for both teachers and students in flood-prone regions and this strategy reflects their awareness of the need for emotional well-being. The importance of professional development is highlighted with a mean score of 4.24, ranking fifth. Teacher's commitment to continuous learning and improvement is evident in their participation in workshops and training. Maintaining a moral support system ranks sixth, with a mean score of 4.22. This emphasizes the significance of mutual encouragement and camaraderie among educators facing common challenges. Actively involving parents and guardians in the educational process is ranked seventh, with a mean score of 4.21. Collaboration with families is crucial for holistic student development. Cooperative efforts with community groups and agencies rank eighth, with a mean score of 4.20. This reflects the importance of community engagement in addressing the unique challenges posed by flood-prone areas.

Open communication with parents about the educational importance of their children ranks ninth, with a mean score of 4.14. This underlines the role of educators as advocates for their students. social support from co-teachers and friends is ranked tenth, with a mean score of

4.13. Building a support network can be invaluable in coping with the challenges of teaching in flood-prone regions. The results of this ranking provide valuable insights into the coping strategies that are most emphasized by teachers in flood-prone areas. These teachers prioritize creating a safe and inclusive learning environment, nurturing problem-solving skills, and addressing the emotional well-being of their students. These strategies reflect a holistic approach to education in challenging circumstances. It's important to note that these findings may have specific implications for education policy and teacher training in flood-prone areas. Further research and collaboration with local communities and educational authorities can help refine and implement effective coping strategies in these regions.

Table 3. Ranking of participant's views about their training need in developing coping strategies for dealing with social vulnerability

Training Needs About	W.S.	Mean	S.D.	Rank
Motivational	370	4.3	0.9	1
Culturally sensitive	369	4.3	0.9	2
Working with active citizen formation groups	366	4.3	0.9	3
Creating shelter classroom	364	4.2	1.0	4
Teach about floods and safety	364	4.2	0.9	5
Camp making for tentative shelter	363	4.2	1.0	6
Disaster response management	361	4.2	1.1	7
Stress and anxiety management	361	4.2	1.1	8
Blended learning	360	4.2	0.9	9
Saving drowning person	358	4.2	1.04	10
Innovative resource management	357	4.2	0.9	11
Pupils emotional needs	357	4.2	1.0	12
Health management and awareness	347	4.0	1.1	13
Food safety and food storage	333	3.9	1.2	14

In Table 3, we present the ranking of participant's views on their training needs to develop coping strategies for dealing with social vulnerability. The training needs are ranked based on the weighted score (W.S.), mean, standard deviation (S.D.), and their respective positions. The top-ranked training need, with a mean score of 4.35, is "Motivational." Teachers in flood-prone areas recognize the importance of motivation in sustaining resilience and inspiring students in challenging circumstances. second-highest ranked training need, with a mean score of 4.34, involves being "Culturally sensitive." This emphasizes the significance of understanding and respecting the cultural context of the community to foster effective coping strategies. The third-ranking training need, with a mean score of 4.31, is "Working with active citizen formation groups." Collaboration with community groups can play a pivotal role in addressing social vulnerability and disaster response. Creating shelter classrooms is ranked fourth, with a mean score of 4.28. This training highlights the importance of preparing safe learning environments in emergency situations, such as during floods. Teaching about floods and safety ranks fifth, with a mean score of 4.28. This underscores the need for educators to equip themselves with the knowledge and skills required to educate students about disaster preparedness. Preparing camps for tentative shelter is ranked sixth, with a mean score of 4.27. This training need is crucial in providing temporary refuge during flood-related emergencies. Disaster response management is the seventh-ranked training need, with a mean score of 4.25. Training in this area is vital for teachers to effectively manage and respond to disasters, safeguarding their students and themselves. Stress and anxiety management ranks eighth, with a mean score of 4.25. Coping with the psychological impact of disasters is essential for teachers in flood-prone regions. The ninth-ranked training need is "Blended learning," with a mean score of 4.24. Incorporating blended learning approaches can enhance education continuity during

crises. Saving a drowning person is ranked tenth, with a mean score of 4.21. This training need reflects the recognition of teacher's roles in ensuring the safety of students during floods. The results of this ranking provide valuable insights into the training needs perceived by teachers in flood-prone areas for developing coping strategies. Teachers value motivational training, cultural sensitivity, and working with community groups to enhance their ability to address social vulnerability effectively. These training needs align with the challenges faced by educators in such regions and suggest areas where investment in teacher training and professional development can make a significant impact.

