International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Development of a Scale to Measure Attitude of Higher Secondary Students in West Bengal Toward Water Conservation

Dr. Susmita Pal

Department of Education, The University of Burdwan, Golapbag, Burdwan, Purba Bardhaman, West Bengal, India

Abstract:
Water conservation is a critical environmental concern, and students' attitudes play a key role in promoting sustainable water-use behavior. This study aimed to develop and validate a comprehensive scale to measure attitudes toward water conservation among higher secondary students in West Bengal. A cross-sectional survey was conducted with 400 students. The scale was developed based on theoretical frameworks and expert validation. Exploratory Factor Analysis (EFA) using Principal Component Analysis with Varimax rotation was performed, along with reliability analysis. The data were suitable for factor analysis (KMO = 0.949; Bartlett's $\chi^2(435) = 20068.19$, $p < .001$). Although a dominant general factor emerged, the scree plot supported an eight-factor solution. The final 30-item scale showed acceptable factor loadings with minor cross-loadings. The scale demonstrated excellent internal consistency (Cronbach's $\alpha = 0.982$), with subscale reliabilities ranging from 0.822 to 0.884. High inter-correlations indicated a coherent multidimensional construct. The developed scale is a reliable and valid instrument for assessing multidimensional attitudes toward water conservation among students and can be effectively used for research and educational interventions.

Keywords: Water Conservation, Attitude Scale Development, Exploratory Factor Analysis, Environmental Attitudes, Higher Secondary Students

1. Introduction:

Water conservation has become an urgent global priority as freshwater resources are limited and unevenly distributed (Koner, 2018) . Many regions face seasonal water scarcity or quality issues, making efficient use of existing water resources crucial. In India, and West Bengal in particular, the need to conserve water is increasingly important amid growing demand and recurring shortages (Koner, 2018). Recognizing this, environmental education has been made a compulsory part of the school curriculum (per a Supreme Court directive), with water conservation included as a key topic for students (Koner, 2018). The rationale is that building awareness and knowledge in youth will foster a culture of wise water use. However, beyond theoretical knowledge, attitudes towards water conservation play a pivotal role in whether individuals actually adopt water-saving behaviors (Koner, 2018)

Attitudes are the evaluative dispositions that can influence one's intentions and actions regarding a behavior. Pro-environmental attitudes have been identified as the "cognitive basis" of pro-environmental behaviors (Li et al., 2024; Gifford, 2014; Gong et al., 2023). In the context of water use, positive

attitudes and beliefs have been linked to lower household water consumption (Willis et al., 2011; Reddy et al., 2023) Yet, attitude is a multifaceted construct; numerous psychosocial factors shape whether someone is inclined to conserve water. Prominent behavioral theories like the Theory of Planned Behavior (TPB) and Norm-Activation Model suggest that one's social norms, perceived control, personal moral obligations, habits, emotional connection to nature, and awareness of consequences all contribute to conservation-related decisions (Bamberg & Möser, 2007). Measuring these dimensions can provide deeper insight into students' propensity to engage in water-saving practices.

Understanding students' attitudes is particularly important because they are future custodians of water resources. By late adolescence (higher secondary level), students form values and habits that can last into adulthood. If they hold strong positive attitudes and a sense of responsibility toward saving water, they are more likely to carry out conservation behaviors and influence others in their families and communities (Reddy et al., 2023). Determining the prevailing attitudes and the factors influencing them can therefore guide educational interventions. As Reddy et al. note, assessing "the extent to which people are aware of the problem" and their motives is a critical first step for designing effective water-saving strategies (Reddy et al., 2023). With this in mind, the present study focuses on developing a comprehensive scale to measure the attitude of higher secondary students in West Bengal toward water conservation, capturing a broad range of underlying domains that theory and past research indicate are important.

2. Objectives:

The study's main objective is to develop and validate a standardized Attitude Toward Water Conservation Scale for higher secondary students in West Bengal. The specific objectives are as follows:

- **Development of the Scale:** To design a questionnaire that measures students' attitudes toward water conservation across eight key domains: (A) general attitude, (B) social norms, (C) perceived behavioral control/self-efficacy, (D) personal moral norms, (E) behavioral intentions, (F) habits/past behavior, (G) ecological empathy/nature connectedness, and (H) perceived barriers/awareness of consequences. These domains are grounded in established behavioral theories (such as TPB and Norm-Activation theory) and prior empirical findings, ensuring the scale has content validity.
- **Validation of the Scale:** To examine the reliability and validity of the scale. This involves testing the internal consistency of each subscale, exploring the factor structure to confirm that the items indeed group into the eight proposed domains, and establishing validity (content validity through expert review, construct validity through factor analysis, and, if possible, criterion validity by correlating the attitude scale with related outcomes or behaviors).
- **Application for Assessment:** To use the scale in gauging the current attitudes and predispositions of higher secondary students toward water conservation in West Bengal. By identifying strengths and gaps in these attitude domains, the results can inform educators and policymakers on where to focus efforts (for instance, if students have positive attitudes but low perceived control or if social norms are not supportive of conservation, etc.). Ultimately, the objective is that the new scale will serve as a diagnostic tool to measure and track changes in student attitudes and to evaluate the impact of educational interventions or awareness programs on water conservation attitudes.

