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A Pedagogical Dimension to the Technocratic Problem of Water Management: Preschool Teacher Beliefs and Attitudes Towards Teaching Water Science and Sustainable Management of Water in the Context of Environmental Education

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Abstract

Future generations are necessary to become conscious of water environmental problems, since preschool age, as they will be forced to manage them in the future. Experiential Environmental Education is a tool for sustainable management of water resources, but the key to this process is teachers and the factors that shape their readiness to fulfill their role. In this research their beliefs and attitudes are being investigated, as they influence the quality of teaching and environmental awareness of children. Specifically, 128 preschool teachers from North Greece were interviewed on how they perceive a) their Willingness to improve their skills and knowledge on the scientific subject of water and its sustainable management, b) their Comfort in teaching these subjects and c) their Familiarity with the content knowledge, pedagogical teaching methods of preschool and environmental education and developmentally appropriate activities for teaching these subjects according to Psychology. In addition, it explores preschool teacher's beliefs and attitudes d) about whether water science and sustainable management of water could keep Child's Interest and e) if it contributes to Child Benefit, raising children's awareness of environmental issues and developing his/her language, art, math, technological and social skills. Correlation Analysis showed that preschool teacher's beliefs and attitudes towards teaching the subject of water were positive but under certain preconditions (they do not have the Willingness to spend time creating materials, they do not need more scientific knowledge, they do not consider children's experimentation as the best way of learning, the 'creative clutter' caused by experimentation annoys them, they are not willing to engage in children's experimentation with water, watching what children do, what they say or ask and they do not consider more activities with water necessary). However, these items of the Scale may constitute basic preconditions of Experiential Environmental Education. Following the findings of our research, we propose organizing experiential educational activities for teachers that may enhance preschool Teacher Willingness.

Keywords: Water, Sustainable management, Environmental education, Preschool teachers Beliefs and attitudes

1. Introduction

"Water is a gift from God", people say. It is a natural resource of vital importance. 'Water is critical for sustainable development, including environmental integrity … and is indispensable for human health and well-being" ("Water for Life", 2005-2015, UN 2003) [1]. As fresh water resources are limited and fresh water shortage is a reality faced by a growing part of our planet, it is essential for future generations to study the network of human relationships and environmental problems. Manolis Glezos, the Greek luminary in sustainable water management, capacity building and community outreach, taught us how the course of his life and his legacy in Glezos [2]. As shown by research, childhood, and especially preschool age (3.5-6.5), is a crucial period of life. Research findings report the long-term benefits of preschool education. A supportive environment during this period provides a clear advantage. It enhances cognitive, social and emotional development and it is a "foundation for concurrent and later well-being and mental health, as well as learning and early school success" as discussed by Denham [3].

Many studies indicate that "high-quality, effective early education program improve the development of all children" as discussed by Shonkoff & Phillips [4]. For this reason, education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues (U.N. Environment Programme, 1992) [5]. Education of the children, playing an important role in human knowledge and development, is one of the main methods to ensure sustainable management of the water resources as discussed by Zaimes & Emmanouloudis [6]. Specifically, preschool experiential environmental education could help children to become aware of the environmental problems and contribute to sustainable management of world water resources. The question is if preschool teachers consider this subject appropriate for this age and if they are prepared enough to teach it. A literature search did not produce many studies related to this environmental subject. The field lacks valid and reliable measurement. The hypothesis of this study is that preschool teachers' beliefs and attitudes towards

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teaching water science and sustainable management of water are positive.

2. Literature Review

Beliefs and attitudes toward teaching are a significant component of efficacious Preschool education. They influence one another and affect the frequency and quality of teaching as discussed by Maier et al. [7]. They reflect the emotional side of teaching which is associated with efficacy as discussed by Cho et al. [8]. They are often unconscious assumptions that determine the criteria of the basic options of teachers and dictate decisions during schooling as discussed by Hofer [9]. It was proven that they lead the behavior of teachers in the classroom as discussed by Brown [10] and may influence the way they teach as discussed by Earl & Winkeljohn [11]. Teachers with greater levels of self-efficacy and greater outcome expectancy tend to prefer teaching science to other subjects (e.g. language, art) spend more time showing the most significant concepts to their children in practice, and generally feel confident about teaching science, answering children's questions and organizing activities as discussed by Lakshmanan, Heath, Perlmutter, & Elder [12]. In previous years, many researchers, policymakers and education professionals have shown a growing interest in new teaching techniques and practical approaches to children of the early childhood as discussed by Greenfield et al. [13]. One of these new teaching techniques is Outdoor Education as discussed by Malone & Tranter [14] which aims at direct contact with nature. Children gain experience within the natural environment or where the environmental problem appears, learn by doing and having field experiences.