Table 4. Gender-wise comparison of the affectiveness of the coping strategies currently used by teachers (male/female)

Effectiveness of Coping Strategies	Gender	N	Mean	S.D.	t-value	p-value
Teaching about floods and safety prepares students	Male	68	4.1	0.95	0.38	.704^{NS}
	Female	17	4.0	1.1		
Effect on kids mental health	Male	68	4.0	1.0	0.48	.627^{NS}
	Female	17	3.9	1.1		
Sensitivity and compassion are beneficial	Male	68	4.2	0.9	0.94	.346^{NS}
	Female	17	3.9	1.1		
Teamwork is minimized	Male	68	4.1	0.9	-.10	.916^{NS}
	Female	17	4.1	1.1		
Relaxation assists in controlling stress	Male	68	4.1	1.2	0.7	.485^{NS}
	Female	17	3.9	1.2		
Inclusive learning environment	Male	68	4.1	0.96	1.3	.184^{NS}
	Female	17	3.8	1.1		
Workshops and trainings are effective	Male	68	4.3	0.98	1.1	.257^{NS}
	Female	17	4.0	1.0		
Flood preparedness assists socially disadvantaged pupils	Male	68	4.3	1.0	1.5	.135^{NS}
	Female	17	3.8	1.1		
Struggle to effectively communicate safety measures	Male	68	4.3	0.96	1.1	.241^{NS}
	Female	17	4.0	1.1		
Tactics avoid academic interruption	Male	68	4.2	1.0	2.9	.004**
	Female	17	3.2	1.4		
Provide limited moral support	Male	68	4.1	1.1	0.9	.357^{NS}
	Female	17	3.8	0.95		
Technology helps teacher	Male	68	4.2	1.0	0.3	.714^{NS}
	Female	17	4.1	.88		
Build resilience for students	Male	68	4.2	0.92	1.1	.253^{NS}
	Female	17	3.9	0.74		
Identify student needs	Male	68	4.3	1.0	0.7	.443^{NS}
	Female	17	4.1	0.78		
Improve mental health	Male	68	4.4	0.9	3.5	.001**
	Female	17	3.4	1.4		
Work with local governments	Male	68	4.4	0.90	1.5	.125^{NS}
	Female	17	4.0	1.1		

NS = non-significant, ** = Highly significant (Significant at 1% level of significance)

Table 4 presents a gender-wise comparison of the effectiveness of coping strategies currently used by male and female teachers. The table includes the mean, standard deviation (S.D.), t-value, and p-value for various coping strategies. The analysis shows that there is no significant difference in the perceived effectiveness of this strategy between male and female teachers (p = .704). Both genders consider this strategy similarly effective. There is no significant

difference in the perceived effectiveness of this strategy between male and female teachers (p = .627). Both genders believe that this strategy is equally effective. Again, no significant difference in perceived effectiveness is observed (p = .346). Both male and female teachers consider sensitivity and compassion to be equally beneficial. The analysis indicates that there is no significant difference in the perceived effectiveness of this strategy (p = .916). Both male and female teachers have similar views on the impact of minimizing teamwork. No significant difference is observed (p = .485), as both genders rate the effectiveness of this strategy similarly. Although male teachers rate this strategy more favorably, the difference is not statistically significant (p = .184). The perceived effectiveness of workshops and training is not significantly different between male and female teachers (p = .257). The analysis shows that male teachers find this strategy more effective, but the difference is not statistically significant (p = .135). There is no significant difference in the perceived effectiveness of this strategy (p = .241). This strategy shows a statistically significant difference in perceived effectiveness between male and female teachers (p = .004**). Male teachers rate this strategy significantly higher in terms of effectiveness compared to their female counterparts. The perceived effectiveness of providing limited moral support is not significantly different between male and female teachers (p = .357). Both genders perceive the effectiveness of technology similarly (p = .714). Although male teachers rate this strategy higher, the difference is not statistically significant (p = .253). The perceived effectiveness of this strategy is not significantly different between male and female teachers (p = .443). There is a highly significant difference in perceived effectiveness between male and female teachers (p = .001**). Male teachers believe that this strategy is significantly more effective in improving mental health compared to their female counterparts. The perceived effectiveness of working with local governments is not significantly different between male and female teachers (p = .125). The results suggested that while there are some differences in the perceived effectiveness of coping strategies between male and female teachers, many strategies are seen as equally effective by both genders. Strategies like "Tactics to avoid academic interruption" and "Improve mental health" showed significant differences in perception between male and female teachers, indicating potential areas for further investigation and professional development.

