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Article

# Mixed-method approach for sustainable water conservation efforts among Malaysian generation Y with social cognitive theory

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**Abstract:** One of the most important factors for raising living standards is the drivers supporting water conservation and water management. Individual's attitude and emotional factors with social cognitive behavior will play an essential role. This empirical study utilizing mixed methods was carried out in Malaysia with the Y generation. The focus group consisted of 52 participants (18 men and 34 women). As for the quantitative study, 607 respondents from the Generation Y population were used with the convenience sampling method. The finding revealed that the outcome expectancy of Generation Y significantly improves water conservation with appropriate water management. Environmental factors, personal factors, and perceived self-efficacy all predicted the result expectancy, which is confirmed by identifications of reciprocal determinism.

**Keywords:** water use efficiency; water management; water scarcity; reciprocal determinism; water conservation

## 1. Introduction

Water conservation is a critical issue globally, especially in the context of climate change and increasing water scarcity (Rahman, 2021). Water conservation service is an essential link between natural ecosystems and human society's demand for ecosystem services, and it plays an essential role in the water cycle and water balance of river basins, as well as human survival and development (Zeng et al., 2022). The impact of the landscape pattern on water-related ecosystem services is mainly reflected in the change in intensity, but the dominant relationship does not change (Zeng et al., 2022).

Water conservation is crucial in developing countries, including Malaysia (Afroz et al., 2016; Rahman, 2021). Water is an essential resource for life and economic development, and many developing countries face challenges related to sustainable water management. Malaysia, for instance, is one of the fastest-growing economies in Southeast Asia, with a projected increase in water demand due to population growth, urbanization, and industrialization (Rahman, 2021). Apart from that, water resources in Malaysia are facing significant challenges due to rapid economic growth, population growth, and climate change (Afroz et al., 2016; Rahman, 2021). The country is located in the equatorial region, which means that it experiences high rainfall throughout the year. However, the distribution of rainfall is uneven, leading to water scarcity in some parts of the country and flooding in others (Afroz et al., 2016). The increasing demand for water in Malaysia is driven by various factors, including

population growth, urbanization, and industrialization (Rahman, 2021).

Therefore, sustainable water management is crucial to ensure the availability of water resources for present and future generations. Sustainable water management involves the efficient use of water resources, conservation of water, protection of water quality, and the equitable distribution of water resources.

Efficient use of water resources involves reducing water waste through the adoption of water-saving technologies and practices. The Malaysian government has implemented various water conservation measures, including the use of efficient irrigation systems in agriculture, the promotion of water-saving technologies in industries, and the adoption of water-efficient fixtures in households (Richard, 2019; Rahman, 2021).

In small, rural communities, water management may be relatively simple and involves primarily the maintenance of local wells and reservoirs. In larger urban areas, water management may be much more complex, involving the coordination of multiple agencies and the use of advanced technology to monitor and control water flow, distribution, and quality (Aini et al., 2007; Inhaz et al., 2020; Trang, 2019).

Promoting water conservation is a complex issue that requires a multifaceted approach. The research around how to best promote water conservation is still not well developed, including on which communication strategies, how to frame and target messages, and how success is influenced by trust in the information source etc. (Afroz et al., 2016; Moglia et al., 2018; Rahman, 2021). One aspect of the main concentration of conservation may relate to the messages given to the population in the context of capability, opportunity, and motivation behavior dimensions (Addo et al., 2019; Trang, 2019). It can create a role to play in determining household water-conservation behavior (Addo et al., 2019).

Water management in developing countries may be more challenging due to a lack of resources and infrastructure, while water management in developed countries may be more advanced and sophisticated, with a greater emphasis on conservation, sustainability, and disaster preparedness (Malay Mail, 2019; Rahman, 2021). But, relying on resources and awareness alone is not sufficient to ensure the adoption of water conservation behaviors and practices among the population (Ahmed et al., 2018; Trang, 2019).

