

Model of environmental intergenerational learning extending to the later years

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Abstract

The existential threat of climate change can draw living generations together through lifelong learning for a cohesive response. People in their later years must understand environmental impacts on themselves and future generations. A useful model of environmental learning must work well for every generation. This policy paper has two objectives based on the value of combining the theory of Nature Relatedness and Nudge theory for a model of environmental learning. First, to examine if the theory of Nature Relatedness which measures the individual's relationship with nature is appropriate. It categorizes the relationship into four categories: passive, aware, responsive, and active based on observable characteristics of knowledge seeking, favourable attitudes, personal behaviour, and social action. Second, to investigate if learning based on Nudge theory can advance the relationship with nature to result in behavioural change. This model provides a useful framework to design environmental learning by all generations.

La minaccia esistenziale del cambiamento climatico può unire le generazioni viventi attraverso l'apprendimento permanente per una risposta coesa. Le persone in età avanzata devono comprendere gli impatti ambientali su sé stesse e sulle generazioni future. Un modello utile di apprendimento ambientale deve funzionare bene per ogni generazione. Questo documento politico ha due obiettivi, basati sull'utilità di combinare la teoria della *Nature Relatedness* e la teoria *Nudge* per un modello di apprendimento ambientale. In primo luogo, esaminare se la teoria della *Nature Relatedness*, che misura il rapporto dell'individuo con la natura, è appropriata. Essa categorizza il rapporto in quattro categorie: passivo, consapevole, reattivo e attivo, sulla base di caratteristiche osservabili di ricerca di conoscenza, atteggiamenti favorevoli, comportamento personale e azione sociale. In secondo luogo, si vuole indagare se l'apprendimento basato sulla teoria *Nudge* può far progredire il rapporto con la natura e portare a un cambiamento comportamentale. Questo modello fornisce un quadro utile per progettare l'apprendimento ambientale da parte di tutte le generazioni.

Keywords: older adults; environmental relatedness; environmental learning; learning model; behavioural change

Parole chiave: adulti anziani; relazione ambientale; apprendimento ambientale; modello di apprendimento; cambiamento comportamentale

1. Introduction

Population aging and climate change are two global trends occurring simultaneously with mutual impacts. People 75 years and over are one of the fastest growing population groups. The growing numbers of people in later life and their relationship to nature have a potential impact on climate change. Since they form a significant proportion of society, climate change cannot be mitigated without this population segment boosting societal efforts.

Knowledge is the most powerful human tool to manage positive change in the world. Concurrently, the negative impacts of climate are rising quickly and information on the environment is increasing rapidly. The existential threat of climate change can draw multiple living generations together through lifelong learning for a concerted response. People 75 years and over, must understand environmental impacts on themselves and future generations. The environmental learning goal for younger generations is the same. The challenge is to use a model of environmental learning that works well for each generation as well as for multiple generations learning formally or informally together to convert awareness of the impacts to cohesive action against this collective risk.

Better health, more education and higher standards of living contributed to the growth of longevity. Growing population aging and life expectancy have resulted in an increasing population of people over 75 years of age experiencing later life – a new life stage. Globally, a person aged 65 years in 2015-2020 could expect to live, on average, an additional 17 years. By 2045-2050, that figure will increase to 19 years (UN, 2019). More people in every cohort since 1950 have lived longer as shown in Figure 1. It is an exceptional achievement and a unique experience for humanity.

