

How to Raise Climate Change Awareness to Early Childhood? Perception of In-Service Teacher and Pre-Service Teacher in Indonesia

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Abstract

This research aims to describe in-service and preservice teachers' perspectives to promote climate change awareness in early childhood education. To engage the study, the respondents join an online interview. This study involved 187 respondents, which separated into two categories: pre-service teachers, in-service teachers, 122 and 65, respectively. This research used a qualitative method. To collect the data, this research uses a structured interview. The data analysis technique used the interactive model of Miles & Huberman with the stages of data collection, data reduction, data presentation, verification, and conclusion drawing. This research revealed no significant difference between teachers and preservice teachers in the perspective of climate change awareness in ECE. Both have diverse ways to express and think about the best thing to pursue climate change awareness in children. Participants also understand how to foster children's awareness using suitable media, learning resources, methods, indoor and outdoor play activities. Besides, participants understand how to assess the learning process to implement climate change awareness in early childhood education.

Keywords: climate change awareness, teacher perception, teacher, pre-service teacher, early childhood education

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Introduction

Climate change occurs along with changes in human life patterns. Climate change is caused by several factors, such as a lack of awareness of human behavior in protecting the environment (Haryanto & Prahara 2019). The emergence of new technologies also has several negative impacts on environmental conditions. According to the Indonesian Maritime and Research Center, the impacts that occur due to climate change include extreme weather, changes in temperature and sea level, and changes in rainfall (Mustangin, 2017). Global climate change causes several diseases (Keman, 2007).

Climate change awareness is very crucial to prepare for early childhood. In addition to understanding the impacts of climate change, providing knowledge about climate change is also one step to build awareness of protecting the environment. Unfortunately, many teachers do not understand climate change awareness. Teachers' awareness of climate change is still deficient (Dal, et al., 2015).

Understanding of climate change is needed for children because with understanding climate change, children can know some of the impacts of climate change, and children can understand the threats that will occur so that children can identify positive and negative behaviors that affect climate change. That way, understanding climate change can be formed and can make children change behavior to protect their environment. Awareness of climate change impacts can lead to positive behaviors in children, such as protecting the earth by reducing greenhouse gases (Halady & Rao, 2010).

Global climate change can affect life in the future. Several countries are responsible for the impact of carbon emissions on the climate. The impact of climate change has violated children's rights to live in the future. Global warming caused by greenhouse gases causes the melting of glaciers, rising sea levels, flooding, and drought (Borter, 2019). The impact of climate change has become one of the agendas discussed at the UN General Assembly on sustainable development. Addressing climate change and protecting the environment is one of the sustainable development areas (Lawler, 2011).

Education related to climate change should be carried out in the school system. Research related to climate awareness education has been carried out by (Dal, Ozturk, Alper, Sonmez, & Cokelez, 2015), who examines his analysis of teachers' climate change awareness. They

compared teachers who teach science and social fields regarding the level of awareness about climate change. Furthermore, Dal, et al., (2015) also examines a model for pre-service teachers' climate change awareness and willingness to act for pro-climate change friendly behavior.

Besides, Bendito and Barrios (2016) also examine encouraging transdisciplinary approaches to implementing effective climate change adaptation and disaster risk reduction. They argue that developing a transdisciplinary strategy that effectively integrates disciplines, approaches, and knowledge systems will lead to greater and more sustainable impacts. Research related to climate change awareness was also conducted by Haryanto & Prahara (2017); he described that respondents were still less aware of climate change in terms of perception and behavior, which led to their lack of involvement in caring for the environment. However, scholars have given little attention regarding awareness in early childhood, especially in the Indonesian context (Astriyulita, 2017; Djoehaeni, 2014; Purnomowati, Asrihapsari, & Fauzi, 2016). The school accreditation instrument as a measure of quality in early childhood education in Indonesia also does not include assessing climate change awareness from an early age (Oktaria, Hamid, Yuningsih, & Suparti, 2019).

Awareness of climate change needs to be taught from an early age because, at a young age, they can practice it better for the next life stage. Climate change awareness education in early childhood will be successful if there are qualified teachers to teach it. Teachers need to have good perceptions, attitudes, knowledge, skills related to climate change awareness.

This investigation explores the perspectives of early childhood teachers and teacher candidates related to climate change. It provides an overview of the lessons carried out by teachers in developing climate awareness education for early childhood. Specifically, this study followed the early childhood teacher and pre-service teacher to explore the research question, *How are in-service and pre-service teachers raising climate change awareness in early childhood education?*

Method

This study uses a qualitative method, in which researchers explore the perceptions of teachers and preservice teachers on how to improve awareness of climate change in early childhood. Qualitative data were collected using structured online interviews individually. This interview was conducted to determine the participants' views on climate change awareness in early childhood for approximately 15 minutes. The questions asked by the researcher to the participants were nine items.

Table 1. *Interview Items*

No	Item
1	Reasons for equipping children with climate change awareness
2	Climate change issues
3	Causes of climate change
4	Media to introduce climate change awareness
5	Learning resources that make it easy to teach climate change
6	Methods for introducing climate change awareness
7	Indoor play activities to introduce climate change awareness
8	Outdoor play activities to introduce climate change awareness
9	How to assess the climate change awareness learning process

The research participants consisted of 65 kindergarten teachers and 122 kindergarten teacher candidates spread across six provinces in Indonesia (Jakarta, Banten, West Java, Central Java, Southeast Sulawesi, East Kalimantan). Participants selected by the random sampling who agree to fill a letter of consent.