Tbilisi Declaration (1977) in [15], that came from the World's first intergovernmental conference on environmental education organized by the UNESCO in cooperation with UNEP, constitutes the framework, principles and guidelines for Environmental Education and attaches great importance to preschool environmental education. Education for the environment as first formulated by Lucas in [16] is a) education "on the environment" that aims at obtaining knowledge that contributes to the perception of the social, political, economic and science factors influencing the functioning of ecosystems and the formation of concepts, models of thought and relationships through which persons understand what is happening around them, b) education "within the environment", which considers the environment as a means of not only acquiring knowledge and skills but interest and appreciation, as well. Direct experience of the environment develops positive feelings toward it, c) education "for the sake of the environment", which intends to develop attitudes and behaviors that would ensure making decisions and acting in the best interest of the environment. It is linked to the moral aspect of personality and the value system utilized to assess the action as discussed by Georgopoulos et al. [17]. Environmental Education, based on life experiences, must start from the early years of human life as discussed by Wilson [18] as these children's life experiences play an important role in shaping positive attitudes, values and behavioral patterns in the natural environment as discussed by Tilbury [19]. After 'Earth Summit' and Agenda 21, Chapter 36, in U.N. 1992 in [5] the term sustainable development became a priority for formal education at all levels in all state-members. "Education for Sustainable Development provides a vision of education that seeks to balance human and economic wellbeing with cultural traditions and respect for the environment" as discussed by UNESCO [20]. According to Davis [21] early investment in human capital provides significant returns to individuals and communities. When preschool teachers begin to deal with sustainability, they have a widespread effect. The Curriculum for Greek kindergartens (2002) by Dafermou et al. [22] is in line with the international research data for teaching water science and sustainable management of water as discussed by Ntoliopoulou [23]. Water subject is considered so important, that from the total 430 pages of the "Guide for the Preschool Teacher" about 50 pages are devoted especially to water activities, from the total of 77 pages devoted to Environmental Education. The terms we use in the title of our study, "Sustainable management of water", were inspired by the New Greek Preschool Curriculum [24] announced in 2011 but not implemented yet. This Curriculum introduces the term "Sustainable Development" and "Management of water resources" in Greek preschool education, under UNESCO's 2005 guideline for Sustainable Development [25]. It includes a separate unit named "Environment and Education for Sustainable Development" in accordance with "United Nations Decade of Education for Sustainable Development: 2005-2014 (UNESCO 2006) [26] and a chapter under the name of "Management of water resources" in accordance with "Water for Life", International Decade for Action, 2005-2015, UN 2003 [1]. The contents of the chapter are: water uses and saving water at school and home. The purpose of teaching this subject is for students to become active, realize water shortage implications, take responsibility ("I can contribute to water conservation"), raise awareness of the unsustainable use of water and develop attitudes (self-control strategies) that enforce conservation practices for wise water use at school and home. All these activities should be "on the environment", "within the environment", "for the sake of the environment" as Lucas stated [16]. Studies in Greek kindergartens have proven that water is a very popular environmental subject. Specifically, as discussed by Flogaitis et al. [27] they found that Greek preschool teachers are teaching water more often (22.8%) than the other environmental issues (recycling, pollution, biodiversity, forests).