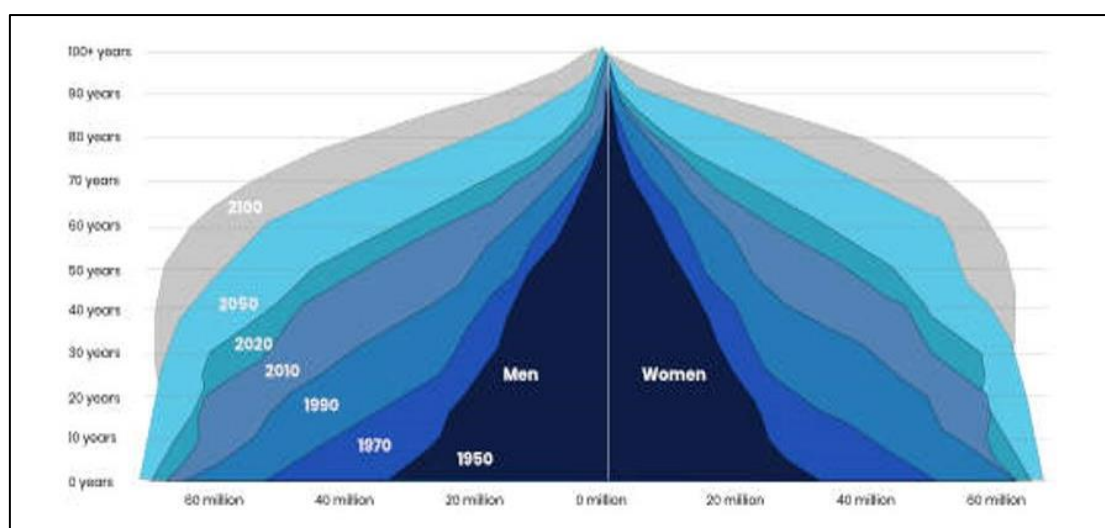


Figure 1. UN estimates of the world population by age and sex from 1950 to 2018, and projected to 2100 (Source: Scott, 2021).

Climate change is major challenge in this century, particularly because of the uncertainty of the speed and seriousness of the damage to the environment that supports life. Toxic pollutants in the air, water and food can affect both individuals and the society in which we live. The environment is under stress due to the cumulative effect of unprecedented production and consumption of the growing world population. The threat arises because the rate and scale of environmental change is creating severe risks to economic, social, and environmental resilience and even exceeding critical and irreversible limits. The consequences for the natural world and human

society, now and in the future are of grave concern because changes in the environment can be disruptive, dangerous, or even deadly. Without exception everyone is affected by these environmental changes, no matter whether they are informed, involved or sustainably active.

2. Rationale

All segments of the population need to understand the causes, the impacts, and the prognosis of climate change. Though the population cohorts 75 and over may not enjoy environmental benefits as long as other cohorts, they need to understand current issues in order to be active agents to counteract negative environmental change. They may also need to understand climate change and seek help for unexpected natural catastrophes due to climate change. Learning about the world in which they live is essential to foster civic responsibility for mitigation, adaptation, and restoration of the environment. If the large later-life population segment is not involved, the rate of change can be appreciably worsened, and mitigation hampered.

3. Literature review

The review showed that there was a steady evolution of theoretical thinking about environmental learning, however, none that particularly addressed continuous, lifelong learning or learning in later life. Early work on pedagogies and environmental literacy created the foundation which aided the shift from factual knowledge to understanding the relationship of individual actions on the entire ecosystem, particularly in school curricula (McBride et al., 2013). The increasing pressures of climate change encouraged researchers and policy makers to use environmental education as a means to engage the public in order to improve the environment (Potter, 2009). Some looked for direct impacts of focused environmental learning on environmental quality, such as air quality education programs on reduction in air pollutants (Duffin et al., 2008). The value of such linear, short-term impacts was limited because the complexity of climate change required a more multimodal societal response which could be addressed through environmental learning.

Wimberley (2009) responded with a proposal that environmental education should use a framework of nested ecologies, starting with personal ecology and extend through relationships with material goods, people, and other life forms, progressively nested in social, environmental and finally a cosmic ecology. Environmental learning should begin with a meaningful exploration of lifestyles and its impact on the individual's health and well-being, relate these effects to community and societal relationships and finally the human place in the environment. This objective would create a better worldview of humans, nested in larger social and environmental systems. These interlinkages should ensure a sustainable environmental ethic to direct decision making at individual and societal scales.