The need of understanding on population group also plays a significant role. For example, Generation Y born within 1977 to 1994 make up a substantial portion of the new consumer market (Lazarevic and Lazarevic, 2009). This generation can be characterized as diversified both ethically and demographically with inclined consumption attitude and supplanted from the previous generation in terms of higher financial risk-taking appetite (Talbott, 2012). Studies have proved their inclination towards green awareness (Novak et al., 2018; Suki, 2013a), green purchasing (Nizam et al., 2014), organic products consumption (Saleki and Seyedsaleki, 2012; Thambiah et al., 2015), clothing disposal (Yee et al., 2016) and ecological behaviour (Suki, 2013b). Studies have also identified that age along with other socio-demographic variables does influence, however in context of water conservation, the research is not very comprehensive even though female plays an important role in the usage of water (Inhaz et al., 2020; Tong et al., 2017).

Some studies have argued that with higher levels of education tend to have a

greater understanding of the importance of water conservation and may be more likely to take actions to conserve water in their households (Inhaz et al., 2020; Tong et al., 2017). People with higher income tend to have more resources and access to water-saving technologies and may be more likely to invest in water conservation measures (Inhaz et al., 2020). Other socio-demographic factors that have been found to be related to household water conservation behavior include occupation, gender, and cultural background (Aini et al., 2007; Inhaz et al., 2020; Malay Mail, 2019).

It's worth noting that these findings may vary in different cultures, societies, and locations (Trang, 2019). With that, substantial research is needed to understand the specific factors that influence water conservation behavior in different contexts. Studies revealed that age, education, and other socio-demographic have been found to be interconnected with behavior patterns of people in water conservation (Ahmed et al., 2018; Boylu and Gunay, 2017; Zhuang, 2018). This can be emphasized that water conservation factors require further investigation on psychological determinants with self-conscious, attitude and emotional factors to bring out the fundamental principle on each individual population in the aspects of pride, shame and guilt to increase water conservation motivation level.

From the above fact finding shown on the various social demographical factors pertaining to water conservation the novelty of assessing its contribution to the field is essential particularly in adding the existing knowledge on generation Y and the relevance of social cognitive theory.

Therefore, the objective of this research is to investigate and develop effective strategies to preserve and manage water resources sustainably. The specific aims are to address the extent of personal, environmental and the perceived self-efficacy of generation Y in Malaysia in water conservation through the approach of social cognitive theory.

## 2. Social cognitive theory

The social cognitive theory is an application theory with utility towards sustainable consumption studies (Phipps and Govan, 2011). The strength of this theory lies in its unique proposition of "reciprocal determinism" whereby it is argued that "an individual function in terms of triadic reciprocal causation" (Bandura, 2001) in which the interplay is between personal, environmental and behavioral factors (Pajares, 2002) and the influences are bidirectional in nature (Bandura, 2001). It is being propounded as primarily based on agentic perspective (Bandura, 2001). The breadth of this theory lies in its varied application encompassing domains such as population studies (Bandura, 2002), personality (Cervone et al., 2001), green behaviour (Lin and Hsu, 2015). The apparent use of this theory in various disciplines further establishes its credibility for intervention based studies. However, in terms of water conservation, the use of this theory is not very evident. A study conducted Yazdanpanah et al. (2015) tested the behavioral drivers towards conserving water using this theory and it was observed that self-efficacy was the most important factor followed by outcome expectancy as behavioral influencers of the farmers (Yazdanpanah et al., 2015). In this study, the concentration of reciprocal determinism in context of generation Y, water conservation is explored and the reinforcement in individual behavior is determined

to create an emphasis of reciprocal occurrence.

Reciprocal determinism propounds that an interpretation of an individual's own behavior subsequently influences and alters his/her external environment and their possessed personal factors, which in turn affects their future behavior (Pajares, 2002). Within the personal factor, the self-efficacy component has been highlighted as a key player (Bandura, 1999, 2001, 2002; Carillo, 2010) due to its ability to influence all the three factors participating in the triadic relationship (Bandura, 2001). It can affect at both individual and collective level.

## 3. Mixed method approach

This research was carried out using a mixed method that included both qualitative and quantitative strands. The paradigm of this research in the qualitative strand is interpretive, as the interpretative paradigm is based on understanding and interpreting subjective and intersubjective views of the individuals (Creswell, 1998; Patton, 1990). Ontologically, it is hermeneutics. Where else the paradigm of this research in the quantitative strand is functional as the functional paradigm is particularly suitable for scale or survey-based descriptive quantitative research because it is ontologically realistic (Gunbayi and Sorm, 2018). In this research, a convergent mixed methods design with the data-transformation variant was used, and as for the qualitative strand, the descriptive phenomenological design was used. A phenomenological study focuses on what people experience and the description of how they experience events. The primary purpose of phenomenological study is to reveal what is in one's mind, that is, the essence of the perception of lived experiences (Creswell, 1998; Patton, 1990). The mixed method application diagram is outlined in **Figure 1**.