Data analysis in this investigation used Miles and Huberman (2005). The data are analyzed in 3 stages, data reduction, display data, and conclusion (drawing/verifying data). Data reduction in this study focuses on data by the theme and provides codes for each aspect. All data were classified according to the focus of the study. According to the research category, these codes are used to organize data units, namely: sentence fragments taken from research notes.

The next stage is data presentation. The presentation of the data in this study is intended

to find meaning from the data that has been obtained, then arranged systematically, from complex to simple but selective forms of information. Lastly is conclusion and verification. Conclusion in this research is carried out in stages: a) check data representation; b) checking data on the influence of researchers; c) make data comparisons; d) use extreme cases which are realized by interpreting negative data. To display the data, this study code the participant using n1,n2,n3, and so on, for teachers and pn1, pn2, pn3, and so on for pre-service teacher.

Table 2. *Teacher Demographics*

Categories	Content	%
Teacher's Age (in range)	21-30	26,15
	31-40	46,15
	41-50	26,15
	50	1,54
Education Level	Master Degree-PhD	1.54
	Bachelor Degree	69.23
	Education Diploma	6.15
	Secondary School	23.08
Type of School	Day Care (0-2 years old)	3.08
	Play Group (3-4 years old)	27.69
	Kindergarten (4-6 years old)	58.46
	Informal ECE Centers (0-6 years old)	10.77
Teaching Experience (years)	No more than 1	3.08
	1-3	12.31
	4-6	24.62
	7-10	15.38
	More than 10	44.62
Number of children in each class	1 - 5	1.54
	6 - 10	7.69
	11 - 15	41.54
	16 - 20	20
	Lebih dari 20	29.23
Joined training/ seminar/ workshop on climate change awareness education	Yes	10.8
	No	89.2

Table 3. *Pre-Service Teacher Demographics*

Categories	Content	%
Pre-Service Teacher's Age (in range)	Less than 21	71.31
	21-30	28.69
Semester	2	27.87
	4	32.79
	6	31.15
	8	4.92
	More than 8	3.28
Joined training/seminar/workshop on climate change awareness education	Yes	13.93
	No	86.07

Results

This research reveals the teachers' perceptions of climate change awareness education and what steps to implement it. Teacher perceptions are described in categories 1 to category 3, which describe reasons for equipping children with climate change awareness, climate change issues, and climate change causes. Furthermore, the actions taken by teachers and preservice teachers are described in categories 4 to 9, which explain the media to introduce climate change awareness, learning resources that make it easy to teach climate change, methods, indoor play activities, outdoor play activities to introduce climate change awareness, and how to assess the learning process of climate change awareness.

Reasons for Equipping Children with Climate Change Awareness

The first category discusses teachers and prospective teachers' reasons to equip Early Childhood (EC) with climate change awareness. These categories consist of 9 and 12 codes, respectively. Participants stated that the reasons for equipping EC with climate change awareness were to get to know the environment, increase knowledge, protect the environment, and be prepared for changes that occur. Preservice teachers are more detailed in explaining the importance of equipping EC with climate change awareness than teachers. They have explained in more detail than the teacher regarding public health awareness and influence on children's development biologically and socially.

Table 4. *Reasons for Equipping EC with Climate Change Awareness*

No	Category: Reasons for Equipping EC with Climate Change Awareness	
	Teacher	Pre-Service Teacher
1	To understand climate change awareness (n2) (n8) (n14) (n15) (n16) (n19) (n22) (n23) (n27) (n28) (n33) (n36) (n39) (n40) (n42) (n46) (n48) (n55) (n57) (n58)	To understand the problems and find solutions that exist in their environment (pn15) (pn17) (pn18) (pn20) (pn25) (pn26) (pn30) (pn46) (pn56) (pn65) (pn80) (pn82) (pn101) (pn106)
2	Increase knowledge (n4) (n6) (n11) (n13) (n17) (n18) (n24) (n26) (n29) (n31) (n37) (n47) (n49) (n56) (n62) (n63) (n64)	Because studying climate change for early childhood is very important (pn8) (pn10) (pn11) (pn121) (pn14) (pn24) (pn31) (pn32) (pn39) (pn40) (pn57) (pn63) (pn81) (pn97) (pn99) (pn103) (pn105) (pn112) (pn113) (pn115)
3	To keep up with the changes (n7) (n54)	For better public health awareness (n12) (n37) (n61) (n64) (n98) (n114)
4	To protect the environment (n20) (n34)	So that children are familiar with climate change (pn24) (pn60) (pn62) (pn86) (pn90) (pn87) (pn96) (pn98) (pn120) (pn110)
5	Get to know more about climate issues (n32) (n45) (n58) (n61)	Introducing the child about the power of God. (pn36) (pn119)
6	Adding experience (n35)	Foster self-confidence in early childhood (pn108)
7	Knowing the symptoms and atmosphere (n44) (n50) (n51)	So that children can find out about weather changes and their effects (pn17) (pn20) (pn23) (pn95) (pn47) (pn52) (pn64) (pn68) (pn84) (pn85) (pn87) (pn95) (pn109) (pn111)
8	Overcoming disasters (n60)	In order to awaken people who do not want to protect the earth (pn29) (pn46) (pn106) (pn110)
9	To get to know nature (n52) (n53)	In order to add insight or knowledge (pn35) (pn42) (pn43) (pn45) (pn54) (pn55) (pn56) (pn58) (pn62) (pn68) (pn70) (pn75) (pn87) (pn91) (pn92) (pn93) (pn94) (pn100) (pn104) (pn107) (pn111) (pn120)
10		Influence on children's development biologically and socially (pn54)
11		Becoming the experience of prospective teachers on climate learning (pn69) (pn73)
12		Preparing a smart generation (pn30) (pn33) (pn48) (pn51) (pn56) (pn59) (pn66) (pn71) (pn88) (pn91) (pn116) (pn118) (pn101) (pn104)