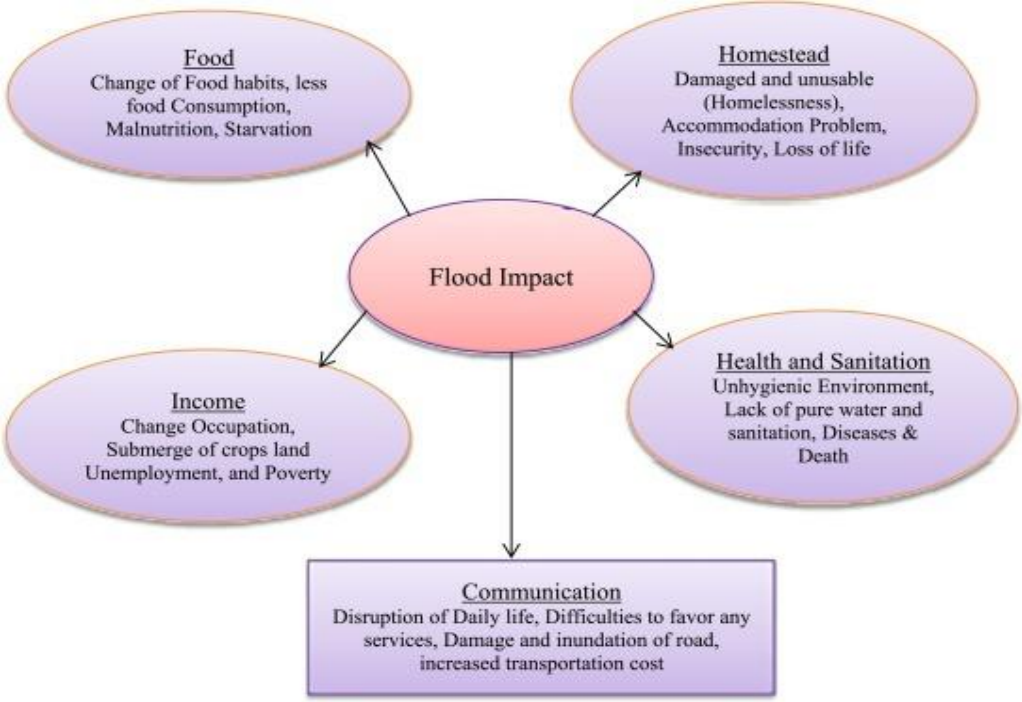

Figure 2. Flood impact flow on char land households [16].

The flowchart delineates various stages of a flood disaster and their corresponding impacts on the livelihoods of the community. It offers a clear depiction of the chain of events, commencing with the onset of a flood and its immediate consequences on infrastructure, agricultural yields, and housing. Furthermore, the flowchart illustrates the subsequent effects, including displacement, loss of income, and heightened health risks. By scrutinizing the flood disaster flowchart, the study seeks to reveal the holistic repercussions of flooding on the livelihoods of Taunsa Sharif residents. This comprehension is vital for the formulation of effective coping strategies, preparedness measures for disasters, and policy interventions aimed at alleviating the detrimental effects of floods and bolstering the resilience of the impacted communities. The flood disaster flowchart (Figure 1) serves as a visual tool to illustrate the interconnections between different elements and the overall consequences of flooding in the study area. It will guide the subsequent data analysis and interpretation, providing insights into the specific challenges faced by the affected population and informing the development of targeted strategies.

Construct Validity and Reliability:

Cronbachs alpha stands as one of the most widely employed techniques for assessing internal reliability. Scholars, as emphasized by Hair et al., recommend an optimal Cronbachs alpha value exceeding 0.70. Furthermore, a pragmatic guideline categorizes values as follows: ≤0.90 signifies exceptional reliability, 0.70-0.90 indicates high reliability, 0.50-0.70 suggests reasonable reliability, and values below 0.50 are labeled as poor reliability. The imperative role of confirming Measurement Model outcomes through construct validity is highlighted by Hair et al. Construct validity evaluates scales and their constituent items to ascertain whether they accurately probe the intended concept. To this end, this study has employed two approaches for assessing construct validity: convergent validity and discriminant validity.

Table 5. Factor loading

	Cronbachs Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Adaptive Coping	0.9	0.9	0.9	0.6
Adaptive Teaching Method	0.9	0.9	0.9	0.5
Emotional Coping	0.8	0.8	0.9	0.6
Problem-solving coping	0.9	0.9	0.9	0.6
Psychological Wellness	0.9	0.9	0.9	0.5
Social Support coping	0.9	0.9	0.9	0.6

Convergent validity investigates the interrelationships among measuring items and assesses whether these measures align within the same scale, as elucidated by [17]. Key indicators of convergent validity encompass factor loadings, t-values (critical ratio), composite reliability (CR), and average variance extracted (AVE). In line with factor loadings should meet or exceed 0.50, whereas suggest a minimum acceptable threshold of 0.70 for composite reliability and 0.50 for average variance extracted. Scrutinizing Table 5 reveals that all factor loadings in the current model surpass 0.50, CR values exceed 0.70, and SAVE figures are greater than 0.50. This confluence of evidence underscores the attainment of convergent validity within this scholarly inquiry.

