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Climate Knowledge and Engagement in Primary Education: Insights from an Audience Segmentation Approach

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Climate Knowledge and Engagement in Primary Education: Insights from an Audience Segmentation Approach

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Περίληψη

Η παρούσα μελέτη εξετάζει τις γνώσεις, τις εναλλακτικές ιδέες και τις στάσεις των μαθητών/τριών της Ε' και ΣΤ' Δημοτικού σχετικά με την κλιματική αλλαγή, αξιοποιώντας το εργαλείο τμηματοποίησης κοινού Six Americas Short SurveY (SASSY), του Πανεπιστημίου Yale. Τα ευρήματα δείχνουν ότι ενώ η πλειονότητα του μαθητικού κοινού εντάσσεται σε τμήματα με αυξημένη ευαισθητοποίηση, οι εναλλακτικές ιδέες παραμένουν ευρέως διαδεδομένες, ενώ οι μεγαλύτεροι/ες ηλικιακά μαθητές/τριες εμφανίζουν περισσότερες παρανοήσεις σε σχέση με τους/τις μικρότερους/ες. Η μελέτη αναδεικνύει την ανάγκη για στοχευμένες εκπαιδευτικές παρεμβάσεις, για την ενίσχυση της κατανόησης και της περιβαλλοντικής συνείδησης.

Λέξεις κλειδιά: πρωτοβάθμια εκπαίδευση, εργαλείο SASSY, κλιματική αλλαγή, τμηματοποίηση κοινού

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Abstract

This study examines the knowledge, alternative conceptions, and attitudes of 5th and 6th-grade primary students regarding climate change, utilizing the Six Americas Short SurveY (SASSY) audience segmentation tool developed by Yale University. The findings indicate that while most students fall into segments characterized by heightened awareness, alternative conceptions remain widespread. Notably, older students exhibit more misconceptions compared to their younger peers. The study underscores the need for targeted educational interventions to enhance understanding and foster environmental consciousness.

Keywords: audience segmentation, climate change, primary education, SASSY tool

Introduction

Climate change education is challenging, particularly for younger audiences. Despite the growing global focus on developing appropriate educational interventions, children often struggle with conceptual understanding, hold misconceptions, and show varied responses to climate issues.

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To explore this interaction, we used the Six Americas Short SurveY (SASSY) developed by Yale University was used. SASSY is a tool that segments individuals into six groups—Alarmed, Concerned, Cautious, Disengaged, Doubtful, and Dismissive—using a 4-item questionnaire that assesses the varying degrees of awareness and engagement based on self-reported beliefs, concern levels, and personal connection to climate change (Chryst et al., 2018). In this study, SASSY was adapted to classify Greek 5th and 6th-grade primary students.

Segmentation Types in Children's Climate Perspectives

Audience segmentation is a popular method for identifying different subgroups. When it comes to student audiences, segmentation based on climate perspectives has been done in a variety of ways. (i) Demographics: Misconceptions regarding climate, such as conflating ozone depletion with the greenhouse effect, are widespread across all age groups (Leščešen et al., 2024). Older students typically demonstrate greater understanding, but younger ones often show more concern and willingness to act than older peers (Nepras et al., 2023). Girls show higher levels of perceived risk and are more likely to engage in adaptive actions (Nepras et al., 2023). (ii) Emotional Engagement: Eco-anxiety, driven by feelings of fear and helplessness, can hinder children's ability to act. Constructive hope, on the other hand, empowers children to transform concern into positive action (Demetriou et al., 2024). (iii) Psychographic Segmentation: Children are grouped into four distinct profiles, based on how they perceive risk and self-efficacy: indifference (low risk, weak efficacy), proactive (low risk, strong efficacy), avoidance (high risk, weak efficacy), and responsive (high risk, strong efficacy) (Mead et al., 2012). (iv) Cognitive-Affective Segmentation: High climate knowledge correlates with positive attitudes and pro-environmental behaviors, while limited knowledge often results in neutral or negative attitudes. (Karpudewan et al., 2014).