Climate Change Issues

The second category discusses climate change issues that are known to in-service teachers and preservice teachers. These categories consist of 8 codes. Participants stated that extreme weather, the greenhouse effect, the transition period, global warming, and natural disasters are climate change issues. Prospective teachers are more detailed in mentioning climate change issues than teachers. They can give more details than teachers related to climate change, from emerging diseases to natural disasters.

“I know that climate change issues can affect human health, air quality, agriculture and food supplies, forests, ecosystems, coastal areas, and water resources.”

(np19, pre-service teacher, 1st interview)

Table 5. *Climate Change Issues*

No	Category: Climate Change Issues	
	Teacher	Pre-Service Teacher
1	Erratic climate cycle (n4) (n15) (n22) (n35) (38) (55) (n60) (61)	Greenhouse gas effect (pn1) (pn24) (pn55) (pn104) (pn115)
2	Global warming (n6) (n15) (n20) (n29) (n34) (n36) (n39) (n42) (n47) (n52) (n53) (n56) (n57) (n58) (63)	Global warming (pn1) (pn2) (pn15) (pn23) (pn25) (pn26) (pn29) (pn32) (pn46) (pn49) (pn53) (pn62) (pn63) (pn66) (pn68) (pn71) (pn75) (pn80) (pn85) (pn93) (pn103) (pn106) (pn118) (pn38) (pn59) (pn112)
3	Climate plague (n7) (n13)	Deforestation (pn1) (pn60)
4	Disaster (n23) (n14)	Acid rain (pn2) (pn6)
5	Disease due to climate change (n19) (n50) (n62)	Climate change (pn4) (pn5) (pn18) (pn21) (pn30) (pn91) (pn110) (pn13) (pn14) (pn40) (pn41) (pn42) (pn43) (pn45) (pn51) (pn58) (pn51) (pn74) (pn84) (pn86) (pn87) (pn94) (pn97) (pn100) (pn121) (pn101)
6	Climate change education (n21)	Extreme weather (pn7) (pn25) (pn31) (pn36) (pn47) (pn56) (pn67) (pn70) (pn77) (pn81) (pn92) (pn118) (pn101)
7	Extreme weather (n33)	Increasingly sick people (pn8) (pn12) (pn18) (pn20) (pn56) (pn77)
8	Acid rain and the greenhouse effect (58)	Many natural disasters (pn17) (pn25) (pn33) (pn44) (pn60) (pn70) (pn82) (pn92) (pn109) (pn108) (pn112)

Causes of Climate Change

The third category deals with the causes of climate change. These categories consist of 6 and 7 codes, respectively. Participants stated that climate change causes environmental conditions, global warming, the number of greenhouses, pollution, environmental pollution, and low public awareness of protecting the environment. Preservice teachers can more thoroughly list the causes of climate change than teachers. They can already describe in more detail than the teacher the process of climate change, starting from the environment and natural phenomena.

Table 6. *Causes of Climate Change*

No	Category: Causes of Climate Change	
	Teacher	Pre-Service Teacher
1	Global warming (n4) (n9) (n22) (n24) (n56) (n60) (n63) (n21)	Greenhouse gas effect (pn5) (pn8) (pn13) (pn14) (pn15) (pn24) (pn37) (pn47) (pn50) (pn53) (pn60) (pn63) (pn70) (pn71) (pn76) (pn85) (pn92) (pn93) (pn99) (pn106) (pn110) (pn112) (pn113) (pn118)
2	The number of greenhouses (n11) (n40) 5(n31) (n36) (n52) (n56) (n57) (n58)	Human activities (pn1) (pn4) (pn6) (pn15) (pn21) (pn23) (pn29) (pn32) (pn33) (pn41) (pn43) (pn46) (pn47) (pn49) (pn50) (pn51) (pn53) (pn55) (pn56) (pn60) (pn62) (pn64) (pn68) (pn71) (pn74) (pn75) (pn79) (pn80) (pn82) (pn85) (pn87) (pn92) (pn93) (pn94) (pn100) (pn101) (pn106) (pn108) (pn118)
3	Deforestation (n7) (n11) (n41) (n42) (n3)	The effects of global warming (pn8) (pn17) (pn30) (pn37) (pn38) (pn42) (pn47) (pn50) (pn53) (pn57) (pn60) (pn66) (pn67) (pn76) (pn81) (pn85) (pn92) (pn93) (pn100) (pn101) (pn104) (pn118) (pn25) (pn34) (pn70) (pn84) (pn115)
4	Environmental Pollution (n15) (n29) (n36) (n16) (n20) (n39)	Unpredictable weather (pn54) (pn69) (pn122) (pn121)
5	Weather and natural phenomena (n17) (n19) (n38)	Earth's atmosphere changes (pn52)
6	Low awareness of protecting the environment (n23) (n34) (n62)	Damage to the ozone layer (pn58) (pn60) (pn66) (pn76) (pn85) (pn106) (pn118)
7		Changing environmental conditions (pn44) (pn21)

“Climate change can cause extreme weather such as floods and storms, sea level rise. It can also increase the temperature, which can cause heat waves and drought. Climate change can also cause forest fires and increase air pollution.”