Model Fitness:

To evaluate both the measurement and structural models, a fundamental requirement is to compute a minimum of four model fit estimates. The analysis of the default measurement model reveals that out of the five model fit tests conducted, four indicate a reasonable fit, while one test is indicative of a near-fitting model as revealed in Table 6.

Table 6. Fitness Summary

	Saturated	Estimated

SRMR	0.06	0.06
D ULS	6.9	6.9
D G	10.4	10.4
Chi-Square	3560.05	3560.1
NFI	0.5	0.5

Model R^2:

In Model R^2, the proportion of variance explained in the dependent variable by the independent variables is quantified in the form of a percentage. The outcomes of the analysis in Table 7 reveal that the overall model accounts for 88% of the variation in Psychological Wellness ($R^2 = 0.883$) and 89% of the variance in Adaptive Teaching ($R^2 = 0.893$). This suggests that the independent variables considered in the respective models contribute significantly to explaining the observed variations in both Psychological Wellness and Adaptive Teaching.

Basic Model:

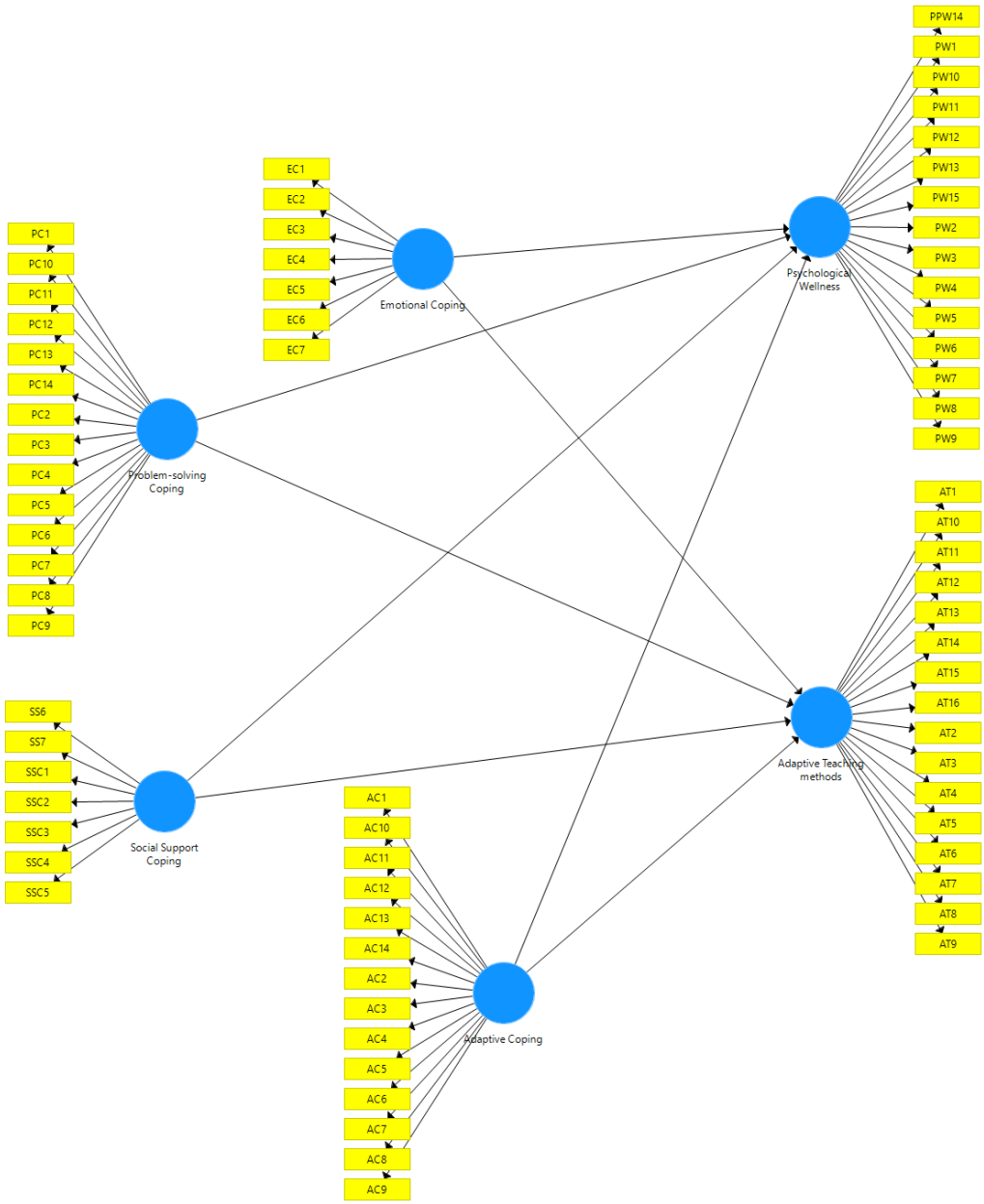

Figure 3 Basic Model. To analyze psychological wellbeing and Advanced teaching method adoption as an impact of coping strategy

