The Effects of Globalisation on STEM Education in Arabic-Language High Schools in Israel

Thesis for the degree of "Doctor of Philosophy"

By Aurel H. Diamond

Resubmitted to the Senate of the Hebrew University of Jerusalem

March 2021

The Effects of Globalisation on STEM Education in Arabic-Language High Schools in Israel

Thesis for the degree of "Doctor of Philosophy"

By Aurel H. Diamond

Resubmitted to the Senate of the Hebrew University of Jerusalem

March 2021

This work was carried out under the supervision of

Dr. Elyakim Kislev

ACKNOWLEDGEMENTS

Of the many people to whom I am grateful, my first and most earnest thanks go to my supervisor, Dr. Elyakim Kislev. His unparalleled generosity, patience, and kindness over the last five years made the completion of this thesis not only possible, but also pleasant and enjoyable. Elyakim encouraged me to continue when the research and writing became challenging, and his criticisms of my work – always sensitive and constructive – pushed me to do and be my very best. Elyakim continues to inspire me with his ambition, intellectual curiosity, and benevolence. I am both privileged and honoured to have been his first PhD student, and I enthusiastically anticipate continuing our research collaboration in the (nearly) immediate future.

Very special thanks also go to Prof. Michal Frenkel and Dr. Limor Samimian-Darash, who served as my committee members, for their time, availability, and investment in ensuring that my PhD research could be completed successfully. I am particularly grateful for Dr. Samimian-Darash's advice on the planning of my ethnographic research, which resulted in the publication of the fourth chapter of this thesis, and to Prof. Frenkel for her career guidance and support, especially in the few months leading to the completion of this thesis.

I was also humbled by the mentorship and guidance that I received from further afield. I extend my wholehearted thanks to Prof. Daniel Bar-Tal, Dr. Meytal Nasie, and Prof. Andreas Stylianides for investing in our joint research endeavours parallel to my PhD studies, and for writing countless recommendation letters for the scholarships and grants that funded my work. I am particularly grateful to Prof. Bar-Tal and Dr. Nasie for inviting me to join their research group at Tel Aviv University in 2012, only a few months after I emigrated to Israel. With hindsight, I understand that this was my route into Israeli academia, and without their warm and eager invitation I may have embarked upon a substantially different path.

I would also like to thank the staff at the Federmann School of Public Policy, who offered and provided support and advice at every step of my PhD studies. I am grateful to Prof. David Levi-Faur and Prof. Sharon Gilad for their time investment in my professional development throughout my time in the department, and to Prof. Momi Dahan, who provided invaluable feedback on my work when I was re-drafting my research proposal. I am especially thankful to Ofra Toren Commere, Yael Baron, Roni Sadikler-Cohen, Meital Shtain, and all the administrative staff for always being available, and diligently solving every bureaucratic question and challenge that arose throughout my studies.

This PhD would have not been possible without external financial support. I would like to thank to the Ministry of Aliyah and Integration, the Centre for the Study of Multiculturalism and Diversity, PresenTense Israel, the Federmann School of Public Policy, as well as the Israel Institute for doctoral scholarships, fellowships, and research grants that enabled my research. I am also grateful to the Van Leer Jerusalem Institute for appointing me as a Junior Library Fellow, and for giving me the desk space where I wrote the majority of this thesis.

None of my research would have been possible without access to the field. To Khouloud Ayuti, Badawi Farra, and Abdallah Zoabi, thank you for putting so much time and effort into ensuring that I was able to collect the data I needed for my research. Your optimism always made me smile, and your belief in the importance of my research was my greatest source of inspiration and motivation. I am especially grateful to Khouloud and Badawi for the enthusiastic early-morning phone calls before school, and for taking the extra time to tell me about all of the best places in Jaffa. Particular thanks go to the teachers and students of the schools I worked with, whose names I must withhold in order to preserve their anonymity.

I would like to mention the special role that my friends played in this PhD. I moved to Israel with no family, and very quickly saw that the pastoral support my peers received from their spouses and families, I was receiving from my friends. I think particularly of PhD students, past and present. To Dr. Assaf Shaham, and soon-to-be Drs. Benjamin A. Katz, Michelle Spektor, Miri Fenton, and Shani Friedman, to name but a few, thank you for your empathy, patience, and support. I think of André Rothschild and Daniel Milbauer, who, after living with me during the PhD experienced first-hand all the ups and downs of what it means to be a graduate student. I also think of all of people who together weaved what turned out to be an invaluable support system during the COVID-19 lockdowns. To my friends and neighbours who spent months on end with me in pyjamas in Jerusalem, and to the special individuals who made my move to Tel Aviv smooth and pleasant: thank you all for being here for me. I especially want to mention my inspirational friend and housemate from Bath, Lena Chudasama, whose weekly progress updates and general life mentoring, and shared laughter on WhatsApp and Zoom kept me accountable to myself and my spirits high.

To my cousin Gwen Diamond, who over the last eight years has been my friend, flatmate, bandmate, proof-reader, support system, and family in Israel: you absolutely deserve your own

paragraph. Your contribution to this thesis has been immeasurable and I will be forever grateful for your support.

To my brothers, Garrick and Lazarus, my sister Grace, and sisters-in-law Alexa and Miriam: I might be the eldest sibling, but the truth is that I spend most of my time looking up to you for inspiration. Thank you for being the greatest cheerleaders that I could have ever asked for, and for encouraging me to be the best brother and teacher I can. I struggled for words to describe my gratitude and appreciation, so, as per Grace's suggestion and request, I wish to publicly declare that I love you all more than cheese.

Finally, and most of all, to my parents Karen and Murray, who patiently waited until the end of my acknowledgements to see their own names. You supported me emotionally, physically, and financially throughout my time at school and university, but your impact and influence in this thesis runs at a much deeper level. Mummy and Daddy, thank you for teaching me the importance of education, equity, and equal opportunity. Your biggest mark on this thesis was the choice of subject, which in and of itself is a direct reflection of the values and morals you instilled in all of us, even before I could tie my own shoes or count to ten.

So, to my parents, who every day at dinner when I was growing up would go around the table and ask each child "how was school today?" – today was my last day of school, and it was absolutely wonderful. I asked the most fascinating questions that even the teachers did not know how to answer. And no, for once, I do not have any homework. Thank you for being here for me. This work is yours as much as it is mine.

ABSTRACT

STEM education has undergone rapid shifts in recent years as a result of globalisation. The study of meta-cultural scientific and programming languages, the availability of quickly accessible information, and raised awareness of challenges brought about by global socio-scientific issues have all impacted the context of the STEM classroom. Scholars therefore suggest that STEM can act as an agent that introduces students to globalisation within the education system.

Existing research investigates how STEM education impacts students in a number of ways outside the classroom, focussing primarily on how STEM can act as a means of achieving social mobility and economic stability. Yet, almost no studies investigate how the globalised aspects of STEM impact the social and educational outcomes for the students. This presents an apparent gap in the literature that relates to a wider theoretical question: for whom and under what circumstances is globalisation beneficial and/or detrimental? Particularly for minority groups, scholars are engaging on debates that frame globalisation as a force of empowerment for resource-poor, disadvantaged, and minority groups on the one hand, and as a source of social threat on the other.

Accordingly, this dissertation aims to contribute to the emerging debate on how forces of globalisation impact minorities, using STEM education as an example. It analyses questionnaire data from Jewish and Arab-Palestinian high school students in Israel (N=380), and 21 months of ethnographic observations at a high school in Jaffa, Israel, in order to determine how different perceptions of STEM and globalisation are related to educational outcomes, acculturation patterns, anticipated discrimination, and views of intergroup relations. The Israeli case study is instructive due to the high contrast between the high levels of social, economic, and education inequality in comparison to the opportunity and status in STEM in Israel.

The dissertation consists of five journal articles. The first article, entitled "The social reproduction of science education outcomes for high school students in Israel" (Diamond 2020a, *British Journal of Sociology of Education*), asks whether there are differences in the social reproduction of STEM education outcomes for Jewish and Arab-Palestinian students. Regression analyses on questionnaire data suggest a significant positive correlation between perceiving STEM as global and increased interest in STEM, self-efficacy in STEM, and STEM university aspirations. In addition, while Arab-Palestinian students are on average more interested in STEM, science capital and socioeconomic status are significant predictors of interest in STEM at university, but only for Jewish students. The analyses therefore provide important contextual

information on majority-minority differences in Israeli STEM education, and an initial indication of the connection between perceptions of globalisation and the educational outcomes of students.

The second article, entitled "High school students' perceptions of science and attitudes towards intergroup cooperation" (Diamond and Kislev 2020a, *Compare: A Journal of Comparative and International Education*), and third article, entitled "Perceptions of science and their effects on anticipated discrimination in STEM for minority high-school students" (Diamond and Kislev 2020b, *Cambridge Journal of Education*), also present regression analyses of the questionnaire data. These papers show how global and international perceptions of science can reduce the amount of anticipated discrimination in STEM and improve the willingness to cooperate with the outgroup, respectively. Yet, and importantly, the analyses indicate that this is only true for individuals and groups who experience high levels of minority salience. The argument is that the concept of globalisation and global spaces, as delivered by STEM, can provide minority students with a way of partially circumventing institutionalised discrimination, with consequences for social mobility and educational outcomes.

The fourth article, entitled "Minority youth acculturation in third spaces: An ethnography of Arab-Palestinian high school students visiting the Israeli innovation sector" (Diamond 2020b, *Journal of Ethnic and Migration Studies)* presents an ethnographic account of high school students visiting large innovation sector company offices as a part of an extra-curricular programme mandated by the Tel Aviv-Jaffa municipality. The companies are perceived by many students as global and international, creating a unique context for acculturation with diverging consequences for minority students.

The fifth and final article, entitled "A globalisation diversity ideology" (Diamond under review, *Cross Cultural & Strategic Management*) uses findings from the dissertation research in order to situate globalisation as a concept within diversity models, and thus connects the educational research conducted here to contexts outside of schools.

Together, these articles demonstrate how STEM can create a global context – or 'global space' – for some students, and how global spaces, in some instances, can improve educational outcomes and accelerate social mobility for minority groups. To that end, the dissertation uses empirical evidence to weigh in on debates regarding the impacts of globalisation on minorities from the perspective of STEM education. The dissertation concludes with policy recommendations that emerge from these findings.

האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

Aurel H. Diamond, PhD Candidate
Federmann School of Public Policy
Hebrew University of Jerusalem
Mount Scopus, Jerusalem 91905
Israel
aurel.diamond@mail.huji.ac.il
+972-533-305-791

16 March 2021

Statement of authorship and dissertation components

Dear Committee Members and Assessors,

I hereby declare that my PhD thesis, entitled "The Effects of Globalisation on STEM Education in Arabic-Language High Schools in Israel", is written in the form of a compilation of journal articles. This thesis (dissertation) comprises of five articles, four of which have been accepted for publication in peer-reviewed journals, and the fifth of which is currently under review.

Three of these articles were written without any co-authors, and two were published in collaboration with my supervisor, Dr. Elyakim Kislev, who is listed as a second author. In the papers that I wrote alone, I developed the theoretical models and research design, collected the data, conducted analyses, and wrote the manuscripts, and Dr. Kislev assisted by providing critical feedback on my research plan and on drafts of these papers. In the two papers where Dr. Kislev is listed as a co-author, Dr. Kislev provided additional comments on the theoretical models and regression analyses conducted. Dr. Kislev's contribution to the two papers where he is listed as a second author is declared in the attached form, as required.

The first article, entitled "The social reproduction of science education outcomes for high school students in Israel", was published in the *British Journal of Sociology of Education*. The second article, entitled "High school students' perceptions of science and attitudes towards

intergroup cooperation", co-authored with Dr. Kislev, was published in *Compare: A Journal of Comparative and International Education*. The third article, entitled "Perceptions of science and their effects on anticipated discrimination in STEM for minority high-school students", also co-authored with Dr. Kislev, was published in the *Cambridge Journal of Education*. The fourth article, entitled "Minority youth acculturation in third spaces: An ethnography of Arab-Palestinian high school students visiting the Israeli innovation sector", was published in the *Journal of Ethnic and Migration Studies*. The fifth and final article, entitled "A Globalisation Diversity Ideology", is under review at *Cross Cultural & Strategic Management*.

These five articles are accompanied by an introduction chapter and a conclusion chapter, both of which were written as requested and to the specifications laid out by my PhD committee members Dr. Elyakim Kislev, Prof. Michal Frenkel, and Dr. Limor Samimian-Darash. As per their request and instructions, the introduction chapter was kept brief, since all the relevant literature and theoretical background can be found in the respective literature reviews of each of the five papers. Also as recommended by my committee, the conclusion chapter summarises the general theoretical insights gained from considering the fiver papers together, lists policy recommendations that emerge from the studies, and includes methodological reflections, a general discussion on research limitations, and possible directions for future research.

The thesis was originally submitted to the Senate of the Hebrew University of Jerusalem in January 2021. The current version includes minor corrections and additions that were made in response to the external assessors' comments. A letter detailing the nature of these changes and my response to the assessors is attached separately.

Faithfully,

Aurel H. Diamond

REFERENCES

Diamond, Aurel H. 2020a. "The Social Reproduction of Science Education Outcomes for High School Students in Israel." *British Journal of Sociology of Education* 41(7):1029-46. doi: 10.1080/01425692.2020.1806040.

Diamond, Aurel H. 2020b. "Minority Youth Acculturation in Third Spaces: An Ethnography of Arab-Palestinian High School Students Visiting the Israeli Innovation Sector." *Journal of Ethnic and Migration Studies*. doi: 10.1080/1369183X.2020.1847055.

Diamond, Aurel H. and Elyakim Kislev. 2020a. "High School Students' Perceptions of Science and Attitudes Towards Intergroup Cooperation." *Compare: A Journal of Comparative and International Education*. doi: 10.1080/03057925.2020.1748494.

Diamond, Aurel H. and Elyakim Kislev. 2020b. "Perceptions of Science and Their Effects on Anticipated Discrimination in Stem for Minority High School Students." *Cambridge Journal of Education*. doi: 10.1080/0305764X.2020.1806989.

Diamond, Aurel H. under review. "A Globalization Diversity Ideology." *Cross Cultural & Strategic Management*.

CONTENTS

INTRODUCTION

The term ‘globalisation’ most probably made its first appearances in the English language in the 1930s. Similarly to today, it was the name given to the exchanges of ideas, populations, goods, services, and information across borders that was together lead to a more interconnected world. Yet, its use was to be limited to peripheral scholarly contexts, at least initially (James and Steger 2014). Globalisation as a popular and scholarly term started to gain traction several decades later when advances in science in technology facilitated rapid exchanges between peoples and countries, thus accelerating processes of economic, cultural, and political globalisation (Chase-Dunn 1999). Science and globalisation are thus inextricably linked, with science in as of itself acting as an agent that delivers global contexts and contents (Drori et al. 2003, Moore et al. 2011).

The starting point of this thesis is the nexus between science and globalisation, particularly within the context of science, technology, engineering, and mathematics (STEM) education. As a result of the needs to prepare students for a global work market, the emerging importance of global socio-scientific issues, and the international standardisation of STEM education standards, STEM education classrooms present a social context that is increasingly characterised by globalisation (Carter 2005, Carter 2012, Chiu and Duit 2011, DeBoer 2011, Dierking and Falk 2016, Fensham 2011, Tobin 2016). Thus, upon entering or ‘border crossing’ into the STEM classroom (Aikenhead 1996), students are likely to encounter globalisation in ways they do not in other contexts.

Scholars are engaging in wider debates regarding the impacts of globalisation on minority social groups. On the one hand, extensive reviews suggest that globalisation has the potential to cause identity threat, disengagement, reduced overall wellbeing, and increased inequality for minorities, in part due to the perceived risk of culture erasure (Sharma and Sharma 2010, Sharma 2016, Torres 2008). On the other hand, and where global contexts (or 'spaces': Lefebvre 1991) give individuals the opportunity to partially circumvent or avoid a challenging national context, globalisation may act as a source of empowerment for minority groups (Bamgbose 2011, Sassen 2007, Sassen and Van Roekel-Hughes 2008). Yet, and despite the links between science and globalisation, almost no empirical research investigates how the globalisation of STEM education impacts different groups of students.

This thesis therefore begins to address an apparent gap in the literature by investigating the effects of globalisation on minority students in STEM education. By investigating how students’ experiences and perceptions of globalisation in STEM education are related to different measures

of social wellbeing and educational outcomes, I aim to facilitate a discussion regarding how globalisation impacts different social groups in the context of STEM education. Theoretically, this research engages in debates on whether and under what circumstances globalisation can act as a source of threat and/or empowerment for different social groups. Due to the aforementioned debates regarding the impact of globalisation and global spaces on minorities in particular, this thesis focusses on minority students.

The focus on minority students in this research is also of practical importance due to the persisting disparities for minorities in the STEM track. Indeed, and despite great efforts to improve access to STEM education, minority students are broadly and consistently underrepresented in STEM fields, particularly later in the STEM track (Gonzalez and Kuenzi 2012, Museus et al. 2011, Xie, Fang and Shauman 2015). Thus, by understanding the impact of globalisation for students in STEM education, this research complements emerging studies and reports (Archer et al. 2020, Cheung 2018, Dierking and Falk 2016, van Griethuijsen et al. 2015) that seek to establish factors that increase minority students' interest and success in STEM.

