



8



9

Environmental education and climate change in a colonial context

Mazin B. Qumsiyeh^{**}, Reena Saeed^{*}, Mohammad Najajrah^{*},
Nedal Katbeh-Badr^{**}, Hadeel Ikhmais^{**}, Otto Simonett^{***},
Alex Mackey^{***} e Maria E. Libert^{***}

pp. 109-121

Introduction

The United Nations Framework Convention on Climate Change (UNFCCC) was negotiated at the Earth Summit in Rio de Janeiro in 1992 to address the threat to human life and life on Earth caused by climate change. The convention entered into force on 21st March 1994. The 1977 Tbilisi Intergovernmental Conference on Environmental Education identified key objectives that allow learning for behavioral change and rejected the older model that presumes that increasing awareness of environmental issues (knowledge transfer) leads to behavioral change (Hungerford & Volk, 1990: 8). UNESCO suggested methods for integrating environmental education in schools via project-based approaches and student-centered learning techniques as well as civic engagement (Corraliza & Berenguer, 2000: 832; Fauville *et al.* 2014: 248).

Article 6 of the UN Framework Convention on Climate Change (UNFCCC) proposes educational programs for training and public awareness on climate change and its effects. The years 2005-2014 marked the UN Decade of Education for Sustainable Development (DESD) and climate change was one of the most essential topics covered globally. Education for Sustainable Development (ESD) aims to empower the public to change the way of their thinking towards sustainable future (Anderson, 2012: 191; Mochizuki and Bryan 2015: 4). Yet, education must also lead to behavioral change among students (Karpudewan *et al.* 2017: 207) and it should engage people at the level of personal responsibility (Leal Filho, 2009: 6). UNFCCC set some guidelines regarding those¹. Earlier studies demonstrate the values of well-structured programs for awareness leading to behavioral change especially in young people (see for example meta-analysis in Zelezny, 2010: 5). The national strategy for the State of Palestine also emphasized the need to develop environmental awareness and education to deal with the significant challenges facing the Palestinian environment especially Climate Change (EQA 2016; MOEHE, 2017).

¹ <https://doi.org/10.21747/0874-2375/afr37a8>

^{*} The Biodiversity Center, Palestine Institute of Biodiversity and Sustainability (PIBS), Bethlehem University (BU).

^{**} The Environment Quality Authority, Ramallah, Palestine.

^{***} Zoë Environment Network, Geneva, Switzerland.

[Online]. [Consult. 21.March.2022]. Available at: <https://unfccc.int/topics/education-and-outreach/resources/ace-guidelines>.

As environmental education should follow the mantra of “thinking globally and acting locally” (Gough 2002: 1217), we must develop locally sensitive “climate change” educational material not influenced by orientalism or educational modules that would work in more economically advanced societies. European and U.S. colonialism left a legacy that is rather negative for both colonized and colonizing people (Anderson 2006: 116). Paul Gilroy’s *Black Atlantic* (1993) points to forms of ‘cultural insiderism’ that highlight the lasting links between crude colonial racism, ethnic differentiation, and Eurocentric cosmologies, which many higher education (HE) curricula play a part in perpetuating today. The British HE system is only just beginning to get to grips with the differential black and minority ethnic student attainment resulting from this. Shilliam (2015: 149) promoted the need to think outside Eurocentric, ethno-nationalist worldviews in order to treat the wounds of colonialism. The Western conceptual framework for many subjects thus would not be appropriate in a developing decolonized country. Western societies do have materials and ideas to contribute but will be successful only if paired with partners in these developing countries that actually create most of the content in a locally sensitive way. This is precisely what we tried to do in this project. The project adopts a view of knowing as ‘collective, situated and tentative’ rather than fixed (Blacker, 1995: 1035; see also Wenger, 1998; Trowler 2008). This has implications for understanding how academics learn to become effective teachers and supporters of learning in HE. As knowledge evolves through a process of reflection on socially situated practices and contexts, academic identities will change.