3. Methodology

In the current study, we use the "Preschool Teacher Attitudes and Beliefs toward Science Teaching" Scale, [P-TABS]. This advanced Scale incorporates some items of previous relevant Scales created by Coulson [28] and Cho et al [8]. The [P-TABS], developed and validated by the researchers Maier et al [7], refers to Science teaching in general. Due to the lack of an appropriate tool to measure our subject, we adapted the [P-TABS] for the needs of the current study, for assessing early childhood teachers' beliefs and attitudes toward teaching the scientific subject of water and its sustainable management in the context of Environmental Education. Then, under the guidance of supervisors, out of the available 35 item of [P-TABS] scale, we selected the 21 most representative ones. The 21 items produced, referred to water science and sustainable management of water in a preschool level. Finally, the

theoretical factors of the model were teachers' perceived willingness, comfort and familiarity, child benefit and child interest. The study was sent to 230 preschool in-service teachers of North Greece by email or personal contact. Finally 128 preschool teachers participated in the research. A 5-point Likert scale was used.

4. Statistical Analysis

The mean age of participants in the study was 44.49 while the mean years of service were 16.23. 85.9% of them stated they had a Degree in kindergarten teaching, 5.5% had a Masters' Degree and for 8.6% of them the Degree in kindergarten teaching was their second Degree. 50.2% of the participants worked in all-day kindergartens, while the rest worked in typical morning kindergartens. According to the data collected, 76% of the participants had never attended a seminar on water management, 13.3% had attended one seminar, 7.8% 2 seminars, 0.8% 3 seminars and 1.6% 4 seminars.

Pre-Analysis Procedure
The results showed that there were no missing values in the answers of the respondents and the data was not normally distributed.

Reliability Analysis
For our analysis we got a Cronbach's alfa equal to 0.821, which suggests that the internal consistency of the items is good.

Confirmatory Factor Analysis
Running the analysis for items that concern Teacher Willingness, we realize that initially 2 factors are extracted. The KMO test result equals 0.721, which means that our data is appropriate for factor analysis, since sampling adequacy is high, while the Bartlett's test of sphericity gives

$$F(1.21) = 152.46$$

The variance explained by the 2 factors is 52.92%, but the communalities of items 2,3,6 and 9 are below the critical value of 0.5. We come to the conclusion that these items should be excluded from the analysis and we confirm that by checking the loadings of the items in the factor. When running the analysis without the 4 items we end up with the items that comprise Teacher Willingness. We continue the factor analysis with the items that in theory comprise Teacher Comfort. The items that comprise this factor are items 7-8-10-11-12 and 13 from the scale. The results show a KMO equal to 0.743, a statistically significant Bartlett's test since

$$F(1.21) = 151.29 p < 0.05$$

all communalities being greater than 0.5, a total variance explained equal to 61.097% and thus we come to the conclusion that there are 2 factors extracted by the 6 items. Items 7 and 11 extract the factor Teacher Comfort and items 8, 10, 12 and 13 produce the factor Teacher Familiarity with the content knowledge and methodology to teach the subject of water. For the Perceived Child Interest factor we are using the items 14 and 15 from the scale. The KMO and Bartlett's test indicate critically adequate sphericity KMO equal to 0.5 and sampling adequacy as we report

$$F(1.1) = 27.64 p < 0.05$$

Both factor loadings are greater than 0.4 and communalities are greater than 0.5. Finally, we run the analysis for the Perceived Child Benefit factor with items q16-q21 taking part in the analysis. The KMO equal to 0. 843 and the Bartlett's test of sphericity

$$F(1.5) = 207.9. p < 0.05$$

indicates that there the data is appropriate for principal components analysis. The total variance explained is just above the critical value of 50% while the communalities for items 16 and 21 are less than 0.5 and have to be excluded from the analysis. Overall, 1 factor is extracted with eigenvalues greater than 1. Finally, the 21 items of the scale are teamed to five factors concerning the perceived level of Teacher Willingness, Comfort and Familiarity, Child Interest and Child Benefit. The items 2, 3, 6, 9, 16 and 21 were excluded from the statistical analysis, because they did not support the hypothesis.