4. Motivation

Environmental learning is a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment (US Environmental Protection Agency, 2021). This paper builds on previous thinking but differs in three ways. First, it considers environmental learning from a life course, multi-generational perspective, including the older generation which is often excluded from the learning system. Second, it takes a systemic policy approach, attracting individuals to environmental learning from their current status to increase the collective pool of environmental knowledge. In other words, successful policies affect individuals for population level results. Third, to create a cohesive response to climate change by placing individual behaviours and social interactions within society.

Environmental learning, whether formal or informal, is an important way to encourage responsible decisions and to instigate desirable behaviours based on an understanding of climate change. Learners, regardless of their age, must first understand the many ways in which the environment is important to them and how they can make a difference to the sustainability of the environment. As environmental science continues to advance in step with the changes in the environment, this knowledge has to be continuously transmitted to the public for responsive action. Success would depend on the effectiveness of learning to generate effective action for environmental protection. A useful model of environmental learning would enable a learning strategy that would address the needs of learners at the starting stage of their environmental knowledge and would customize content and process to incrementally advance positive behaviours.

5. Objectives

This policy paper explores the value of combining the theory of Nature Relatedness (Nisbet et al., 2009) and Nudge theory (Thaler & Sunstein, 2008) for a model of environmental learning to achieve results, once the importance of the environment to human life is understood, especially by those in later life. There are two objectives: First, to examine if the theory of Nature Relatedness applies realistically for all individuals, particularly those in their later years. It measures the individual's relationship with nature in four categories - Passive, Aware, Responsive and Active - based on observable characteristics of Knowledge seeking, Favourable attitudes, Personal behaviours and Social action. Second, to investigate if learning approaches based on Nudge theory can advance the relationship with nature to result in behavioural change.

6. Method

Effective policy results in public benefit. Models, constructed images of reality, can be used to understand how environmental learning strategies can potentially target, shape and increase policy outcomes of positive societal action. The methodology of a plausible model is constructed from prior knowledge to achieve the high plausibility of a desired scenario (Connell & Keane, 2006). Such a model considers uncertainty and partial knowledge when choosing a policy option that maximizes the chances of success in new situations (Manski, 2013). A model based on known theoretical frameworks serves as a guide for reasonable action with high plausibility of a desired policy result. Such models may be used early in the policy cycle, for creating a widely shared understanding of a strategy to be tested in the field. Resulting evaluation data can be used to modify the model for the next iteration of the policy. This approach can speed up a policy response by reducing the time used for problem definition and option exploration in policy development.

7. Individual relationships with nature built over a long life are diverse

The nature relationships in later life are dependent on their individual life histories, life stage characteristics and the evolution of climate change. These distinguish older generations from younger ones. Trajectories through 75 years of life result in varied individual life experiences for people in this life stage though they share some characteristics with others in this age group. Those with positive trajectories could have good health, sufficient income, happy family and social relationships and fewer tragic life events. Others could have one or more disadvantages. Fixed retirement income could result in lowered quality of life. Some of them may have experienced bereavement and live alone. Weakened immune systems and chronic conditions such as arthritis result in declining health. Diminished mobility can result from weaker physical strength, poor stamina and perhaps inability to drive. Their diminished ability to regulate body temperature and tendency to dehydration may make them

reluctant to be outdoors. Their shrinking social network may reduce the number of friends and companions and opportunities for interaction. These factors can enhance or diminish their exposure to the natural environment and their range of environmental behaviours.

Societal expectations and traditional opinions of other generations may affect the way the relationship with nature in old age is viewed. For example, some among the younger generation may consider the older generation as major contributors to current problems. The relationship with the environment in later life is built through life but it is dependent on the context and the accepted views of the time. In general, their real and perceived relationship is a mix of roles but not necessarily of all.

Perpetrators. People born 1945 or earlier lived through tough and boom times and have contributed to worsening environmental problems through their patterns of consumption through their past and present lives. Zheng and his colleagues found in a survey of 32 developed countries that people aged 60 and over had the largest greenhouse gas footprint (Zheng et al., 2022).