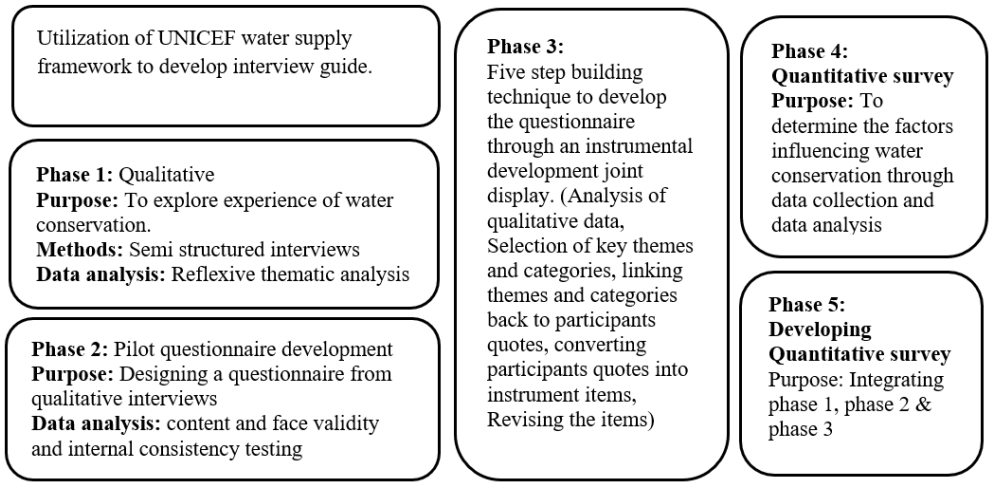


**Figure 1.** Mixed method application diagram.

As for the sampling size, the technique used was purposeful sampling, which was used on a voluntary basis for the qualitative research. This sampling technique covers the inclusion of individuals who meet the criteria in accordance with the purpose of a particular research (Palys, 2008). Since water conservation is essential for everyone, convenience sampling was appropriately relevant for the quantitative part of this study.

In the context of ethical factors, utmost care was taken to ensure the participants'

rights and safety. An informed consent form was obtained from the participants before the discussion group. Participants were fully informed about the purpose of the study, its confidentiality and safety, and the absence of physical and psychological risks. Permission was obtained from the participants to record the audio and they were informed that the recordings would be kept for least two years. Participant confirmation was obtained immediately after the data was transcribed as well.

## 4. Qualitative finding and hypotheses development

The study used focus group method to elicit the participants viewpoints The participants age ranged from 26 to 40 and lived mostly in apartments, condominiums, and landed property (Foo et al., 2018; Olanrewaju and Tan, 2018) and from middle income social class with or below RM 15,000 household income in demography. This is in line with other studies that found that age and lifestyle have a significant impact on water usage (Pullinger et al., 2013; Rahman, 2021; Turner et al., 2010).

The sample characteristics were age, gender, and residence in relation to personal and household water use (Novak et al., 2018; Pullinger et al., 2013; Turner et al., 2010). A total of 102 people—39 men and 63 women participated in this study and each focus group consisted of 6–9 participants.

The grounded theory used revealed certain identification on individual preference in water conservation and the drivers are presented below considering the qualitative results, each followed by a brief literature review to place the hypotheses in perspective with previous research.

### 4.1. Water availability as an environmental factor

The environment variables in the social context are the extent of someone's behaviour on a particular condition (Carillo, 2010; Novak et al., 2018). It is assessed based on things like watering plants and taking long showers that can have an impact on the environment. The study finding reveals similarity with other findings such as de Miranda Coelho et al. (2016); Lindsay et al. (2017); Loe and Patterson (2017). Further participants have emphasized the importance of performing a water audit (inspection) at home.

Additionally, the participant also emphasized that water limitations and education efforts will persuade individuals to install rainwater tanks, especially in urban areas, if water conservation is mandated by government legislation (Gardiner, 2010; Head and Muir, 2007; Zhuang, 2018).