3. Rationale for Developing the Scale:

While water conservation attitudes have been studied previously, there was a need for a comprehensive

scale tailored to the context of higher secondary students in West Bengal, integrating multiple psychosocial dimensions. A recent Indian study by Reddy et al. (2023) developed a water conservation attitude scale with seven sub-scales (Reddy et al., 2023), but it did not explicitly include several factors (like social norms, perceived control, and nature connectedness) that contemporary research suggests are influential. The present scale was therefore designed to encompass eight domains, each backed by theory and prior evidence, to capture a holistic picture of students' attitudes toward water conservation:

(A) Attitude Toward Water Conservation: This refers to the general evaluative disposition of students toward saving water (whether they view water conservation positively or negatively). In the TPB framework, attitude toward the behavior is a key determinant of intention (Ajzen, 1991). A student with a favorable attitude believes that water conservation is beneficial, important, or rewarding. Prior research shows that such positive attitudes are associated with greater likelihood of engaging in water-saving actions (Willis et al., 2011; Reddy et al., 2023). For instance, Willis et al. (2011) found that households holding stronger pro-conservation attitudes tended to consume less water (Willis et al., 2011; Reddy et al., 2023). Therefore, measuring the baseline attitude provides insight into students' overall mindset regarding water use (e.g. do they feel it is worthwhile to conserve, or do they take water for granted?).

(B) Subjective & Descriptive Social Norms: Social norms encompass the perceived social pressure and common practices related to water use. Subjective norms are students' perceptions of whether important others (parents, peers, teachers) expect them to conserve water, whereas descriptive norms are perceptions of how others actually behave (e.g. "most people I know try to save water" or not). Social influence is a powerful factor; individuals often look to others' behavior as a guide (Cialdini & Trost, 1998; Schultz et al., 2007; Ramli, 2021). If a student believes that peers and family approve of and practice water conservation, the student may feel compelled to conform to those norms. Empirical studies have demonstrated the impact of norms on conservation behavior. For example, providing information that neighbors are saving water has been shown to encourage households to reduce their own water consumption (Cialdini & Trost, 1998; Schultz et al., 2007; Ramli, 2021). Conversely, lack of a conservation norm or the presence of a wasteful norm can undermine personal efforts. By including social norms in the scale, we acknowledge that students' attitudes are partly shaped by their social context – measuring this domain can reveal whether pro-conservation norms are internalized by students in West Bengal. This is especially relevant in collectivist cultural settings where social expectations strongly influence individual actions.

(C) Perceived Behavioral Control & Self-Efficacy: This domain captures the student's perception of how easy or difficult it is for them to conserve water, and their confidence in their ability to do so. In TPB, perceived behavioral control (PBC) reflects the ease or difficulty of performing the behavior and often overlaps with the concept of self-efficacy, one's belief in their capability to execute the behavior (Ajzen, 1991). If students feel they have little control (for example, they think "I'm just a student, I can't really influence water savings" or they lack access to means of saving water), their positive attitudes may not translate into action. On the other hand, a strong sense of efficacy ("I know how to conserve water and I can make a difference by doing so") empowers action. Bandura's theory of self-efficacy posits that confidence in one's ability is a crucial precondition for behavioral change (Ajzen, 1991). Therefore, the scale assesses PBC via items that might ask whether students feel capable of saving water in daily life and whether they feel external factors (like school infrastructure or family practices) facilitate or hinder their efforts. High perceived control has been linked with stronger intentions to

perform conservation behaviors (Bamberg & Möser, 2007). Including this domain helps identify if any practical or psychological barriers are making students feel unable to act on their conservation goals.

(D) Personal / Moral Norms: Personal norm refers to an internalized sense of moral obligation or responsibility to perform a behavior (here, to conserve water). This concept comes from Schwartz's Norm-Activation Model and the Value-Belief-Norm theory, which suggest that when individuals are aware of problems and feel a sense of responsibility, they develop a personal norm to take action. A student with a strong personal norm might agree with statements like "I feel I ought to save water regardless of what others do." Such moral sentiments can drive behavior even in the absence of external rewards or pressures. Research has consistently found personal moral norms to be a strong predictor of pro-environmental intentions and actions (Bamberg & Möser, 2007). In a meta-analysis, Bamberg and Möser (2007) confirmed that, besides attitude and perceived control, moral norms significantly predict one's intention to engage in pro-environmental behavior (Bamberg & Möser, 2007). By developing items for this domain, we gauge whether students feel a personal duty to conserve water (e.g. to help the community, future generations, or the environment), an important motivator that can spur action out of ethical considerations, even when it's inconvenient.