Victims. Environmental conditions (pollution, pandemics) and extreme events (heat waves, fires, floods, earthquakes) take a human toll. Older people tend to have higher fatalities, injuries and aftereffects than others (Cherniack, 2008). Many have eco-anxiety, fearing environmental disasters that they may not survive.

Beneficiaries. Research has shown measurable physiological and mental health benefits resulting from 20 to 30 minutes exposure three times a week to the natural environment (Hunter et al., 2019). Examples of physiological benefits are greater longevity, lower rates of diabetes, heart disease and hypertension. Some examples of mental health are lower levels of cortisol stress hormone and decreased levels of depression and anxiety.

Activists. Activism can include engagement and involvement in environmental protection, mitigation and restoration through direct and indirect activities. Activities can include participation in citizen science projects, volunteering in parks as well as in organizations such as *Greying Green* and *Mandela's The Elders*.

Every age must continuously be informed about the importance of natural environments and the benefits and hazards related to its condition. Older people can be considered an important indicator test case to evaluate the model for other ages. A successful model of environmental learning must activate a desire for environmental knowledge, accommodate a diversity of relationships with nature and motivate behavioural change in older people and the whole population.

8. Potential benefits increase the importance of natural environments

Biophilia or the tendency to associate with nature may be genetic. Research has shown that there are universal benefits of spending time in the natural environment regardless of age. There are now over three hundred scientific studies that show a strong correlation between time spent outdoors in natural settings, like parks, forests, and green spaces, and improved health outcomes (Metcalf, 2019). Though everyone who spends time outdoors benefits, those who spend more time in the natural environment benefit more. Even those who have no interest in the natural environment nor plan time outdoors can benefit from nature (Nisbet et al., 2009). Having 10 or more trees on the city block where one lives improves self-perceived health, equivalent to being 7 years younger or \$10,000 richer (Kardan et al., 2015). Measurable differences have been found if people had a green view out of a window rather than a concrete wall. In surgical recovery rooms, patients with windows overlooking greenery are less dependent on painkillers (Metcalf, 2019). Exposure to sunlight enhances vitamin D production, which may be partially responsible for a positive mood-enhancing effect (Kerr et al., 2015).

Do these benefits extend to people over 75 years of age? Interaction with nature yields multiple benefits particularly for older people, ranging from improved health to cognitive outcomes according to experimental and epidemiological research with indications of a dose-response relationship. Importantly, better executive

cognitive performance was measured (Berman et al., 2012; Bratman et al., 2012). Improved cardiovascular and metabolic health were found (Shanahan et al., 2016; Crouse et al., 2017) as well as mental health benefits (McMahan & Estes, 2015) and reduced stress (Jiang et al., 2016).

The environmental effect on quality of life was differentiated from general activism when environmental outdoor projects produced better results than other types of projects (Curl et al., 2016). Environmental volunteerism among older people, such as cleaning natural areas, testing stream quality, restoring habitats, monitoring bird houses, and clearing invasive species was an effective way to achieve healthy and active aging (Pillemer et al., 2017). A high exposure to natural environments (green space and gardens) in communities was associated with fewer mental disorders among older people (Wu et al., 2015).

9. Importance of older people for societal environmental action

There are also important reasons why people in their later years are important for societal environmental action, a factor that is not widely recognized. As the population ages, older people represent a growing share of the consuming and voting public. It is well known that older citizens vote in greater proportions than younger cohorts (Frumkin et al., 2012). Many of those 75 and over are fairly well off (McMahon, 2014) and can support environmental causes. A majority in these age cohorts still own their own home and they can exert an impact on environmental sustainability through behavioural and purchasing choices (Haq et al., 2008). Environmental volunteerism is a means to build social capital for older people while enabling other goals (Pillemer et al., 2017). Informed seniors realize that there is a responsibility for immediate action, though the worst impact of inaction will probably be felt beyond their own lives.