[When knowledge received will make [or] find numerous alternative ways for water saving.]

This suggests the possibility of using water-saving appliances and fixtures that could be aligned with sustainability goals. With these significant finding water conservation behavior to a certain extent have bidirectional effect and from this perspective the hypothesis developed were congruent to the theory which entrenches the relative influence of the aforementioned factors on an individual's behavior. This reinforces the results of the qualitative study and supports the first hypothesis.

Hypothesis 1: There is a reciprocal relationship between environmental factors and water conservation effort among generation Y, where higher levels of

environmental factors lead to better water conservation.

### 4.2. Personal obligation in water saving

Any cognitive, personality, or demographic traits that define an individual are referred to as personal factors (Aini et al., 2007; Richard, 2019; Yazdanpanah et al., 2015). People not only influence the environment in which they evolve, but also the environment in which they live. According to Pajares (2002), this confirmation states how people interpret the outcomes of their performance accomplishments that reflect on their environments and self-beliefs, which in turn influences and modifies their subsequent performances. This provides the rationale for intervention efforts in water conservation while also explaining how people could pick up and sustain specific behavioral patterns.

Participants in the focus group discussions suggested that the ability to learn by observation is enhanced by the cognitive objective, quality of analytical thinking, and affective self-reaction from the awareness, education, and knowledge gained for water conservation (Afroz et al., 2016; Yazdanpanah et al., 2015). In other words, a range of elements, including physiological, environmental, and cognitive aspects, seem to influence whether people conserve water (Russell and Fielding, 2010; Saur, 2013; Yazdanpanah et al., 2015). This demonstrates their responsibility to preserve water.

Participant (female; apartment) created her own intervention, saying, "When my husband is taking a long shower, I normally turn on the kitchen faucet, so the shower gets cold for him." The action is better "I think there is a limit when you are telling other people because it will be up to them how to save so instate tell I will do…"

Another participant concurred, "Well, my opinion, I think you should start from the household on water saving arrangement for example loading washing machine, brushing your teeth…" Apart from that (male; apartment) firmly believe that, "High payment (bill) for water usage will show reduction in water use." This will create individual responsibility. With these understanding the following hypothesis supports in the examining of the personal factors' certainty:

Hypothesis 2: There is a reciprocal relationship between personal factors and water conservation effort among generation Y, where higher levels of personal factors lead to better water conservation.

### 4.3. Individual self-efficacy to saving water

The perceived self-efficacy, which assesses a person's level of assurance in their ability to achieve goals and maintain motivation for a certain intention (Bandura, 1999; Bandura, 2002; Zimmerman, 2000). Through the focus group the participants have demonstrated their confidence and aptitude for water conservation. They mentioned on the confidence to conserve water as "If assistance is given with relevant information and other approaches through encouragement…" One of the major tenets of Bandura's theory, which is based on the observation of other people's conduct (Novak et al., 2018; Yazdanpanah et al., 2015; Zhuang, 2018) can increase individual self-efficacy.

According to the aforementioned viewpoint, the participants' main concern was revealing their dedication to taking showers and conserving water based on their daily water usage. Many participants said they needed to take a shower every day. However,

they added that they would be more committed to water conservation if they could persuade their family members or friends to use less water (Male respondents). In addition, even though the majority considered showers to be "vital," but they pointed out that if you can persuade others to use less water at home or at work, they will be convinced that they have done the right thing to conserve water, "I would feel right and motivated if someone take my view positively and implement it." But some respondents have also mentioned that they had never considered giving anyone advice regarding how much time and water they spend in the restroom even though it is necessary. This relates to individual freedom but there is concern to initiate water conservation.

From the finding it shows, self-efficacy as a critical confidence factor that is concerned with assessments of how well one will be able to carry out the courses of action necessary to deal with future problems (Afroz et al., 2016). The interaction between a person's beliefs and their outcome expectations, self-efficacy beliefs, and a sense of volitional control in the social and physical environment in which behavior occurs is particularly a result of the individual's behavior, which is influenced by a variety of personal, environmental, and behavioral factors (Feng, 2018; Kotchen and Reiling, 2000; Novak et al., 2018; Willis et al., 2011; Young et al., 2005; Zimmerman et al., 2000). We suggest that using a smart water management system to monitor and manage water usage can empower individual's self-efficacy for better control over their water consumption. From this perspective it supports the hypothesis proposed by the qualitative study:

Hypothesis 3: There is a reciprocal relationship between perceived self-efficacy factors and water conservation effort among generation Y, where higher levels of perceived self-efficacy factors lead to better water conservation.