Methodology

The study focuses on the following research questions:

RQ1. How are 5th and 6th-grade Greek primary students distributed across the SASSY segments?

RQ2. What is the overall climate knowledge of 5th and 6th-grade primary students, and in what ways do their SASSY segments correlate with their understanding?

RQ3. What is the effect of demographic factors, including age and gender, on primary students' understanding of climate issues, misconceptions, and classification within the SASSY segments?

The study involved 66 students from two primary schools in the Athens region: 33 5th graders and 33 6th graders. The administered questionnaire was structured into three sections:

(i) The demographic section collected information about the participants' gender and grade level. (ii) The SASSY section contained four validated questions from the Six Americas Short SurveY, designed to classify respondents into one of six audience segments regarding climate change: Alarmed, Concerned, Cautious, Disengaged, Doubtful, or Dismissive. These four questions assess climate change concern, perceived personal and societal risk, and issue importance (Chryst et al., 2018). To ensure linguistic and conceptual clarity, the questions were first translated into Greek and then back-translated into English to validate consistency with the original survey instrument. (iii) The climate knowledge section, comprising four multiple-choice questions which assessed students' understanding of key climate science concepts. The first question (Greenhouse Effect) examined students' understanding of how certain atmospheric gases trap heat. The second question (CO_2 Increase Since the Industrial Revolution) examined their awareness of historical changes in carbon dioxide (CO_2) concentrations while the third one (Global Temperature Change Since the Industrial Revolution) assessed their understanding of observed global temperature trends. Finally, the

fourth question (Scientific Consensus on Climate Change) tested their knowledge of the level of agreement among scientists regarding human-caused climate change.

The questionnaire was distributed in the classroom setting, with students completing it under supervision. No personally identifiable information was collected in order to ensure anonymity. Data was analyzed using a combination of descriptive statistics, correlation analysis, and segmentation-based comparisons.

Results

The SASSY segmentation indicates that 76% of the total students fall into the "Alarmed", "Cautious", and "Concerned" segments, while 24% fall into the less engaged segments ("Doubtful", "Dismissive"). More specifically, the "Alarmed" and "Concerned" segments have a relatively even distribution across both 5th and 6th graders while the "Cautious" segment is significantly larger among 6th graders (36%) compared to 5th graders (12%). Smaller proportions of students fall into the "Doubtful" (18% of 5th graders, 9% of 6th graders), "Disengaged" (9% of 5th graders, 6% of 6th graders), and "Dismissive" (3% in both grade levels) segments (Fig. 1).

Figure 1. SASSY segmentation of the student population by age

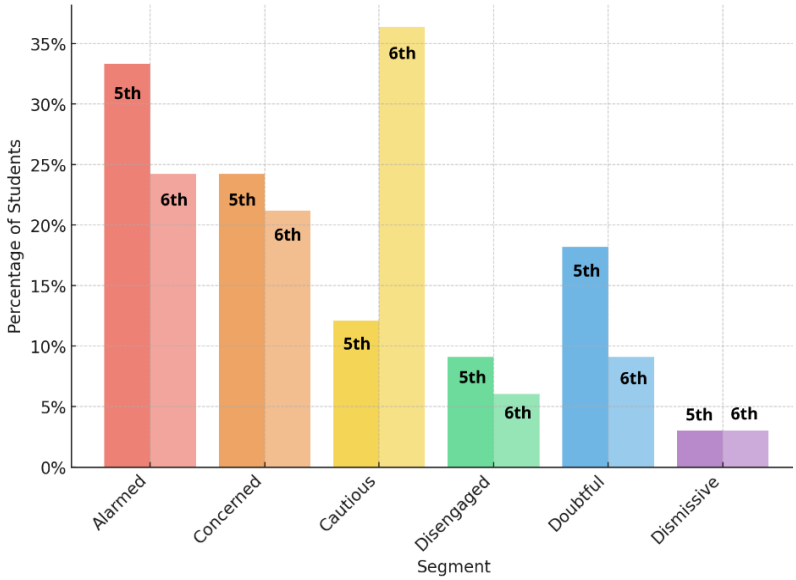
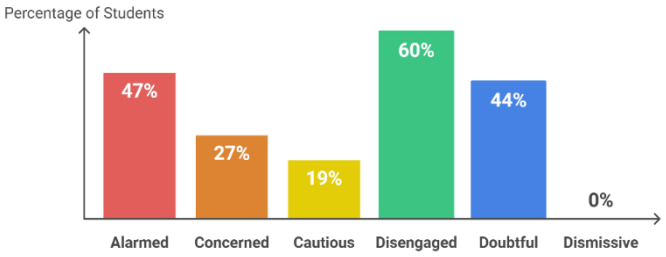