Furthermore, characteristic of this life stage is that they turn to roles not pursued earlier. Erikson describes the concept of generativity, or the role in perpetuating traditions and transmitting values to the next generation as custodians of culture (Erikson, 1994). Thoughts turn to legacy, for leaving behind values, attitudes, and an intact world to their children and grandchildren as well as a concern for the well-being of those who will come after them (Moody, 2010). The environment provides valuable benefits of health and longevity for their own and future generations, and this constitutes a valuable bequest (Takano et al., 2002). The relationship with nature is therefore important.

10. The concept of relatedness can support a model of environmental learning

All people would benefit from environmental learning, but it is important to understand the varying relationship of people in later stages of life to the environment and the keys to appealing to their motivation for learning. According to Zelensky and Nisbet (2013), ‘relatedness’ is the strength of the connection to nature that is felt by an individual. This relationship with the outdoor environment is built over the life course resulting in differences in subjective connectedness or relatedness. The more time people spend in the natural environment, the higher the relatedness tends to be and the more likely they are to engage in environmentally conscious behaviours. Behaviours such as knowledge seeking, attitudes, personal behaviour and societal action varies with an individual’s level of relatedness. Environmental learning, though always relevant, can be assumed to become more contemporaneous, deeper, and more complex with increasing interest or relatedness.

Since the behaviours or activities are overt, they can be used to develop categories of relatedness (not mutually exclusive but continuous and progressive) among people, including those 75 years and over. The model of environmental learning is based on the existing degrees of relatedness and the types of learning that will increase relatedness.

Table 1 shows the four categories of relatedness that are based on four observable activities: knowledge seeking, attitudes, personal behaviour and societal action. For example, the lowest level of relatedness is Passive, identified by no interest in knowledge seeking about the environment while the highest level is Active, characterized by an effort to understand the interrelatedness of lifeforms, air, water and the earth.

Table 1. Categories of relatedness among people 75 and over based on observable activities (constructed based on work of Nisbet et al., 2009).

Categories of relatedness	Passive	Aware	Responsive	Active
Knowledge seeking	No interest	Know of environmental crisis but not details	Self-interest for improving benefits. Selective interest such as biodiversity	Effort to understand the interrelatedness of life forms, air, water and earth
Attitudes	Environment is background for life. Disconnected from nature. Risk of ‘nature deficit disorder’	Environment is important but not my responsibility	Environmental concern, Enviro-anxiety	Values conservation and wise consumption
Personal behaviour	Little activity to enjoy the natural world or to preserve the environment	Spend time in nature. Some green behavior now and then	Personal behaviour supportive of environmental initiatives at local level. Visit natural environments such as parks	Personal behavior for sustainability. Conscious scheduling of time spent in nature
Societal action	None	Societally approved or required actions such as recycling	Votes for action on environmental issues and engages in community environmental actions	Global environmental activism and goal-oriented activities in many aspects of the environment

The number and characteristics of people in later years in each relatedness category can vary considerably, particularly because attitudes do not necessarily transform into actions. However, efforts have been made to operationalize the concept. In the Cornell National Social Survey of 792 adults older than 55 years, not specifically focused on climate change, 83% reported that they “would do what is right for the environment no matter the cost”, and 96% reported that they “think we should maintain the environment for future generations”. However, only 12% reported being members of environmental organizations, and only 15% reported engaging in volunteer activities related to the environment (Frumkin et al., 2012; Cornell University, 2008). But respondents may express their environmental commitments through personal choices, such as reducing energy use or purchasing green products, rather than through group activities. Figure 2 shows that while a high percentage of four different birth cohorts believed that global warming is personally important, much lower proportions were willing to engage in environmental issues politically, financially or socially.