Final research model: **Figure 2** presents the research model induced from the grounded theory study with the proposed hypotheses.

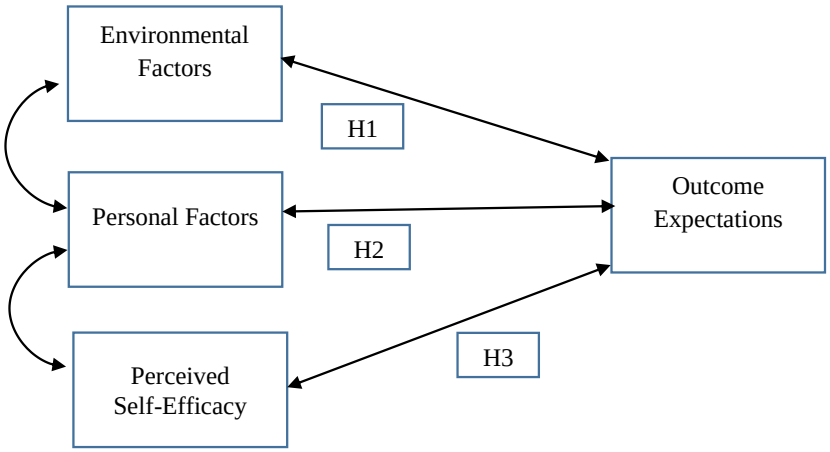


**Figure 2.** Conceptual framework.

## 5. Quantitative study

In the theoretical framework this empirical study applies the model of social cognitive theory (SCT) which explores the ways people learn and develop their interactions in practice with the social and physical environment. Behavioral adequacy

in water conservation is a complex issue that is influenced by a range of factors. Successful conservation programs often involve a combination of educational, financial, and social approaches to encourage individuals and households to adopt water-saving behaviors and practices.

The study was managed with convenience-sampling design with Generation Y in Malaysia with a self-administered online questionnaire in English language. Since water conservation is essential for everyone, convenience-sampling played appropriately relevant for this study. A total of 607 completed samples were used for this study. The process of selecting the respondents and the sampling technique was based on the total size of the population in reference to Krejcie and Morgan (1970) with correlational study method.

## 5.1. Data analysis and results

In identifying the relationship of the variables and to show the essential relevance from the research framework, the empirical study was analysed with SEM AMOS version 24. With that, the finding was accordingly interpreted with the study objective.

According to Byrne (2018), the composite reliability of a measurement model is said to be good reliability to measure each latent variable if the construct reliability value (CR) is ≥0.7 or more than the value of extracted variance (VE) is greater than 0.05, states that in exploration reliability research between 0.5–0.6 can be accepted and then at SEM AMOS a one-way test is carried out with a 95% confidence level, the commonly used critical value (CR) >1.96 which means the assumption of normality is rejected at significance level (P).

**Table 1** shows the outputs obtained in this study are valid and reliable based on the quantity (CR) ≥0.7 and conjointly the average variance extracted (AVE) is higher than 0.05. Therefore, every indicator utilized in this study is reliable and valid and sufficient for analysis.

**Table 1.** Reliability and factor loadings.

| Construct | Item | Factor loadings | Cronbach's Alpha (>0.70) | CR (>0.60) | AVE (>0.50) |
|---|---|---|---|---|---|
| Environmental Factors | q1env | 0.746 | 0.826 | 0.837 | 0.516 |
| | q2env | 0.818 | | | |
| | q3env | 0.811 | | | |
| | q4env | 0.785 | | | |
| | q5env | 0.711 | | | |
| Personal Factors | q1pf | 0.883 | 0.766 | 0.807 | 0.537 |
| | q2pf | 0.700 | | | |
| | q3pf | 0.701 | | | |
| | q4pf | 0.742 | | | |
| | q5pf | 0.783 | | | |
| Perceived Self-Efficacy | q1self | 0.790 | 0.797 | 0.741 | 0.563 |
| | q2self | 0.701 | | | |
| | q3self | 0.744 | | | |
| | q4self | 0.846 | | | |