(E) Behavioral Intentions: Intention represents a person's readiness or plan to perform the behavior, and it is usually the immediate antecedent to actual behavior in frameworks like TPB (Ajzen, 1991). While intention is influenced by all the above factors (attitude, norms, PBC), it is useful to measure in its own right as part of the attitude scale. This is because a student might have positive attitudes and feel capable, but if they have not formed a clear intention or commitment to act ("I intend to start saving water whenever possible" or "I plan to take shorter showers to save water"), their behavior may not follow. Including behavioral intention items helps distinguish between those who merely feel favorably about conservation and those who are likely to translate that into practice. Strong intentions to conserve water are a good predictor that the student will try to do so in real life (Bamberg & Möser, 2007). For example, a student who intends to convince their family to install a rainwater harvester demonstrates a high level of commitment. The scale's intention subscale thus captures the goal-setting aspect of attitudes (the motivational component directing toward future action).

(F) Habits & Past Behavior: Habitual factors refer to the influence of one's past behavior and routine on current tendencies. Often, the best predictor of future behavior is past behavior, especially for actions that have become habits (Ouellette & Wood, 1998). If students have grown up practicing water-saving habits at home (such as regularly turning off taps while brushing teeth, or using buckets instead of long showers), these ingrained behaviors will reflect in a positive attitude and continued behavior. On the contrary, if wasteful water use has been their norm, they may find it harder to change despite knowing the importance of conservation. Ouellette and Wood (1998) showed that well-established past behaviors can directly drive future behavior through automatic repetition, whereas in new contexts past behavior influences intentions in combination with conscious decision-making (Ouellette & Wood, 1998). We include items about past behavior (e.g. "I have conserved water whenever possible in the past") and habitual tendencies ("I usually don't think twice about how much water I'm using" – reverse scored) to assess this dimension. By doing so, the scale can differentiate between students who are novices in water-saving and those for whom conservation is already second-nature. This is important because habit strength might moderate how much improving knowledge or attitudes will actually change behavior. Identifying habit-related attitudes can help in designing habit-breaking or habit-forming interventions.

(G) Ecological Empathy & Nature Connectedness: This domain addresses the emotional and cognitive connection the student feels with nature and water resources. Ecological empathy means feeling concern for the well-being of the natural environment (for example, empathizing with living creatures that need water, or feeling upset at the thought of rivers running dry), while connectedness to nature refers to seeing oneself as part of the broader ecosystem. These traits are linked to environmental attitudes, students who feel connected to nature and empathy for it tend to value conservation more deeply (Li et al., 2024). Recent research has underscored that empathy with nature can promote pro-environmental attitudes, even in young children (Li et al., 2024). Individuals with a strong nature connectedness score are more likely to engage in pro-environment behaviors (as found in multiple studies and meta-analyses) because they have an intrinsic motivation to protect what they feel part of (Li et al., 2024). By measuring this domain, we capture an affective aspect of attitudes: for instance, items may probe whether students feel upset at water wastage in nature, whether they enjoy and respect rivers/lakes, or feel a sense of kinship with the natural world. High ecological empathy could translate into stronger support for conservation initiatives. This domain is somewhat unique to comprehensive environmental attitude scales and ensures our instrument isn't limited to just rational or social factors but also includes this value-based, emotional component that is especially relevant for fostering long-term pro-environment stewardship.

(H) Perceived Barriers & Awareness of Consequences: Even if a student has positive attitudes and intentions, external or internal barriers might impede action. Perceived barriers are the student's perceptions of what obstacles make water conservation difficult – for example, lack of time or resources, inadequate infrastructure (like not having water-saving fixtures), or even social barriers (such as others' apathy). Recognizing barriers is critical, as pointed out in community-based social marketing approaches: effective behavior change requires removing or reducing barriers while enhancing motivators (Sanchez et al., 2023). If students commonly identify certain barriers (e.g. "There's no point in saving water because our school's plumbing wastes a lot anyway"), that highlights areas for improvement. Alongside barriers, awareness of consequences (sometimes called problem awareness) refers to whether students are aware of the potential outcomes of not conserving water – such as water shortages, environmental damage, or health impacts. According to the Norm-Activation theory, awareness of consequences is a precursor to developing a personal norm to act; people who recognize the serious consequences of water wastage are more likely to feel responsible for preventing those outcomes. Bamberg and Möser's meta-analysis indeed found that problem awareness influences behavior indirectly by increasing moral norms and social norms (Bamberg & Möser, 2007). In our scale, we include items to gauge if students understand the gravity of water issues (e.g. "I am aware that my region could face water scarcity if we don't conserve"). We also ask about perceived impediments to conservation (e.g. "I want to save water but I often can't due to [specific reason]"). By including this domain, the scale not only measures attitudes but also sheds light on practical gaps or misconceptions that could be addressed – for instance, if many students cite "lack of knowledge of how to save water" as a barrier, it indicates a need for more practical training in addition to attitude change. Awareness of consequences items will reveal whether students connect their personal water use to larger environmental outcomes, which is important for instilling a sense of efficacy and responsibility.