Table 7. Model R^2

	R Square	R Square Adjusted
Adaptive Teaching Methods	0.89	0.89
Psychological Wellness	0.88	0.88

Measurement Model:

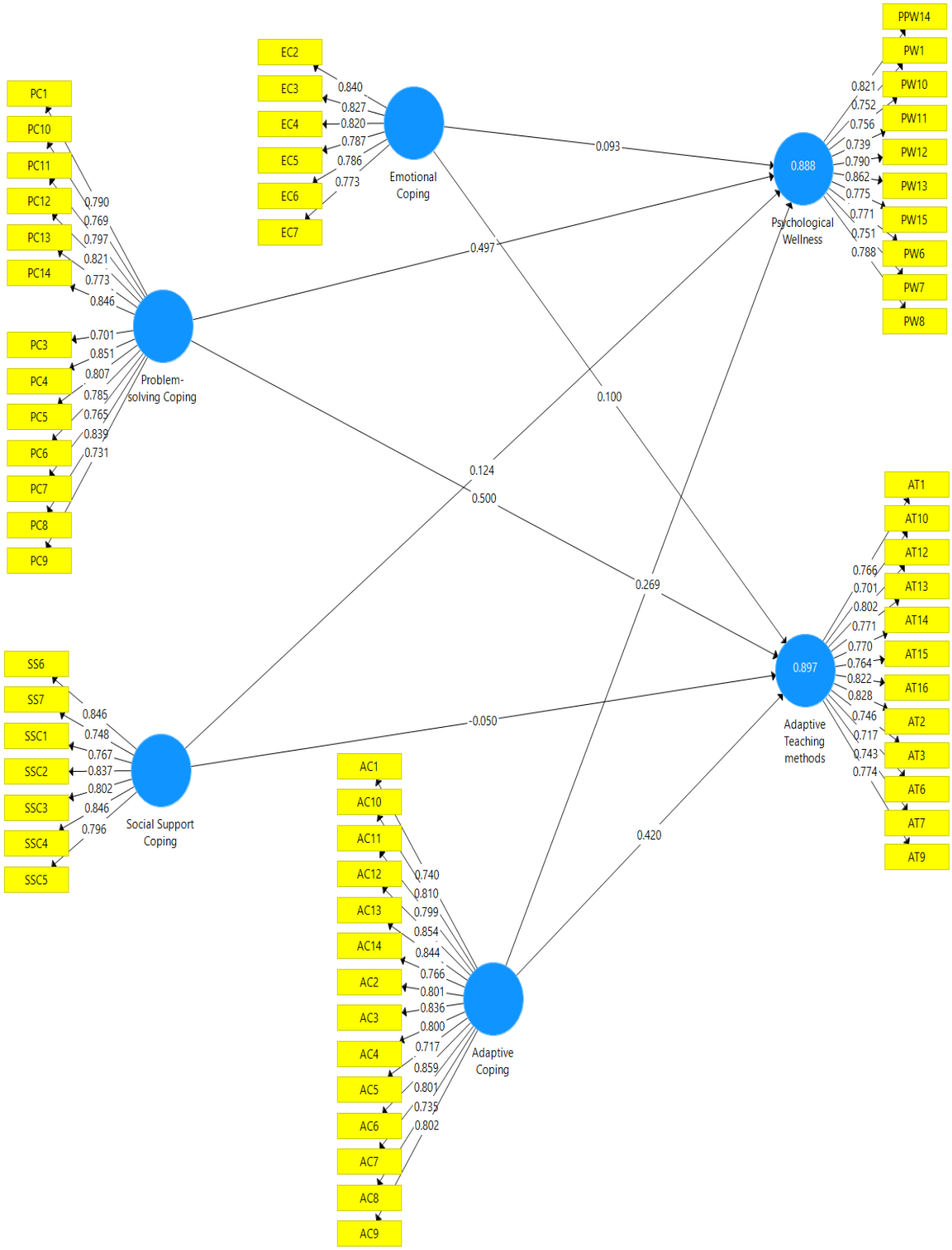

Figure 4 Measurement Model. To examine the effects of coping strategies on the constructs of psychological well-being and the adoption of advanced teaching methods.