(np18, pre-service teacher, 1st interview)

The causes of climate change are greenhouse gases, global warming, ozone depletion, forest degradation, and uncontrolled use of chlorofluorocarbon (CFC) by industry.

(np50, pre-service teacher, 1st interview)

Media To Introduce Climate Change Awareness

The fourth category discusses the media used to introduce climate change awareness. These categories consist of 10 codes. Participants stated that the media that can be used to introduce climate change awareness could be in pictures, media from nature, 3-dimensional media, videos, interesting media, print media, science or experimental media, teacher guides, applications, and some even stated that they had not thought about this. Prospective teachers and the prospective teacher are detailed in mentioning the media to introduce climate change awareness.

Table 7. *Media To Introduce Climate Change Awareness*

No	Category: Media To Introduce Climate Change	
	Teacher	Pre-Service Teacher
1	Using pictures (n7) (n17) (n18) (n19) (n24) (n26) (n28) (n29) (n35) (n55) (n59)	Using pictures (pn7) (pn12) (pn13) (pn15) (pn18) (pn19) (pn24) (pn25) (pn26) (pn30) (pn34) (pn41) (pn42) (pn44) (pn46) (pn48) (pn49) (pn50) (pn56) (pn58) (pn59) (pn60) (pn61) (pn85) (pn91) (pn93) (pn121)
2	Media from nature (n11) (n14) (n15) (n21) (n22) (n23) (n31) (n35) (n36) (n39) (n48) (n52) (n53) (n56) (n63)	Media from nature (pn2) (pn8) (pn20) (pn22) (pn23) (pn32) (pn43) (pn51) (pn54) (pn65) (pn80) (pn103) (pn110) (pn112) (pn10) (pn31) (pn34) (pn37) (pn43) (pn51)
3	Educational games (n8) (n54) (n60) (n61)	Educational games (pn73) (pn85) (pn103) (pn117)
4	Interactive media (n6) (n4) (n7) (n9) (n21) (n25) (n33) (n38) (n46) (n47) (n51) (n57)	Using video (pn5) (pn6) (pn29) (pn38) (pn53) (pn54) (pn67) (pn74) (pn75) (pn79)

	(n58) (n63)	(pn84) (pn94) (pn95) (pn101) (pn106) (pn111) (pn118) (pn12) (pn44) (pn69) (pn85) (pn94) (pn103)
5	Whiteboard (n13)	Using print media (pn4) (pn76) (pn93) (pn95)
6	Electronic media (n16)	Do a hands-on experiment (pn21) (pn22) (pn23) (pn32) (pn37) (pn45) (pn51) (pn54) (pn57) (pn80) (pn81) (pn86) (pn87) (pn96)
7	Storybook (n30) (n49) (n50) (n65)	Using mini-globe (pn114)
8	Used goods (34)	3 Dimensional media (pn64)
9	Diorama (n41)	Book (pn11) (pn90) (pn109)
10	Digital media (n42) (n45)	Mobile application (pn63)

Learning Resources That Make It Easy To Teach Climate Change

The fifth category discusses learning resources that make it easier to teach climate change. These categories consist of 5 and 6 codes, respectively. Participants stated that learning resources that can facilitate teaching climate change include a web for teachers, a web for students, training or workshops, lesson plans, and teacher guides. Prospective teachers know one point more about learning resources that make it easier to teach climate change than teachers. They understand web-based teaching resources for teachers. Although they have yet to experience teaching, they can mention learning resources that can help them make it easier to teach climate change awareness education. Pre-service teachers have more capability to search for learning resources, especially using technology (Siron, Wibowo, & Narmaditya, 2020).

Table 8. *Learning Resources That Make It Easy To Teach Climate Change*

No	Category: Learning Resources That Make It Easy To Teach Climate Change	
	Teacher	Pre-Service Teacher
1	Web-based teaching resources for teachers (n1) (n6) (n9) (n15) (n16) (n18) (n47)	Web-based teaching resources for teachers (pn2) (pn29) (pn30) (pn31) (pn33) (pn35) (pn47) (pn50) (pn54) (pn56) (pn68) (pn69) (pn71) (pn77) (pn78) (pn80) (pn84) (pn85) (pn86) (pn90) (pn91) (pn94) (pn96) (pn101) (pn103) (pn106) (pn110) (pn115) (pn120) (pn122)