Palestine enjoys rich biodiversity compared to other countries in the region due to its distinctive location as well as its special topography and history, despite its small geographical area. It contains four biogeographical zones (Mediterranean, Irano-Turanian, Saharo-Arabian, Sudanese-Ethiopian) and numerous climatic and geographic features (Central Highlands - Semi-Coastal Region - Eastern Slopes - Jordan Rift Valley - Coastal region). Thirteen sites were identified as key biodiversity areas (KBAs) by the Palestinian Environment Quality Authority (EQA). The EQA submitted to UNFCCC on 11th November 2016 the Initial National Communication Report (INCR) and the National Adaptation Plan (NAP). In August 2017 it submitted the Nationally Determined Contributions (NDCs) which represents the national climate agenda (EQA, 2017). The Palestinian Government established a National Committee for Climate Change, and EQA establishment a unit for climate change within EQA in 2010. These documents and the earlier one, National Climate Change Adaptation Strategy (UNDP 2010) highlighted the need for research into the impact of climate change in Palestine and for programs of Environmental Awareness and Education. Very few published articles for example addressed how biodiversity loss may be related to CC in Palestine (Qumsiyeh and Amr, 2020: 29; Saeed and Qumsiyeh, 2020: 69).

The Palestine Museum of Natural History (PMNH) and the Palestine Institute of Biodiversity and Sustainability (PIBS) at Bethlehem University (BU) work in the areas of research, education, and conservation (of our natural & culture heritage) with the idea of sustainability (Qumsiyeh *et al.*, 2017: 340). The educational project addressed in this paper fits within other educational projects initiated that more broadly address habitat destruction and human impact on the environment. It was initiated in a close cooperation and dialogue between PIBS-BU, Zoï Environment Network, and the Palestine EQA to specifically focus on educational modules for climate change. In this paper, we explain how and why we developed environmental education modules on climate change that are culturally sensitive to Palestine, a state underdeveloped and suffering from foreign colonial occupation for decades. The paper presents lessons learned from this pilot in the future for the development of new and additional educational and awareness materials in the field of CC that targeting Palestinian youth.

Methods

PIBS/PMNH founded in 2014 used largely volunteer efforts and local donations and opened to the public in 2017 to serve Palestinian society through applied research, education, and conservation (Qumsiyeh *et al.*, 2017: 340). Zoï Environment Network and PIBS identified the need for this CC project to focus on education based on earlier work of general environmental work. PIBS had already developed programs that benefitted thousands of school and university students. For example, agricultural engineers from Gaza learned how to use aquaponic systems, farmers in marginalized villages learned permaculture, and students worked to reduce their carbon footprint. This project aimed at researching, developing, and implementing tools and techniques for raising awareness of youth on climate change leading to behavioral changes. Certain modules of environmental education were used and updated at PMNH and its botanical and agricultural gardens. The strategy of working between PIBS/PMNH, Zoï Environment Network, and the EQA (Ilustração 01) started with assessing local needs via focus group meetings resulting in conceptual and empirical data and designs relating to UN SDGs 3, 10, and 13. Outputs were validated and rechecked with partners (EQA, Zoi, PIBS) and beneficiaries (school teachers and students) and refined until all felt comfortable with output.

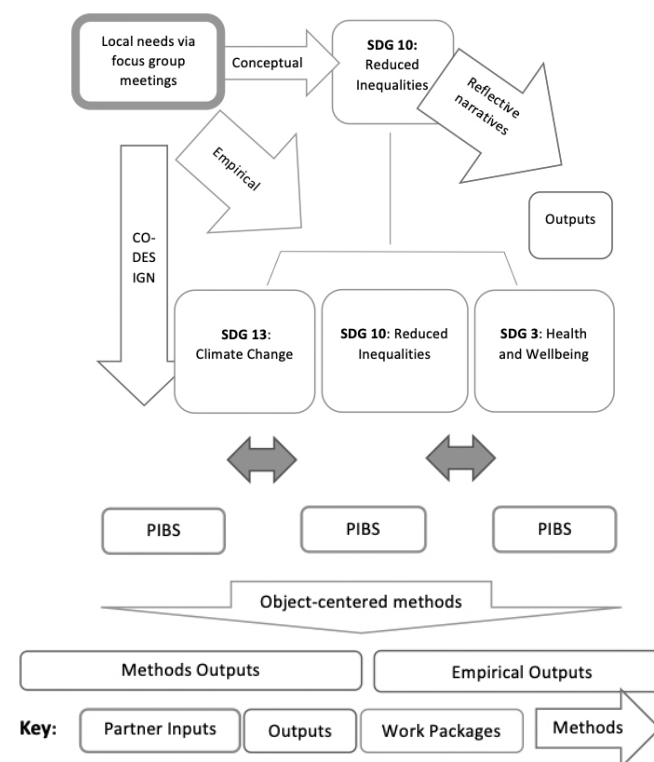


Ilustração 01 – The strategy for working between Zoi Environment Network and the Partner (PIBS).