This thesis presents analyses of questionnaire data from and an ethnographic study conducted in Israeli high schools, where findings for Arab-Palestinian (minority group) students are compared with those for Jewish (majority group) students. As with many national contexts, there are significant gaps between minority and majority students in Israel: the 2018 PISA report finds 144, 116, and 111-point gaps in reading, science, and mathematics, respectively (Bratslavsky, Lipfshtat and Hilu 2019). These gaps are attributable, at least in part, to high levels of social, economic, and education inequality (Agbaria 2018, Al-Haj 2012, Arar 2012, Khamaisi and Abu-Saad 2015). Thus, findings from Israel can be used as an instructive case study for considering minorities in STEM education for other contexts characterised by socioeconomic and educational inequalities.

1. Summary of chapters

I present my findings and analyses across five main chapters, where each chapter is presented as a peer-reviewed journal article (four of which have been accepted for publication, to date). In order to provide additional context for minority-majority differences in Israeli STEM education, the first chapter (Diamond 2020a) uses the questionnaire data to compare the patterns of social reproduction of STEM education outcomes for Jewish (N=134) and Arab-Palestinian (N=246)

high school students in Israel. This study also includes analyses that investigate the relationship between global perceptions of STEM and educational outcomes, as measured by interest in science, self-efficacy in science, and aspirations to pursue science. The second chapter (Diamond and Kislev 2020b) also uses the questionnaire data to investigate how Arab-Palestinian students' (N=246) perceptions of STEM relate to their desire to work and study with Jewish Israelis. The third chapter (Diamond and Kislev 2020a), and final chapter to use the questionnaire data, compares how global perceptions of STEM may predict the levels of discrimination that Jewish (N=134) and Arab-Palestinian (N=246) students anticipate in the STEM track. Collectively, the first three chapters provide quantitative empirical evidence that suggests a statistically significant relationship between perceiving STEM as global and better social and educational outcomes, with minority group salience frequently predicting the strength and significance of these relationships.

In order to triangulate these findings and facilitate a discussion regarding the possible causality of these relationships, the fourth chapter (Diamond 2020b) provides an ethnographic account of Arab-Palestinian students from a high school in Jaffa, Israel, as they visit a global and international tech company on a fieldtrip in neighbouring Tel Aviv. This chapter in particular considers how minority high school students might acculturate in globalised contexts, and how patterns of acculturation are ostensibly related to student socioeconomic status and academic performance.

The findings and analyses from the first four chapters suggest in a number of different ways how global contexts, or indeed global spaces (Sassen 2003, Sassen and Van Roekel-Hughes 2008) can in some circumstances benefit minority groups within the context of STEM education in Israel. However, the question remains as to under what conditions these findings might be juxtaposed to other national contexts, or contexts outside of STEM education. could be a good type of diversity. The fifth chapter (Diamond under review) therefore presents a review article that connects the findings of the first four chapters to the existing literature on diversity models. In doing so, this chapter presents a framework for facilitating positive diversity in the context of globalisation.

Each chapter includes standalone reviews of relevant literature, as well as full methodological details regarding my approach to data collection and analysis. The conclusion chapter summarises the theoretical contributions and insights that are gained from considering the five main chapters in synchrony, as well as policy recommendations that emerge from my research. The conclusion chapter also includes methodological reflections on the research conducted for this

thesis, as well as limitations of the methods used and populations studied. I close the thesis by proposing directions for further research.

2. Overview of methods

I adopt a mixed methods approach in this thesis, combining the use of regression analyses of questionnaire data in Chapters 1, 2, and 3 (Diamond 2020a, Diamond and Kislev 2020a, Diamond and Kislev 2020b) with the ethnographic study presented in Chapter 4 (Diamond 2020b) that relied on observations of high school students in Jaffa. While none of the chapters present a standalone mixed-methods study, it is important to note that I adopted an 'integrated mixed design' (Teddlie and Tashakkori 2009:151), wherein mixed methods were used iteratively to guide each stage of the data collection and ongoing analysis.

Specifically, data were collected continuously over the course of two consecutive academic years (2017-2019). Initial ethnographic observations in schools and discussions with pupils and teachers influenced the questionnaire design, that was updated following a small-scale (N=103) pilot phase. This pilot phase of the questionnaire design is described in the methods sections of Chapter 1 (Diamond 2020a) and Chapter 2 (Diamond and Kislev 2020b), and a copy of the final questionnaire (in Hebrew) is attached as an appendix to this thesis following the conclusion chapter.

Here, I note that ongoing quantitative analyses of the questionnaire data inevitably impacted what I saw, noticed, and drew attention to in my ethnographic study. It is therefore important to draw attention to the potential advantages, disadvantages, and overall suitability of mixed methods research (Johnson and Onwuegbuzie 2004, Onwuegbuzie, Gerber and Schamroth Abrams 2017, Wagner et al. 2012). Reflections on the implications of my use of mixed methods are therefore included in the conclusion chapter.

REFERENCES

Agbaria, Ayman K. 2018. "The 'Right' Education in Israel: Segregation, Religious Ethnonationalism, and Depoliticized Professionalism." *Critical Studies in Education* 59(1):18-34. doi: 10.1080/17508487.2016.1185642.

Aikenhead, Glen S. 1996. "Science Education: Border Crossing into the Subculture of Science." *Studies in Science Education* 27(1):1-52. doi: 10.1080/03057269608560077.

Al-Haj, Majid. 2012. *Education, Empowerment, and Control: The Case of the Arabs in Israel*. Albany, NY: Suny Press.

Arar, Khalid. 2012. "Israeli Education Policy since 1948 and the State of Arab Education in Israel." *Italian Journal of Sociology of Education* 4(1).

Archer, Louise, Julie Moote, Emily Macleod, Becky Francis and Jennifer DeWitt. 2020. "Aspires 2: Young People's Science and Career Aspirations, Age 10–19." Vol. London, UK: UCL Institute of Education.

Bamgbose, Ayo. 2011. "African Languages Today: The Challenge of and Prospects for Empowerment under Globalization." Pp. 1-14 in *Selected proceedings of the 40th annual conference on African linguistics*: Cascadilla Proceedings Project Somerville.

Bratslavsky, Ron, Nurit Lipfshtat and Georgette Hilu. 2019. "Pisa 2018: Israel." Vol. Jerusalem, Israel: Israeli Ministry of Education.

Carter, Lyn. 2005. "Globalisation and Science Education: Rethinking Science Education Reforms." *Journal of Research in Science Teaching* 42(5):561-80. doi: 10.1002/tea.20066.

Carter, Lyn. 2012. "Globalisation and Science Education: Globalism, Postcolonialism and Sustainability Moves and Counter-Moves." in *Second International Handbook of Science Education*, Vol. 24, edited by B. Fraser, K. Tobin and C. J. McRobbie. Dordrecht: Springer Science & Business Media.

Chase-Dunn, Christopher. 1999. "Globalization: A World-Systems Perspective." *Journal of world-systems research* 5(2):188-216.

Cheung, Derek. 2018. "The Key Factors Affecting Students' Individual Interest in School Science Lessons." *International Journal of Science Education* 40(1):1-23. doi: 10.1080/09500693.2017.1362711.

Chiu, Mei-Hung and Reinders Duit. 2011. "Globalization: Science Education from an International Perspective." *Journal of Research in Science Teaching* 48(6):553-66. doi: 10.1002/tea.20427.

DeBoer, George E. 2011. "The Globalization of Science Education." *Journal of Research in Science Teaching* 48(6):567-91. doi: 10.1002/tea.20421.

Diamond, Aurel H. 2020a. "The Social Reproduction of Science Education Outcomes for High School Students in Israel." *British Journal of Sociology of Education* 41(7):1029-46. doi: 10.1080/01425692.2020.1806040.

Diamond, Aurel H. 2020b. "Minority Youth Acculturation in Third Spaces: An Ethnography of Arab-Palestinian High School Students Visiting the Israeli Innovation Sector." *Journal of Ethnic and Migration Studies*. doi: 10.1080/1369183X.2020.1847055.

Diamond, Aurel H. and Elyakim Kislev. 2020a. "Perceptions of Science and Their Effects on Anticipated Discrimination in Stem for Minority High School Students." *Cambridge Journal of Education*. doi: 10.1080/0305764X.2020.1806989.

Diamond, Aurel H. and Elyakim Kislev. 2020b. "High School Students' Perceptions of Science and Attitudes Towards Intergroup Cooperation." *Compare: A Journal of Comparative and International Education*. doi: 10.1080/03057925.2020.1748494.

Diamond, Aurel H. under review. "A Globalization Diversity Ideology." *Cross Cultural & Strategic Management*.

Dierking, Lynn D. and John H. Falk. 2016. "2020 Vision: Envisioning a New Generation of Stem Learning Research." *Cultural Studies of Science Education* 11(1):1-10. doi: 10.1007/s11422-015-9713-5.

Drori, Gili S., John W. Meyer, Francisco O. Ramirez and Evan Schoffer, eds. 2003. *Science in the Modern World Polity: Institutionalization and Globalization*. Stanford, CA: Stanford University Press.

Fensham, Peter J. 2011. "Globalization of Science Education: Comment and a Commentary." *Journal of Research in Science Teaching* 48(6):698-709. doi: 10.1002/tea.20426.

Gonzalez, Heather B. and Jeffrey J. Kuenzi. 2012. "Science, Technology, Engineering, and Mathematics (Stem) Education: A Primer." Congressional Research Service, Library of Congress.

James, Paul and Manfred B. Steger. 2014. "A Genealogy of 'Globalization': The Career of a Concept." *Globalizations* 11(4):417-34. doi: 10.1080/14747731.2014.951186.

Johnson, R. Burke and Anthony J. Onwuegbuzie. 2004. "Mixed Methods Research: A Research Paradigm Whose Time Has Come." *Educational Researcher* 33(7):14-26.

Khamaisi, Rassem and Ismael Abu-Saad. 2015. *Education and Territory: Charged Issues*. Ra'anana, Israel: The Open University of Israel.

Lefebvre, Henri. 1991. *The Production of Space*. Oxford, OX, UK; Cambridge, Mass., USA: Blackwell.

Moore, Kelly, Daniel Lee Kleinman, David Hess and Scott Frickel. 2011. "Science and Neoliberal Globalization: A Political Sociological Approach." *Theory and Society* 40(5):505-32.

Museus, Samuel D., Robert T. Palmer, Ryan J. Davis and Dina C. Maramba. 2011. *Racial and Ethnic Minority Student Success in Stem Education: Ashe Higher Education Report*: John Wiley & Sons.

Onwuegbuzie, Anthony J., Hannah R. Gerber and Sandra Schamroth Abrams. 2017. "Mixed Methods Research." Pp. 1-33 in *The International Encyclopedia of Communication Research Methods*, edited by J. Matthes, C. S. Davis and R. F. Potter. Hoboken, NJ: Wiley.

Sassen, Saskia. 2003. "Globalization or Denationalization?". *Review of International Political Economy* 10(1):1-22. doi: 10.1080/0969229032000048853.

Sassen, Saskia. 2007. *A Sociology of Globalization*. New York and London: W. W. Norton & Company.

Sassen, Saskia and Ada Van Roekel-Hughes. 2008. "Deciphering the Global: Its Spaces, Scales and Subjects." *Social Thought & Research* 29:3-18.

Sharma, Sagar and Monica Sharma. 2010. "Globalization, Threatened Identities, Coping and Well-Being." *Psychological Studies* 55(4):313-22. doi: 10.1007/s12646-010-0048-8.

Sharma, Sagar. 2016. "Impact of Globalisation on Mental Health in Low- and Middle-Income Countries." *Psychology and Developing Societies* 28(2):251-79. doi: 10.1177/0971333616657176.

Teddlie, Charles and Abbas Tashakkori. 2009. *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences*. Los Angeles: Sage.

Tobin, Kenneth. 2016. "Collaborating on Global Priorities: Science Education for Everyone—Any Time and Everywhere." *Cultural Studies of Science Education* 11(1):27-40. doi: 10.1007/s11422-015-9708-2.

Torres, Carlos Alberto. 2008. *Education and Neoliberal Globalization*. Philadelphia, PA: Routledge.

van Griethuijsen, Ralf, Michiel W. van Eijck, Helen Haste, Perry J. den Brok, Nigel C. Skinner, Nasser Mansour, Ayse Savran Gencer and Saouma BouJaoude. 2015. "Global Patterns in Students' Views of Science and Interest in Science." *Research in Science Education* 45(4):581-603.

Wagner, Karla D., Peter J. Davidson, Robin A. Pollini, Steffanie A. Strathdee, Rachel Washburn and Lawrence A. Palinkas. 2012. "Reconciling Incongruous Qualitative and Quantitative Findings in Mixed Methods Research: Exemplars from Research with Drug Using Populations." *International Journal of Drug Policy* 23(1):54-61. doi: 10.1016/j.drugpo.2011.05.009.

Xie, Yu, Michael Fang and Kimberlee Shauman. 2015. "Stem Education." *Annual Review of Sociology* 41(1):331-57. doi: 10.1146/annurev-soc-071312-145659.

CHAPTER 1

The Social Reproduction of Science Education Outcomes for High School Students in Israel

Diamond, Aurel H. 2020. "The Social Reproduction of Science Education Outcomes for High School Students in Israel." *British Journal of Sociology of Education* 41(7):1029-46. doi: 10.1080/01425692.2020.1806040.

British Journal of Sociology of Education

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/cbse20

The social reproduction of science education outcomes for high school students in Israel

Aurel H. Diamond

To cite this article: Aurel H. Diamond (2020) The social reproduction of science education outcomes for high school students in Israel, British Journal of Sociology of Education, 41:7, 1029-1046, DOI: 10.1080/01425692.2020.1806040

To link to this article: https://doi.org/10.1080/01425692.2020.1806040

Published online: 20 Aug 2020.

BRITISH JOURNAL OF SOCIOLOGY OF EDUCATION
2020, VOL. 41, NO. 7, 1029–1046
https://doi.org/10.1080/01425692.2020.1806040

The social reproduction of science education outcomes for high school students in Israel

Aurel H. Diamond

Federmann School of Public Policy, Hebrew University of Jerusalem, Jerusalem, Israel

ABSTRACT

This paper investigates patterns of social reproduction of science education outcomes for high school students in Israel, specifically by examining the relationship between one aspect of science capital – as measured by having a scientist in the family – and SES with three measures of science education success: interest in science; science self-efficacy; and aspirations to pursue science at university. Regression analyses of questionnaire data (N = 380) from 14- to 18-year-old high school students yield differences between Jewish (majority) and Arab-Palestinian (minority) students. Specifically, regarding aspirations for university science, having a scientist in the family and higher SES are positively associated with better outcomes for Jewish students only. The analyses highlight the potential advantages of employing theories of social reproduction and science capital to explore inequalities in science education, which in this case is used to identify additional challenges in increasing minority student uptake in postsecondary science.

ARTICLE HISTORY
Received 9 December 2019
Accepted 3 August 2020

KEYWORDS
Social reproduction; science education; minorities; inequalities; science capital; socioeconomic status

Introduction

One of the key concerns in science education research regards the uptake, participation, and success of minority groups in the science, technology, engineering, and mathematics (STEM) track. Scholars have identified a wide range of factors that contribute to this disparity, such as low teacher expectations, a lack of cultural relevance, stereotype threat, absence of parental and teacher support, anticipated discrimination, and economic factors, amongst others (Xie, Fang, and Shauman 2015). Yet, despite advances in these fields and great policymaker interest, many minority groups continue to be underrepresented in STEM and frequently underperform in science education (Mau and Li 2018). It is therefore apparent that current research knowledge does not sufficiently capture the reasons for persistent inequality in science education and STEM in general.

An arguably understudied way of investigating disparities in STEM is to consider the role that social reproduction can play in the educational outcomes for students in science education. In the context of education, social reproduction theory implies that schools are themselves mechanisms that perpetuate inequality, largely mediated by the roles that parents

CONTACT Aurel H. Diamond aurel.diamond@mail.huji.ac.il

and families play in the schooling and upbringing of their children (Collins 2009). Specifically in the context of science education, studies indicate that students' exposure to and knowledge of science, or *science capital* (DeWitt, Archer, and Mau 2016; Claussen and Osborne 2013; Archer et al. 2015), and family socioeconomic status (SES) (Burke 2007) are significant predictors of student progress in the STEM track. Yet, studies have not addressed how social reproduction theory can be used to explain majority-minority group differences and inequalities in science education.

The current paper therefore asks whether there are minority-majority differences when it comes to the social reproduction of science education outcomes of high school students. In order to test this empirically, the study considers family socioeconomic status (SES) together with one aspect of science capital, which is estimated by close family relationship with someone who has succeeded in a science-related field, and their relationships with three measures of educational outcomes: (i) interest in science; (ii) self-efficacy in science education; and (iii) aspirations to pursue an undergraduate degree in a science-related field. The study focusses on high school students aged 14–18, since student interest in science remains uniformly high until around the age of 10, with levels of interest diverging seriously after the age of 14 (Archer, DeWitt, and Wong 2014). Data was collected from Israeli high schools. As explained further below, the Israeli case is particularly instructive for investigating differences in social reproduction given the stark cultural differences and large social distance between the Arab-Palestinian (minority) and the Jewish (majority) populations in the country.