2	Joining Workshop/seminar (n2) (n4) (n8) (n10) (n11) (n17) (n18) (n20) (n28) (n30) (n34) (n40) (n41) (n45) (n46) (n47) (n56) (n58) (n59) (n60) (n62) (n63) (n65)	Joining Workshop/seminar (pn3) (pn5) (pn6) (pn8) (pn9) (pn29) (pn32) (pn33) (pn35) (pn41) (pn43) (pn45) (pn46) (pn47) (pn50) (pn51) (pn52) (pn54) (pn55) (pn58) (pn60) (pn61) (pn67) (pn68) (pn69) (pn70) (pn71) (pn72) (pn73) (pn74) (pn76) (pn79) (pn81) (pn82) (pn84) (pn85) (pn87) (pn90) (pn93) (pn94) (pn95) (pn96) (pn99) (pn100) (pn102) (pn103) (pn106) (pn108) (pn115) (pn120)
3	Print teaching resources for teachers (n5) (n15) (n19) (n23) (n55) (n60)	Print teaching resources for teachers (pn3) (pn35) (pn62) (pn64) (pn71) (pn72) (pn80) (pn91) (pn93) (pn94) (pn101) (pn103) (pn106) (pn107) (pn110) (pn115)
4	Teacher manual (n21) (n24) (n26) (n30) (n31) (n32) (n35) (n36) (n42) (n47) (n49) (n50) (n51) (n54) (n61) (n62)	Teacher manual (pn1) (pn3) (pn5) (pn6) (pn10) (pn13) (pn14) (pn15) (pn16) (pn17) (pn18) (pn19) (pn20) (pn21) (pn23) (pn24) (pn25) (pn26) (pn31) (pn35) (pn37) (pn39) (pn46) (pn51) (pn52) (pn57) (pn58) (pn59) (pn61) (pn63) (pn67) (pn69) (pn70) (pn72) (pn73) (pn76) (pn78) (pn79) (pn82) (pn90) (pn93) (pn94) (pn95) (pn100) (pn106) (pn107) (pn109) (pn111) (pn114) (pn115)
5	Web-based learning resources for student (n30) (n38) (n39) (n41) (n57)	Web-based learning resources for student activities (pn5) (pn35) (pn37) (pn38) (pn46) (pn47) (pn55) (pn57) (pn69) (pn73) (pn75) (pn78) (pn80) (pn85) (pn91) (pn94) (pn100) (pn103) (pn106) (pn110) (pn115) (pn117) (pn119) (pn120)
6	-	Seminar from experts (pn3) (pn6) (pn8) (pn33) (pn34) (pn39) (pn40) (pn51) (pn52) (pn54) (pn56) (pn58) (pn61) (pn63) (pn64) (pn65) (pn66) (pn67) (pn68) (pn69) (pn70) (pn71) (pn76) (pn80) (pn82) (pn84) (pn85) (pn86) (pn90) (pn93) (pn94) (pn96) (pn101) (pn103) (pn104) (pn106) (pn111) (pn113) (pn115)

Methods for Introducing Climate Change Awareness

The sixth category discusses the method of teachers and teacher candidates introducing an awareness of climate change. These categories consist of 9 and 16 codes, respectively. Participants stated that introducing climate change awareness was using general learning methods, such as telling stories, demonstrations, teacher guidelines, and STEAM. As for others, by doing field trips, examples-non-examples, and problem-based learning. Preservice teachers know more about methods for introducing climate change than do teachers. They can explain that the field trip method, discovery inquiry, examples-non-examples, hypnoteaching method, and problem-based learning can be used to introduce climate change awareness.

Tabel 9. *Methods For Introducing Climate Change Awareness*

No	Category: Methods For Introducing Climate Change Awareness	
	Teacher	Pre-Service Teacher
1	Demonstration (n8) (n9) (n15) (n18) (n21) (n23) (n25) (n29) (n31) (n34) (n36) (n41) (n49) (n51) (n55) (n59) (n60) (n61)	Demonstration (pn24) (pn37) (pn52) (pn77) (pn119)
2	Storytelling (n10) (n14) (n16) (n19) (n20) (n30) (n32) (n33) (n47) (n50) (n65)	Storytelling (pn17) (pn19) (pn34) (pn37) (pn40) (pn41) (pn46) (pn47) (pn58) (pn62) (pn75) (pn90) (pn93) (pn95) (pn120)
3	Question and answer (n10) (n17) (n38) (n57) (n62)	Centre play-based method (pn45) (pn65) (pn69)
4	Experiment (n13) (n10) (n23) (n35) (n48) (n54) (n58) (n62)	Experiment (pn57) (pn62) (pn70) (pn71) (pn81) (pn87) (pn117) (pn122)
5	Project (n15) (n22) (n30)	Field trip (pn3) (pn80) (pn84)
6	Role Playing (n62)	Role Playing (pn79) (pn86) (pn96)
7	Play (n24) (n25)	Play (pn7) (pn25) (pn36) (pn41) (pn44) (pn47) (pn63) (pn85) (pn91) (pn106) (pn109) (pn115)
8	Active student learning (n42) (n63)	Indoor play activities (pn5)
9	STEAM (n7)	Outdoor play activities (pn12) (pn80) (pn121)
10		Discovery inquiry (pn56)
11		Examples Non Examples (pn50)
12		Problem Based Learning (pn20) (pn49)
13		Expository (pn97)

14	Web-based method (pn94)
15	Hypnoteaching (pn64)
16	Practice directly (pn2) (pn21) (pn22) (pn23) (pn29) (pn32) (pn33) (pn38) (pn43) (pn44) (pn61) (pn66) (pn71) (pn73) (pn75) (pn97) (pn99) (pn104) (pn108) (pn110) (pn111) (pn118)

Indoor play activities to introduce climate change awareness

The seventh category discusses the activities of teachers and prospective teachers playing indoor to introduce climate change awareness. These categories consist of 9 and 17 codes, respectively. Participants stated that indoor play activities to introduce climate change awareness, particularly by general indoor learning activities such as role-playing, classroom experiments, storytelling, drawing, watching videos, and others. Moreover, some stated using interactive games via quizziz and simulations of natural disasters. Prospective teachers are more detailed in explaining indoor play activities to introduce climate change awareness than teachers. They mentioned that experimenting, simulating natural disasters, playing quizzes, questioning and answering, and watching videos could be done in indoor play activities.