Correlation Analysis
In order to test the hypothesis, we ran a Confirmatory Factor Analysis. This analysis identified a significant relationship between Teacher Willingness (F1) to improve their own skills and knowledge on water teaching and the Child Interest (F4) as well as Child Benefit (F5), since the p values of the relationships between the 3 factors are less than 0.05. The Teacher Comfort (F2) in using their knowledge on water also plays a significant part in stimulating the children's interest, and it does have a beneficial effect on children since the relationship between the factors is statistically significant ($p<0.05$ for both cases). The same is true for the relationship between Teacher Familiarity (F3) and Child Interest as well as Child Benefit. The Teacher Familiarity to the subject of water management has a significant impact on child interest in learning more about it and plays a beneficial effect on the child (p values less than 0.05) **(Table 1 Statistical Data)**

ANOVA
By running an ANOVA test for different age groups (1-33 years of service) for the Teacher Comfort factor, we realize initially from the Levene's test that the variance across the sample is the same since

$$\text{Levene's Statistic } (3.124) = 1.147 \; p > 0.05$$

thus, the null hypothesis that the variance across the sample is homogenous is accepted. Secondly, we check the results of the ANOVA test and we realize that there is a statistically significant difference between the variances of different groups. More specifically, we can report that

$$F\,(3.124) = 2.72 \; p < 0.05.$$

The next thing we do is check the least significant difference post hoc test **(Table 2 Statistical Data).** We can say that there is a statistically significant difference between the Teacher Comfort of groups 1 and 3 and 1 and 4. The sign of the mean difference in both cases is negative, which means that groups 3 and 4 appear to have significantly more Comfort in communicating the specific subject to the

children compared to group 1, while there is no statistical difference between Comfort and the rest of the groups. On the other hand, if we categorize the years of service in groups of decades and run the ANOVA test for the Comfort variable, we report

Levene's statistic $(3.124) = 1.178\ p > 0.05$

which means that the null hypothesis that the variance is homogenous throughout the sample is confirmed. We can also report F (3.124)=0.445, p>0.05, which means that the null hypothesis that there at least one significant difference between the mean scores of the groups is rejected. In other words, the years of service of a kindergarten teacher do not affect the Teacher Comfort on the subject. Also, the extra Studies teachers received do not seem to have an effect on Teacher Willingness, Teacher Comfort and Teacher Familiarity because we report a significance value for the ANOVA relationship which is greater than the upper boundary of 0.05. Besides, the seminars (1-4) teachers received do not seem to have an effect on Teacher Willingness, Teacher Comfort and Teacher Familiarity because we report a significance value for the ANOVA relationship which is greater than the upper boundary of 0.05. Finally, we run independent samples t-tests and we realize that the type of kindergarten the teachers work at does not affect Teacher Willingness, Teacher Comfort and Teacher Familiarity as the results show that variances are equal across the sample.

Table 1. Statistical Data

Correlations

		Teacher Willingness	Teacher Comfort	Teacher Familiarity	ChildInterest	Child Benefit
Teacher Willingness	Pearson Correlation	1	,211*	,284**	,264**	,257**
	p value		,017	,001	,003	,003
Teacher Comfort	Pearson Correlation	,211*	1	,000	,290**	,365**
	p value	,017		1,000	,001	,000
Teacher Familiarity	Pearson Correlation	,284**	,000	1	,357**	,335**
	p value	,001	1,000		,000	,000
ChildInterest	Pearson Correlation	,264**	,290**	,357**	1	,628**
	p value	,003	,001	,000		,000
ChildBenefit	Pearson Correlation	,257**	,365**	,335**	,628**	1
	p value	,003	,000	,000	,000	

Table 2. Statistical Data

The least significant difference post hoc test

Multiple Comparisons

Dependent Variable: Teacher Comfort

LSD

(I) age_group		Mean Difference (I-J)	Sig.
1	2	-.65383614	.111
	3	-.92790772*	.012
	4	-1.02985266*	.011

5. Discussion

In this chapter, are being discussed preschool teachers answers to the 21 items of study's SCALE, divided to 5 factors determining their beliefs and attitudes towards teaching water science and sustainable management of water.