The contributions of this paper are fourfold. First, by considering social reproduction in the context of science education, the paper offers a novel theoretical approach to understanding the inequalities in the STEM track. While existing studies have established the potential advantages of this approach (for example: Gokpinar and Reiss 2016), it is amongst the first to investigate this relationship quantitively. Second, existing studies establish variation in science capital between social groups (Moote et al. 2019) and engagement or interest in science (Archer et al. 2012) separately. The current article builds on these works by linking the relationship between one aspect of science capital and three different measures of educational outcomes for different social groups. Third, the study is novel in directly comparing the role of an aspect of science capital and SES on educational outcomes. Finally, the Israeli case provides insights into the reproduction of educational outcomes in a case where there are de-facto separate schools for majority and minority high school students.

Social reproduction in science education

The works of Pierre Bourdieu and his colleagues (Bourdieu and Passeron 1977; Bourdieu 1998) have made seminal contributions to understanding the roles that education systems, schools, and families play in reproducing inequalities in modern society. Cultural and social capital, field, and habitus are used to theorise how inequalities in education are reproduced based on class. While these works have attracted criticism for deterministic views of human agency and oversimplification of class and culture (Jenkins 1982), their relevance has re-emerged in recent years in discussing the reproduction of inequalities in science education.

Indeed, an emerging field of research considers how theories of social reproduction can be employed to understand the educational outcomes for students of all ages in science

education. For instance, Bourdieu's notion of cultural capital can be used for understanding the estimated value (or "worth") of science education. Claussen and Osborne (2013) argue that students frequently do not gain an understanding of the embodied and cultural capital of science through formal science education. As a result, each individual's understanding of the value of science can be largely attributed to out-of-school factors. In other words, even in the presence of a strong science education curriculum, students' evaluations of science are likely to be products of the larger social structures outside of school.

Recent studies have therefore empirically explored the way in which science education outcomes can be the product of social reproduction. Noting the roles of parents, cultural contexts, and other extra-curricular factors, Gokpinar and Reiss (2016) demonstrate how science education outcomes may be reproduced in high school students through a two-step model, wherein science-related resources are acquired and subsequently converted into science-related capabilities. However, the ability of science-related resources to school-aged children and youth is closely related to parental involvement in education, background (or lack thereof) in science, and economic resources. Further studies find variation between students' background and home contexts (i.e. habitus, cultural and social capital) and their attitudes regarding pursuing non-compulsory science education (Mujtaba et al. 2018). These findings were also reflected by Archer et al. (2012), who used a Bourdieusian framework to explore how the relationship between family habitus and capital can make science seem more or less achievable or thinkable amongst 10–11 year olds in England. Survey data from over 9,000 children and analyses of 160 semi-structured interviews suggest that while that family habitus is not a deterministic predictor of success in science, inequalities in capital and differences in family habitus result in uneven patterns in interest, aspirations, and persistence in science. Notably, family capital and habitus amongst middle-class children most strongly favoured interest in pursuing science.

It is therefore apparent that social reproduction may be used as a framework for understanding the outcomes for school-aged students in science education. However, for the purposes of understanding minority performance and uptake in science, it is important to consider specific mechanisms through which inequality may be reproduced in science education. This study explores two possibilities: science capital and family SES.

Science capital and outcomes in science education

The term *science capital* was introduced by Archer, DeWitt, and Willis (2014), who demonstrated how science capital could be used to explain differences between working- and middle-class boys' aspirations in science. Science capital is defined here by knowledge, attitudes, experiences, and resources, as embodied by science-related cultural capital, social capital, and habitus. Later studies set out four main components of science capital: science literacy and knowledge; attitudes towards science; knowing people involved with science; and participation in scientific activities (DeWitt, Archer, and Mau 2016). In practice, parents and other family members therefore play central roles in the science capital of school-aged children and youth. Families that encourage scientific learning, foster positive views towards science, include science professionals, or engage in extra-curricular scientific activities are therefore more likely to produce children with higher science capital.

Indeed, a growing number of studies have found high science capital to be positively associated with better outcomes for high school students in science education. High science capital is likely to predict better interest in and attitudes towards, as well as general engagement in science (Mujtaba et al. 2018). In addition, science capital has been demonstrated to be associated with greater interest in future science studies (DeWitt, Archer, and Mau 2016). To illustrate the influence of a family member in STEM, one study reports that high school students with a family member in STEM is more than twice as likely to report "high" levels of science aspirations in comparison to students with no family members working in STEM (Archer et al. 2015). High science capital is also associated with progressing to non-compulsory science, especially for girls and young women throughout high school (Archer et al. 2017).

Given the role that science capital plays in science education outcomes, and in seeking to address minority-majority disparities in science education, it is instructive to ask whether there are differences in science capital between social groups. Analysis of a survey of 7,013 17–18 year olds in England reveals significant differences in science capital between ethnic groups (Moote et al. 2019). Compared to the White majority, Black, South Asian, Chinese, and 'Other' students reported significantly higher science capital. Since other studies report science capital to improve science outcomes, these analyses raise important questions. Whereas most minority groups face additional challenges in progressing and representation in the STEM track, these results may suggest that science capital is not as effective for minority students as it is for majority students. Moote et al. (2019) therefore ask in which contexts science capital may be mobilised, and what the corollaries of science capital may resemble in other national contexts.

Therefore, and answering the question raised by Moote et al. (2019), there is a clear need to understand whether minority status mediates patterns of social reproduction in science education. This study therefore aims to elucidate some of the nuances regarding the role that minority status and social context may play in the reproduction of science education outcomes, with a focus on one form of science capital in particular.

Socioeconomic status and outcomes in science education

In order to appropriately measure the potential relationship between science capital and outcomes in science education, it is important to consider the impact that SES has on minority persistence in the STEM track. Ample research has found strong relationships between socioeconomic factors and racial and ethnic minority student success in science (May and Chubin 2003; Davis 2014). This may be due to direct financial factors such as the inability of the students or their families to pay for further education (Hernandez and Lopez 2004), or a general lack of financial support for science education and related activities (Wang 2013). SES also impacts minority students' persistence in the science education indirectly. For instance, many social groups are less likely to engage in science because of low expected economic return from pursuing a science-related career (Andersen and Ward 2014); families' abilities to fund or promote extra-curricular science activities (Burke 2007); or connections with individuals in science careers who act as role models or provide guidance for children and youth interested in science education (Museus et al. 2011). Moreover, and for students from low-SES backgrounds, dissonances between the anticipated SES status from proceeding in science education and current

SES status contribute to the perceived irrelevance of science education (Hurtado et al. 2010).

To that end, and especially given that family SES is a significant component of the social reproduction of educational outcomes in general (Tzanakis 2011), it is apparent that family SES plays an important part in the reproduction of science education outcomes for all students, with particularly negative impacts expected for families from low-SES backgrounds. While family SES is indeed associated with science capital – for example, since SES is a good indication of parents' abilities to pay for extra-curricular science activities – its significance and uniqueness in the social reproduction of educational outcomes is apparent. The current study therefore compares how one form science capital and family SES are related to science education outcomes. The question remains, however, whether minority status can mediate this relationship.

The Israeli context

This paper analyses data from high school students in Israel, where 76 percent of the population belong to the Jewish majority, and 21 percent to the Arab-Palestinian minority (the remainder are classed as 'others': Central Bureau of Statistics 2017). While some cities in Israel are comprised of mixed Jewish/Arab-Palestinian populations, most Jewish and Arab-Palestinian families live in more or less homogeneous towns or neighbourhoods. Moreover, separate Hebrew-language and Arabic-language schooling systems are maintained for Jewish and Arab-Palestinian citizens, thus maintaining cultural differences between Arab-Palestinian and Jewish citizens of Israel. There are also high levels of tension and inequality between Jews and Arab-Palestinians in Israel that create significant social distance between groups (Smooha 2016). The social and cultural differences between Jewish and Arab-Palestinian high school students Israel are exacerbated by the ongoing conflict in the Middle East, as well as the relatively high levels of poverty amongst Israel's minority populations (Bleikh, Berrebi, and Brand 2016).

As a result, socioeconomic and cultural inequalities in Israel are generally demarcated by ethnic-religious background, whereby Arab-Palestinian minorities are systematically disadvantaged by laws and institutionalised racism and discrimination. For example, approximately half of Arab-Palestinian families live in poverty, compared to 20 percent of Jewish families (Hai 2013). Of particular relevance to the current study, these disparities are also reflected in science education, and in education outcomes in general. Results from the 2018 PISA record 111, 116, and 144 point gaps in mathematics, science, and reading between Jewish and Arab-Palestinian students in Israel, respectively (Bratslavsky, Lipfshtat, and Hilu 2019); the largest minority student disparity in the OECD. Additional studies indicate that Arab-Palestinian students have lower levels of mathematics confidence (Nasser and Birenbaum 2005), and less awareness of science and tech-related careers (Scheindlin 2016). However, studies indicate varying attitudes towards science and mathematics. For example, Arab-Palestinian youth and students often express higher interest in science in general and vocation-based science careers (Lewin-Epstein et al. 2015), often motivated by career and/or income stability. In Israel, this has led to relatively higher representation of minority groups in medical fields of work and study in particular.

In order to understand these nuances, it is instructive to note the overlap between different types of minority status, SES, and experiences of racism and discrimination for Arab-Palestinian students. Indeed, studies that adopt an intersectionality approach to minority/majority differences in Israel indicate that reduced Arab-Palestinian representation in STEM can be attributed in part to gender discrimination against Arab-Palestinian women in STEM (Keshet, Popper-Giveon, and Liberman 2015), and the correlation between lower SES and minority status in Israel, which creates extra challenges for continuing on the STEM track for Arab-Palestinian students (Chachashvili-Bolotin, Milner-Bolotin, and Lissitsa 2016). Thus, differences in STEM participation Jewish and Arab-Palestinian students in Israel can often be attributed to the intersectionality between what defines 'minority status' in Israel (i.e. race/ethnicity/religion) and additional factors that are not necessarily related to minority status.

To that end, and by many measures, the social condition of Arab-Palestinian minorities in Israel is similar to other wherein socioeconomic and educational disparities being delineated on racial, ethnic, and/or religious background (Syed and Chemers 2011). Data from Israel is therefore informative for the purposes of examining patterns of social reproduction in STEM education, and one where structural racisms and intersectional forms of inequality impact participation in STEM. They also provide insights from a population that is not commonly examined in STEM education literature. Nonetheless, the unique social context of Israel, especially in light of the effects of the regional conflict on youth (Nasie, Diamond, and Bar-Tal 2016), impacts the generalisability of these results. The uniqueness of the Israeli case is accounted for in the data analyses and discussion.

Methods

This paper uses data from a purpose-designed questionnaire (N = 380) that was distributed to Arab-Palestinian and Jewish high school students in Israel (ages 14–18) between 2017 and 2019. The data from these questionnaires were used in order to conduct regression analyses. Students' interest in science, self-efficacy in science, and aspirations to pursue higher education in science are regressed on family SES and presence of a family member in STEM, controlling for minority status and other demographic factors (further details below). The anonymous questionnaire included 40 items pertaining to attitudes towards science, educational aspirations and self-efficacy, identity, discrimination and integration, as well as demographic questions.

The questionnaires for Arab-Palestinian students were printed and distributed to the students at schools in the city of Jaffa, where 92 percent (N = 246) of the students in the classes visited chose to return questionnaires. While the schools do not capture the full diversity of Arab-Palestinian society in Israel, they include a wide range of identities and religious practices, and are therefore significantly diverse for the purpose of this investigation. At the request of the teachers of the schools, the questionnaires were printed and distributed in Hebrew, but explained to the students in Arabic. According to the teachers, their students are often equally or more proficient in reading and writing Hebrew than Arabic. In order to avoid methodological issues that may arise from answering the questionnaire in a second language, a pilot phase was conducted (N = 103) during which students by their teachers which language they would prefer to answer in. Only four out of 103 indicated Arabic, and thus the questionnaires were printed in Hebrew and explained in

Arabic, as per the teachers' and students' preferences. The questionnaires for Jewish students (N = 134) were administered online in Hebrew. High school teachers from all regions of the country were asked to distribute the questionnaire to their students, with a response rate of 79.8 percent. Students from 27 municipalities and varying levels of religious observance[1] completed the questionnaires.

Some of the questionnaires were returned partially completed: on average, answers were recorded to 87.1 percent of the questionnaire items. Imputations were therefore carried out using multivariate normal regression in order to estimate values for missing data. Twenty sets of imputations were computed in order to ensure data reliability for these percentages of missing data (White, Royston, and Wood 2011). Sensitivity analyses were conducted using the complete data entries only, and comparisons were made between truncated and non-truncated imputations (Manly and Wells 2015). All of the results were similar, and as a result, non-truncated imputations were used.

Variables

Three questionnaire items were chosen as dependent variables to represent different aspects of science educational outcomes. The first, 'Interest in Science', corresponds to the questionnaire item 'I find science and related fields interesting' (1–5 scale of agreement). The second, 'Science Self-Efficacy', was measured by a questionnaire item that asked students to self-rank their performance in science compared to other students (1–5 scale ranging from far below to far above average). This item therefore captures both actual performance in STEM, as well as self-efficacy. The third item, 'Science University Aspirations' was measured by the level of agreement with the statement 'I want to pursue a college or university degree in a STEM subject (for example: natural sciences, mathematics, engineering, medical or veterinary-related subjects, or computer science)' (1–5 scale). The three items are thus proposed to measure aspects interest, performance, and aspirations of students in science education, and thus provide insights into the educational outcomes of students in the study.

Amongst the independent variables used, two items were used to measure the family characteristics associated with the reproduction of educational outcomes. First, SES was accounted for by self-reported family income (ranging from far below average to far above average, weighted 1–5), henceforth 'Family Income'. Second, the influence of a close family member in science was measured by agreement with the statement 'A close member of my family has succeeded in a STEM or science-related field' (1–5 scale), henceforth 'Scientist in Family'. This variable corresponds to one aspect of science capital and in this study is used for examining patterns of social reproduction. However, it is essential to note that there are existing composite measures of science capital (DeWitt, Archer, and Mau 2016) that capture a broader definition of this concept. The use of the narrower conceptualisation here is of particular interest in the Israeli context, since parental roles have a particularly strong impact on educational and career decisions (Mustafa, Arar, and Khamaisi 2009). However, the theoretical limits of this definition, particularly in its reduced comparability with other studies on science capital, are taken into account in the analyses and discussion.

Finally, additional independent variables were included to account for individual and demographic factors related to educational outcomes. The questionnaire also included items related to minority status since previous studies indicate that minority status is likely related to science capital (Moote et al. 2019) and interest in science in a number of ways.

Following stepwise regression analyses, the following items were included as independent variables: a dummy variable for sex; the desire to work, study, or integrate into a global or international environment (1–5); reported feelings of being a minority (1–5); perceived levels of discrimination in Israel (1–5); preference to work or study in a homogeneous environment (1–5); fluency in Hebrew (1–5); the view that language is a barrier to integrating in society (1–5); perceptions of Jewish-Arab relations (1–5); perceptions of civil equality (1–5); degree of satisfaction as citizens (1–5); levels of religiosity (1–4), and overall levels of happiness (1–5). Moreover, a dummy variable (labelled 'Arab') was included in order to differentiate between Jewish and Arab-Palestinian respondents. Age was found to be insignificant in the regression models and was therefore omitted. For completeness, Appendix Table A1 shows sensitivity analyses that include the age variable.

In order to reduce the large number of variables related to minority status, exploratory factor analysis was performed. Given the high levels of correlation between the items relating to minority status, the resulting components were transformed using a promax oblique rotation (Abdi 2003). Parallel analyses were then conducted in order to determine which factors to retain (Hayton, Allen, and Scarpello 2004). Four factors were retained, as summarised in Table 1. The results of the Kaiser-Meyer-Olkin Test (a = 0.554) support adequacy of this analysis, particularly given the sample size (Cerny and Kaiser 1977). Similar results were also obtained in a sensitivity analysis using a varimax rotation.

The first factor measures feelings of being a minority and perceived levels of discrimination, and was thus labelled 'minority salience'. The second factor, which measures feelings of equality, Jewish-Arab relations, and satisfaction as citizens, was labelled 'social climate'. The third factor, which relates to fluency in Hebrew and perceived language-associated challenges, was labelled 'language'. Here, the positive correlation between fluency in the majority language (Hebrew) and perceiving language as a challenge to integration can be explained by the awareness of language challenges that come with integrating into Israeli society (Arar 2012). The fourth factor has a negative coefficient on preference for global and international environments, and a positive coefficient on preference for a homogeneous environment, and was thus labelled 'social distance'.

Regression analysis

The dependent variables measuring science education outcomes (Interest in Science, Science Self-Efficacy, and Science University Aspirations) were regressed on the two family

Table 1. Factor loadings of minority characteristics after promax oblique rotation (omitted: loadings less than 0.3).