Table 10. *Indoor Play Activities To Introduce Climate Change Awareness*

No	Category: Indoor Play Activities to Introduce Climate Change Awareness	
	Teacher	Pre-Service Teacher
1	Play using collages (n4) (n47)	Give an example (pn1) (pn7) (pn8) (pn10) (pn14) (pn21) (pn22) (pn23) (pn97) (pn108) (pn109) (pn110) (pn122)
2	Play with used goods (n7) (n34) (n42)	Applying visual media (pn4) (pn15) (pn25) (pn33) (pn40) (pn41) (pn43) (pn44) (pn50) (pn74) (pn91)
3	Science experiment play (n11) (n13) (n35) (n36) (n43) (n51) (n55)	Watching video (pn12) (pn29) (pn33) (pn41) (pn54) (pn67) (pn79) (pn84) (pn85) (pn99) (pn104) (pn106)

4	Role Play (n14) (n17) (n30) (n56) (n57) (n58) (n65)	Storytelling (pn17) (pn29) (pn40) (pn67) (pn70) (pn80) (pn106)
5	Storytelling (n18) (n20) (n24) (n50) (n62)	Interactive game via quizziz (pn25) (pn26) (pn56) (pn75)
6	Watching video (n21) (n22) (n31) (n48)	Practice directly with the tools and materials around (pn32) (pn45) (pn55) (pn57) (pn66) (pn70) (pn81) (pn85) (pn87) (pn115) (pn120)
7	Gardening (n23)	Singing (pn37) (pn56)
8	Play using diorama (n41)	Play using puzzles (pn46)
9	Draw (n46) (n52) (n53) (n61)	Demonstration (pn60) (pn77) (pn119)
10		Introducing plants and farming (pn61) (pn92) (pn114) (pn117)
11		Role Playing (pn53) (pn54) (pn56) (pn76) (pn86) (pn96) (pn121)
12		Drawing and coloring activities (n24) (n51) (n58) (n59) (n87) (n94)
13		Natural disaster response simulation (pn2) (pn69) (pn82)
14		Question and answer (pn8) (pn29) (pn82)
15		Motor sensory activities (pn76)
16		Creating environment-based media (pn121)
17		Educational props (pn73) (pn106)

Outdoor Play Activities To Introduce Climate Change Awareness

The eighth category discusses how teachers and prospective teachers develop outdoor play activities to introduce climate change awareness. These categories consist of 4 and 9 codes, respectively. Participants stated that outdoor play activities to introduce climate change awareness include outdoor learning activities such as planting trees, experimenting outside the classroom, getting to know nature, field trips, educational games, keeping clean, and playing with used goods. Prospective teachers know more about some outdoor play activities to introduce climate change awareness than teachers. They understand that field trips, educational games, role-playing, and playing using used goods can be made in outdoor play activities.

Table 11. *Outdoor Play Activities To Introduce Climate Change Awareness*

No	Category: Outdoor Play Activities To Introduce Climate Change Awareness	
	Teacher	Pre-Service Teacher
1	Planting Activities (n4) (n8) (n11) (n20) (n21) (n34) (n35) (n39) (n42) (n56)	Planting Activities (pn1) (pn24) (pn33) (pn46) (pn63) (pn66) (pn79) (pn80) (pn85) (pn106)
2	Science experiment (n15) (n19) (n31) (n38) (n41) (n46) (n47) (n48) (n51) (n52) (n53) (n57) (n58) (n61)	Science experiment (pn2) (pn13) (pn32) (pn37) (pn44) (pn47) (pn52) (pn53) (pn56) (pn57) (pn58) (pn59) (pn67) (pn87) (pn90) (pn99) (pn115) (pn122)
3	Practice maintaining health and personal hygiene (n17) (n46) (n54) (n59) (n63)	Field trip (pn3) (pn16) (pn12) (pn22) (pn65) (pn69) (pn93) (pn94)
4	Get to know the natural surroundings (n13) (n7) (n14) (n18) (n22) (n24) (n25) (n26) (n27) (n36) (n49) (n60) (n62) (n65)	Get to know the natural surroundings (pn4) (pn5) (pn6) (pn7) (pn8) (pn10) (pn11) (pn43) (pn48) (pn49) (pn50) (pn54) (pn55) (pn61) (pn62) (pn64) (pn70) (pn71) (pn73) (pn74) (pn81) (pn84) (pn92) (pn100) (pn103) (pn104) (pn107) (pn109) (pn110) (pn111) (pn119)
5		Drawing (pn19) (pn20) (pn114) (pn116) (pn117)
6		Practice maintaining health and personal hygiene (pn21) (pn23) (pn97)
7		Educational games (pn25) (pn26) (pn41)
8		Play with used goods (pn29)
9		Role Play (pn40) (pn76) (pn77) (pn91) (pn118) (pn121)

How to Assess the Climate Change Awareness Learning Process

The ninth category discusses how teachers and prospective teachers assess the learning process for climate change awareness. These categories consist of 6 and 5 codes, respectively. Participants stated that assessing the learning process for climate change awareness, namely by observing activities, analyzing developmental stages, question and answer, portfolios, and children's activity during learning. Teachers are more detailed than preservice teachers to better understand by analyzing children's activity to assess the learning process.