**Table 1.** (*Continued*).

| Construct | Item | Factor loadings | Cronbach's Alpha (>0.70) | CR (>0.60) | AVE (>0.50) |
|---|---|---|---|---|---|
| Outcome Expectations | q1exp | 0.827 | 0.843 | 0.944 | 0.737 |
| | q2exp | 0.809 | | | |
| | q3exp | 0.897 | | | |
| | q4exp | 0.902 | | | |
| | q5exp | 0.885 | | | |
| | q6exp | 0.825 | | | |

**Table 2** shows the process Model (GOF) results. The finding reveals that the model is found to reach the number of predictions of all models (structural and mensuration models). The fitness indexes in **Table 2** have met the threshold values as stated. The Absolute Fit category, namely RMSEA, is 0.87 (achieved the threshold of less than 0.90), the Incremental Fit category, namely CFI, is 0.917 (achieved the threshold of greater than 0.85), and the Parsimonious Fit category, namely the ratio of Chisq/df is 4.828 (achieved the threshold of 5.0). Thus, the measurement model of all latent constructs in **Table 2** and model projected in **Figure 3** have achieved the requirement for construct validity (Awang, 2015; Awang et al., 2018).

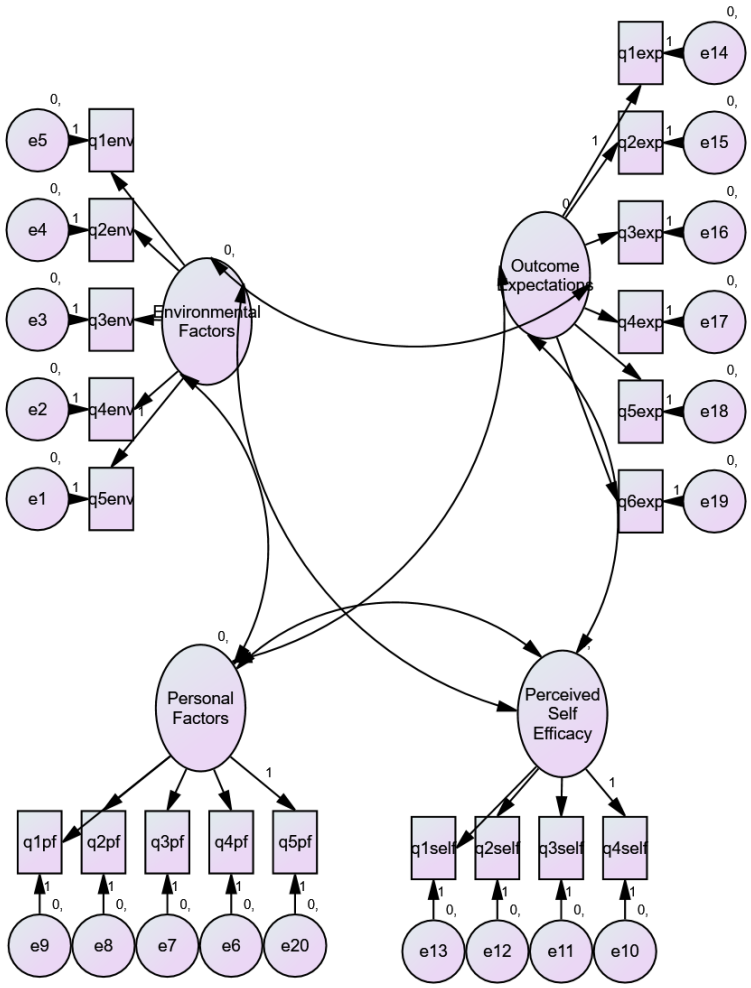


**Figure 3.** Model of direct and indirect contribution of sustainable water conservation efforts among Malaysian generation Y with Social Cognitive Theory.