Structural Model:

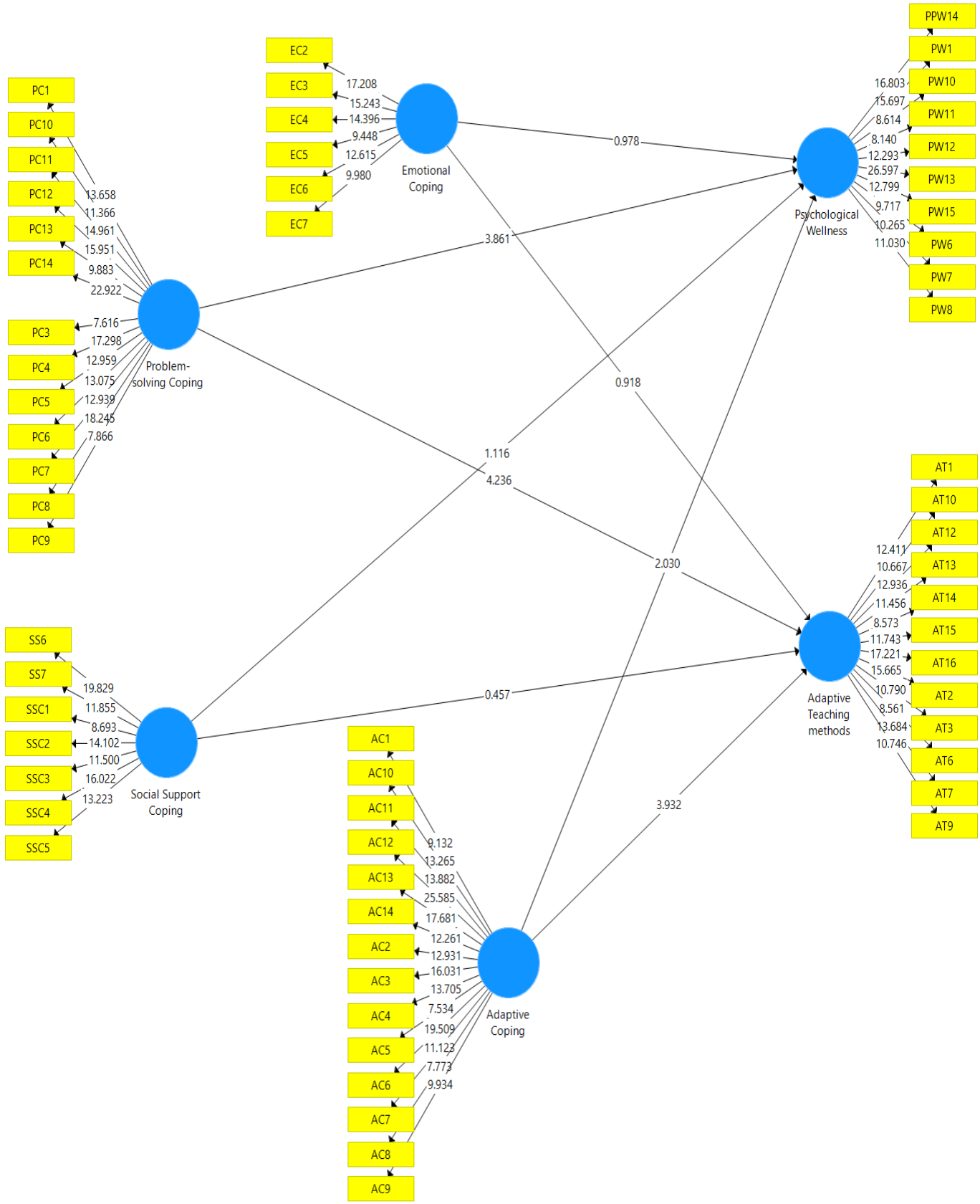

Figure 5 Structural Model. Exploring the Influence of Coping Strategies on Psychological Well-being and the Adoption of Advanced Teaching Methods.

Structural Model:

Following the confirmatory factor analysis, which demonstrated reasonable fit, the subsequent step involves examining the structural model. Biswas (2021)[18] defines the structural model as one where theoretical connections between factors are postulated and subsequently investigated to ascertain their existence [18]. The testing of the structural model encompasses the calculation of Model R^2 and the evaluation of hypothesized relationships among variables through hypothesis testing. The calculation of Model R^2 is based on the PLS algorithm, which was validated in the measurement model.

The primary objective of this analysis is to quantitatively assess the impact of coping strategies on teacher's psychological well-being and their adaptation to teaching methods. Hypotheses are tested using path coefficients, t-values, and p-values. Significant relationships between factors are typically indicated when t-values exceed 1.96 and p-values are below 0.05.

The findings in Figures 2,3 & 4 reveal that both Adaptive Coping and Problem-Solving Coping have a positive and significant effect on psychological well-being, as indicated by their positive path coefficients that meet the established criteria. However, Emotional Coping and Social Support Coping do not yield significant results in adaptive teaching methods and psychological well-being. This outcome stands out as a unique aspect of the study, deviating from previous research. Additionally, it is noteworthy that Social Support Coping exhibits a weak and negative correlation with adaptive teaching, as evidenced by the regression coefficient.