Collectively, these eight domains form a robust framework for understanding student attitudes toward water conservation. Each domain is supported by cross-references in environmental psychology literature, underscoring their relevance. By developing a scale that covers all eight areas, we aim to

obtain a nuanced profile of attitudes rather than a single attitude score. This is important because a student might score high in one domain but low in another (for example, they care about water conservation and intend to act, but they may feel powerless due to external barriers). Identifying such patterns can help tailor interventions (perhaps by improving self-efficacy or addressing misconceptions) to ultimately foster both the willingness and the ability to conserve water among students.

4. Methodology:

4.1 Research Design and Participants:

This scale development study utilized a cross-sectional survey design to assess attitudes toward water conservation among higher secondary students (Grade 11–12) in West Bengal, India. A total of N = 400 students (approximately 16–18 years old) participated in the study. Participants were selected through a multi-stage sampling strategy to ensure diversity across different schools and regions. Schools were first stratified by district and type (urban/rural), then a random sample of schools was chosen, and within each selected school, students were randomly invited to participate. The final sample included roughly equal numbers of male and female students, representing various socio-economic backgrounds. Prior to data collection, informed consent was obtained from the students (and parental consent where required, since respondents were minors), and participation was voluntary. No incentives were provided, and respondents were assured of anonymity and confidentiality.

4.2 Instrument Development:

The Attitude Toward Water Conservation Scale (ATWCS) was developed through a multi-step process. **First**, an initial pool of items was generated based on literature review of environmental attitudes and water conservation behaviors, as well as consultation with subject-matter experts in environmental education. The aim was to capture multiple dimensions of attitudes toward water conservation, including personal beliefs, social influences, and behavioral tendencies. I identified eight theorized sub-domains of attitude, namely: (A) General Attitude Toward Water Conservation, (B) Subjective and Descriptive Social Norms, (C) Perceived Behavioral Control & Self-Efficacy, (D) Personal/Moral Norms, (E) Behavioral Intentions, (F) Past Conservation Habits/Behaviors, (G) Ecological Empathy & Nature Connectedness, and (H) Perceived Barriers & Awareness of Consequences (relevant domains A–H as discussed in the Rationale). Multiple statements were written for each sub-domain. For content validity, a panel of 5 experts in environmental science and educational psychology reviewed the item pool, evaluating each item's relevance and clarity. Based on their feedback, items were refined for wording and some were eliminated or revised to ensure adequate coverage of each domain and age-appropriate language.

Second, a pilot test was conducted with a small group of 30 students similar to the target population. This helped in refining the wording of items and verifying the understandability of both English and Bengali versions of the statements. Notably, the scale was prepared in bilingual format (English and Bengali) to accommodate the vernacular medium of instruction in West Bengal. A forward-translation and back-translation procedure was employed: items drafted in English were translated into Bengali by a bilingual educator, then a different bilingual expert back-translated them to English to check for consistency. Discrepancies were resolved to ensure the Bengali items accurately reflected the original meaning. The final instrument consisted of an initial 34-item Likert-type questionnaire (5-point scale: 1 = Strongly Disagree, 5 = Strongly Agree). Several items were negatively worded to control for acquiescence bias (e.g., "Saving water is a waste of time and effort" in the Attitude subscale) and were

reverse-scored during analysis. Each hypothesized subscale contained 4–5 items (including one reverse-scored item where applicable).

4.3 Procedure:

After finalizing the scale, data were collected from the participating students during school hours under teacher supervision. The survey was administered in paper-and-pencil format. Students received a brief orientation explaining the purpose of the study and instructions on how to use the 5-point agreement scale to respond to each statement. They were assured that there were no right or wrong answers and were encouraged to respond honestly. The bilingual questionnaire (English/Bengali) was provided to ensure all students comprehended the items fully. Research assistants and teachers were present to address any questions and to ensure a standardized administration. On average, students took about 15–20 minutes to complete the survey. The completed questionnaires were collected and checked for completeness; all 400 returned surveys were usable, with no missing responses, indicating high engagement.

4.4 Data Analysis:

All responses were entered into IBM SPSS (Version 25) for analysis. The scale development followed classical test theory procedures. Exploratory Factor Analysis (EFA) was performed on the 34 initial items to uncover the underlying factor structure. Prior to EFA, the data's suitability was confirmed: the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were computed. Based on best practices, factor extraction was decided using a combination of criteria – initial eigenvalues (Kaiser's criterion >1), the scree plot visual inspection, and theoretical interpretability of factors. Given an expectation of multiple attitude dimensions, we also considered a fixed-factor extraction approach. The EFA used Principal Component Analysis for initial extraction of factors, followed by orthogonal Varimax rotation to achieve a simpler structure. (Although the attitude dimensions were conceptually related, Varimax was chosen to aid in clear item clustering; the results were additionally examined with an oblique rotation, which yielded a very similar factor pattern given the high inter-factor correlations.) Items were retained on a factor if they exhibited a loading of at least 0.40 on that factor and did not cross-load above 0.30 on any other factor. Iterative EFA runs were conducted, removing one item at a time that showed poor loading or substantial cross-loading, until a clean factor solution emerged. This process led to the elimination of a few items (e.g., items C2, F2, G3, H3 were dropped during analysis due to low communalities or cross-loadings), resulting in a final 30-item scale (Table-1). The retained items clustered into eight factors, consistent with the a priori subscale structure.