Table 12. *How to Assess the Climate Change Awareness Learning Process*

No	Category: How to Assess the Climate Change Awareness Learning Process	
	Teacher	Pre-Service Teacher
1	Identify the stages of child development (n4) (n39) (n42) (n49) (n62)	Make observations (pn1) (pn5) (pn7) (pn12) (pn15) (pn18) (pn19) (pn20) (pn21) (pn23) (pn24) (pn25) (pn33) (pn34) (pn41) (pn43) (pn46) (pn47) (pn48) (pn51) (pn56) (pn60) (pn61) (pn65) (pn68) (pn79) (pn81) (pn84) (pn86) (pn87) (pn90) (pn91) (pn92) (pn93) (pn96) (pn97) (pn99) (pn100) (pn104) (pn108) (pn109) (pn110) (pn114) (pn115) (pn116) (pn117) (pn118) (pn119) (pn120)
2	Make observations (n7) (n8) (n13) (n17) (n20) (n22) (n23) (n24) (n34)	Through interviews (pn4) (pn8) (pn10) (pn55) (pn58) (pn63) (pn67) (pn71) (pn77)
3	Child performance (n11) (n16) (n18) (n19) (n36) (n57) (n63)	Child development analysis (pn22) (pn26) (pn29) (pn40) (pn44) (pn49) (pn50) (pn52) (pn53) (pn54) (pn59) (pn73) (pn74) (pn85) (pn95) (pn106) (pn111)
4	Through interviews (n14) (n26) (n51)	Anecdotal records (pn32) (pn37) (pn57) (pn66) (pn70) (pn80) (pn94) (pn103)
5	Through the portfolio (n15) (n35) (n41) (n48) (n52) (n53) (n58) (n65)	Through the portfolio (pn64) (pn75)
6	Analyze children's activities (n25) (n29) (n30) (n31) (n38) (n46) (n47) (n54)	

Discussion

Reasons for Teachers and Teacher Candidates Providing Climate Change Awareness to the Children

The first category discusses the reasons for teachers and preservice teachers to provide children with an awareness of climate change. Understanding of the impact of climate change on health is a starting point so that individuals can change behaviour to preserve the environment and make individuals have the awareness to reduce the use of greenhouse gases (Halady & Rao, 2010). Children can carry out climate change campaigns, as did some

children from several countries who protested against world leaders' inaction in overcoming climate change (Borter, 2019). With awareness of climate change, children can influence them to overcome climate change because sustainable education is crucial, especially in early childhood education, which must develop to play its role in the life to come. Children as successor agents are expected to make changes and influence the people around them to do the right thing and overcome the problems they face (Davis, 2014).

Climate Change Issues Known by Teachers and Teacher Candidates.

The second category discusses climate change issues that are known to teachers and preservice teachers. They understand several issues that occur due to climate change. They can also adapt to climate change issues (Dal et al. 2015). According to (Lawler, 2011), global climate change has impacts in various parts of the world. One of the impacts of climate change in South-East Asia is the lack of clean water availability, flooding on the coast resulting in various ecosystem losses, and disease and death caused by diarrhea. The impacts of climate change in South Asia and the Pacific include an increased risk of flooding in the rainy season and water shortages in the summer, and a lack of production from agriculture in the interior.

Teachers and prospective teachers are sufficiently able to identify and classify current issues related to climate change. Their knowledge can draw a general description of the issue of climate change that is happening. This knowledge will be an important asset for teachers to pass on their ideas to their students. A good teacher's perception will have a positive impact on the learning she does.

Causes of Climate Change

The third category deals with the causes of climate change. Teachers can already describe the causes of climate change very well. Peacock (2011) has been able to identify the causes of climate change, generally. Their answers are also related to (Keman, 2007) opinion, which states that the global climate is caused by industrial activities carried out by humans as well as transportation and agricultural intensification. Likewise, the increase in

greenhouse gases causes a greenhouse effect that impacts global warming, which causes extreme global climate change (Pratama, 2019). Their answers are also relevant to UNESCO (2017), which states that human activity is the biggest cause of climate change and is an anthropogenic phenomenon due to increased greenhouse gas emissions.

Media Used To Introduce Climate Change Awareness

The fourth category discusses the media used to introduce climate change awareness. The teacher stated that media images, audiovisuals, whiteboards, storybooks, and electronic media could introduce climate change awareness. Meanwhile, prospective teachers mentioned several media used to introduce climate change, including teacher guides, 3-dimensional media, video, and print media. Media dioramas consisting of miniature trees can make children aware that planting trees is one way to reduce global warming (Christin et al, 2016). Besides, early childhood education should encourage students to learn about nature, recycling, and gardening as main practices (Davis, 2014). The use of media in the learning process can make it easier for teachers to deliver the material. The use of image media can influence students in the learning process about weather and earth to better understand the material presented (Embun & Astuti, 2015). Also, the use of learning media can make learning outcomes more optimal (Audie, 2019).