Table 8. Path Coefficients

	Original Sample	Sample mean	Standard Deviation	T-Statistics	P Values
Adaptive Coping -> Adaptive Teaching Methods	0.4	0.4	0.1	3.9	0.00
Adaptive Coping-> Psychological Wellness	0.2	0.2	0.1	2.03	0.04
Emotional Coping -> Adaptive Teaching Methods	0.1	0.1	0.1	0.9	0.35
Emotional Coping -> Psychological Wellness	0.09	0.08	0.09	0.9	0.32
Problem- solving coping -> Adaptive Teaching Methods	0.5	0.5	0.1	4.2	0.00
Problem- solving coping -> Psychological Wellness	0.4	0.4	0.1	3.8	0.00
Social Support Coping-> Adaptive Teaching Methods	-0.05	-0.05	0.1	0.4	0.64
Social Support Coping-> Psychological Wellness	0.1	0.1	0.1	1.1	0.26

These results in Table 8 provide valuable insights into the intricate interplay between coping strategies, teaching methods, and psychological wellness among educators, underscoring the importance of adaptive and problem-solving coping strategies in promoting innovative teaching and overall well-being. The path coefficients within the structural equation model offer crucial insights into the connections between coping strategies and their effects on adaptive teaching methods and psychological wellness. The path coefficient of 0.4 demonstrates a significant positive relationship between adaptive coping strategies and the adoption of adaptive teaching methods. Teachers who utilize adaptive coping mechanisms are more likely to implement flexible and innovative teaching approaches, indicating a strong correlation between their coping abilities and their teaching methods (T-Statistics: 3.9, p-value: 0.00). With a path coefficient of 0.2, there is a positive connection between adaptive coping strategies and

psychological wellness. Educators who engage in adaptive coping are inclined to experience improved psychological well-being, highlighting the link between their coping strategies and overall mental health (T-Statistics: 2.03, p-value: 0.04). The path coefficient of 0.1 suggests a slight positive relationship between emotional coping strategies and the implementation of adaptive teaching methods. Nevertheless, this relationship lacks statistical significance (T-Statistics: 0.9, p-value: 0.35). With a path coefficient of 0.09, emotional coping strategies show a marginally positive association with psychological wellness. However, this relationship is not statistically significant (T-Statistics: 0.9, p-value: 0.32). A substantial path coefficient of 0.5 indicates a robust positive relationship between problem-solving coping strategies and the utilization of adaptive teaching methods. Teachers employing problem-solving coping mechanisms are more inclined to implement adaptive teaching approaches, signifying a significant and positive connection (T-Statistics: 4.2, p-value: 0.00). The path coefficient of 0.4 highlights a significant positive association between problem-solving coping strategies and psychological wellness. Educators using problem-solving coping strategies tend to experience enhanced psychological well-being, underscoring the importance of these coping mechanisms (T-Statistics: 3.8, p-value: 0.00). The path coefficient of -0.05 suggests a weak negative relationship between social support coping strategies and the adoption of adaptive teaching methods. Nonetheless, this relationship lacks statistical significance, indicating that the use of social support coping does not significantly impact the choice of teaching methods (T-Statistics: 0.4, p-value: 0.64). With a path coefficient of 0.1, social support coping strategies exhibit a modest positive association with psychological wellness. Nevertheless, this relationship lacks statistical significance (T-Statistics: 1.1, p-value: 0.26).

Discussions:

The findings of this study shed light on the coping strategies employed by teachers in Taunsa Sharif, Punjab, Pakistan, and their impact on well-being in the context of flood-prone areas. The study underscores the significance of exploring coping strategies as integral components of teacher wellbeing and community resilience. Proposed research reveals a positive association between active coping approaches and teacher's psychological well-being. Effective coping strategies were found to be linked to lower psychological distress and matched with Govt of Pakistan statistics [19]. Teachers in Taunsa Sharif appeared to be aware of the value of employing diverse coping strategies, reflecting the need for both awareness and resources in managing the unique challenges presented by flood-prone regions. This aligns with existing literature emphasizing the crucial role of coping mechanisms in mitigating the psychological impact of disasters [20]. Our findings are consistent with previous research that highlights the positive impact of active coping strategies on well-being [21]. An interesting aspect of our study is the variation in coping strategy adoption among different school levels. While primary and secondary school teachers predominantly utilized certain coping strategies, teachers at higher levels as their primary approaches, results are at par with Halder [22]. This variation may reflect the differing demands and responsibilities of teachers at various educational levels as Zwęgliński has discussed the same [23]. Policymakers and education authorities must recognize these differences and provide tailored support and training to address the unique needs of teachers at different levels as also revealed the same by Khalid [24].