Factor 1.Teacher Willingness

Items 1, 4, 5. The results of our study show that preschool teachers have the Willingness to teach the subject of water science and the sustainable management of water. They report enjoying reading resource books and searching on the Net to get ideas about water activities, enjoying collecting materials, books and objects to use in teaching water science topics and they like discussing ideas and issues about water science with other teachers. Our findings are in accordance with the findings as discussed by Haney et al [29], who argue that some teachers at the first grade of education have positive attitudes towards science, spend more hours than other teachers teaching science, use materials and information, spend time organizing science activities and try to incorporate more hours of teaching science in their curriculum. Besides, Georgopoulos et al. [17] stated that teachers elaborate on environmental programs because of their personal awareness and their desire to pass it on to their students. Considering environmental education as a "personal matter", they promote it with volunteering and expressing their emotions. On the contrary, Flogaitis et al [27] in their study have found that preschool teacher sources of information for teaching environmental issues is usually television rather than the Net, books or seminars. Goodrum et al. [30] stated that teachers in their study, were not willing to collect materials to perform their lesson the best way possible. Therefore, they preferred to teach other subjects than science and they had a clear preference for teaching literacy, social studies and arts rather than science.

Factor 2.Teacher Comfort

Item 7. The results of our study show that preschool teachers consider that they have the Comfort and self-efficacy to teach the subject of water science and sustainable management of water. They refer that they feel comfortable doing water activities and they are not afraid of children asking them questions about scientific principles or causes of environmental problems that they cannot answer. Our findings are in accordance with the findings of Tenaw [31] stating that most teachers participating in his study were confident about their knowledge in science. On the contrary, Kallery and Psillos [32] having researched the ways kindergarten teachers understand the scientific terms and the phenomena of the natural environment and also the way they choose to present them to the children, argue that some preschool teachers report reduced self-efficacy. This feeling

seems to be caused by insufficient preparation or training, i.e. the limited knowledge of conceptual content of the basic laws of Physics and the difficulty of transferring scientific knowledge and information. In addition, Greenfield et al. [13] states that many preschool teachers report low self-efficacy for teaching science, while Yoon & Onchwari [33] argue that some teachers do not feel confident about approaching scientific issues. Goodrum et al [30] claim that they hesitate to answer children's questions. They also feel uncertain or insecure, which prevent them from providing the best science education possible as Wenner discussed by [34]. Moreover, in the study of Kavalari et al. [35] many preschool teachers stated the feeling of insecurity.

Item 11. The results of our study show that preschool teachers have the Comfort and self-efficacy to teach the subject of water science (properties of the water, the states of water, water-Cycle, water in nature, water necessity for life, organisms living in water, water on Earth, water as a source of energy) and feel comfortable using any proper material for this age (e.g. materials for dramatization, video, photos, basin of water, bottles, glasses, coffee pot, salt, sugar, oil, jars, ice cube trays, cork, sponge, cotton, paint, toys) for experiential water science activities in their classroom. In contrast, Greenfield et al. [13] argue that preschool teachers state low self-efficacy and express discomfort during science lessons when using materials or having to answer children's questions.

Factor 3. Teacher Familiarity (with content knowledge, methodology and developmentally appropriate activities)

Item 8. The results of our study show that preschool teachers have the content knowledge to teach subjects related to water, as they report having enough knowledge to teach subjects related to water science and sustainable management of water at a preschool level. Our findings are in accordance with the findings of Papadopoulou & Christidou [36] stating that in their survey related to water sustainability, preschool teachers consider their content knowledge as sufficient. In contrast, Kallery [37] argues that teachers report not having the appropriate scientific knowledge.

Items 10, 13. The results of our study show that preschool teachers reported generally, when teaching water science and sustainable management of water, are familiar with the content knowledge, appropriate activities and methodology. Our findings are in accordance with the findings of Kavalari et al., [35] reported that the participants of their study, even though they considered having a good perception on the content knowledge of Physics, their overall evaluation indicated a low score, showing their actual lack of knowledge.

Item 12. The results of our study show that preschool teachers reported having the ability to determine which water activities are developmentally appropriate for young children, according to Developmental Psychology. Our findings are in accordance with the findings of Papadopoulou &Christidou [36] in a study on water shortage and conservation, designed and implemented in two Greek kindergartens. Preschool teachers used developmentally appropriate activities successfully to teach the subject, through multimodal functional texts using paintings, symbols, words and so on. Besides, Samaltani &Christidou [38] argue that in their study preschool teachers taught the concept of water sustainability successfully to a class of seventeen preschoolers. Twelve developmentally appropriate activities were used introducing them to the concepts of water value, water shortage and water conservation.