After establishing the factor structure, Reliability Analysis was conducted. Cronbach's alpha was computed for each identified subscale and for the overall 30-item scale to evaluate internal consistency. Additionally, item-total correlations were examined to ensure each item contributed meaningfully to its subscale. Lastly, to gather evidence of construct validity, inter-correlation analyses were performed among the eight subscale scores. These Pearson correlations indicate how distinct or overlapping the sub-dimensions are, and whether they all relate to an overall attitude toward water conservation. All analyses used a significance level of 0.05 (two-tailed) for statistical tests, where applicable.

4.5 Ethical Considerations:

The study adhered to standard ethical guidelines for research with human participants. Approval was obtained from the institutional research ethics committee before initiating the study. Permission was also secured from school authorities to survey students on campus. Participants were informed about the

purpose of the research and their rights. Informed consent was obtained: written consent from the students (assent) and their parents or legal guardians was collected prior to participation. Participation was entirely voluntary, and students could refuse or withdraw at any time without any negative consequences. Confidentiality of responses was strictly maintained – no identifying information was collected on the questionnaires, and data were analyzed and reported in aggregate form. The research was conducted with respect for the dignity and privacy of all student participants, and debriefings were provided to school staff regarding general findings to benefit the educational community.

5. Results and Discussion:

5.1 Factor Structure Validation (Exploratory Factor Analysis):

The factor analysis supported an eight-factor solution for the ATWCS. Preliminary checks indicated that the data were indeed suitable for factor analysis: the KMO measure was 0.949, indicating excellent sampling adequacy, and Bartlett's test of sphericity was highly significant ($\chi^2(435) = 20068.19$, $p < 0.001$), confirming that the item correlation matrix was factorable (Table-2). Although the Kaiser criterion suggested only one component with eigenvalue greater than 1 (the first component's eigenvalue was 8.96, while subsequent eigenvalues were <1), the scree plot (Figure-1) revealed a large initial drop followed by a gradual flattening around the 8th factor. In other words, after one dominant general factor, the slope of the scree plot leveled off by about the eighth component, suggesting the presence of multiple smaller factors. Given the theoretical expectation of eight sub-domains and the interpretability of an eight-factor structure, an eight-factor EFA model was extracted and rotated for examination.

After Varimax rotation, the rotated component matrix indicated a clear eight-factor structure aligning with the hypothesized subscales. Most items showed acceptable primary loadings (generally ≥ 0.50) on one factor, although some dispersion across factors was observed (Table-3). Items did not cluster perfectly according to the hypothesized subscales; for instance, items from subscale A, B, and H were distributed across multiple factors rather than loading on a single component. In contrast, some constructs such as Ecological Empathy (G) and parts of Habitual Behavior (F) showed clearer clustering. A few items exhibited moderate cross-loadings or relatively weaker loadings. For example, C3 and D1 loaded on more than one factor, B4 showed cross-loading across two factors, and B3 had a comparatively lower loading. However, these cross-loadings were modest and did not substantially affect interpretability; thus, the items were retained based on their theoretical relevance.

Overall, the results suggest that the ATWCS reflects a multidimensional construct with a strong general factor, alongside several related but overlapping components. While the eight-factor solution is broadly interpretable and theoretically meaningful, the observed dispersion of some items indicates that the dimensions are not entirely distinct, highlighting the complex and interconnected nature of students' attitudes toward water conservation.

It is noteworthy that the first factor accounted for a large proportion of common variance (indicative of a general pro-conservation attitude underlying all items), yet the additional factors, each smaller in variance explained, were necessary to represent specific nuances (such as social pressures, personal norms, practical difficulties, etc.) of the attitude construct.

5.2 Reliability and Internal Consistency:

The ATWCS demonstrated very high internal consistency. The overall 30-item scale achieved a Cronbach's alpha of 0.982, indicating excellent reliability for an aggregated attitude score (Table-4). Moreover, each of the eight subscales showed strong reliability, with Cronbach's α values ranging from

0.822 to 0.884. In particular, the subscale-level alphas were: Attitude (A) α = 0.875, Social Norms (B) α = 0.884, Perceived Control (C) α = 0.879, Personal/Moral Norms (D) α = 0.822, Behavioral Intentions (E) α = 0.842, Habits/Past Behavior (F) α = 0.868, Ecological Empathy (G) α = 0.822, and Barriers/Consequences (H) α = 0.866 (Table-5). These coefficients all exceed the conventional threshold of 0.70, signifying that each subscale is measured with good internal consistency. The high reliabilities suggest that the items within each factor are highly inter-correlated, reflecting cohesive underlying constructs. The inclusion of reverse-worded items did not adversely affect reliability; in fact, item-total statistics indicated that all items contributed meaningfully to their respective subscale (no Cronbach's alpha improved with deletion of any item). The exceptionally high overall alpha (0.982) implies that the ATWCS as a whole is very consistent – perhaps unsurprising given that all subscales measure facets of a common overarching attitude. However, such a high alpha also warrants consideration of potential redundancies; in this case, it likely reflects the genuinely strong internal correlations among different attitude facets rather than verbatim redundancy, since an eight-factor structure was clearly supported. Nonetheless, the scale could be used either as a single summative measure of attitude or as an indexed profile of eight sub-attitudes, depending on research need.