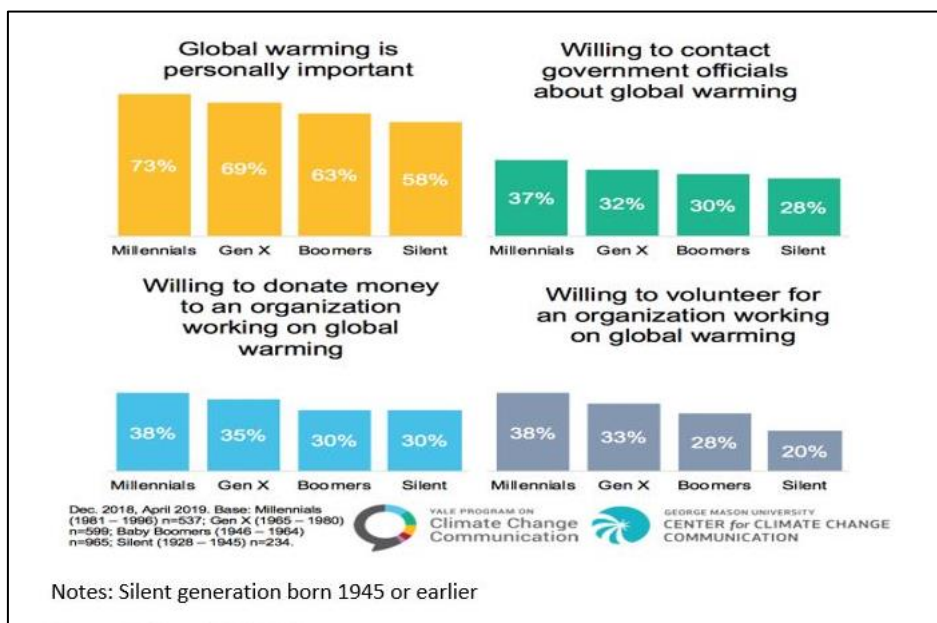


Figure 2. Proportions of people 55 and over who fall into different relatedness categories vary considerably because attitudes do not necessarily transform into actions (Source: Ballew et al., 2019).

11. Importance of environmental learning in the later years

Environmental issues are a major threat and an opportunity of this century. According to the *Davos World Economic Forum Global risk report*, four of the top ten threats, based on likelihood and impact, are environmental and they rank as the top three (Edmond, 2020). Older people need to understand these issues first and then decide if and how they will respond. Environmental learning can help them make these decisions however, it has to compete with their other interests and other important topics for their time and attention.

Though the perception lingers that older people are fixed in their ideas and grow more conservative with age, they are more likely than younger people to change attitudes in light of new information such as personal and global benefits of the environment (Eaton et al., 2009). Ranney and Clark (2016) has shown that informing older people about climate science promotes change in behaviour towards mitigation of climate change.

The motivations at levels of relatedness that would drive their behaviours are key to their openness to learning. At the awareness level, a combination of self-interest (broadly construed) and altruism can cause such behaviours. For example, installing energy-conserving devices or home insulation can be justified both to “save money” and “to help the environment”. At the active level of relatedness, the personal legacy incentive may be the primary incentive, focusing on one’s children or grandchildren by addressing climate change now rather than burdening distant generations (Moody, 2009). So, the invitation to environmental learning must appeal to their stage of relatedness and move them to higher levels.

12. Nudge Theory may be used to attract older learners to environmental learning options based on their level of relatedness

Behavioural economics suggests that Nudge Theory (Thaler and Sunstein, 2008) encourages socially desirable behavior without coercion, hard-sell or forbidding any options. It has been recognized as a way to transform values or attitudes into action by providing clues supporting decision making. The ‘nudge’ assumes that this behavioural change will be incremental or in stages, rather than a drastic change from never to always. The nudge

uses persuasion and suggestion, making the choice easier by simplifying choices, showing its value, its existing wide use and by positive reinforcement.

The four stages of behavioural change in Nudge Theory parallel the categories of relatedness (Table 2). A person exposed to the nudge based on the personal stage of relatedness may choose a learning option that will lead to the next stage of relatedness.

Table 2. The stages of behavioural change in Nudge Theory parallel the categories of relatedness (constructed based on the work of Thaler and Sunstein, 2008)

Nudge theory stages of behavior change	Unaware	➔	Aware contemplating behavior change	➔	Prepares and intends to take action	➔	Desired behavior change
Categories of relatedness	Passive		Aware		Responsive		Active

13. Environmental learning for older adults based on the model

The Environmental Learning Model has two desired outcomes: first that older adults are attracted to environmental learning and second, that as a result of the learning, their behaviour shifts them into a higher level of relatedness. To start the chain of behavioural change, the attractiveness of environmental learning targets each level of relatedness (Table 3). If the older adult progresses in their environmental learning, over time, they could become activists for the environment.