Factor 4. Child Interest

Items 14, 15. The results of our study suggest that preschool teachers stated that activities related to water help foster preschool children's interest in water science in later grades of education; they also indicate how curious young children are about scientific concepts and environmental problems concerning water. Our findings are in accordance with the findings of Papadopoulou &Christidou [36] in a study related to water conservation that kept the interest of children. Moreover, Samaltani &Christidou [38] state that in their study concerning water sustainability preschoolers participated happily and showed a great interest in the program.

Factor 5. Child Benefit

Item 17. The results of our study show that preschool teachers consider water activities to be beneficial to preschoolers, as they help them learn science concepts and raise awareness of human-induced environmental problems. Our findings coincide with the findings of Georgopoulos et al. [17] stating that preschool teachers believe that Environmental Education contributes to cultivating children's critical thinking and decision-making abilities, while they considered these as prerequisites to become aware and active citizens in the future. On the contrary, Kallery and Psillos [32] in their qualitative surveys as well as Peterson and French [40] in their quantitative one, have shown that there was a number of kindergarten teachers believing that teaching science should not be a priority at the curriculum of the kindergarten since they believe that most things would not be accessible to the minds of the children. In addition, Eshach & Fried [40] claim that preschool teachers often express doubts about the benefits of science teaching.

Item 18. The results of our study show that preschool teachers consider that activities related to water are beneficial to preschoolers, as they contribute to improving skills in Mathematics and Technology. Our findings are in accordance with the findings of Samaltani &Christidou [38] stating that preschool teachers successfully combined general objectives of Mathematics and Technology in a program related to water sustainability, setting goals resulting from the interdisciplinary Greek curriculum by Dafermou et al. [22].

Item 19. The results of our study show that preschool teachers consider water activities to be beneficial to preschoolers, as they develop skills in language and arts. Our findings coincide with the findings of Samaltani &Christidou [38] stating that preschool teachers successfully combined general objectives of language and arts in order to plan their interdisciplinary environmental program "Saving water". Besides, Kavalari et al. [35] in their study compare two teaching strategies that preschool teachers use to approach two water science concepts (sinking/floating and evaporation), teaching the vocabulary of water properties enhancing preschoolers' skills in language and arts. Moreover, Hong &Diamond [41] successfully used two teaching approaches to facilitate, among others, children's learning of vocabulary related to objects floating and sinking in the water, thus combining science and language learning objectives.

Item 20. The results of our study show that preschool teachers consider water activities to be beneficial to preschoolers, and contribute to the development of social skills. Our findings are in accordance with the findings of

Georgopoulos et al. [17], reporting that preschool teachers argue that through an environmental program children acquire necessary values and skills such as respect, critical thinking or the ability to make decisions, which will help them become conscious citizens of the world. Preschool teachers also wish to pass on to their students their love for the environment through environmental programs.

As we reported in the Statistical Analysis, the items 2, 3, 6, 9, 16 and 21 of the Scale were excluded from the statistical analysis, because they did not support the hypothesis. Many scientists claim that these items constitute basic preconditions of Experiential Environmental Education. Our negative findings are in accordance with the findings of Eshach [42] argue that many preschool teachers report "anti-science" attitudes. Specifically:

Item 2. Preschool teachers report that they do not have the Willingness to spend time creating materials. They are probably missing enthusiasm for the subject.

Item 3. Preschool teachers report that they don't need more scientific knowledge on water science and the sustainable management of water, even though, the demographical data have shown that they didn't attend many seminars. This may be due to their fatigue with seminars or that they don't consider so important teaching about water. Nevertheless, scholars state that outdoor educational experience for teachers enhance their confidence and efficacy, thus increasing their enthusiasm for science, nature, and environmental education. Ultimately, greater knowledge and efficacy could lead to spending more time in such activities discussed by Torquati et al. [43].