5.3 Subscale Inter-Correlations and Validity Evidence:

To examine the relationships among the attitude dimensions, Pearson correlation coefficients were computed between all pairs of subscale scores. The analysis found that all eight subscales were positively and significantly inter-correlated (all $p < 0.01$). Importantly, the correlations were quite high in magnitude, ranging approximately from $r = 0.80$ to $r = 0.96$ (Table-6). For instance, the Subjective Social Norms subscale correlated $r = 0.959$ with the Perceived Behavioral Control subscale, indicating these two facets tend to align closely in students (those who feel social pressure to conserve water also tend to feel confident in their ability to do so). Even the lowest correlation observed – between Ecological Empathy and Perceived Barriers – was around $r = 0.80$, which is still a strong positive relationship. This pattern of high inter-correlations suggests that the subscales are not orthogonal; rather, they all tap into a common overarching pro-conservation attitude. In terms of construct validity, this provides evidence of convergent validity – each subscale, though distinct in content, converges with others as expected for facets of the same general attitude. At the same time, the fact that an eight-factor model was necessary (and interpretable) indicates discriminant validity among the subscales: each factor represents a specific component that is not entirely accounted for by the others. For example, a student might have strong personal norms about saving water yet still perceive many barriers to action; the moderate-high (but not perfect) correlations between the Personal Norms subscale and the Barriers subscale reflect this possible nuance. Thus, the ATWCS can provide a profile of attitude components, which is valuable for diagnosing particular strengths or gaps in students' attitudes.

Validity was further supported by the content of the factors and their relationships. The alignment of item groupings with theoretical constructs (e.g., all normative items loading together, all intention items together, etc.) supports the construct validity of the scale. Additionally, the strong internal consistencies and inter-correlations imply that the ATWCS is measuring a coherent construct system. Future studies could bolster validity evidence by correlating ATWCS scores with external criteria (for instance, actual water-use behaviors or related environmental attitudes) or by conducting a confirmatory factor analysis; however, within this development sample, the results already indicate that the scale functions as intended.

6. Interpretation and Implications:

Overall, the development of the ATWCS was successful in producing a reliable and valid multi-dimensional scale for assessing students' attitudes toward water conservation. The eight identified factors illustrate that adolescents' attitudes toward conserving water are influenced by a combination of personal beliefs, perceived social expectations, confidence in one's ability, moral obligations, habitual behaviors, empathy towards the environment, and perceived difficulties or consequences. In practice, this means the scale can diagnose which aspect of attitude might need strengthening. For instance, if a particular group of students scores lower on Perceived Behavioral Control, educators might focus on building students' self-efficacy in water-saving actions (through hands-on demonstrations or skill-building activities). Likewise, a low score on Awareness of Consequences would signal a need for more education on the impacts of water wastage and benefits of conservation (Table-7).

The high overall attitude score reliability (α ~0.98) also suggests that the ATWCS can be used as a single index to compare general attitude levels across groups or to measure change over time (e.g., before and after a water conservation curriculum). The rich subscale information, however, is what sets this instrument apart: it acknowledges that "attitude toward water conservation" is not monolithic but rather a tapestry of related perceptions and intentions. This nuance can help researchers and policymakers design more targeted interventions. For example, knowing that students already have strong behavioral intentions but face perceived barriers (like lack of knowledge or resources) would imply that providing practical solutions and resources might be more effective than merely trying to increase motivation.

In conclusion, the ATWCS fills an important gap by providing a comprehensive measure tailored to the context of secondary school students in West Bengal. Its development grounded in theory and empirical validation means that stakeholders can confidently use the scale for educational assessments, program evaluations, and further research on youth environmental attitudes. The results and discussion here demonstrate that the scale has robust psychometric properties and meaningful implications: by understanding student attitudes in detail, better educational strategies can be formulated to foster a water conservation ethic in the next generation.

7. References:

1. Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211.
2. Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211.
3. Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. Journal of Environmental Psychology, 27(1), 14–25
4. Cialdini, R. B., & Trost, M. R. (1998). Social influence: Social norms, conformity, and compliance. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), The handbook of social psychology (4th ed., Vols. 1–2, pp. 151–192). McGraw-Hill.
5. Dolnicar, S., & Hurlimann, A. (2010). Australians' water conservation behaviours and attitudes. Australasian Journal of Water Resources, 14(1), 43–53. https://doi.org/10.1080/13241583.2010.11465373.