Variable	Minority salience	Social climate	Language	Social distance	Uniqueness
Global/international environment				–0.336	0.837
Feel like minority	0.638				0.606
Perceived discrimination	0.632				0.581
Prefer homogeneous environment				0.473	0.764
Fluent in Hebrew			0.373		0.800
Language barrier			0.338		0.828
Jewish-Arab relations		0.427			0.762
Treat citizens equally		0.621			0.620
Satisfied as citizens		0.444			0.620

characteristics (Family Income and Scientist in Family), the four minority factor variables, and all of the remaining aforementioned individual characteristics. Interaction terms were then included between minority status (as measured by the dummy variable for Arab students) and family characteristics in order to test whether patterns of reproduction of science educational outcomes are different for Jewish and Arab students. Since much of the data is ordinal, sensitivity analyses included ordered logistic regressions using the same equations. The results were similar and are available upon request.

Results

Table 2 provides a descriptive summary of the data used for analyses in this paper. Differences between Jewish and Arab-Palestinian students on measures of minority status are apparent from t-test results. On the whole, Arab-Palestinian students feel more like a minority, perceive more discrimination, are less satisfied as citizens, and report lower estimated family incomes. Conversely, however, Jewish students report higher preference for homogeneous environments and gave a lower rank to perceived Jewish-Arab relations.

Regarding educational outcomes, Arab-Palestinian students on scored significantly higher than Jewish students when it comes to general interest in science or interest in pursuing a science degree. Arab-Palestinian and Jewish students scored similarly, however, when it came to self-evaluation in science classes. Finally, Jewish students scored higher in reporting a family member who has succeeded in STEM, indicating potentially higher levels of this type of science capital.

Table 3 shows the coefficients of regression of Interest in Science, Science Self-Efficacy, and Science University by individual and family characteristics. Several patterns emerge

Table 2. Summary of data and means comparison according to primary identity.

Variable	Total sample	Jewish	Arab-Palestinian
N	380	134	246
% total	100	35.3	64.7
% female	56.3	60.4	54
Mean age	15.44**	16.22	15.19
Mean family income (1–5)	3.30**	3.49	3.22
Mean degree of religiosity (1–4)	2.08	2.06	2.09
Mean happiness (1–5)	4.10	4.05	4.16
Mean feel like minority (1–5)	2.86**	2.35	3.04
Mean perceived discrimination (1–5)	2.65**	2.16	2.82
Mean equal citizens (1–5)	2.50*	2.56	2.48
Mean satisfied citizen (1–5)	2.96**	3.56	2.77
Mean Jewish-Arab relations (1–5)	2.68**	2.32	2.80
Mean fluent in Hebrew (1–5)	4.18**	4.61	4.05
Mean fluent in English (1–5)	3.63**	3.55	3.85
Mean language is a challenge (1–5)	2.95	2.93	2.95
Mean prefer global/international environment (1–5)	3.54	3.49	3.56
Mean prefer homogeneous environment (1–5)	2.11**	2.48	2.00
Mean scientist in family (1–5)	3.21**	3.48	3.16
Mean interest in science (1–5)	3.63*	3.56	3.66
Mean science self-efficacy (1–5)	3.43	3.45	3.43
Mean science university aspirations (1–5)	3.58**	3.11	3.66

* P < .05; ** P < .01.

Two-sample t-tests were used to check for significant differences between the Jewish and Arab-Palestinian respondents. Significance is indicated in the total sample column.

Table 3. Coefficients of regression of science education outcome by individual and family characteristics.

	Interest in science	Science self-efficacy	Science university aspirations
Variable	Model 1	Model 2	Model 3
Individual characteristics			
Female	−0.277**	−0.225**	−0.053
Religiosity	−0.023	0.032	0.099
Happiness	0.121	0.053	0.171
Arab[a]	−0.046	−0.014	0.535***
Minority salience	0.284**	0.213**	0.346**
Social climate	0.182	0.241**	0.086
Language	0.340**	0.456***	0.416**
Social distance	−0.415***	−0.372***	−0.446***
Family characteristics			
Family income	−0.046	0.048	0.052
Scientist in family	0.059	0.070*	0.089
Intercept	3.490***	3.120***	2.115***
N	380	380	380
R^2	0.097	0.154	0.169

* P < .1; ** P < .05; *** P < .01.
[a]Reference: Jewish-Israeli.
R^2 is the average over the 20 imputations.

regarding the science education outcomes for the students in this sample. First, and in line with studies from outside of Israel, female students report significantly lower levels of interest in science, and also lower levels of self-efficacy in their science education achievements. However, no significant gender differences are recorded when it comes to reported aspirations to pursue science at university. This results therefore reflect studies showing that while girls and women may have similar (and occasionally higher) science aspirations than boys and men, outside factors such as gender-based discrimination and stereotype threat negatively impact self-efficacy and perceived relevance of science (Xie, Fang, and Shauman 2015).

Second, the results in Table 3 indicate on the whole how different aspects of minority status are related to educational outcomes for both Arab-Palestinian and Jewish students. Notably, the minority salience and language variables are positively associated with all three reported measures of science education outcomes, as is social climate with science self-efficacy. Similarly, the coefficients of the social climate, language, and social distance variables in Table 3 demonstrate how minority status are negatively associated with science education outcomes for the students in this study. In other words, and as with existing studies on minority interest in science, it appears that identifying more strongly as a minority is associated with great interest, higher self-efficacy, and high university aspirations in science. This can be explained where minority school students in Israel may view science careers as an opportunity for socioeconomic mobility in a context that otherwise poses challenges for minority groups. In other words, pursuing science may be a way of circumventing some challenges for those who see themselves as minorities, Jewish or Arab-Palestinian. This may also explain the results here indicating that Arab-Palestinian respondents report significantly higher levels of interest in pursuing science at university in Model 3: although this is not tested directly, pursuing higher education in science may be seen as a way of acquiring social status or capital that is often reduced for the Arab-Palestinian minority by socio-political and other field-related factors (e.g. discrimination and racism, amongst others: Al-Haj 2012).

The final pattern apparent from Table 3 regards the apparent lack of significant relationship between family characteristics and science education outcomes for the students in the study. The only exception appears to be a significant and positive association between science self-efficacy and the presence of a scientist in the family (Model 2), suggesting that there may be a relationship between this type of science capital and student self-efficacy. The remaining measures, however, were not associated with having a scientist in the family, nor were any of the measures associated with family SES. Here, the correlation between the minority factor variables and better science education outcomes in Table 3 indicates how lived minority experiences are associated with higher interest in science, science self-efficacy, and science university aspirations for both Jewish and Arab-Palestinian students in general, while family characteristics appear to be insignificant. This may be due to differential effects of the family characteristics for Jewish and Arab-Palestinian students.

In order to explore this possibility, and indeed in order to address the question whether there are minority/majority differences in the reproduction of educational outcomes, Table 4 presents the coefficients of regression of science education outcomes by individual and family characteristics in interaction with the variable 'Arab' whose value was set at 1 for Arab-Palestinian students and 0 for Jewish students.

Regarding general interest in science Models 4 and 5 present the interaction between the two measured family characteristics with minority status. For both reported family SES and the presence of a scientist in the family the interaction terms with minority status are insignificant, therefore suggesting that there no significant difference between Jewish and Arab-Palestinian students in the sample when it comes to how family SES and having a scientist in the family are related to interest in science. In addition, it also

Table 4. Coefficients of regression of science education outcomes by individual and family characteristics in interaction with minority status.

	Interest in science		Science self-efficacy		Science university aspirations	
Variable	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Individual characteristics						
Female	−0.271**	−0.286**	−0.224**	−0.231***	−0.018	−0.071
Religiosity	−0.020	−0.022	0.032	0.033	0.121	0.102
Happiness	0.121	0.123	0.053	0.054	0.166	0.172*
Arab[a]	0.141	−0.017	0.012	0.005	1.635***	0.592***
Minority salience	0.285**	0.288**	0.214**	0.216**	0.351**	0.354**
Social climate	0.181	0.183	0.242**	0.243**	0.082	0.088
Language	0.343**	0.355**	0.457***	0.453***	0.434**	0.407**
Social distance	−0.416***	−0.417***	−0.372***	−0.373***	−0.453**	−0.449***
Family characteristics						
Family income	−0.008	−0.047	0.053	0.047	0.271**	0.050
Scientist in family	0.059	0.139	0.070*	0.125*	0.088	0.246**
Family income*Arab[a]	−0.054		−0.008		−0.320*	
Scientist in family*Arab[a]		−0.120		−0.082		−0.235**
Intercept	3.349***	3.462***	3.100***	3.100***	1.303**	2.058***
N	380	380	380	380	380	380
R^2	0.099	0.102	0.155	0.157	0.182	0.182

*P < .1; **P < .05; ***P < .01.
[a]Reference: Jewish–Israeli.
R^2 is the average over the 20 imputations.

appears that family SES and having a scientist in the family are not significant predictors of interest in science. These results therefore reflect studies that minority status and SES do not necessarily have a negative impact on student interest in science (Wenner 2003).

Similar patterns can be observed for the models regressing students' reported science self-efficacy in Models 6 and 7. While having a family member in science is still positively associated with higher science self-efficacy, no significant relationships are found between science self-efficacy and family SES. Most of the variation in these models can be attributed to individual characteristics. Moreover, due to the insignificant interaction terms, these models give no indication to Jewish/Arab-Palestinian differences when it comes to predicting the students' science self-efficacy.

Differences between Jewish and Arab-Palestinian students, however, can be found in the models that regress the students' reported aspirations to pursue science at university. In Model 8 in Table 4, the introduction of the interaction term between reported family SES and minority status impacts the coefficient for family SES (without the interaction). Indeed, and unlike in Model 3 (the base model in Table 3), Model 8 indicates a positive and significant relationship between family SES and science university aspirations. This is in line with previous research on persistence in the STEM track, where economic factors impact the accessibility and relevance of university for high school students (Museus et al. 2011). Yet, it is important to note that the interaction term in Model 8 is negative and significant, indicating that the relationship between reported family SES and science university aspirations is weaker for the Arab-Palestinian minority. In fact, looking at the effect size and considering the results from Model 3, these results suggest that while reported family SES is a significant predictor of science university aspirations for Jewish students, no such relationship is apparent for Arab-Palestinian students. This indicates that minority-majority differences when it comes to motivational factors for pursuing higher education, or indeed, diverging patterns of social reproduction.

A similar pattern can be seen through the introduction of an interaction term between minority status and the variable for having a family member in science, as in Model 9. Here, it is apparent that there is a positive and significant association between having a family member in science and reporting a desire to pursue science at university. Yet, given the negative and significant coefficient to the interaction term, and its similarity in magnitude to the Scientist in Family variable on its own, this positive association appears to be only relevant for the Jewish students in the sample. The results therefore suggest that this aspect of science capital – that is, having a family member who has succeeded in science – only has a positive impact on the science university aspirations for the Jewish (majority) students. Model 9 therefore is a second example of Arab-Palestinian/Jewish differences in the social reproduction of educational outcomes.

Discussion

The primary focus of this paper is to investigate whether there are majority-minority differences when it comes to the reproduction of science education outcomes for high school students. Before discussing the results, the limitations of self-reported data need to be taken into account in this context, particularly when it comes to the dependent variables. Indeed, the measures of interest in science, 'self-efficacy', and university aspirations do not measure

actual outcomes in the STEM track. The same can be said about SES, which was self-reported and based on participants' impressions. Thus, inconsistencies in results between the three measures of 'educational outcomes' may be partially attributed to the measurements used. Equally importantly, any discussion of science capital here can only refer to the aspect measured, as described in the methods. In order to improve reliability and validity, future studies would benefit from using composite measures of both science capital and SES, and from longitudinal data that tracks actual progress and achievement in the STEM track. Moreover, and given the framing of social reproduction, there is also a need to account for parental educational levels, and compare with patterns in non-science subjects. That being said, the analyses presented here provide evidence to suggest that there are likely significant differences between the social reproduction of science education outcomes for Arab-Palestinian and Jewish students in Israel. These results should encourage such further studies.

Namely, the results suggest that higher SES and the presence of a scientist in the family only have a positive impact on the university aspirations for the majority group students, with no effect discernible for minority students. As such, the results demonstrate quantitatively how social reproduction may assist in explaining inequalities in science education, and build on existing studies that show variation in science capital between social groups (e.g. Moote et al. 2019) by showing how these variations may lead to the reproduction of said inequalities. These results are impactful insofar as they imply that minority status can mediate the social reproduction in the context of science education, and should therefore encourage studies that investigate broader definitions of science capital and science education outcomes. The potential of undertaking such investigations can be made apparent by considering some of the mechanisms that may explain minority-majority differences in the social reproduction of science education outcomes.

In addition, the analyses revealed some similarities in the patterns of social reproduction of science education outcomes between Jewish and Arab-Palestinian students. Indeed, family SES was not associated with student interest in science or science self-efficacy, and having a scientist in the family had an equal impact on increasing science self-efficacy for Jewish and Arab-Palestinian students. Moreover, no significant differences in these measures are found between Jewish and Arab-Palestinian students. Thus, observed differences between groups in science education tests (Bratslavsky, Lipfshtat, and Hilu 2019) are likely due to external factors not measured in this paper. Here, variation between students can be accounted for by individual characteristics and social structures and inequalities (such as discrimination, as discussed below, as well as in Diamond and Kislev 2020). In particular, the analyses in these paper point at a multifaceted model of understanding inequalities in science education, where family characteristics partially account for minority-majority differences in aspirations for postsecondary science, and individual factors, social attitudes, and external and structural factors account for differences in science achievement.

In this respect, it is important to draw attention to the particular results suggesting that Arab-Palestinian participants are significantly more interested in science and pursuing science at university in comparison to Jewish participants. Internationally, there are many cases where minority students are more interested in science and highly represented in STEM degrees (Roysircar, Carey, and Koroma 2010). It is arguable that minorities may seek scientific or professional capital in order to compensate for reduced cultural capital (notably and exceptionally, Arab-Palestinian interest in medical professions: Lewin-Epstein et al.

2015). In these studies, the field allows for the manifestation of habitus (i.e. interest in pursuing science), while for most STEM fields in Israel, this is not the case. Ostensibly, the results in this paper present a case where two forms of capital (SES and having a scientist in the family) result in differential patterns of reproduction across social groups. The disparity between interest in science and actual science education outcomes for minorities can be explained by the field, which is characterised by political differences, institutionalised discrimination and racism, lack of educational funding, and other socio-political factors that were not measured in this study (Al-Haj 2012). Alternatively, differences may be attributed to aspects of capital that were not measured in this study (i.e. the aforementioned limitations on the choice of variables in this study). This possibility resonates studies outside of Israel (Archer, DeWitt, and Osborn 2015) that attribute importance to the field in the social reproduction of science outcomes.

On that note, the results also highlight a disjuncture whereby Arab-Palestinian students have higher levels of postsecondary science aspirations that are not apparent in participation and success. This disjuncture was noted by Archer et al. (2020) to be apparent amongst students identifying as Black in the UK. They attribute this disjuncture to racism and social inequalities that hinder minority group progress on the STEM track, and coined it as 'science debt' that society owes to these students. The results from the current study therefore suggest that Arab-Palestinian students in Israel are also in science debt, insofar as high aspirations for science are not matched by representation. The results could also be indicative of an education debt in Israel in general (i.e. not only in science education: Ladson-Billings 2006). This possibility, however, is not investigated empirically here.

To that end, modest speculations can be made regarding the circumstances under which increased science capital – in the form of having a scientist in the family – is correlated with better outcomes in science education (see: Moote et al. 2019). In order to explain why this aspect of science capital is only associated with raised university aspirations for majority students, it is possible to consider the barriers in accessing higher education for minority students in Israel. As is the case in many national contexts, minority access to postsecondary science in Israel is made more challenging due to funding issues, language difficulties, oppositional culture, lack of appropriate courses or preparation in high schools, and the requirement for geographic mobility (amongst other issues: Arar and Mustafa 2011). In this case, having a scientist in the family may be able to raise student aspirations, but only to the extent where the challenges to accessing university are perceived as surmountable by the students. Moreover, the results reflect studies showing that science educational outcomes are not necessarily related to SES (DeWitt, Archer, and Mau 2016), nor are they necessarily correlated to minority status. Indeed, Arab-Palestinian respondents scored significantly higher in interest in science and aspirations for science at university, and SES was not a significant predictor for any of the educational outcomes. Two conjectures can be made: first, that science educational outcomes may be better predicted by aspects of capital not measured in this study; and second, that disparities in participation and success in STEM in Israel may be better attributed to structural or institutional challenges.

Through identifying the nuances in the relationship between minority status in the social reproduction of science education outcomes, and through understanding which inequalities can be structural and institutional challenges, policymakers and educators should be able creating targeted programming for improving equality in science education. In particular,

science educators can draw on different forms of capital – outside of the family – in order to reduce science debt.

Note

1. Hebrew-language schools in Israel are split into secular, religious ('Orthodox'), and highly-religious ('ultra-Orthodox') systems. Secular and religious schools follow similar STEM curricular and were included in the study. The ultra-Orthodox (approximately 10 percent of Jewish Israelis) attend a separate high school system that includes minimal levels of STEM education, and are therefore not included in this study.

Acknowledgments

I would like to thank the Israel Institute for the award of a doctoral grant and the Federmann School of Public Policy for a doctoral scholarship that together funded my PhD studies while conducting this research. I am especially grateful to the anonymous reviewers and my doctoral advisor, Elyakim Kislev, whose comments and feedback were invaluable in improving the quality of this manuscript.