Items 6, 16. Preschool teachers report that they do not consider children's hands-on experimentation with materials and objects as the best way of learning this subject and the 'creative clutter' caused by experimentation with many materials annoys them. However, Dewey support that education must be a process that helps the child to gain experience through their relationship and interaction with the environment ("learning by doing"), Bruner stress the importance of learning by discovery and active participation of children in search of the structure of things, and Piaget says "I know an object means I act on it and I transform it, to understand the mechanisms of this transformation together with my trials transformative acts" Katz & Chard [44]. Besides, Maria Montessori [45] supported the idea that we get education "not by listening to words, but by experiences upon the environment".

Item 9. Preschool teachers report that they are not willing to engage in children's experimentation with water, watching what children do, say or ask However, Lidar et al. [46] support the idea that the interplay between teachers and children is of crucial significance for the teaching process, as well as, Helm & Katz [47] claim that teachers should be prepared to support children's curiosity through exploration and research.

Item 21. Preschool teachers report that they do not consider more activities with water to be necessary in their classroom. However, Pedersen & McCurdy [48] support that "Nature is considered to be important for young children in terms of experiences and learning outcomes compared with other curricular areas".

To sum up, in this chapter we have discussed where we are with preschool environmental education according to the teachers and where should be according to scientists. Participants' responses to the items provide an insight into how early childhood educators think about the subject of "water" and how the "water" activities can promote children's learning and development. Based on the findings, we could say that teachers could be collaborators in learning and help children to become aware of the necessity of water for life on our planet, the interdependence and interaction between man and nature and the significance of water shortage and of water conservation provided that, teachers would be prepared to fulfill their role. This seems to be a key that should be warrant more attention by policy makers. This is the first study to systematically examine this subject and thus it was necessary to develop research instrumentation to do this. Although we believe that our Scale with 21 items can be developed further perhaps depicting other qualities, it is a useful reflection tool if we are discussing teacher belief and attitude towards this subject. We think that our findings can help us understand how preschool teachers guide children's learning processes and how they sensitize children in sustainable water management. These findings can also be used for developing other systematic tools to study early childhood educators' perceptions and practices towards this subject.

Limitation

Many limitations to this study should be identified. First, results of this study are based on self-reports of participants' beliefs and attitudes as we did not monitored, documented and analyzed preschool teaching processes and children's learning processes. Besides we had a limited sample of teacher respondents in a limited geographical place.

Implications on the Study

Following the findings of our research, we propose organizing attractive educational experiences outdoors, by teacher's educators that could enhance preschool Teacher Willingness, so as to limit the negative preconditions stated in the survey. These educational experiences could concern training in student-centered learning methods and techniques according to modern pedagogical theories, such as, Enquiry learning (Problem solving), Experiential learning, Open-ended questions, Storytelling, Role play, Game based learning, Creating educative board game with students, Outdoor Education, Study visits, Research in the field, Interdisciplinary method, Project method, Scientific method (observation, reflection, information searching, predictions, hypothesis formulation, experimentation, conclusion formulation, conclusion control and operational definitions formulation). Policy makers, researchers, educators and teachers should consider preschool teacher beliefs and attitudes in order to help them improving their practices, according to the principals of Experiential Education. Given the increased interest on the "water" by Curricula, more emphasis should be given to identify the factors that affect the quality of teaching. It would also be useful to be conducted a research not only reporting teacher's believes and attitudes towards the subject, but also, observing the frequency, depth, and duration of teaching and evaluating teacher's practices in the classroom. Besides, it could be conducted a research evaluating student's environmentally friendly behavior toward water, after participating in programs aiming to raise environmental awareness and concern. Furthermore, it would be useful to conduct further research examining whether kindergarten teachers believe that informing and raising children's awareness and concern contribute to more environmentally friendly behavior toward water on a long term basis.