6. Dolnicar, S., & Hurlimann, A. (2010). Australians' water conservation behaviours and attitudes. Australasian Journal of Water Resources, 14(1), 43–53
7. Gifford, R. (2014). Environmental psychology matters. Annual Review of Psychology, 65, 541–579. 10.1146/annurev-psych-010213-115048
8. Gong, Y. , Tian, J. , Li, Y. , Zhou, J. , Pongpiachan, S. , Chen, X. , & Sun, Y. (2023). Mitigating perceived environment insignificance through Information engagement. Science Communication, 45(4), 431–459. 10.1177/10755470231188357.
9. Koner, S. (2018). Water Conservation and Awareness – A Study in Kolkata. International Journal of Trend in Scientific Research and Development (IJTSRD), 2(5), 1898-1902.
10. Li Y, Zhao Y, Huang Q, Deng J, Deng X, Li J. Empathy with nature promotes pro-environmental attitudes in preschool children. Psych J. 2024 Aug;13(4):598-607. doi: 10.1002/pchj.735. Epub 2024 Feb 13. PMID: 38351460; PMCID: PMC11317190.
11. Li, Y., Zhao, Y., Huang, Q., Deng, J., Deng, X., & Li, J. (2024). Empathy with nature promotes pro-environmental attitudes in preschool children. PsyCh Journal. (Advance online publication).
12. Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. Psychological Bulletin, 124(1), 54–74.
13. Ramli, U. (2021). Social Norms Based Eco-Feedback for Household Water Consumption. Sustainability, 13(5), 2796. https://doi.org/10.3390/su13052796.
14. Reddy, R. A., Sengupta, R., Jackson, B. M., & Lewis, C. (2023). Development of a new measure to check attitude towards water conservation. MethodsX, 10, 101992.
15. Sanchez, C., Rodriguez-Sanchez, C., & Sancho-Esper, F. (2023). Barriers and Motivators of Household Water-Conservation Behavior: A Bibliometric and Systematic Literature Review. Water, 15(23), 4114. https://doi.org/10.3390/w15234114.
16. Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. Psychological Science, 18(5), 429–434. https://doi.org/10.1111/j.1467-9280.2007.01917.x.
17. Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. Psychological Science, 18(5), 429–434.
18. Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. Journal of Social Issues, 56(3), 407–424.
19. Willis, R. M., Stewart, R. A., Panuwatwanich, K., Williams, P. R., & Hollingsworth, A. L. (2011). Quantifying the influence of environmental and water conservation attitudes on household end use water consumption. Journal of Environmental Management, 92(8), 1996–2009.

Table-1: Attitude Scale towards Water Conservation constitute with Eight Primary Sub-Scales

Sub-Scale	Sl. No.	Item No.	Question/Statement
A. Attitude Toward Water Conservation	1	A1	Using water efficiently is a sign of responsibility.
	2	A2	Conserving water is essential for future generations.
	3	A3	I believe water conservation is a valuable action.
	4	A-R1	Saving water is a waste of time and effort.

B. Subjective & Descriptive Social Norms	5	B1	My parents think I should conserve water.
	6	B2	My friends expect me to use water responsibly.
	7	B3	Most students at my school try to save water.
	8	B4	I feel pressure from my community to conserve water.
C. Perceived Behavioral Control & Self-Efficacy	9	C1	I have enough knowledge to save water at home.
	10	C3	I can help reduce water wastage at my school.
	11	C4	I feel sure about how to apply water-saving practices like turning off taps, using buckets, or reusing water.
	12	C-R1	Even if I try, I don't feel I can save water at home.
D. Personal / Moral Norms	13	D1	I feel a strong moral duty to conserve water.
	14	D2	Saving water is the right thing to do.
	15	D-R1	I don't feel guilty at all if I use water carelessly.
E. Behavioral Intentions	16	E1	I intend to save water every time I brush my teeth.
	17	E2	I plan to encourage my family and friends to use water wisely.
	18	E3	I will act to reduce water use in my daily life.
	19	E-R1	I have no plans to reduce my water use in the near future.
F. Habits & Past Behavior	20	F1	I turn off the tap while brushing my teeth.
	21	F3	I have participated in school water-saving campaigns.
	22	F4	I take short showers to avoid wasting water.
	23	F-R1	I often leave taps running without thinking.
G. Ecological Empathy & Nature Connectedness	24	G1	I feel sad when I see rivers or lakes polluted.
	25	G2	I care about how my water use affects aquatic life.
	26	G-R1	I don't really mind when I see water bodies polluted.
H. Perceived Barriers & Awareness of Consequences	27	H1	It is difficult for me to save water because water-saving tools (like low-flow taps or buckets) are expensive.
	28	H2	I don't always know how to conserve water correctly.
	29	H4	I understand that water waste causes future shortages.
	30	H-R1	I don't think wasting water has any serious consequences.