The project focused on mitigation and adaptation to climate change. To do this, six key stages (translating to activities) were constructed, refined, and then implemented:

1. Researching and production of educational panels

The first part of this was a desktop study to understand the situation of the Palestinian environment and how others had developed culturally sensitive climate change power-point presentations. The teams from Switzerland and Palestine worked together to share experiences and skills. Complementation was noted as for example when the Palestinian team (PIBS) had experiences in environmental threats in Palestine while the Swiss team had experience working on climate change in other countries including African countries. We also accumulated relevant local data such as potential audience, approached the Ministry of Education and got approval to get into schools etc. At each stage of data gathering, we consulted with stakeholders, partners, and educators (school teachers and supervisors from ministry of education).

2. Arabic translation and adaptation

Educational modules were initially designed in English so as to facilitate co-development between Zoi and PIBS. PIBS team then translated to Arabic and shared with locals and stakeholders for feedback. Translations were not literal translations since the text had to be much more amenable to use by Arabic reading people.

3. Training in information production and visual communication

The developed material already included teacher and Ministry of Education input (step 1 above). In this third stage, training the trainers (TOT) sessions were held and included the team involved in educational material design training two university students and >20 teachers via informative interactions (both focus groups and one-on-one) to agree on content and presentation.

4. Building local relationships and conducting workshops in local schools (including media work)

The main target audience are schools, two environmental education experts from PIBS worked with 14 schools in south of the West Bank and the target group were ninth and tenth grades students (due to syllabus considerations).. During and after the workshops (which used poiwerpoints and interactive setting), evaluation was made via questions asked to students (see also conceptual aspects of evaluation methodology in Lombardi *et al.*, 2016: 1392).

5. Local schools visits to PMNH/PIBS

In this stage, students visited to observe and learn more about sustainable and interactive educational modules (e.g. aquaponis, eco-agriculture, composting, and recycling).

6. Scaling-Up and Communication

This involved printing more materials, reviewing success, reporting, continuing discussions to expand project with stakeholders, and visitation by two team members to Geneva and starting discussion of project expansions and research publications.

The six stages were implemented over the total project period of six months but with flexibility based on need. For example, translation was sometimes done for one educational module before other modules were ready for translation. Finally, six beautiful educational modules were created which deal with six topics related to Palestine and its climate; agriculture, biodiversity, geography energy and transportation, Waste and chemicals and climate change in both Arabic and English. The material was produced to applied to posters and flyers for the purpose of availability to the public schools, universities and also policy makers and politicians.

Results

We worked diligently to create culturally sensitive posters that result in behavioral change. Key elements of these modules included: **a)** listing problems and identifying solutions, **b)** be accurate/factual yet carry simplified messages/memes, **c)** have simple catchy diagrams. In the end, six modules were settled on that covered the following themes. Here are brief descriptions and links to modules:

1. Climate change: in addition to focus on the Palestinian context data on the global scope of climate change, global agreements, Palestinian situation and need to reverse negative trends.²
2. Biodiversity: Create pride in the rich biodiversity of Palestine. Identify challenges caused by humans (including apartheid wall, colonies, use of pesticides etc). Focus on solutions of what everyone can do to conserve biodiversity from showing respect for nature, keeping bees, insect motels, planting trees etc³. (Ilustração 02 as a sample poster, English version)
3. Geography: geographical dimensions of climate change in the Mediterranean region and issues of changing climate in Palestine in global and regional context⁴.
4. Energy and transportation: focuses on main sources of air pollution and greenhouse gasses and how we can act to reduce and even eliminate fossil fuel use and improve our environment including air quality. Simple procedures to reduce use of energy and promote alternative green energy are also given⁵.
5. Agriculture: covered problems like soil erosion and use of chemicals and offered solutions about traditional and eco-friendly agriculture practices to ensure both healthy and sustainable food security while conserving ecosystems and natural resources⁶.