6. Conclusion

Our study contributes to the study of preschool teacher's beliefs and attitudes towards teaching water science and sustainable management of water in the context of Environmental Education. Findings of this study indicate that their beliefs and attitudes are positive, as they report that they have the Willingness, Comfort and Familiarity to teach this subject and they believe that the subject keeps Child's Interest and contributes to Child Benefit. However, their beliefs and attitudes are positive under certain preconditions. Based on the data, the preconditions are that kindergarten teachers do not have the Willingness to spend time creating materials and they do not need more scientific knowledge on water science and the sustainable management of water. They do not consider children's experimentation with many materials as the best way of learning this subject and the 'creative clutter' caused by experimentation with many materials annoys them. Besides, they are not willing to engage in children's experimentation with water, watching what children do, what they say or ask, or do not consider more activities with water as necessary. However, these items of the Scale may constitute basic preconditions of Experiential Education, especially in preschool age. Is noteworthy that teacher's answers were negative towards what many scientists would say is the way science and environmental education should be taught.

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Appendices

Appendix 1: Scale

Please indicate the degree to which you agree or disagree with each statement below by circling the appropriate letters: strongly disagree (SD), mildly disagree (MD), neutral (N), mildly agree (MA), or strongly agree (SA)

DEMOGRAPHIC DATA

A. Age: ……

B. Years of teaching experience ……..

C. Studies: a) PhD, b) Master's, c) Second University Degree, d) First University Degree

D. The type of kindergarten where teachers work: a) All day kindergarten (8am to 4pm) b) Classic kindergarten (8am to 12.15pm)

E. Environmental post-university training attended related to the subject of water (seminars)

ITEMS

1. I enjoy reading resource books and searching on the Net to get ideas about water activities for preschoolers.
2. I spend time setting up materials helping my students to explore water science concepts.
3. I am ready to get more scientific knowledge for planning hands-on activities raising children's awareness on sustainable management of water.
4. I like to discuss ideas and issues on the subject of water with other teachers.
5. I enjoy collecting materials books and objects to be used when teaching water.
6. I use many materials for water science activities and I do not mind the mess created in my classroom.
7. I feel Comfortable teaching water science and sustainable management of water and I am not afraid that children may ask me questions about scientific principles or causes of water environmental problems, which I would not be able to answer.
8. I have enough knowledge to teach water science and sustainable management of water at a preschool level.
9. I have the Willingness to be involved in children's experimentation with water, watching what they do, say or ask.
10. I am familiar with raising open-ended questions on issues related to water science and sustainable management of water during our educational visits.
11. I feel Comfortable using any material (e.g. materials for dramatization, video, photos, basin of water, bottles, glasses, coffee pot, salt, sugar, oil, jars, ice cube trays, cork, sponge, cotton, paint, toys) for water science activities in my classroom.
12. I am able to determine which water activities are developmentally appropriate for preschoolers according to Developmental Psychology.
13. I am familiar with pedagogical methods that encourage preschoolers to explore subjects related to water science and sustainable management of water: Outdoor Education (study visits, research in the field), Enquiry learning (problem solving), Experiential learning, Storytelling, Role play, Interdisciplinary method, Project method, Scientific methodology (observation, reflection, information searching, predictions, hypothesis formulation, experimentation, conclusion formulation, conclusion control, operational definitions formulation) and the like.
14. Preschool activities related to water help stimulate children's interest in science in later grades of education.
15. Preschoolers are curious about scientific concepts and environmental problems related to water.
16. Hands-on experimenting with materials and objects is how preschoolers learn best any water science concepts.
17. Water activities help preschoolers to learn scientific concepts and raise their awareness of human-induced environmental problems.
18. Activities related to water help preschoolers to improve their skills in mathematics and technology.

19. Water activities help improving preschoolers' skills in language and arts.
20. Activities related to water help improve preschoolers' social skills.
21. More activities related to water should be taught in early childhood.

Appendix 2.The 5 Factors

1.
2. Factor: Teacher Willingness
3. Factor: Teacher Comfort
4. Factor: Teacher Familiarity
5. Factor: Child Interest
6. Factor: Child Benefit

The numbers represent the items of the SCALE that grouped to every factor. The underlined numbers represent the items of the SCALE that were excluded from the analysis, because they didn't support the hypothesis.

a) Teacher Willingness. 1, 2, 3, 4, 5, 6, 9
b) Teacher Comfort. 7, 11
c) Teacher Familiarity. 8, 10, 12, 13
d) Child Interest. 14, 15
e) Child Benefit.16, 17, 18, 19, 20, 21