One significant finding is the pivotal role of collaborative efforts and community engagement in flood management. Teachers in Taunsa Sharif actively participated in community-based flood response and resilience-building initiatives. This underscores the importance of community involvement in disaster management as shown in the same findings by [25]. Teachers, as trusted figures within the community, play a vital role in fostering a sense of preparedness and resilience. The study identified specific training needs, with the most prominent being motivational training and cultural sensitivity. These findings emphasize the

importance of professional development programs that address these specific needs. While this research provides a foundation for understanding training needs, future efforts should focus on developing and implementing training programs tailored to these needs and evaluating their effectiveness as depicted by Khan [26]. The ranking of training needs for teachers in flood-prone areas provides valuable insights into the specific requirements for building resilience and enhancing disaster preparedness within the education sector as similar results found by Kumar [27]. These training needs are of paramount importance in addressing the unique challenges faced by educators in such regions. The top-ranked training need, "Motivational," underscores the critical role of maintaining motivation among teachers Smith revealed that the role of motivation traits in decision-making depends on continuous training [28]. In flood-prone regions, educators often face overwhelming challenges, from disrupted classrooms to students dealing with upset. Sustaining motivation is essential for teachers to navigate these challenging circumstances effectively, same statistics written by smith in his book Teachers as Role Models [29]. Motivated teachers can inspire their students, fostering a positive and resilient learning environment [30]. This training highlights the need for strategies that empower teachers to stay motivated and inspire resilience within themselves and their students. Culturally Sensitive" training is prioritized, emphasizing the importance of educators understanding and respecting the diverse cultural backgrounds of their communities. In flood-prone regions, communities often have distinct cultural norms and practices. Teachers need to adapt their coping strategies to resonate with local contexts. Cultural sensitivity not only enhances their effectiveness but also fosters trust and community integration, which is vital in disaster response and resilience building [31]. This training need recognizes the need for teachers to be culturally competent in addressing the specific needs and perspectives of their students and their communities. The third-ranked training need, "Working with Active Citizen Formation Groups," highlights the significance of collaboration between teachers and local communities as Brown discussed that direct and moderating impacts of the CARE mindfulness-based professional learning program for teachers on childrens academic and social-emotional outcomes [32]. Teachers play a central role in community-based disaster response and resilience-building efforts. Active engagement with citizen formation groups can facilitate effective disaster management, as local communities often possess valuable knowledge and resources. This training need emphasizes the importance of equipping teachers with the skills and knowledge to collaborate with local groups effectively. It also underscores the importance of involving teachers in community-driven initiatives for enhanced disaster resilience. These distinctions in training needs underscore the practical and contextual challenges faced by teachers in flood-prone areas [16]. They highlight the necessity for tailored teacher training and professional development programs that address the specific requirements of these educators. Such programs should equip teachers with the necessary skills and knowledge for effective disaster response, resilience building, and community collaboration. Furthermore, considering the ranking of training needs, it becomes apparent that teachers in flood-prone areas face unique challenges and demands. These distinctions highlight the necessity to investigate gender-specific preferences in coping strategies, emphasizing potential areas for further exploration [33]. Customized professional development programs tailored to the needs of teachers, both male and female, are essential for bolstering disaster resilience within educational settings [34]. These programs can help teachers effectively address the challenges posed by their environment and contribute to building a more resilient educational system in flood-prone regions [35].

The study exhibits several inherent limitations that deserve acknowledgment. Firstly, it is imperative to recognize that the assessment is confined exclusively to the distinct geographical context of Taunsa Sharif within Punjab, Pakistan. Consequently, the coping strategies identified may not be universally representative of those employed in other regions prone to flooding.

Secondly, the identification of training needs is fundamentally grounded in the perceptions of teachers in Taunsa Sharif, rendering the applicability of these findings to teachers in analogous regions less direct. Thirdly, the studys evaluation primarily centers on the perspectives of teachers, potentially offering a somewhat narrower view of the overall impact on students and their families. Furthermore, the exploration of these perceptions is inherently delimited to the specific milieu of Taunsa Sharif, potentially omitting the full spectrum of perspectives prevalent in other flood-prone regions. Lastly, while the study indicates the potential for developing training programs, its essential to recognize that further customization may be requisite to align with the distinctive characteristics and needs of other flood-prone areas within the broader Punjab region.

Conclusion:

This study investigated the coping strategies and their impact on teacher's well-being in Taunsa Sharif, revealing the positive association between active coping approaches and psychological well-being. Effective coping methods were also linked to lower psychological distress. Teachers recognized the value of diverse coping strategies, emphasizing the need for awareness and resources. Varied coping strategies adopted among different school levels underscore the importance of tailored training. Collaborative efforts and community engagement played a pivotal role in flood management, while a comprehensive training needs assessment highlighted essential areas for capacity building. This research provides valuable insights for enhancing teacher well-being, community resilience, and disaster preparedness in flood-prone regions.

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