2 [Online]. [Consult. 21.March.2022]. Available at: <https://www.palestinature.org/education/Climate-Change-eng.pdf>.

3 [Online]. [Consult. 21.March.2022]. Available at: <https://www.palestinature.org/education/Biodiversity-eng.pdf>.

4 [Online]. [Consult. 21.March.2022]. Available at: <https://www.palestinature.org/education/Geography-eng.pdf>.

5 [Online]. [Consult. 21.March.2022]. Available at: <https://www.palestinature.org/education/EnergyandTransport-eng.pdf>.

6 [Online]. [Consult. 21.March.2022]. Available at: <https://www.palestinature.org/education/EnergyandTransport-eng.pdf>.

6. Waste and chemicals: Covers problems like with solid and liquid waste, pesticides/ insecticides, and plastics. It suggests solutions like biogas, reducing and recycling⁷.



Ilustração 02 – Sample poster/brochure (this one on biodiversity): Note design is as a foldout here cut into two sides. Note images taken from existing sites (locations) and activities that students visiting PMNH/PIBS would be engaged in.

Simplified animated videos suitable for children were produced on the six topics⁸. 14 local schools were introduced to the six educational modules. More than 700 school students (50 % female: 50 % male) directly benefited from workshops held in schools as evident by positive feedback received at end of workshops and that 10 of the 14 schools developed environmental clubs. Usually the workshops started by explaining who we are (and suggesting they can later visit the museum of natural history and the botanic gardens associated with it). To get them thinking about man’s impact on the environment, we showed them a video of 3.5 minutes about man’s impact on the environment (this video⁹ already has 41 million viewers). This was followed by discussion to see how many problems the video covered and if there are other problems. The students now more aware of the main problems were exposed to the educational modules, which while briefly covering problems, focus on solutions. A quick post-workshop survey showed that the presentation quality rated excellent while many students already had background information on the subjects covered (see Tabela 02). Many students beyond the participants benefited indirectly via creation of environmental clubs at schools that spread knowledge to other students (ripple effect).

To follow up with the students, they were invited to visit the museum and its nascent botanical garden to learn more about sustainable ecofriendly modules and encouraged to create environmental clubs that spread knowledge to other students. 370 students visited PMNH/PIBS for follow-up from these 14 schools. More than 90 % of those appreciated the visit and said that it was very productive especially since it covered practical modules on the ground at the museum and gardens. Students particularly appreciated seeing and touching items they only heard about before green walls, aquaponics, biogas, animals

being rehabilitated for release, and the aquatic ecosystem (over 80 % positive feedback on each of these five items from visiting school classes). They had many questions about the exhibits indoors and impact of humans on wildlife.

The educational materials are also aimed at a more general public, including politicians. Many thousands visiting the museum and botanical gardens appreciated the connection of all our indoor and outdoor exhibits to issues of climate change and “thinking globally and acting locally”. The EQA presented the material during the Action for Climate Empowerment (ACE) workshop¹⁰. Zoi and EQA presented the modules in Madrid during COP25 of UNFCCC in the Palestine exhibition (December 2019).

Tabela 01 – Answer to two questions asked to students in five schools (of 14 where workshops were held) as representative of collected data

	School 1	School 2	School 3	School 4	School 5	All five schools
Q1 New Information was presented (1-10)	5.38	4.9	4.42	5.47	5.88	5.21
Q2 Presentation Quality (1-10)	9.47	8.38	9.61	9.17	9.83	9.29

N.B. On a scale of 1-10 students rated the presentation highly (over 9) but it was obvious that students had some level of climate change information. The five schools selected here are the ones with the highest number of students attending and a minimum 25 participating questionnaires.



Ilustração 03 – Workshop on Climate Change in Palestine in a Bethlehem school.