Learning Resources That Make It Easy To Teach Climate Change

The fifth category discusses learning resources that make it easier to teach climate change. Researchers investigate what media teachers use in climate change learning more deeply and provide opportunities to think about future teachers if they become a real teacher and what media they will use. Teachers and prospective teachers state the same thing in selecting learning resources that make it easier to teach climate change, including web learning resources for teachers, printed teaching resources, lesson plans, teacher guides, expert seminars, and web learning for students. The use of learning resources that are usually used by teachers includes books, pictures, films, and programmed learning (Supriadi, 2015). The lesson plan's role is also very important in the learning process

because, with lesson plans, teachers can develop teaching skills and not be monotonous in teaching (Sufiati & Afifah, 2019).

Methods for Introducing Climate Change Awareness

The sixth category deals with methods for introducing climate change awareness. Many teachers and preservice teachers offer several methods that can be used to help the successful learning of climate change awareness. They have many alternatives for realizing the aims of the excellent quality of climate change awareness learning. However, story telling is the most popular method mentioned by the teachers and pre-services to foster climate change awareness. Story telling is one of the most effective ways to habituate children (Rahiem, Abdullah, & Rahim, 2020). This method is a favorite of teachers because it is easy and simple to practice. A great learning method positively impacts the learning outcomes when the teachers can apply it correctly. So, the learning objective can be achieved by the school stakeholders easily.

Learning objectives will be performed well if through the right pathway (Sriwahyuni & Nofialdi, 2016). Teachers and preservice teachers can introduce students to climate change awareness if the method is applied correctly.

Indoor Play Activities to Introduce Climate Change Awareness

The seventh category discusses indoor play activities to introduce climate change awareness. Teachers and prospective teachers have a variety of answers. Besides activities that use multimedia and technology, they think that puzzles, drawing and colouring, and other sensory activities can also foster climate change awareness. Although teachers and preservice teachers' main objective in carrying out these activities is to increase children's awareness, children's other benefits can be obtained when teachers implement sensory activities. Sensory activities can improve the fine motor skills of early childhood (Huda, Faeruz, & Hayati, 2019; Qomariah, Marlina, & Oktamarina, 2020).

Indoor play is an important activity for children to maximize their development and development related to climate change awareness. Climate change awareness learning will

be realized well if indoor play activities can be carried out well and provide good indoor learning spaces. The provision of facilities, infrastructure, and settings for learning spaces while playing can stimulate children's creativity (Masiming, 2009). The classroom environment can also affect a child's ability to focus and easily understand learning. As for room decoration, such as color selection or classroom decoration, it is necessary to pay attention so the learning atmosphere is more interesting and fun (Nuritasari & Julianto, 2015). Thus, the room's arrangement needs to be considered in indoor play activities to make the learning atmosphere more interesting and fun.

Outdoor Play Activities To Introduce Climate Change Awareness.

The eighth category discusses outdoor play activities to introduce climate change awareness. Outdoor learning encourages children's exploration and curiosity through their senses to provide several interesting experiences (Mariyana & Setiasih, 2018). The other benefits of outdoor learning can optimize social skills, physical, emotional, social development, and social and cultural skills in children (Rohmah, 2016). Moreover, outdoor activities also greatly affects children's cognitive abilities (Syaikhu & Napis, 2020). Outdoor activities are activities that are very useful in the stages of child development. With this activity, children can be grateful for the universe that God created, and children are also able to observe and explore natural objects around them through their five senses (Herlinda, 2018).

How to Assess the Climate Change Awareness Learning Process

The ninth category discusses how to assess the learning process for climate change awareness. In general, teachers and preservice teachers have a similar understanding, although there are several variations in their views in assessing the learning process for climate change awareness. Assessment is a process of collecting and interpreting students' developments through systematic, periodic, continuous, and comprehensive learning (Weni et al, 2017). Assessment is a recommendation for the outcomes of student learning progress through a planned process. Teachers need to assess because it becomes an instrument to

enhance the classroom's quality of learning (Zahroh, 2015). Evaluating the education process for climate change awareness is very important to measure students' comprehension of climate change awareness.

Conclusion

This research reveals the relationship between teachers' perceptions of climate change awareness education in early childhood education. Besides, this study reveals the steps taken by teachers and prospective teachers in implementing them. Teachers have reasons for equipping children with climate change awareness and consider it very important to deal with their children. They have also been able to explain climate change issues and causes of climate change in detail. This knowledge becomes the first support for teacher development steps in increasing competence in climate change awareness. Furthermore, the teacher has also been able to explain the steps to develop learning. Teachers can determine good and suitable media to introduce climate change awareness. Likewise, in deciding on learning resources that make it easy to teach climate change. The teacher already understands what methods are suitable for applied and indoor and outdoor play activities suitable for introducing climate change awareness. Teachers already have viewpoints related to how to assess climate change awareness in the learning process.

The preservice teacher's views are not much different from those of experienced teachers. Several categories are better described. Such as explaining the reasons, current issues, and causes of climate change. Likewise, prospective teachers are more skilled in describing media, methods, learning resources, indoor and outdoor activities for learning based on climate change awareness. This ability signifies that teachers need to upgrade their knowledge to be similar prospective teachers who can have better perceptions concerning climate change awareness even though they have not had experience and direct practice in schools.

This study has limitations on the number of participants. The participants involved are relatively small when compared to the number of teachers in Indonesia. Retrieval of data through structured interviews also makes the depth of research results need to be explored

further. Despite its limitations, this research can be used as a reference in the formulation of a curriculum that can increase awareness of climate change in early childhood education. Increasing the skills of teachers in mainstreaming climate education also needs to be implemented in learning.

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