Disclosure statement

No potential conflict of interest was reported by the author.

ORCID

Aurel H. Diamond http://orcid.org/0000-0001-6038-186X

References

Abdi, Hervé. 2003. "Factor Rotations in Factor Analyses." In *Encyclopedia for Research Methods for the Social Sciences*, edited by Michael S. Lewis-Beck, Alan E. Bryman, and Tim Futing Liao, 369–374. Thousand Oaks, CA: Sage.

Al-Haj, Majid. 2012. *Education, Empowerment, and Control: The Case of the Arabs in Israel*. Albany, NY: Suny Press.

Andersen, Lori, and Thomas J. Ward. 2014. "Expectancy-Value Models for the STEM Persistence Plans of Ninth-Grade, High-Ability Students: A Comparison between Black, Hispanic, and White Students." *Science Education* 98 (2): 216–242. doi:10.1002/sce.21092.

Arar, Khalid. 2012. "Israeli Education Policy since 1948 and the State of Arab Education in Israel." *Italian Journal of Sociology of Education* 4 (1): 113–145.

Arar, Khalid, and Mohanned Mustafa. 2011. "Access to Higher Education for Palestinians in Israel." *Education, Business and Society: Contemporary Middle Eastern Issues* 4 (3): 207–228. doi:10.1108/17537981111159975.

Archer, Louise, Emily Dawson, Jennifer DeWitt, Amy Seakins, and Billy Wong. 2015. "Science Capital": A Conceptual, Methodological, and Empirical Argument for Extending Bourdieusian Notions of Capital beyond the Arts." *Journal of Research in Science Teaching* 52 (7): 922–948. doi:10.1002/tea.21227.

Archer, Louise, Jennifer DeWitt, and Jonathan Osborne. 2015. "Is Science for Us? Black Students' and Parents' Views of Science and Science Careers." *Science Education* 99 (2): 199–237. doi:10.1002/sce.21146.

Archer, Louise, Jennifer DeWitt, Jonathan Osborne, Justin Dillon, Beatrice Willis, and Billy Wong. 2012. "Science Aspirations, Capital, and Family Habitus: How Families Shape Children's Engagement and Identification with Science." *American Educational Research Journal* 49 (5): 881–908. doi:10.3102/0002831211433290.

Archer, Louise, Jennifer DeWitt, and Beatrice Willis. 2014. "Adolescent Boys' Science Aspirations: Masculinity, Capital, and Power." *Journal of Research in Science Teaching* 51 (1): 1–30. doi:10.1002/tea.21122.

Archer, Louise, Jennifer DeWitt, and Billy Wong. 2014. "Spheres of Influence: What Shapes Young People's Aspirations at Age 12/13 and What Are the Implications for Education Policy?" *Journal of Education Policy* 29 (1): 58–85. doi:10.1080/02680939.2013.790079.

Archer, Louise, Julie Moote, Becky Francis, Jennifer DeWitt, and Lucy Yeomans. 2017. "The "Exceptional" Physics Girl: A Sociological Analysis of Multimethod Data from Young Women Aged 10–16 to Explore Gendered Patterns of Post-16 Participation." *American Educational Research Journal* 54 (1): 88–126. doi:10.3102/0002831216678379.

Archer, Louise, Julie Moote, Emily Macleod, Becky Francis, and Jennifer DeWitt. 2020. *ASPIRES 2: Young People's Science and Career Aspirations, Age 10–19*. London, UK: UCL Institute of Education.

Bleikh, Haim, Claude Berrebi, and Gilad Brand. 2016. "Poverty and Inequality in Israel: Trends and Decompositions." In *State of the Nation Report*, edited by Avi Weiss, 315–351. Jerusalem, Israel: Taub Center.

Bourdieu, Pierre. 1998. *Practical Reason: On the Theory of Action*. Palo Alto: Stanford University Press.

Bourdieu, Pierre, and Jean-Claude Passeron. 1977. *Reproduction in Education, Society and Culture*. London and Beverly Hills: Sage Publications.

Bratslavsky, Ron, Nurit Lipfshtat, and Georgette Hilu. 2019. *PISA 2018: Israel*. Jerusalem, Israel: Israeli Ministry of Education.

Burke, Ronald J. 2007. "Women and Minorities in STEM: A Primer." In *Women and Minorities in Science, Technology, Engineering, and Mathematics: Upping the Numbers*, edited by Ronald J. Burke and Mary C. Mattis, 3–27. Northampton, MA: Edward Elgar Publishing.

Central Bureau of Statistics. 2017. *Statistical Abstract of Israel*. Jerusalem, Israel: Central Bureau of Statistics.

Cerny, Barbara A., and Henry F. Kaiser. 1977. "A Study of a Measure of Sampling Adequacy for Factor-Analytic Correlation Matrices." *Multivariate Behavioral Research* 12 (1): 43–47. doi:10.1207/s15327906mbr1201_3.

Chachashvili-Bolotin, Svetlana, Marina Milner-Bolotin, and Sabina Lissitsa. 2016. "Examination of Factors Predicting Secondary Students' Interest in Tertiary STEM Education." *International Journal of Science Education* 38 (3): 366–390. doi:10.1080/09500693.2016.1143137.

Claussen, Stephanie, and Jonathan Osborne. 2013. "Bourdieu's Notion of Cultural Capital and Its Implications for the Science Curriculum." *Science Education* 97 (1): 58–79. doi:10.1002/sce.21040.

Collins, James. 2009. "Social Reproduction in Classrooms and Schools." *Annual Review of Anthropology* 38 (1): 33–48. doi:10.1146/annurev.anthro.37.081407.085242.

Davis, Telesia Evon. 2014. "Transforming the Culture of the STEM Disciplines: A Multiple Case Study of Successful Strategies for Inclusive Excellence." (Doctoral dissertation). University of South Carolina. Columbia, SC. Retrieved from https://scholarcommons.sc.edu/etd/2816.

DeWitt, Jennifer, Louise Archer, and Ada Mau. 2016. "Dimensions of Science Capital: exploring Its Potential for Understanding Students' Science Participation." *International Journal of Science Education* 38 (16): 2431–2449. doi:10.1080/09500693.2016.1248520.

Diamond, A.H., and Kislev, E. (in press). *Perceptions of Science and Their Effects on Anticipated Discrimination in STEM for Minority High School Students*. Cambridge Journal of Education. doi :10.1080/0305764X.2020.1806989.

Gokpinar, Tuba, and Michael Reiss. 2016. "The Role of Outside-School Factors in Science Education: A Two-Stage Theoretical Model Linking Bourdieu and Sen, with a Case Study." *International Journal of Science Education* 38 (8): 1278–1303. doi:10.1080/09500693.2016.1188332.

Hai, Avivit. 2013. *Arab Citizen Employment in Israel: Critical Concern and Great Potential*. Tel Aviv, Israel: Inter-Agency Task Force on Israeli Arab Issues.

Hayton, James C., David G. Allen, and Vida Scarpello. 2004. "Factor Retention Decisions in Exploratory Factor Analysis: A Tutorial on Parallel Analysis." *Organizational Research Methods* 7 (2): 191–205. doi:10.1177/1094428104263675.

Hernandez, John C., and Mark A. Lopez. 2004. "Leaking Pipeline: Issues Impacting Latino/a College Student Retention." *Journal of College Student Retention: Research, Theory & Practice* 6 (1): 37–60. doi:10.2190/FBLY-0UAF-EE7W-QJD2.

Hurtado, Sylvia, Christopher B. Newman, Minh C. Tran, and Mitchell J. Chang. 2010. "Improving the Rate of Success for Underrepresented Racial Minorities in STEM Fields: Insights from a National Project." *New Directions for Institutional Research* 2010 (148): 5–15. doi:10.1002/ir.357.

Jenkins, Richard. 1982. "Pierre Bourdieu and the Reproduction of Determinism." *Sociology* 16 (2): 270–281. doi:10.1177/0038038582016002008.

Keshet, Yael, Ariela Popper-Giveon, and Ido Liberman. 2015. "Intersectionality and Underrepresentation among Health Care Workforce: The Case of Arab Physicians in Israel." *Israel Journal of Health Policy Research* 4 (1): 18. doi:10.1186/s13584-015-0004-0.

Ladson-Billings, Gloria. 2006. "From the Achievement Gap to the Education Debt: Understanding Achievement in U.S. Schools." *Educational Researcher* 35 (7): 3–12. doi:10.3102/0013189X035007003.

Lewin-Epstein, Noah, Alexandra Kalev, Erez Marantz, and Shimrit Slonim. 2015. "Arab Israeli Pharmacists in the Israeli Labor Market." In *Bulletin Articles*, edited by Laura Brass, 1–83. Jerusalem: Taub Center for Social Policy Studies in Israel.

Manly, Catherine A., and Ryan S. Wells. 2015. "Reporting the Use of Multiple Imputation for Missing Data in Higher Education Research." *Research in Higher Education* 56 (4): 397–409. doi:10.1007/s11162-014-9344-9.

Mau, Wei-Cheng J., and Jiaqi Li. 2018. "Factors Influencing STEM Career Aspirations of Underrepresented High School Students." *The Career Development Quarterly* 66 (3): 246–258. doi:10.1002/cdq.12146.

May, Gary S., and Daryl E. Chubin. 2003. "A Retrospective on Undergraduate Engineering Success for Underrepresented Minority Students." *Journal of Engineering Education* 92 (1): 27–39. doi:10.1002/j.2168-9830.2003.tb00735.x.

Moote, Julie, Louise Archer, Jennifer DeWitt, and Emily MacLeod. 2019. "Who Has High Science Capital? An Exploration of Emerging Patterns of Science Capital among Students Aged 17/18 in England." *Research Papers in Education* 1–21. doi:10.1080/02671522.2019.1678062.

Mujtaba, Tamjid, Richard Sheldrake, Michael J. Reiss, and Shirley Simon. 2018. "Students' Science Attitudes, Beliefs, and Context: Associations with Science and Chemistry Aspirations." *International Journal of Science Education* 40 (6): 644–667. doi:10.1080/09500693.2018.1433896.

Museus, Samuel D., Robert T. Palmer, Ryan J. Davis, and Dina C. Maramba. 2011. *Racial and Ethnic Minority Student Success in STEM Education: ASHE Higher Education Report*. Hoboken, NJ: John Wiley & Sons.

Mustafa, Mohanned, Khalid Arar, and Rassem Khamaisi. 2009. "Higher Education among Minorities: The Case of the Arab Minority in Israel." In *Arab Society Book*, edited by Rassem Khamaisi, 204–226. Bnei Brak: Hakibbutz Hameuchad - Sifriat Poalim.

Nasie, Meytal, Aurel Harrison Diamond, and Daniel Bar-Tal. 2016. "Young Children in Intractable Conflicts: The Israeli Case." *Personality and Social Psychology Review* 20 (4): 365–392. doi:10.1177/1088868315607800.

Nasser, Fadia, and Menucha Birenbaum. 2005. "Modeling Mathematics Achievement of Jewish and Arab Eighth Graders in Israel: The Effects of Learner-Related Variables." *Educational Research and Evaluation* 11 (3): 277–302. doi:10.1080/13803610500101108.

Roysircar, Gargi, John Carey, and Sorie Koroma. 2010. "Asian Indian College Students' Science and Math Preferences: Influences of Cultural Contexts." *Journal of Career Development* 36 (4): 324–347. doi:10.1177/0894845309345671.

Scheindlin, Dahlia. 2016. "Entrepreneurship and Arab citizens of Israel: A society ripe for change." Presented at: *MasarUp: The Council for Arab Entrepreneurship*. 23 March 2016. Tel Aviv, Israel.

Smooha, Sammy. 2016. *Index of Arab-Jewish Relations in Israel 2015*. Haifa: University of Haifa.

Syed, Moin, and Martin M. Chemers. 2011. "Ethnic Minorities and Women in STEM: Casting a Wide Net to Address a Persistent Social Problem." *Journal of Social Issues* 67 (3): 435–441. doi:10.1111/j.1540-4560.2011.01708.x.

Tzanakis, Michael. 2011. "Bourdieu's Social Reproduction Thesis and the Role of Cultural Capital in Educational Attainment: A Critical Review of Key Empirical Studies." *Educate* 11 (1): 76–90.

Wang, Xueli. 2013. "Why Students Choose STEM Majors: Motivation, High School Learning, and Postsecondary Context of Support." *American Educational Research Journal* 50 (5): 1081–1121. doi:10.3102/0002831213488622.

Wenner, George. 2003. "Comparing Poor, Minority Elementary Students' Interest and Background in Science with That of Their White, Affluent Peers." *Urban Education* 38 (2): 153–172. doi:10.1177/0042085902250483.

White, Ian R., Patrick Royston, and Angela M. Wood. 2011. "Multiple Imputation Using Chained Equations: Issues and Guidance for Practice." *Statistics in Medicine* 30 (4): 377–399. doi:10.1002/sim.4067.

Xie, Yu, Michael Fang, and Kimberlee Shauman. 2015. "STEM Education." *Annual Review of Sociology* 41 (1): 331–357. doi:10.1146/annurev-soc-071312-145659.

Appendix Table A1. Coefficients of regression of science education outcomes by individual and family characteristics: Sensitivity analyses including age

	Interest in science		Science self-efficacy		Science university aspirations	
Variable	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15
Individual characteristics						
Age	0.134	0.149	0.029	0.036	0.036	0.076
Female	–0.297*	–0.283*	–0.225*	–0.232**	0.054	–0.038
Religiosity	–0.026	–0.022	0.032	0.032	0.099	0.120
Happiness	0.110	0.110	0.051	0.051	0.168	0.162
Arab[a]	0.092	0.730	0.015	0.314	0.573**	2.386***
Minority salience	0.291**	0.298**	0.215**	0.219**	0.348**	0.362***
Social climate	0.179	0.180	0.241**	0.243**	0.085	0.084
Language	0.346**	0.345**	0.458***	0.454***	0.418**	0.427**
Social distance	–0.418***	–0.421***	–0.372***	–0.374***	–0.446***	–0.457***
Family characteristics						
Family income	–0.045	–0.009	0.048	0.047	0.052	0.253*
Scientist in family	–0.045	0.143	0.070*	0.127*	0.089	0.233**
Family income*Arab[a]		–0.053		0.001		–0.297*
Scientist in family*Arab[a]		–0.128		–0.085		–0.233**
Intercept	1.173	0.502	2.439	2.123	1.257	–0.643
N	380	380	380	380	380	380
R^2	0.102	0.108	0.155	0.159	0.170	0.195

*P < .1; **P < .05; ***P < .01.

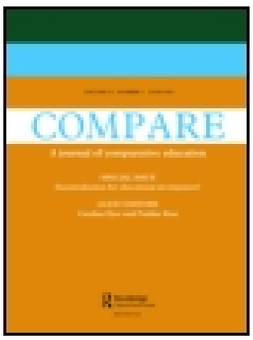
[a]Reference: Jewish-Israeli.

R^2 is the average over the 20 imputations.

CHAPTER 2

High School Students' Perceptions of Science and Attitudes Towards Intergroup Cooperation

Diamond, Aurel H. and Elyakim Kislev. 2020. "High School Students' Perceptions of Science and Attitudes Towards Intergroup Cooperation." *Compare: A Journal of Comparative and International Education*. doi: 10.1080/03057925.2020.1748494.



Routledge
Taylor & Francis Group

Compare: A Journal of Comparative and International Education

ISSN: 0305-7925 (Print) 1469-3623 (Online) Journal homepage: https://www.tandfonline.com/loi/ccom20

High school students' perceptions of science and attitudes towards intergroup cooperation

Aurel H. Diamond & Elyakim Kislev

To cite this article: Aurel H. Diamond & Elyakim Kislev (2020): High school students' perceptions of science and attitudes towards intergroup cooperation, Compare: A Journal of Comparative and International Education

To link to this article: https://doi.org/10.1080/03057925.2020.1748494

Published online: 29 Apr 2020.

COMPARE, 2020
https://doi.org/10.1080/03057925.2020.1748494

Routledge
Taylor & Francis Group

High school students' perceptions of science and attitudes towards intergroup cooperation

Aurel H. Diamond[a] and Elyakim Kislev[a,b]

[a]Federmann School of Public Policy, Hebrew University of Jerusalem, Jerusalem, Israel; [b]Harry S. Truman Research Institute for the Advancement of Peace, Hebrew University of Jerusalem, Jerusalem, Israel

ABSTRACT

Science education projects are being used to improve attitudes between conflicting groups, but it is not clear which aspects of science make it an effective agent for this purpose. This paper investigates how attitudes towards intergroup cooperation relate to different perceptions of science. Regression analyses are conducted on questionnaire data (N = 246) collected from Arab-Palestinian minority high school students in Israel, comparing students who identify primarily as Israeli, Palestinian, and pan-Arab. The analyses indicate that perceiving science as global and international is strongly associated with a preference for mixed work or study environments. The paper suggests that for many students, science and technology in Israel have become globalised and internationalised to the point that science education represents a distinct social space from mainstream Israeli society. By border-crossing into the science classroom, students enter a 'global space' wherein the challenges associated with minority status and poor minority–majority relations are less salient.