7 [Online]. [Consult. 21.March.2022]. Available at: <https://www.palestinature.org/education/Waste-and-Chemicals-eng.pdf>.
8 [Online]. [Consult. 21.March.2022]. Available at: <https://www.palestinature.org/education/Waste-and-Chemicals-eng.pdf>.
9 [Online]. [Consult. 21.March.2022]. Available at: <https://youtu.be/WfGMYdaICIU>.

10 [Online]. [Consult. 21.March.2022]. Available at: <https://www.palestinature.org/education/Waste-and-Chemicals-eng.pdf>.



Ilustração 04 – Students visit PIBS and its garden with education on permaculture and climate change.

A workshop was held 14th November 2018 in Bethlehem University with members of Zoi and EQA and in presence of policy makers, stakeholders and more than 30 students. The event included a ceremony to close the project and to launch the designed modules to a wider audience. The audience appreciated the cooperative work to achieve the project activities and its goals, also to develop strategies to spread awareness and bring actions about the climate change in Palestine on a wider scale with policy makers and stakeholders. All agreed on the need to implement in more schools and the representatives of the Ministry of Education supported this initiative. When the project ended, other projects followed. For example, as students showed interest in agriculture and local production of food, we started a new project creating a community garden at PMNH/PIBS and also home gardens and this benefitted 30 families anchored by the students. The latter project was partially funded by the Rotary Club of Bethlehem. These two projects led to further work for sustainability in line with SDGs. Hence a ripple effect was produced from a rather small project of climate change educational module development.

Discussion

Today many people realize that there are major threats facing us as a species from climate change, nuclear proliferation, pandemics, and much more. These global challenges require global responses. The current systems based on consumerism and capitalism cannot “fix” a problem they created. Thus, it is the people who need to make the change. Accurately diagnosing the problems we face based on good reading of social and human history is essential. This must be followed by offering therapy based on logic and ensuring a relatively good prognosis for us and our planet. Education is critical to address global problems. Education must be learner-centered and focus on creating environments where students develop their critical thinking. The role of those engaged in education is facilitation and providing tools and a good environment for this process. Yet, education is constrained when the work must be done under colonization. Colonizers are interested in creating new realities, in our case creating a supposed “*land without a people for a people*

without a land”. This means that even after the ethnic cleansing of most Palestinians during the formation of the state of Israel in 1948-1949 and its subsequent expansion in 1967, there was a need to make life very difficult for remaining Palestinians. Every aspect of the life is controlled and managed in an apartheid system (labeled as such by human rights organizations like Human Rights Watch, Amnesty International, B’Tselem, and Yesh Din). This includes areas like education, freedom of movement, freedom of religion, and access to natural resources.

Climate Change is the top challenge facing humanity over the next decade.¹¹ The latest COP26 in Glasgow was disappointing to activists because the governments failed to take the drastic challenge seriously (Tobin & Barritt, 2021: 4). Climate change in countries like Palestine will also exacerbate conflicts over resources and will affect sustainability (Brown and Crawford, 2009; Elasha, 2010; Feitelson *et al.*, 2012; Mimi *et al.*, 2010; Mulligan *et al.*, 2017). There is an urgency to include climate change adaptation and mitigation plans in Palestine because Palestine is getting hotter and dryer and this is already having an impact. The updated nationally determined contributions (NDC) to the UNFCCC confirmed worrying global trends globally and locally.¹² Yet this paper is about managing to do things even in difficult circumstances.

The paper summarizing results on a short term project showed that it is possible to leverage collaboration and varied expertise to produce educational modules on climate change that encourage behavioral change (reduce, reuse, recycle, repair). Leveraging the posters and brochures and school workshops with practical models of things like composting and recycling showed that students indeed developed behavioral changes (see results). Paris (2012: 93) showed that there is a great need for change in our education (pedagogy) to become culturally sensitive. Since people’s values differ in different areas, we certainly cannot speak of climate change in the same way to different people (O’Brien and Wolf, 2010: 232). Hodson (2003: 645) argued for emphasis on education leading to activism. After we worked on this project with the Ministry of Education in 14 local schools, the ministry proceeded to encourage us to expand to other schools and also asked for our support in revising the middle school science curriculum using the same principles advanced here. This is also in line with the national strategies, which advocate awareness and action on Climate Change (MOPAD, 2014; MOEHE, 2017).