Table-2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.949
Bartlett's Test of Sphericity	Approx. Chi-Square	20068.190
	df	435
	Sig.	.000

Based on correlations

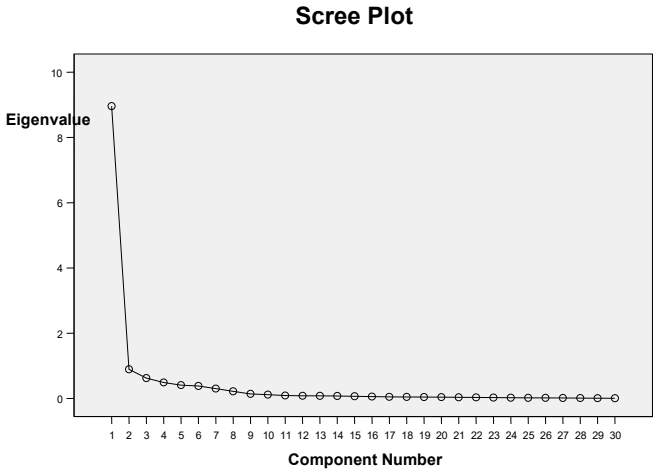

Figure-1: Scree plot of eigenvalues from the exploratory factor analysis of the ATWCS

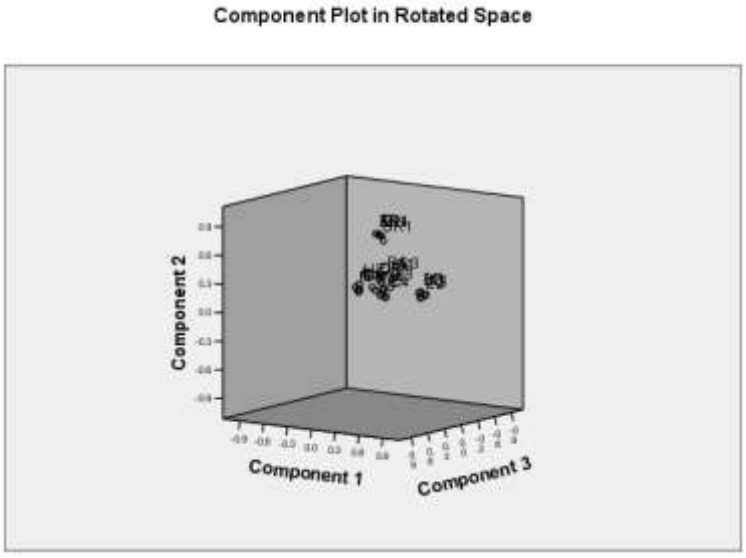

Figure-2: Component Plot in Rotated Space from the exploratory factor analysis of the ATWCS

Table-3: Rotated Component Matrix

Rotated Component Matrix																
Raw Component									Rescaled Component							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
A1			.464								.725					
A2	.483								.815							
A3					.408								.639			
AR1		.636								.826						

B1			.481								.729						
B2	.410								.759								
B3				.266								.448					
B4		.276				.398				.402				.580			
C1			.478								.722						
C3	.331	.284						.397	.475	.407							.568
C4				.519								.837					
CR1						.516								.714			
D1	.308							.412	.419								.560
D2				.517								.856					
DR1						.527								.735			
E1							.539								.765		
E2	.454								.775								
E3					.576								.797				
ER1		.639								.817							
F1							.541								.766		
F3		.666								.839							
F4	.478								.798								
FR1			.486								.729						
G1		.589								.839							
G2				.502								.813					
GR		.52								.76							

1 H1 H2 H4 HR 1	.41 9 .39 0	7	.46 3		.55 0				.77 2 .74 7	1	.66 5		.79 2			

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization
Rotation converged in 7 iterations.

Table-4: Reliability Analysis of ATWCS Scale

Scale	Reliability		Split-Half Reliability				
	Cronbach's Alpha		Guttman Split-Half Coefficient	Cronbach's Alpha (Part-1)		Cronbach's Alpha (Part-2)	
	N	α		N	α	N	α
ATWCS	30	.982	.981	15	.969	15	.962

Table-5: Reliability Analysis of Eight Primary Sub-Scales

Sub-Scale	Reliability	
	Cronbach's Alpha	
	N	α
A. Attitude Toward Water Conservation	4	.875
B. Subjective & Descriptive Social Norms	4	.884
C. Perceived Behavioral Control & Self-Efficacy	4	.879
D. Personal / Moral Norms	3	.822
E. Behavioral Intentions	4	.842
F. Habits & Past Behavior	4	.868
G. Ecological Empathy & Nature Connectedness	3	.822
H. Perceived Barriers & Awareness of Consequences	4	.866

Table-6: Pearson's Pairwise Corrrelation of Sub-Scales

	A	B	C	D	E	F	G	H
A	1							
B	.930(**)	1						
C	.908(**)	.959(**)	1					

D	.867(**)	.937(**)	.957(**)	1				
E	.939(**)	.920(**)	.891(**)	.866(**)	1			
F	.958(**)	.928(**)	.909(**)	.853(**)	.955(**)	1		
G	.875(**)	.842(**)	.851(**)	.837(**)	.866(**)	.870(**)	1	
H	.931(**)	.920(**)	.893(**)	.866(**)	.922(**)	.905(**)	.796(**)	1

** Correlation is significant at the 0.01 level (2-tailed).

Table-7: Categorization of ATWCS Score

Score Range	**Interpretation**
30 – 59	Very Low Attitude toward Water Conservation
60 – 89	Low Attitude
90 – 119	Moderate Attitude
120 – 135	High Attitude
136 – 150	Very High/Pro-Conservation Attitude