KEYWORDS

Globalisation; Israel; minorities; quantitative methods; science education

Introduction

Science, technology, engineering, and mathematics (STEM) education initiatives and projects are being used to foster peace and trust between conflicting groups and peoples. At the Arava Institute in Israel, projects in environmental science education have fostered friendships and positive relationships between Jordanian, Israeli, and Palestinian university students (Cohen 2005). In Jerusalem, more than 250 Israeli and Palestinian high school students go to annual computer programming summer camps, after which 82% of participants report a better understanding of people from the other nationality, and 95% report that they are willing to work with people from the other nationality (Middle East Entrepreneurs of Tomorrow 2020). Positive reports also emerge from the Tech2Peace project that runs computing and high-tech workshops for Israeli and Palestinian youth: participating students report on greater understanding of each other's social groups following the workshop (Rowley 2019). In medicinal sciences, Israeli and Palestinian students who worked together on a four-week research project demonstrated immediate improvements in attitudes towards intergroup cooperation (Sriharan et al. 2009), and

CONTACT Aurel H. Diamond aurel.diamond@mail.huji.ac.il Federmann School of Public Policy, Hebrew University of Jerusalem, Mount Scopus Campus, Jerusalem 9190501, Israel

built positive and meaningful relationships that lasted years after their cooperation (Martiniuk and Wires 2011). STEM education has also been employed as a platform for creating constructive dialogue between conflicting groups, and is reported as an effective agent for increasing confidence building and building cross-group friendships (Langer 2018).

While these studies and reports establish the potential role that STEM education can play in improving intergroup relations, they do not identify the aspects of STEM education that make it suitable for this purpose. In principle, one can argue that the STEM classroom consists of a unique space with its own culture, values, and context (Aikenhead 1996), and that this context is more availing to positive intergroup contact, particularly between majority and minority groups. Indeed, the examples given above show how the context of STEM can ostensibly satisfy many of the necessary criteria for positive intergroup contact (Forsyth 2009). For example, STEM may provide a context wherein conflicting individuals and groups have a more equal status as learners or doers of science. In addition, STEM presents a context wherein individuals cooperate and interact with each other to work towards a common or superordinate goal (Tobin 2016). Moreover, pre-existing tensions between individuals and groups may be less important in the context of STEM education (Skinner et al. 2005), thus creating an opportunity for improving intergroup relations.

Yet the mechanisms behind this relationship remain unclear. What are the characteristics of STEM education that help facilitate positive intergroup contact? This paper considers two possible answers: it could be that STEM provides a collaborative context, where there is an opportunity for diverse groups to work together on shared problems and projects. On the other hand, it is also possible that the nature of STEM education in general represents a global social context (Erduran and Dagher 2014; Pan 2010) that is more favourable for positive intergroup contact. Both explanations, however, present issues for minority students. In the former case, the underrepresentation of minorities in STEM may create challenges in perceiving equitable minority-majority collaboration. In the latter, the globality of STEM carries a Western bias (Siegel 2002) that may be less relatable for minority and indigenous students. Moreover, there are conflicting arguments regarding the conditions under which the global context may be empowering or threatening for minorities (Sassen and Van Roekel-Hughes 2008; Sharma and Sharma 2010). This raises important questions about whether and how STEM can reduce intergroup hostilities for minority students in particular.

This paper therefore investigates the impact of STEM education on intergroup relations by asking two questions. First, what is the connection between STEM education and intergroup relations? And second, which perceptions of STEM potentially contribute positively to this relationship? In particular, the paper asks how minority groups' willingness to integrate into a mixed work or study environment relates to whether they hold collaborative or global perceptions of STEM. By doing so, this paper aims to clarify which perceptions of STEM facilitate positive intergroup contact, and to discuss the potential impact of globalisation on minority students in the context of STEM education.

These questions will be examined in the context of Arab-Palestinian minority students in the Israeli high school system, comparing the attitudes for students who identify primarily as Israeli, Palestinian, and pan-Arab. As detailed below, the Israeli context provides a case of high minority-majority intergroup tensions and one where STEM-

based peace education programs have yielded positive results (for example, Cohen 2005; Sriharan et al. 2009). The Israeli case is thus demonstrative for the purposes of this study.

Perceptions of STEM and intergroup relations

The type of context that STEM provides for intergroup contact is a direct product of individual perceptions of STEM. Perceptions of science (or STEM), or indeed understandings of the nature of science, are developed throughout formal education (McComas 2017), and vary greatly between individuals and groups with diverging implications. For instance, different perceptions of science have been found to predict willingness to engage with science (Hurtado and López Cerezo 2012), support funding scientific projects (Muñoz, Moreno, and Luján 2012), and social and political attitudes (Snow and Dibner 2016).

To that end, and based on the existing evaluations of STEM-based peace and cooperation projects, the current study conjects that certain perceptions of STEM will be more availing to positive intergroup contact than others. In other words, this paper investigates how the different perceptions of STEM are leveraged to create STEM education that is more conducive to positive intergroup contact and improved intergroup relations. If particular perceptions of STEM education are found to reduce intergroup hostilities, they could then be emphasised in STEM education as a way of improving intergroup relations. This research considers two perceptions that are hypothesised directly facilitate positive intergroup contact in STEM, as below.

Collaborative perceptions of STEM education

One perception of STEM education that may facilitate positive intergroup attitudes has to do with the collaborative nature of the scientific process. Scientific ideas are developed and refined through cooperation between researchers and scientists. Indeed, it is widely acknowledged that STEM and the scientific process are highly collaborative, with students and teachers encountering scientific collaboration as a part of their STEM education from elementary school (Kaartinen and Kumpulainen 2002), and all the way through higher education (Ramirez, Pinedo, and Forster 2015). Here, the collaborative nature of STEM both facilitates and expects cooperation between people from different social groups.

The collaborative aspect of STEM education also provides students with examples of positive intergroup cooperation. Indeed, in the framework of problem-solving of shared issues in science (Tobin 2016), STEM curricula can include examples of people from different social groups and nationalities cooperating with one another (Fedoroff 2009), providing students with examples and role models for intergroup interactions. Since perceiving or imagining positive intergroup contact is sufficient for improving attitudes (Miles and Crisp 2014), the examples of cooperation given in STEM education arguably contribute to the potential positive effect here.

More directly, and in addition to learning about collaboration, lessons in STEM frequently require students to participate in cooperative learning amongst themselves (Lin 2006). Particularly for minorities who continue in STEM education late into high school or university, STEM education often represents a significant shared space where

they have meaningful encounters with majority-group members for the first time. In addition, STEM can provide the opportunities for individuals from different social groups to cooperate on shared issues that are common to them or to their communities (Sadler 2009). Indeed, STEM education can facilitate students' participation in community life and thus lead to intergroup contact and cooperation (Roth and Lee 2004). In particular, previous research on intergroup collaborative projects in STEM education shows how the context of STEM can reduce or eliminate the sense of competition between social groups (Martiniuk and Wires 2011; Langer 2018), which in turn improves the potential impact of intergroup cooperation.

It is therefore possible to argue that collaborative nature of STEM education may contribute to reduced intergroup hostilities, but with one caveat: minority groups are frequently underrepresented in STEM (Gonzalez and Kuenzi 2012). The collaborative nature of STEM may therefore be less impactful for individuals who do not identify members of their own group participating in said collaboration.

Global perceptions of STEM education

STEM education can be characterised by its relatively globalised nature. Indeed, scholars have framed science in particular as a global cultural framework of understanding (Drori et al. 2003). Particularly within STEM education, globalisation impacts the social context in at least five ways (Chiu and Duit 2011). First, schools are increasingly recognising the need to prepare their students for a more global world that may command maintaining international contacts, possessing a near-native mastery of a second or third language, or having the technological capabilities to access the global sphere (Gorski 2009). This may include meta-cultural programming languages, or specifically the English language, which although far from being neutral, can provide different social groups with a shared language that provides them with a relatively more equal status (i.e. if members of both groups are speaking English or using meta-cultural vocabulary as a second or third language: Ala-Mutka et al. 2009). Second, technological advances have resulted in children learning in global environments through the use of digital technology and devices, forcing schools and educators to quickly adapt to a more technologically- and globally oriented school environment (Nachmias, Mioduser, and Forkosh-Baruch 2010). Third, advanced skills and specialist knowledge, such as that in fields of STEM, are required in order to be a part of the 'knowledge society' that is driven by the needs of the global economy (Stromquist 2002). Fourth, increasing challenges faced by global socio-scientific issues such as climate change, antibiotic resistance, or internet security (amongst othes: Friedrichsen et al. 2016) mean that scientific literacy has become an important part of global citizenship (Tobin 2016). Fifth, the globalisation of STEM education (McComas 2014) has led to internationalised standards and values in teaching STEM, as evident through the existence of international testing such as TIMMS and PISA, and guidelines set by international bodies such as UNESCO (Tsui 2007). The STEM classroom is considered here as a *global space*, wherein members of different social groups: (i) have relatively equal status (as students learning similar or identical STEM curricula, or using the same STEM-related languages and vocabulary); (ii) work towards common goals (i.e. addressing socio-scientific issues, or contributing to knowledge society); (iii) cooperate with one another, or are exposed to cooperation through

technological publics; and (iv) are supported in their learning personally (through their teachers) and institutionally (through international educational bodies). These characteristics of the STEM classroom ostensibly satisfy the conditions for positive intergroup contact (Forsyth 2009). As such, the social context of the STEM classroom, as a global space, is hypothesised to be supportive of positive intergroup contact.

Two important considerations must be made when evaluating the STEM classroom as a global space. First, this paper does not directly address the extent to which STEM is uniquely positioned to act as a global space. In the context of rapidly globalising education, other subject classrooms could also ostensibly form global spaces that facilitate positive intergroup relations (e.g. music education: Sandoval 2016; citizenship education: Brown and John Morgan 2008). Yet studies in peace education outside of STEM indicate how the power relations that exist in humanities, social sciences, arts, and languages are easily replicated even in seemingly global contexts. Majority-group students are advantaged since they are closer to the hegemonic culture of these subjects, thus creating challenges for creating equal status between members of different social groups (for example, in the instruction of the English language: Awayed-Bishara 2015). The theoretical focus of this study is therefore the extent to which global spaces can facilitate positive intergroup relations and the extent to which the STEM classroom can act as such a space.

Second, the collaborative and global aspects of STEM education are not mutually exclusive. Indeed, considering the above argument and the definition of processes of globalisation, it is apparent that collaboration is a part of the globalisation of STEM. The globalisation of STEM and STEM education implies the cooperation of different groups. In other words, collaboration is a necessary – but not sufficient – condition for the globalisation of STEM, and while globalisation implies collaboration, the converse is not necessarily true.

The Israeli context

This study focuses on data from Israel, where 76% of citizens belong to the Jewish majority, and approximately 21% to the Arab-Palestinian minority[1] (Central Bureau of Statistics 2017). The vast majority of Jewish Israelis attend Hebrew-language schools, while Arab-Palestinian citizens attend Arabic-language schools. As a result, most students do not encounter a mixed Jewish/Arab-Palestinian learning environment during mandatory education, and the education system serves as an agent for maintaining and increasing social distance and Palestinian-Arab otherness in Israel (Agbaria 2018). In addition, and due to socioeconomic disparities between Jewish and Arab-Palestinian citizens (Al-Haj 2012) and government investment favour Hebrew-language schools (Arar and Haj-Yehia 2016), this de-facto separation leads to large majority-minority student educational gaps. For example, the latest PISA data indicate 111, 116, and 144-point gaps between Arab-Palestinian and Jewish students in mathematics, science, and reading, respectively (Bratslavsky, Lipfshtat, and Hilu 2019). These disparities and effective separation between Arab-Palestinian and Jewish students have been facilitated by a lack of effective government policy to improve equality (Jabareen and Agbaria 2011), and by language gaps. Indeed, Jewish-Israelis typically do not learn functional Arabic in

school, and less than 10% of Jewish-Israelis can speak Arabic. This is compared to 88% of Arab-Palestinians who have some command of Hebrew (Shenhav et al. 2015).

In addition to educational disparities, majority–minority relations in Israel are very tense, with the Jewish/Arab-Palestinian schism being recorded as particularly wide (Sachs and Reeves 2017). Intergroup relations in Israel are complicated by the Israeli-Palestinian conflict, which deepens divisions between Jews and Arab-Palestinians from a very young age (Nasie, Diamond, and Bar-Tal 2016). As such, the Israeli case can provide insights on the relationship between STEM education and positive intergroup contact where majority–minority relations are particularly challenging.

Border crossing into STEM education in Israel

How and why have previous Jewish/Arab-Palestinian STEM education projects improved various measures of intergroup relations (for example, Sriharan et al. 2009; Martiniuk and Wires 2011), despite the apparent challenges? When students enter the context of STEM education, the literature reviewed above points at two possible perceptions of STEM that may help. A collaborative perception of STEM may help students to perceive and imagine Jews and Arab-Palestinians working together, where Jewish/Arab-Palestinian cooperation is otherwise elusive. After perceiving or experiencing Jewish/Arab-Palestinian cooperation, many research projects indicate that intergroup attitudes are expected to improve (see, for example, Berger et al. 2016).

By comparison, a global perception of STEM may provide a context where minority status and the context of conflict play smaller roles in intergroup relations. By entering the perceived-global space of STEM education, students enter a context where intergroup relations are more positive. In addition, global spaces can in some circumstances be empowering for minority groups (Sassen and Van Roekel-Hughes 2008), thus creating a more equitable backdrop for minority–majority interactions. This approach of 'minority salience' in different spaces has been adopted to study the experiences of women working in science. For example, the gender disadvantage of American women researching in international science careers decreases since they are perceived first as American, and only second as women (Zippel 2017). While the gendered challenges of being a woman in science are still apparent, they become displaced and less central since the prestige of being American takes precedent. This paper conjects that the same may be the true for minority students in STEM education, who in the global space of STEM may see themselves primarily as learners or doers of science (Aschbacher, Li, and Roth 2010), thus reducing the salience and impact of minority status in interactions with the outgroup.

Thus in the current study, border-crossing into STEM education (Aikenhead 1996) may in fact represent border-crossing into a global space, whose social order is more conducive to positive intergroup contact. It is possible that Arab-Palestinian minority status and the context of poor Jewish/Arab–Palestinian relations, and the Israeli-Palestinian conflict, are less salient in the context of global STEM, and as such, the globality offered in STEM education can provide a platform for improving intergroup attitudes. In other words, this paper suggests that by perceiving STEM as global, students may enter a global space and thus reduce the negative impact of the national-social context.

The impact of global spaces in Israel is potentially enlarged by racism and discrimination against minorities in Israel. Arab-Palestinians in Israel report high levels of alienation from Jewish-Israeli society (Smooha 2016), that are fuelled by everyday racism, as well as institutional discrimination and legislative practices that disadvantage or exclude minorities (Al-Haj 2012). Here, global spaces may assist in reducing the salience of alienation and discrimination, as well as that of the Israel-Palestinian conflict.

Method, data, and variables

The study is theoretically interested in the potential impact of global spaces on minority students and as such focusses on data from minority students only. Purpose-designed questionnaire (N = 246) that was distributed to Arab-Palestinian high school students studying at five different schools in the Israeli city of Jaffa in 2017 and 2018. Participants in the study were in the 10^{th}, 11^{th}, or 12^{th} grade (aged 15–18) at the time of data collection. This demographic was chosen since by this age, the students have already had significant exposure to STEM in mandatory education, and unlike university students or adult STEM professionals, there is no selection effect regarding socioeconomic background, educational achievement, or interest in STEM. The questionnaire was explained to the students in Arabic at the beginning of a lesson, and students were subsequently invited to complete the questionnaire, which was printed and distributed to the whole class. While participation was emphasised as voluntary, the vast majority of students (92%) returned questionnaires.

At the request of the school teachers, the questionnaire was administered in Hebrew. Although the students' native language is invariably Arabic, the teachers explained that responding to a questionnaire would be simpler in Hebrew since the students in Tel Aviv-Jaffa – where less than 5% of residents are Arab-Palestinians – can frequently read and write Hebrew just as well (or even better) than Arabic. Since this may create methodological issues, a pilot phase (N = 103) was conducted, where students were asked in Arabic by their teachers whether they would prefer to answer in Arabic or Hebrew, as it would be preferable to allow participants to choose which language they want to answer in (Cohen, Manion, and Morrison 2013). Only four out of 103 indicated preference for Arabic, and as such the questionnaire, though administered and explained in Arabic, was in Hebrew.

In order to answer the questions posed here, multiple regression analyses were conducted on the questionnaire data. The dependent variable in this study is a measure of the willingness to work with the outgroup, which is indicated by the questionnaire: 'I would prefer to work and study in a homogeneous environment (i.e. only Arab-Palestinians), compared to a mixed Jewish-Arab environment'. The regression analyses made use of the level of agreement with this statement, which was given by a five-point Likert scale.

The predominant independent variables used in the regression analyses represent the various perceptions of STEM. The first of these independent variables was given by the questionnaire item 'I find STEM interesting'. This item was included in the regression analysis as a way of representing interest in and understanding of STEM in general, before being decomposed into global and collaborative perceptions, respectively.