The impact of climate change will not be even across the world since vulnerability of exposed communities differs largely depending on their exposure and adaptive capacities. Even when effects are similar in neighboring areas, the joint statement by world science academics warns that

*developing nations that lack the infrastructure or resources to respond to the impacts of climate change will be particularly affected. It is clear that many of the world’s poorest people are likely to suffer the most from climate change. Long-term global efforts to create a more healthy, prosperous and sustainable world may be severely hindered by changes in the climate.*¹³

11 [Online]. [Consult. 21.March.2022]. Available at: <https://news.un.org/en/story/2021/03/1088812>.

12 [Online]. [Consult. 21.March.2022]. Available at: <https://unfccc.int/news/updated-ndc-synthesis-report-worrying-trends-confirmed>.

13 [Online]. [Consult. 21.March.2022]. Available at: <http://nationalacademies.org/onpi/o6072005.pdf>.

Many biodiversity conservation challenges in Palestine affect the whole region. Habitat destruction comes from a broad range of sources, including unplanned urban expansion, overgrazing, over-exploitation, deforestation, land degradation, unplanned forestry activities, desertification and drought, invasive alien species, and pollution from different contaminants. The fact that Palestinian areas have been under a brutal military occupation since 1967 significantly impacts not only the environment including the knowledge and ability to mitigate and adapt to climate change.

The outcome of this study expands and strengthens existing literature, concluding that environmental education and awareness must be done in scientific/systematic methods (Lefkaditou *et al.*, 2014: 523) and this would directly result in conservation and behavioral change (Boyes & Stanisstreet, 2012: 1591; Halady and Rao, 2010: 6). Our results further demonstrated the importance of working together with experts (global and local) and with non-experts (local) to create environmentally and culturally sensitive modules and implement them in schools and for extracurricular activities (like visiting museums and botanic gardens). These are the principles that guided our successful model outlined above. We are expanding based on our experiences for example the very positive reaction to animated video cited above about human impact on the environment gave us the idea to now animate the six educational modules developed. We also developed animated videos (see results) suitable to younger students (elementary schools). That we are able to succeed in introducing Palestinian students and others to climate change and other issues affecting ecosystems in an effective way (leading to behavior change) is also a source of hope for a brighter, more sustainable, and more peaceful future for all living in this land.

Acknowledgments

The project was implemented in a close cooperation and dialogue between PIBS-BU in cooperation with Zoï and the Environment Quality Authority of Palestine. We are grateful to Reena Saeed, Niveen Hazboun, Laila Ayyad, Elias Handal, Julius Pahl, and Mohammad Abusarhan and others at PIBS-BU & Zoï for their support.

Funding

Project partially financed by the City of Geneva to Zoi Environment Network Work. The work was performed in the Biodiversity (with consultation with the education center at the Galilee Society) via a grant from the European Union Peacebuilding initiative titled "Unity and Diversity in Nature and Society" (ENI/2019/162124/83). Funders are not responsible for contents of the work.

Bibliographic references

Amr, Z. S., Handal, E. N., Bibi F., Najajrah, Mohammad H. and Qumsiyeh, M. B. (2016), *Change Of Diet Of The Eurasian Eagle Owl, Bubo Bubo, Suggest Decline In Biodiversity In Wadi Al Makhrou, Bethlehem Governorate. Palestinian Territories*. Slovak Raptor Journal, Vol. 10, pp. 75-79.