Table 3. Targeted environmental learning for adults in later life based on the model (constructed based on the work of Nisbet et al., 2009; Thaler and Sunstein, 2008).

Levels of relatedness	Passive	Aware	Responsive	Active
Nudge theory stages of behavior change	Unaware	Aware, contemplating behavior change	Prepares and intends to take action	Desired behavior change
Targeted environmental learning content appealing to each level of relatedness	Awareness raising. Personal benefits and self-protection.	Self-interest. Understanding one’s place in the world. How the environment is changing, and actions being taken. Increased mind-share for the environment.	Trial involvement. Choices for social responsibility. Consider preservation attitudes and environmentally sustainable behavior.	Legacy. Options to be change agents, champions, and activists; peer to peer awareness raising and knowledge exchange; citizen science. Donations and bequests. Political agenda.

For an older adult who is passive in relatedness and unaware, environmental learning with ideas about the personal benefits and self-protection might be attractive. Once aware, the learning objectives can be wider thus increasing mindshare. Content can stress self-interest, but also information about environmental change and mitigation responses as well as responsibilities arising from one’s place in the world. The first step in behavioural change would be exploration of socially responsible attitudes and testing more socially responsible actions. At the highest active level of relatedness, environmental learning will be focused on information for those who can

work as ‘greenfluencers’, change agents or as champions, engaging in environmental issues and supporting the environmental agenda by donating time, money, and effort. Collaboration with others with similar interests and favorable outcomes of personal efforts yield satisfaction.

14. Discussion

A key caveat for the success of any model of environmental learning is the effectiveness of learning. As early as 1977, the *Tbilisi Declaration* resulting from the intergovernmental conference organized by UNESCO endorsed a set of guiding principles for environmental education. These include the need for compulsory and continuous lifelong environmental learning, which is interdisciplinary and involves all aspects of the totality of the environment to capture the complexity of issues (UNESCO, 1978).

Environmental learning is a key strategy for an appropriate societal response. Due to the importance of society-wide knowledge for a shared understanding of the contemporary state of the environment, environmental learning has to be available to all ages in society. This can be achieved by ensuring environmental learning for specific ages, as well as for multi-generational learning opportunities.

There are three factors of special importance for the effectiveness of environmental learning. First, curricula or course content must be updated often, even every six months because of the rapidity of environmental change and knowledge generation. Second, every age and ability group must be provided with learning opportunities that are customized for them even if the content is similar. Third, because behaviour change is an objective, active learning processes and methods rather than passive learning should be a priority.

15. Conclusion

Universal respect and care for the planet and its web of life are essential when the stresses on them are unprecedented. Environmental learning for all members of society, particularly for the large segment of older people who are often excluded from learning opportunities, is of immense value for environmental preservation.

Speed is of the essence to create an informed popular movement engaged in a groundswell of interest in the conservation of the environment. This environmental learning model has the potential to shorten the policy cycle by using a ‘best bet’ approach based on current knowledge to reduce the time used for problem definition and option exploration in policy development. This model can be used to create an environmental learning strategy based on promising theories where the results can be tested and evaluated in the field in order to revise the model.

If rapid attitudinal and behavioural change is to be achieved through environmental learning, older generations as well as younger ones should have the opportunity to become ecologically knowledgeable to engage in their intergenerational responsibility to build a sustainable future for the human ecosystem. The older generation may consider their intergenerational responsibility and their concern for the wellbeing of future generations, but they may not immediately consider the value of environmental learning which would connect them to people with similar interests and with an advocacy community to work as stewards of the natural environment. Attracting seniors in later life to environmental learning is an important way to benefit individual older adults and society at large by creating a new culture with positive patterns of behaviour for a sustainable future.

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