Figure 2. Ozone misconception percentages by segment



Confusion between depletion of the ozone layer with the greenhouse effect is prevalent across segments, not only among less engaged ones, like "Disengaged" (60%) or "Doubtful" (44%), but in "Alarmed" (47%) as well. No misconceptions were reported among the "Dismissive" group, though this may be influenced by the small sample size of this segment. (Fig. 2).

Regarding the "climate knowledge" questions, two-thirds of the students correctly identified the increase of CO_2 levels since industrialization, while one-third underestimated it. Similarly, while 41% recognized the temperature rise since the Industrial Revolution, the rest either underestimated it or held misconceptions about temperature stability. Finally, 36% of students accurately identified the percentage of scientists who agree that human activity is the primary cause of climate change.

The Kruskal-Wallis H test confirmed no statistically significant differences in ozone misconceptions across SASSY segments ($H = 6.31$, $p = 0.277$. However, the Kruskal-Wallis test revealed significant differences by age for CO_2 increase knowledge ($H = 4.05$, $p = 0.044$), scientists' consensus awareness ($H = 6.88$, $p = 0.009$), and ozone misconceptions ($H = 14.79$, $p < 0.001$). While younger students were generally less likely to answer knowledge questions correctly (with only 18% doing so compared to 55% of older students), older students exhibited significantly more misconceptions about the ozone layer. So, even though older students

correctly identified the greenhouse effect more often, they were also more likely to mistakenly associate it with ozone depletion.

The relationship between age and climate change-related variables was explored with a Pearson correlation analysis. The results indicate a moderate-to-strong positive correlation between age and misconceptions about the ozone layer, $r(64) = .477$, $p < .001$. Additionally, self-reported knowledge on climate change showed a significant positive correlation with age, $r(64) = .403$, $p < .001$. Scientists' consensus also correlated positively with age, $r(64) = .296$, $p = .016$. A weak negative correlation was observed between age and knowledge about CO_2 increase, $r(64) = -.253$, $p = .041$. Other variables did not show statistically significant correlations with age. Correlations between gender and key variables within the sample are weak. Both male and female students demonstrated similar levels of knowledge and misconceptions across most climate-related topics.

Discussion

Most students fell into the "Alarmed," "Cautious," and "Concerned" segments, indicating a general awareness and concern about climate change (RQ1). However, misconceptions were prevalent across all segments, not just the less engaged ones. While "Disengaged" (60%) and "Doubtful" (44%) exhibited high levels of ozone misconceptions, similar trends were observed among the "Alarmed" group, so the assumption that higher engagement correlates with accurate understanding is not supported. The Kruskal-Wallis analysis confirmed that SASSY segments did not significantly differ in climate knowledge or misconceptions (RQ2). In terms of age differences, the Kruskal-Wallis test and correlation analyses revealed that while older students demonstrated a better understanding of CO_2 increase and scientists' consensus on climate change, they also held significantly more misconceptions about the ozone layer compared to their younger peers. This contradiction suggests that misconceptions about climate concepts like ozone depletion can persist or even increase over time. The observation that some students who correctly identified the greenhouse effect also selected the ozone-related answer, suggested that their understanding is not entirely incorrect but still influenced by misconceptions. Gender was found to have minimal influence on climate knowledge or misconceptions, suggesting that educational strategies should be inclusive and designed for the entire student population rather than targeted at specific gender groups (RQ3).

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