- Anderson, B R. (2006), *Imagined Communities: Reflections on the Origin and Spread Of Nationalism* London: Verso Books, 160 pp.
- Anderson, A. (2012), *Climate change education for mitigation and adaptation*. Journal of Education for Sustainable Development, Vol. 6, N.º 2, pp. 191-206.
- Blacker, F. (1995), *Knowledge, knowledge work and organizations*. Organizations Studies, Vol. 1, N.º 6, pp. 1021-1046.
- Boyes, E. and Stanisstreet, M. (2012), *Environmental education for behaviour change: Which actions should be targeted?*. International Journal of Science Education, Vol. 34, N.º 10, pp. 1591-1614.
- Brown, O. and Crawford, A. (2009), *Rising temperatures, rising tensions: climate change and the risk of violent conflict in the Middle East*. Winnipeg: International Institute for Sustainable Development.
- Burton, A. M. (2003), *After the Imperial Turn: Thinking With and Through the Nation*. Durham: Duke University Press.
- Corraliza, J. and Berenguer, J. (2000), *Environmental values, beliefs, and actions: A situational approach*. Environment and Behavior, Vol. 32, N.º 6, pp. 832-848.
- Elasha, B. O. (2010), Mapping of climate change threats and human development impacts in the Arab region. UNDP Arab Development Report-Research Paper Series, UNDP Regiona Bureau for the Arab States.
- EQA- Environment Quality Authority (2021), *Sixth National CBD Report – Palestine*. [Online]. [Consult. 21.March.2022]. Available at: <https://chm.cbd.int/database/record?documentID=257520>.
- ____ (2016), *National Adaptation Plan to Climate Change*. EQA, Ramallah. [Online]. [Consult. 21.March.2022]. Available at: https://unfccc.int/files/national_reports/non-annex_i_parties/application/pdf/national_adaptation_plan__state_of_palestine.pdf.
- ____ (2014), *National strategy for environmental awareness and education 2014-2020 (in Arabic)*. EQA, Ramallah. [Online]. [Consult. 21.March.2022]. Available at: <http://environment.pna.ps/ar/files/Awareness Strategy.pdf>.
- ____ (2007), *Palestine's Initial National Communication Report to the United Nations Framework Convention on Climate Change (UNFCCC)*. EQA, Ramallah. <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/State%20of%20Palestine%20First/State%20of%20Palestine%20First%20NDC.pdf>
- Fauville, G., Lantz-Andersson, A. and Säljö, R. (2014), *ICT tools in environmental education: reviewing two newcomers to schools*. Environmental Education Research, Vol. 20, N.º 2, pp. 248-283.
- Feitelson, E., Tamimi, A. and Rosenthal, G., 2012. Climate change and security in the Israeli-Palestinian context. Journal of Peace Research, Vol. 49, N.º 1, pp. 241-257.
- Gilroy, P. (1993), *The Black Atlantic: Jewels Brought from Bondage: Black Music and the Politics of Authenticity*. Cambridge, Mass.: Harvard University Press, pp. 72-110.
- Gough, N. (2002), *Thinking/acting locally/globally: Western science and environmental education in a global knowledge economy*. International Journal of Science Education, Vol. 24, N.º 11, 1217-1237.
- Halady, Indrani R. and Purba, H. Rao (2010), *Does awareness to climate change lead to behavioral change?*. International Journal of Climate Change Strategies and Management, Vol. 2, N.º 1, pp. 6-22.