**Table 2.** Fitness index measurement.

| Fit Indices | Benchmark | Value | Results |
|---|---|---|---|
| Chisq | $p \geq 0.05$ | 939.322 | Achieved |
| RMSEA | ≤0.80 | 0.078 | Achieved |
| GFI | ≥0.90 | 0.956 | Achieved |
| AGFI | ≥0.90 | 0.916 | Achieved |
| CFI | ≥0.90 | 0.917 | Achieved |
| TLI | ≥0.90 | 0.903 | Achieved |
| Chisq/df | ≤5.0 | 4.828 | Achieved |

With reference to hypotheses presented, the test results in **Table 3** show the critical ratio and significance of path coefficients. The critical ratio (CR) for (H1) is 11.54, (H2) is 7.08, (H3) is 14.72 respectively. All the output has generated the outcome of >1.96 for a regression weight, that path is significant at the 0.05 level or better (that is, its estimated path parameter is significant). With that in reference to the *p*-value, three asterisks (***) indicate significance smaller than 0.001.

**Table 3.** Summary of research hypotheses results.

| Paths | Estimate | S.E. | C.R. | *P* | Remarks |
|---|---|---|---|---|---|
| OutcomeExp: Env factors | 0.422 | 0.037 | 11.536 | *** | H1: Supported |
| OutcomeExp: Personal Factors | 0.366 | 0.052 | 7.083 | *** | H2: Supported |
| OutcomeExp: PerceivedSelfEff | 0.669 | 0.045 | 14.717 | *** | H3: Supported |

## 6. Discussion and conclusion

The result finding for outcome expectation implies that the better and higher environmental factors, personal factors, and perceived self-efficacy utilized in water conservation in Malaysia among Generation Y, the higher the outcome expectations rate. There is indeed a significant positive and linear relationship between environmental factors, personal factors, and perceived self-efficacy factors with outcome expectations of Generation Y cognitive behaviour. In addition, this study also lends credence to the Bandura theory of reciprocal determinism. Indeed, environmental factors, personal factors, and perceived self-efficacy enhance the outcome expectations in water conservation with social cognitive theory.

In explaining the predictive ability of environmental factors, personal factors, and perceived self-efficacy the model fit in **Table 2** determines the best linear combination of all the variables for predicting outcome expectations.

With the finding it can be interpreted that social cognitive theory (SCT) is a sufficient theoretical framework that explores how people learn and develop through their interactions with the social and physical environment around them. On the other point the practice of grounded theory approach, used further confirms theory through the analysis of data collected from discussion groups which shapes people's behavior and learning through analysing inductively to identify patterns and themes that develop within their social and environmental contexts. The finding shows that on identifying the various cognitive and behavioural processes that occur during learning

and development in the context of water conservation, the element such as attention, motivation, self-regulation, and social reinforcement strengthens the perceived self-efficacy of the individual.

The relationship shows, an individual who conserves water may find that they have more resources and opportunities available to them, which can increase their perceived self-efficacy and motivation to continue to conserve water. On the other hand, if an individual does not conserve water, they may find that they have less resources available to them, which can decrease their perceived self-efficacy and motivation to conserve water. From this aspect, combining social cognitive theory with grounded theory approach can provide a rich and nuanced understanding of how people learn and develop within their social and environmental contexts. With that social cognitive theory can be applied to water conservation by using role models, social support, and feedback, and creating and reinforcing social norms around conservation, these can help to increase the adoption of water-saving behaviors and practices among the population. This shows the dynamic level of interplay between personal factors, environmental factors, and behavior in shaping human behavior and development.

In conclusion, raising awareness is indeed crucial, but it's just the initial step. Addressing various factors like economic considerations, social norms, and access to resources is essential for ensuring the actual adoption of water-saving behaviors. It's a holistic approach that acknowledges the complexity of human behavior and the environment in which it operates. Programs and policies that aim to address other factors such as perceived costs and benefits, social norms, and access to resources and tools, can be more effective in promoting the adoption of water conservation behaviors. There are some limitations in this study such as discussion group could not reflect the entire population and finding can also reveal other actual behavior which was not presented in the research framework and there could be other variables influencing an individual behavior for example economic and other psychological factors or even moral development. This leads to the factors that the assurance of all relevant contextual variables in equation can be incomplete. Apart from that, this research is conducted with cross-sectional data. Longitudinal study approach would be extremely useful for clear judgement on generation Y's behavior because time comparison can reveal behavior modification and other uncertainty.

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