The analysis also required two independent variables used to represent global and collaborative views of STEM. Collaborative perceptions of STEM were measured by agreement with the statement: 'There is cooperation between different groups of people in STEM in Israel'. Factor analysis was used to create a composite variable for global perceptions of STEM, using two items: 'Work and studies in STEM in Israel happen in a global and international environment'; and 'Work and studies in STEM in general provide opportunities to integrate into a global and international environment'. Results of the Kaiser-Meyer-Olkin test (a = 0.6284) support the validity of this variable, but for completeness, sensitivity analyses were conducted to regress each component separately in this paper, and results were similar (see Appendix Table A1).

In addition, the regressions include demographic and socioeconomic variables that may account for intervening mechanisms that could help predict individuals' willingness to work, study, or cooperate with the outgroup. These included: sex (a dummy variable), age, family income, presence of a STEM role model in the family, perception of equality in Israel, religious observance, and fluency in Hebrew. An item that measured feelings of being a minority was also included in order to account for the salience of minority status. In addition, the regression analyses made use of the answer to the question about identity, where respondents were asked to identify as primarily Israeli, primarily Palestinian, or primarily Arab. Identity was included as a dummy variable, since identifying primarily as Israeli may reduce the social distance from Jewish Israelis, thus increasing willingness to study and work together. Similarly, identifying as Palestinian or Arab invariably represents increased social distance in this instance.

Not all of the questionnaires returned were fully complete. In order to allow for the use of the full data set, multiple chained imputations were completed on missing data items (Manly and Wells 2015). On the primary dependent and independent variables, 3.75% of the answers were incomplete, so the number of imputations was set at 20 in order to ensure sufficiently reliable imputations (White, Royston, and Wood 2011). In addition, sensitivity analyses were conducted with only the complete data entries, and also to compare the outcome for truncated and non-truncated imputations (Rodwell et al. 2014). Results in all of the cases were similar, so the non-truncated multiple chained imputations were used.

Findings

Table 1 provides a descriptive overview of the population sampled in the study, presented by their primary identity: Israeli, Arab, and Palestinian-identifying participants represent approximately 42%, 22% and 35% of the sample, respectively. The descriptive statistics suggest that among students in the sample, the social distance from Israeli society and the Jewish majority is smaller among those who identify primarily as Israeli, and larger for students who identify primarily as Arab or Palestinian. For example, in measures such as feeling like a minority and perceived discrimination, Palestinian- and Arab-identifying respondents score higher. Palestinian- and Arab-identifying respondents are also less likely to agree that minority citizens are treated equally, and more likely to prefer homogeneous work and study environments. It is worth noting that language is likely to play a role here. Indeed, Israeli-identifying students have a higher self-rated fluency in Hebrew. These results are consistent with recent studies surveying Jewish/Arab–

Table 1. Summary of data according to primary identity.

Variable	Total Sample	Israeli	Arab	Palestinian
N	246	104	55	87
% total	100	42.3	22.4	35.4
% female	54	52.9	43.6	62.1
Mean age	15.19	15.12	15.31	15.22
Mean perceived family income (1–5)	3.22	3.13	3.25	3.33
Mean family role model (1–5)	3.16	3.24	3.14	3.07
Mean feel like minority (1–5)	3.04	2.80	3.13	3.27
Mean perceived discrimination (1–5)	2.82	2.49	2.94	3.16
Mean fluent in Hebrew (1–5)	4.07	4.33	3.96	3.84
Mean fluent in English (1–5)	3.62	3.73	3.37	3.63
Mean happiness (1–5)	4.16	4.00	4.32	4.24
Mean equal citizens (1–5)	2.48	2.71	2.48	2.22
Mean degree of religiosity (1–4)	2.12	1.91	1.81	2.51
Mean interest in STEM (1–5)	3.63	3.80	3.39	3.63
Mean STEM is collaborative (1–5)	3.65	3.76	3.28	3.73
Mean global (Israeli STEM) (1–5)	3.47	3.57	3.22	3.48
Mean global (STEM in general) (1–5)	3.67	3.72	3.54	3.68
Mean preference to work in homogeneous environment (1–5)	2.04	1.76	2.28	2.23

Palestinian relations in Israel (Smooha 2016) that report on Arab-Palestinian citizens' sense of belonging and relations to the Jewish majority in Israel. The descriptive statistics also indicate differences between Israeli, Arab, and Palestinian-identifying students when it comes to the perceptions of and interest in STEM. Israeli-identifying students on the whole perceive higher levels of globality and collaboration in STEM and are on average more interested in STEM. The exception is Jewish/Arab-Palestinian collaboration in STEM, where the three groups scored similarly.

Descriptive statistics also reveal some sex differences, in Table 2. Female respondents recorded higher levels of social distance, as measured by the mean reported discrimination, feeling like a minority, perception of equal treatment, and preference to work in a homogeneous environment. This can be attributed to the additional discrimination and challenges that minority women and girls face in general, and particularly in STEM (Weisgram and Bigler 2007).

Table 2. Summary of data according to sex.

Variable	Total Sample	Male	Female
N	246	113	133
% total	100	46	54
Mean age	15.19	15.20	15.18
Mean perceived family income (1–5)	3.22	3.29	3.15
Mean family role model (1–5)	3.16	3.24	3.07
Mean feel like minority (1–5)	3.04	2.90	3.16
Mean perceived discrimination (1–5)	2.82	2.78	2.86
Mean fluent in Hebrew (1–5)	4.07	4.08	4.07
Mean fluent in English (1–5)	3.62	3.71	3.51
Mean happiness (1–5)	4.16	4.22	4.12
Mean equal citizens (1–5)	2.48	2.62	2.40
Mean degree of religiosity (1–4)	2.12	2.20	2.05
Mean interest in STEM (1–5)	3.63	3.67	3.60
Mean STEM is collaborative (1–5)	3.65	3.58	3.50
Mean global (Israeli STEM) (1–5)	3.47	3.48	3.45
Mean global (STEM in general) (1–5)	3.67	3.62	3.70
Mean preference to work in homogeneous environment (1–5)	2.04	2.20	1.91

Table 3. Coefficients of multiple regression of preference to work and study in a homogeneous environment.

Variable	Model 1	Model 2
Individual Characteristics		
Female	−0.335**	−0.385**
Age	−0.131	−0.080
Family income	−0.072	−0.077
Role model	0.033	0.038
Feel like minority	0.180***	0.208***
Fluent in Hebrew	−0.209***	−0.206***
Happiness	−0.112	−0.077
Equal citizens	−0.034	−0.045
Degree of religiosity	0.160	0.133
Identity[a]		0.284
Arab	0.355*	
Palestinian	0.240	0.230
Interest in STEM		−0.177**
Intercept	4.691*	4.439**
N	246	246
R^2	0.179	0.212

*P <.1 **P <.05 ***P <.01
[a]Reference: Israeli-identifying.
R^2 is the average over the 20 imputations.

Table 4. Coefficients of multiple regression of preference to work and study in a homogeneous environment.

Variable	Model 3	Model 4	Model 5
Individual Characteristics			
Female	−0.344**	−0.325**	−0.359**
Age	−0.033	−0.112	−0.033
Family income	−0.040	−0.069	−0.044
Role model	0.045	0.053	0.038
Feel like minority	0.213***	0.191***	0.211***
Fluent in Hebrew	−0.232***	−0.193**	−0.247***
Happiness	−0.082	−0.089	−0.086
Equal citizens	−0.043	−0.030	−0.051
Degree of religiosity	0.133	0.140	0.144
Identity[a]			
Arab	0.276	0.306	0.264
Palestinian	0.175	0.246	0.163
Perception of STEM			
Global	−0.245**		−0.259**
Collaborative		−0.112	0.079
Intercept	4.384	4.581**	3.752
N	246	246	246
R^2	0.212	0.187	0.216

*P <.1 **P <.05 ***P <.01
[a]Reference: Israeli-identifying.
R^2 is the average over the 20 imputations.

Tables 3 and 4 present the coefficients of multiple regression analyses of preference to work and study in a homogeneous environment. Thus, a negative and significant coefficient in the table indicates higher readiness to work and study in a mixed environment, which in this context can be understood to refer to as integration with Jewish Israelis. Similarly, a positive and significant coefficient in the table indicates a preference for homogeneous work and study environments.

Model 1 in Table 3 is included as a base model, and thus has no variables that relate to the characteristics of STEM. This model thus shows the relationship between various individual and demographic characteristics and the preference for homogeneous work or study environments. In this base model, and indeed in the rest of the models in Tables 3 and 4, some of the individual and demographic characteristics are consistently significantly associated with willingness to work and study in a mixed environment. Indeed, being female is more highly associated with preferring a mixed environment in each of the models presented. These are consistent with studies showing that men and boys react more strongly and negatively than women to intergroup threat (Vugt, De Cremer, and Janssen 2007). In addition, fluency in Hebrew is strongly associated in every model preferring mixed environments. In the sensitivity analysis, fluency in English was not found to be significant. This result highlights the importance of the native language for the integration of minority and majority groups in the Israeli context, and the potential of STEM to act as a language bridge where English might be less effective.

The individual and demographic characteristics also highlight the potential relationship between social distance and minority salience in preference for mixed or homogeneous environments. Across all of the models, feeling more strongly like a minority is significantly associated with a higher preference for homogeneous work or study environments. These results may reflect the role that intergroup threat can play in willingness to integrate with the majority group (Stephan and Lausanne Renfro 2002), particularly within the context of education (Ogbu 2008). Similar results (available upon request) are apparent regarding perceived discrimination. In other words, respondents who feel strongly like a minority and report higher levels of discrimination are more likely to prefer a homogenous environment, which may be perceived as more supportive and less discriminatory. It is worth noting here that for the most part, identifying as primarily Arab or Palestinian does not produce significantly different to identifying as Israeli. This could suggest that for Arab-Palestinian students, identifying as Israeli does not reduce the social distance from Jewish Israelis, or change the social context of Arab-Palestinian and Jewish Israelis working together.

Model 2 in Table 3 regresses the preference to work and study in a homogeneous environment on students' general interest in STEM variable. This variable is included in order to account for the potential relationship between STEM and intergroup attitudes without breaking STEM up into various components and characteristics. The relationship here is negative and significant, indicating a relationship between readiness to work and study in a mixed environment, and being interested in STEM in general. The question remains which perception of STEM explains this relationship.

Accordingly, Table 4 regresses the preference to work and study in a homogeneous environment on global and collaborative perceptions of STEM education. Models 3 and 4 compare the preference to work and study in a homogeneous environment with global and collaborative perceptions of STEM, respectively. In Model 3, the coefficient for the global variable shows a significant negative relationship between perceiving STEM as global and preference for homogeneous work and study environments. This model therefore gives the first indication in this study that the global perception of the STEM education space may be helpful in improving minority students' willingness to work, study, and cooperate with the outgroup. At the same time, in Model 4, there appears to be no significant relationship between perceiving STEM as collaborative and preference to

work in a mixed or homogeneous environment. These models therefore highlight an important difference between collaborative and global perceptions of STEM education in facilitating positive intergroup contact: while global perceptions of STEM are positively associated with a positive impact on this measure of intergroup relations, collaborative perceptions display no apparent effect. These models therefore point at a potential advantage of global spaces over collaborative spaces in this respect.

For reference and comparison, Model 5 includes both measured perceptions of STEM. The results again show a significant negative relationship between perceiving STEM as global and preference for homogeneous work and study environment, while no such relationship was found with perceiving collaboration.

Discussion and conclusion

This research was motivated by the need to understand how and why STEM education can be an effective tool for improving intergroup relations. Specifically, this paper identified global and collaborative perceptions of STEM education, and tested the relationship between perceiving these two characteristics and preference for mixed or homogeneous work and study environments.

Two main findings emerge from this study. First, there is a clear negative relationship between general interest in STEM and preference for homogeneous work and study environments. In the context of this study, and for the surveyed minority students in Israel, there is an apparent relationship between an interest and STEM and readiness to work or study with the majority group; in this case, Israeli Jews. This indicates the potential of STEM education for improving intergroup cooperation between different groups in Israel, and is consistent with the evaluations of the many programs that bring Jewish and Arab-Palestinian citizens of together through STEM education initiatives. However, the majority of existing studies document cooperation through STEM education at the postsecondary level (for instance: Sriharan et al. 2009; Skinner et al. 2005; Martiniuk and Wires 2011). This result therefore provides new evidence that this relationship is also relevant at the high school level. Moreover, and in answering the first question posed by this paper, the results offer empirical evidence of the relationship between STEM education to intergroup attitudes. In order to understand the mechanisms behind this relationship, this paper considered different characteristics of STEM education separately.

Indeed, the second principal finding comes from considering the impact of different possible perceptions of STEM. Here, the results show a significant negative relationship between global perceptions of STEM education and preference for homogeneous work and study environments, with no such significant effect for collaborative perceptions. In other words, the results indicate that global perceptions of STEM are positively associated with better intergroup relations, while the collaborative perceptions of STEM appear to be insignificant. Thus, in answering the second question posed by this paper, the relationship between STEM education and improved intergroup attitudes lies within the global aspect of STEM. This finding provides three potential theoretical insights.

First, and regarding the potential of global spaces, these findings could be supported by the idea that the global sphere and global spaces can be, in some circumstances, empowering or more equitable for minorities (Sassen and Van Roekel-Hughes 2008;

Sassen 2007). Indeed, the idea that social order of global spaces may be availing to positive intergroup contact offers a feasible mechanism that could help to explain the relationship between perceived globalisation and readiness to integrate with others, as shown in this study. However, this explanation still does not account for the extensive research indicating how globalisation can pose identity-threats and be detrimental to intergroup relations (Sharma and Sharma 2010). There is therefore a need to consider the nuances of the conditions under which global spaces can be empowering for minority students, and for what purposes.

To that end, it is instructive to consider the national context of the current research. In Israel, where intergroup threat is high and majority–minority relations are tense, it could be that the global context of STEM education offers a space where the salience of minority status, the Israeli-Palestinian conflict, and discriminative practices take a less central role. Indeed, the results indicate that the salience of minority status is consistently and significantly associated with preference for homogeneous work environments. Therefore, reducing the salience of this category – by entering a global space – is expected to reduce the significance of this relationship. This mechanism of minority salience would help explain why there is a relationship between perceiving globalisation and readiness to work or study with the outgroup, since in the Israeli context, willingness to engage in intergroup cooperation is generally low (Smooha 2016). This minority salience mechanism would reflect research conducted on the impact of gender salience in global STEM (Zippel 2017) and work environments (Ridgeway and Smith-Lovin 1999), and is therefore deserving of further investigation. In particular, while the results here indicate the potential advantages of global spaces for fostering positive intergroup relations, they do not necessarily preclude the possibility that global spaces may still be threatening to minority groups, in other contexts. This would also need to be the subject of further research.

The second theoretical insight regards the nature of STEM education as a bridge for facilitating positive intergroup contact; these findings provide insight into how and why STEM education has succeeded in this manner. When minority students enter the sub-culture of STEM education, the results suggest that in some instances, students 'border-cross' into a global space, and that the nature and social order of this space is connected to improved intergroup relations. The results therefore build on Aikenhead's (1996) concept of border-crossing into a sub-culture of STEM education by conceptualising the global aspects of this sub-culture, and their potential impacts on minority students and intergroup relations.

The third insight from these findings comes from considering the non-significance of the collaborative perceptions of STEM education in predicting preference for homogenous or mixed environments. It is widely accepted that seeing or perceiving examples of intergroup cooperation or collaboration is generally associated with more prosocial attitudes towards the outgroup, and while perceiving positive intergroup contact is often a necessary condition for improving relations, it is not intrinsically sufficient (Forsyth 2009). Therefore, and since no significant relationship was found between perceiving collaboration and readiness for intergroup contact in this study, perceiving collaboration in this context may not sufficient for improving attitudes towards the outgroup. Perceiving globalisation, on the other hand, is sufficient.

The lack of sufficiency of perceiving collaboration for improving intergroup attitudes might be explained by studies indicating that perceiving intergroup cooperation, in some instances, has a deterrent effect since majority–minority interactions may be perceived as undesirable or threatening (for example, in Israel: Ron et al. 2017; and in Europe: Bansak, Hainmueller, and Hangartner 2016). Indeed, the context within which the interactions take place plays a significant role in predicting the outcome of intergroup contact. The findings presented here suggest that a global space or context is more effective than a space that is simply perceived as collaborative.

These insights, however, are based on the analyses of data coming from minority students only. While the theoretical intention of the study – to investigate the impact of global spaces on minorities in the context of intergroup relations – led to the choice of research participants, it creates an inherent limitation by placing the onus of intergroup relations on the minority group. Future studies will benefit from comparing data from majority and minority students.

Nonetheless, and following this discussion, it is possible to consider why STEM may be particularly advantageous for facilitating positive intergroup contact: the globalisation of STEM education (McComas 2014; Chiu and Duit 2011) facilitates the creation of a global space, which arguably facilitates positive intergroup contact. While STEM carries western cultural bias that may disadvantage minority students (Siegel 2002), the results from this study indicate that this does not preclude a significant relationship between the context of global STEM and improved intergroup relations. In order to explore the extent to which, how, and why the globalisation of STEM reduces impact of western cultural bias here, further studies may compare the relationships between global spaces and intergroup relations in other school subjects. This way, it will be possible to consider why STEM may be more advantageous than English education (Awayed-Bishara 2015), music education (Sandoval 2016), citizenship education (Brown and John Morgan 2008), or other subjects in improving intergroup relations.