- Hungerford, H. & Volk, T. (1990), *Changing Learner Behavior Through Environmental Education*. The Journal Of Environmental Education, Vol. 21, pp. 8-21.
- Hodson, D. (2003), *Time for action: Science education for an alternative future*. International Journal of Science Education, Vol. 25, N.º 6, pp. 645-670.
- Karpudewan, Mageswary and Mohd Ali Khan, Nur Sabrina (2017), *Experiential-based Climate Change Education: Fostering Students' Knowledge and Motivation towards the Environment*. International Research In Geographical And Environmental Education, Vol. 26, N.º 3, pp. 207-222.
- Leal Filho, W. (2009), *Communicating climate change: challenges ahead and action needed*. International journal of climate change strategies and management, Vol. 1, N.º 1, 6-18.
- Lefkaditou, A., Korfiatis, K. and Hovardas, T. (2014), *Contextualising the teaching and learning of ecology: Historical and philosophical considerations*. International handbook of research in history, philosophy and science teaching Springer, Dordrecht, pp. 523-550.
- Lombardi, D., Brandt, C. B., Bickel, E. S. and Burg, C. (2016), *Students' evaluations about climate change*. International Journal of Science Education, Vol. 38, N.º 8, pp. 1392-1414.
- Mimi, Z., Mason, M. and Zeitoun, M. (2010), *Climate Change Adaptation Strategy and Programme of Action for the Palestinian Authority*. Final Report of Consultants to the UNDP/PAPP initiative.
- MOEHE - Ministry of Education and Higher Education (2017), *Education Sector Strategic Plan 2017-2022*. Ramallah, Palestine. [Online]. [Consult. 21.March.2022]. Available at: http://www.lacs.ps/documentsShow.aspx?ATT_ID=34117.%20.
- Mochizuki, Y. and Bryan, A. (2015), *Climate change education in the context of education for sustainable development: Rationale and principles*. Journal of Education for Sustainable Development, Vol. 9, N.º 1, pp. 4-26.
- MOPAD - Ministry of Planning and Administrative Development (2014), *State of Palestine National Development Plan 2014-2016*. [Online]. [Consult. 21.March.2022]. Available at: http://www.mopad.pna.ps/en/images/PDFs/Palestine%20State_final.pdf.
- Mulligan, M., Keulertz, M. and McKee, M. (2017), *Environmental Factors in the MENA Region: A SWOT Analysis*. CIDOB.
- O'Brien, K. L. and Wolf, J. (2010), *A values-based approach to vulnerability and adaptation to climate change*. Wiley Interdisciplinary Reviews: Climate Change, Vol. 1, N.º 2, pp. 232-242.
- Paris, D. (2012), *Culturally sustaining pedagogy: A needed change in stance, terminology, and practice*. Educational Researcher, Vol. 41, N.º 3, pp. 93-97.
- Qumsiyeh, M. B. (2018), *Ethnoecology of Palestine: Preserving Culture Heritage of Palestine's Natural History*. Conference Proceeding. In 4th Hyperheritage International Seminar Proceedings (International Conference): Smart Heritage. [Online]. Available at: <http://europa.fr/HIS4>.
- Qumsiyeh, M. B. and Amr, Z. S. (2020), *Protection of endangered ecosystems via establishing museum research and education facilities: Experience from Palestine and proposal for the Arabian Gulf*. Museums in the Middle East Journal (UAE), Vol. 1, pp. 29-32.
- ____ (2016), *Protected Areas in the Occupied Palestine Territories*. Jordan Journal of Natural History, Vol. 1, N.º 3, pp. 25-46.
- Qumsiyeh, M., Handal, E. N., Chang, J., Abualia, K., Najajreh, M. and Abusarhan, M. (2017), *Role of museums and botanical gardens in ecosystem services in developing countries: Case study and outlook*. International Journal of Environmental Studies, Vol. 74, N.º 2, pp. 340-350.
- Qumsiyeh, M. B., Zavala, S. and Amr, Z. S. (2014), *Decline in Vertebrate Biodiversity in Bethlehem, Palestine*. Jordan Journal of Biological Sciences, Vol. 7, N.º 2.
- Saeed, R. and Qumsiyeh, M. (2020), *Are 19th century studies relevant to understanding changes in raptor bird fauna in the Fertile Crescent? An example from Tristram's work*. Sandgrouse (Journal of the Ornithological Society of the Middle East), Vol. 42, pp. 69-77.
- Shilliam, R. (2015), *Rātana, Baxter, RasTafari*. In *The Black Pacific: Anti-Colonial Struggles and Oceanic Connections*. Bloomsbury Academic, pp. 149-168.
- Sowers, J., Vengosh, A. and Weinthal, E. (2011), *Climate change, water resources, and the politics of adaptation in the Middle East and North Africa*. Climatic Change, Vol. 104, N.º 3-4, pp. 599-627.
- Tobin, P. and Barritt, J. (2021), *Glasgow's COP26: The Need for Urgency at 'The Next Paris'*. Political Insight, Vol. 12, N.º 3, pp. 4-7.
- Trowler, P. (2008), *Cultures and change in higher education: Theories and practices*. Macmillan International Higher Education.
- UNDP (2010), *Climate Change Adaptation Strategy and Programme of Action for the Palestinian Authority*. [Online]. [Consult. 21.March.2022]. Available at: https://www.ps.undp.org/content/papp/en/home/library/environment_energy/palestinian-climate-change-adaptation-strategy.html.
- Wenger, E. (1998), *Communities of Practice: Learning, Meaning, and Identity*. New York: Cambridge University Press.
- Zelezny, L. C. (2010), *Educational Interventions That Improve Environmental Behaviors: A Meta-Analysis*. Journal of Environmental Education, Vol. 31, N.º 1, pp. 5-14.