Finally, there are potential practical implications of the findings. The questions posed by this paper were motivated by the successes of STEM education programs that have succeeded in improving intergroup attitudes. Thus, by shedding light on the possible mechanisms behind this relationship, it is possible to speculate how to effectively design such programs. The above arguments suggest that successful programming offers STEM education as a global space for interactions between minority and majority students, and that this space may be intrinsically effective at facilitating positive intergroup encounters, since the social order of a global space can be empowering for minority students. In the Israeli case, the source of this 'empowerment' is ostensibly connected to the distinction between the context of mainstream society in general and the STEM global space, wherein Arab-Palestinian minorities expect and confront less racism and discrimination, especially in comparison to the Israeli national context. Accordingly, successful programmes should aim to provide a global space for said interactions, which can be done by highlighting the global nature of STEM and its distinction from other social spaces. Existing studies encourage the inclusion of teaching about the nature of STEM within school curricula (McComas 2017); this paper demonstrates a potential benefit about highlighting the nature of STEM in peace initiatives. To that end, existing STEM-based peace initiatives (e.g. Middle East Entrepreneurs of Tomorrow 2020; Rowley 2019) attribute their success to the creation of a 'special' or 'unique' context for intergroup contact. The arguments presented here suggest that said context may be global.

Note

1. The remaining citizens are classified as 'others', including Christian and Muslim non-Arabs, and individuals of Jewish ancestry who are not recognised by the Ministry of Interior as Jews.

Acknowledgments

The authors would like to thank the Truman Research Institute, PresenTense Israel, and the Center for the Study of Multiculturalism and Diversity at the Hebrew University of Jerusalem for continued support throughout the duration of this research. Aurel H. Diamond is grateful for a Doctoral Fellowship from the Israel Institute, and for a Doctoral Scholarship awarded by the Federmann School for Public Policy at the Hebrew University of Jerusalem.

Disclosure statement

The authors declare no potential conflicts of interest in the data collection, analysis, and writing of this research article.

Funding

This work was supported by a Doctoral Fellowship from the Israel Institute under grant numbers GL20314 and GL20475, awarded to Aurel H. Diamond.

ORCID

Aurel H. Diamond http://orcid.org/0000-0001-6038-186X

References

Agbaria, A. K. 2018. "The 'Right' Education in Israel: Segregation, Religious Ethnonationalism, and Depoliticized Professionalism." *Critical Studies in Education* 59 (1): 18–34. doi:10.1080/17508487.2016.1185642.

Aikenhead, G. S. 1996. "Science Education: Border Crossing into the Subculture of Science." *Studies in Science Education* 27 (1): 1–52. doi:10.1080/03057269608560077.

Ala-Mutka, K., D. Broster, R. Cachia, C. Centeno, C. Feijóo, A. Haché, S. Kluzer, S. Lindmark, W. Lusoli, and G. Misuraca. 2009. "The Impact of Social Computing on the EU Information Society and Economy." *JRC Scientific and EU Science Hub.*

Al-Haj, M. 2012. *Education, Empowerment, and Control: The Case of the Arabs in Israel*. Albany, NY: Suny Press.

Arar, K., and K. Haj-Yehia. 2016. *Higher Education and the Palestinian Arab Minority in Israel*. Basingstoke: Palgrave Macmillan.

Aschbacher, P. R., E. Li, and E. J. Roth. 2010. "Is Science Me? High School Students' Identities, Participation and Aspirations in Science, Engineering, and Medicine." *Journal of Research in Science Teaching* 47 (5): 564–582. doi:10.1002/tea.20353.

Awayed-Bishara, M. 2015. "Analyzing the Cultural Content of Materials Used for Teaching English to High School Speakers of Arabic in Israel." *Discourse & Society* 26 (5): 517–542. doi:10.1177/0957926515581154.

Bansak, K., J. Hainmueller, and D. Hangartner. 2016. "How Economic, Humanitarian, and Religious Concerns Shape European Attitudes toward Asylum Seekers." *Science* 354 (6309): 217–222. doi:10.1126/science.aag2147.

Berger, R., J. Benatov, H. Abu-Raiya, and C. T. Tadmor. 2016. "Reducing Prejudice and Promoting Positive Intergroup Attitudes among Elementary-school Children in the Context of the Israeli–Palestinian Conflict." *Journal of School Psychology* 57: 53–72. doi:10.1016/j.jsp.2016.04.003.

Bratslavsky, R., N. Lipfshtat, and G. Hilu. 2019. "PISA 2018: Israel." National Authority for Learning and Assessment in Education (In Hebrew). Israel: Israeli Ministry of Education.

Brown, E. J., and W. John Morgan. 2008. "A Culture of Peace via Global Citizenship Education." *Peace Review* 20 (3): 283–291. doi:10.1080/10402650802330089.

Central Bureau of Statistics. 2017. *Statistical Abstract of Israel*. Jerusalem, Israel: Central Bureau of Statistics.

Chiu, M.-H., and R. Duit. 2011. "Globalization: Science Education from an International Perspective." *Journal of Research in Science Teaching* 48 (6): 553–566. doi:10.1002/tea.20427.

Cohen, L., L. Manion, and K. Morrison. 2013. *Research Methods in Education*. London: Routledge.

Cohen, M. M. 2005. "The Arava Institute for Environmental Studies: Nature Knows No Borders." *Palestine-Israel Journal of Politics, Economics, and Culture* 12/13 (4): 52–54.

Drori, G. S., J. W. Meyer, F. O. Ramirez, and E. Schoffer. 2003. *Science in the Modern World Polity: Institutionalization and Globalization*. Stanford, CA: Stanford University Press.

Erduran, S., and Z. R. Dagher. 2014. "Reconceptualizing Nature of Science for Science Education." In *Reconceptualizing the Nature of Science for Science Education: Scientific Knowledge, Practices and Other Family Categories*, edited by S. Erduran, and Z. R. Dagher, 1–18. Dordrecht: Springer Netherlands.

Fedoroff, N. V. 2009. "Science Diplomacy in the 21st Century." *Cell* 136 (1): 9–11. doi:10.1016/j.cell.2008.12.030.

Forsyth, D. R. 2009. *Group Dynamics*. Boston, MA: Cengage Learning.

Friedrichsen, P. J., T. D. Sadler, K. Graham, and P. Brown. 2016. "Design of a Socio-scientific Issue Curriculum Unit: Antibiotic Resistance, Natural Selection, and Modeling." *International Journal of Designs for Learning* 7 (1). doi:10.14434/ijdl.v7i1.19325.

Gonzalez, H. B., and J. J. Kuenzi. 2012. *Science, Technology, Engineering, and Mathematics (STEM) Education: A Primer*. Washington, DC: Congressional Research Service.

Gorski, P. C. 2009. "Insisting on Digital Equity: Reframing the Dominant Discourse on Multicultural Education and Technology." *Urban Education* 44 (3): 348–364. doi:10.1177/0042085908318712.

Hurtado, M. C., and J. A. López Cerezo. 2012. "Political Dimensions of Scientific Culture: Highlights from the Ibero-American Survey on the Social Perception of Science and Scientific Culture." *Public Understanding of Science* 21 (3): 369–384. doi:10.1177/0963662510373871.

Jabareen, Y. T., and A. K. Agbaria. 2011. *Education on Hold: Israeli Government Policy and Civil Society Initiatives to Improve Arab Education in Israel*. Nazareth, Israel: Dirasat, Arab Center for Law and Policy.

Kaartinen, S., and K. Kumpulainen. 2002. "Collaborative Inquiry and the Construction of Explanations in the Learning of Science." *Learning and Instruction* 12 (2): 189–212. doi:10.1016/S0959-4752(01)00004-4.

Langer, S. 2018. "Crossing Divides: Science Towards Peace in the Middle East." *Chemistry International* 40 (3): 51–53. doi:10.1515/ci-2018-0331.

Lin, E. 2006. "Cooperative Learning in the Science Classroom." *Science Teacher* 73 (5): 34–39.

Manly, C. A., and R. S. Wells. 2015. "Reporting the Use of Multiple Imputation for Missing Data in Higher Education Research." *Research in Higher Education* 56 (4): 397–409. doi:10.1007/s11162-014-9344-9.

Martiniuk, A. L. C., and S. M. Wires. 2011. "Reflections on Peace-through-health: The First Canadian, Israeli and Palestinian Maternal and Child Health Programme for Medical

Students." *Medicine, Conflict and Survival* 27 (4): 197–204. doi:10.1080/13623699.2011.645146.
McComas, W. F. 2014. "Globalization of Science Education." In *The Language of Science Education: An Expanded Glossary of Key Terms and Concepts in Science Teaching and Learning*, edited by W. F. McComas, 44. Rotterdam: SensePublishers.
McComas, W. F. 2017. "Understanding How Science Works: The Nature of Science as the Foundation for Science Teaching and Learning." *School Science Review* 98 (365): 71–76.
Middle East Entrepreneurs of Tomorrow. 2020. "Meet Our Impact." https://meet.mit.edu/our-impact/
Miles, E., and R. J. Crisp. 2014. "A Meta-analytic Test of the Imagined Contact Hypothesis." *Group Processes & Intergroup Relations* 17 (1): 3–26. doi:10.1177/1368430213510573.
Muñoz, A., C. Moreno, and J. L. Luján. 2012. "Who Is Willing to Pay for Science? On the Relationship between Public Perception of Science and the Attitude to Public Funding of Science." *Public Understanding of Science* 21 (2): 242–253. doi:10.1177/0963662510373813.
Nachmias, R., D. Mioduser, and A. Forkosh-Baruch. 2010. "ICT Use in Education: Different Uptake and Practice in Hebrew-speaking and Arabic-speaking Schools in Israel." *Journal of Computer Assisted Learning* 26 (6): 492–506. doi:10.1111/j.1365-2729.2010.00374.x.
Nasie, M., A. H. Diamond, and D. Bar-Tal. 2016. "Young Children in Intractable Conflicts: The Israeli Case." *Personality and Social Psychology Review* 20 (4): 365–392. doi:10.1177/1088868315607800.
Ogbu, J. U. 2008. *Minority Status, Oppositional Culture, & Schooling*. New York: Routledge.
Pan, S.-Y. 2010. "Exploring How Globalization Shapes Education: Methodology and Theoretical Framework." *Cultural Studies of Science Education* 5 (2): 315–324. doi:10.1007/s11422-010-9257-7.
Ramirez, J., C. A. Pinedo, and B. M. Forster. 2015. "Discovery of the Collaborative Nature of Science with Undergraduate Science Majors and Non-Science Majors through the Identification of Microorganisms Enriched in Winogradsky Columns." *Journal of Microbiology & Biology Education* 16 (2): 211. doi:10.1128/jmbe.v16i2.926.
Ridgeway, C. L., and L. Smith-Lovin. 1999. "The Gender System and Interaction." *Annual Review of Sociology* 25 (1): 191–216. doi:10.1146/annurev.soc.25.1.191.
Rodwell, L., K. J. Lee, H. Romaniuk, and J. B. Carlin. 2014. "Comparison of Methods for Imputing Limited-range Variables: A Simulation Study." *BMC Medical Research Methodology* 14 (57): 1–11. doi:10.1186/1471-2288-14-57.
Ron, Y., J. Solomon, E. Halperin, and T. Saguy. 2017. "Willingness to Engage in Intergroup Contact: A Multilevel Approach." *Peace and Conflict: Journal of Peace Psychology* 23 (3): 210–218. doi:10.1037/pac0000204.
Roth, W.-M., and S. Lee. 2004. "Science Education As/for Participation in the Community." *Science Education* 88 (2): 263–291. doi:10.1002/sce.10113.
Rowley, M. J. 2019. "How Tech Is Bringing Israelis and Palestinians Together." *BBC News*. London.
Sachs, N., and B. Reeves. 2017. "Tribes, Identity, and Individual Freedom in Israel." *Center for Middle East Policy*. Washington, DC: Brookings Institute.
Sadler, T. D. 2009. "Situated Learning in Science Education: Socio-scientific Issues as Contexts for Practice." *Studies in Science Education* 45 (1): 1–42. doi:10.1080/03057260802681839.
Sandoval, E. 2016. "Potential Contributions of Music Education to Peacebuilding: Curricular Concerns." *Journal of Peace Education* 13 (3): 238–251. doi:10.1080/17400201.2016.1234647.
Sassen, S. 2007. "A Sociology of Globalization." In *Contemporary Societies*, edited by J. C. Alexander, 1–250. New York: W. W. Norton & Company.
Sassen, S., and A. Van Roekel-Hughes. 2008. "Deciphering the Global: Its Spaces, Scales and Subjects." *Social Thought & Research* 29: 3–18.
Sharma, S., and M. Sharma. 2010. "Globalization, Threatened Identities, Coping and Well-being." *Psychological Studies* 55 (4): 313–322. doi:10.1007/s12646-010-0048-8.

Shenhav, Y., M. Dallashi, R. Avnimelech, and Y. Mandel. 2015. *Knoweldge of Arabic Amongst Jews in Israel*. Jerusalem, Israel: Van Leer Jerusalem Institute.
Siegel, H. 2002. "Multiculturalism, Universalism, and Science Education: In Search of Common Ground." *Science Education* 86 (6): 803–820. doi:10.1002/sce.1052.
Skinner, H., Z. Abdeen, H. Abdeen, P. Aber, M. Al-Masri, J. Attias, K. B. Avraham, et al. 2005. "Promoting Arab and Israeli Cooperation: Peacebuilding through Health Initiatives." *The Lancet* 365 (9466): 1274–1277. doi:10.1016/S0140-6736(05)74817-0.
Smooha, S. 2016. *Index of Arab-Jewish Relations in Israel 2015*. Haifa: University of Haifa.
Snow, C. E., and K. A. Dibner. 2016. "Science Literacy: Concepts, Contexts, and Consequences". In edited by National Academies of Sciences, 85–104. Washington, DC: National Academies Press.
Sriharan, A., Z. Abdeen, D. Bojrab, S. David, Z. Elnasser, T. Patterson, R. Shprintzen, H. Skinner, Y. Roth, and A. Noyek. 2009. "Academic Medicine as a Bridge to Peace: Building Arab and Israeli Cooperation." *Academic Medicine* 84 (11): 1488–1489. doi:10.1097/ACM.0b013e3181baa22d.
Stephan, W. G., and C. Lausanne Renfro. 2002. "The Role of Threat in Intergroup Relations." In *From Prejudice to Intergroup Emotions: Differentiated Reactions to Social Groups*, edited by D. M. Mackie and E. R. Smith, 191–207. New York: Psychology Press.
Stromquist, N. P. 2002. *Education in a Globalized World: The Connectivity of Economic Power, Technology, and Knowledge*. Washington, DC: & Littlefield Publishers.
Tobin, K. 2016. "Collaborating on Global Priorities: Science Education for Everyone—any Time and Everywhere." *Cultural Studies of Science Education* 11 (1): 27–40. doi:10.1007/s11422-015-9708-2.
Tsui, L. 2007. "Effective Strategies to Increase Diversity in STEM Fields: A Review of the Research Literature." *The Journal of Negro Education* 76 (4): 555–581.
Vugt, M. V., D. De Cremer, and D. P. Janssen. 2007. "Gender Differences in Cooperation and Competition: The Male-Warrior Hypothesis." *Psychological Science* 18 (1): 19–23. doi:10.1111/j.1467-9280.2007.01842.x.
Weisgram, E. S., and R. S. Bigler. 2007. "Effects of Learning about Gender Discrimination on Adolescent Girls' Attitudes toward and Interest in Science." *Psychology of Women Quarterly* 31 (3): 262–269. doi:10.1111/j.1471-6402.2007.00369.x.
White, I. R., P. Royston, and A. M. Wood. 2011. "Multiple Imputation Using Chained Equations: Issues and Guidance for Practice." *Statistics in Medicine* 30 (4): 377–399. doi:10.1002/sim.4067.
Zippel, K. 2017. *Women in Global Science*. Stanford, CA: Stanford University Press.

Appendix

Table A1. Sensitivity Analysis: Coefficients of Multiple Regression of Preference to Work and Study in a Homogeneous Environment.

Variable	Model A1	Model A2	Model A3	Model A4
Individual Characteristics				
Female	−0.335**	−0.323**	−0.347**	−0.348**
Age	−0.131	−0.091	−0.149	−0.135
Family income	−0.072	−0.062	−0.064	−0.077
Role model	−0.072	−0.062	−0.064	−0.077
Feel like minority	0.180***	0.191***	0.187***	0.179**
Fluent in Hebrew	−0.209***	−0.208***	−0.197***	−0.222***
Happiness	−0.112	−.092	−0.093	−0.118
Equal citizens	−0.034	−0.037	−0.044	−0.041
Degree of religiosity	0.160	0.157	0.136	0.170
Identity[a] Arab	0.355*	0.322	0.309	0.346*
Palestinian	0.240	0.222	0.238	0.229
Perceptions of STEM Global (international)		−0.126*		
Global (Israel)			−0.145*	
Collaborative				0.074
Intercept	4.691*	4.384*	5.350**	4.636**
N	246	246	246	246
R^2	0.179	0.192	0.191	0.182
Adjusted R^2	0.140	0.151	0.149	0.140

*P <.1 **P <.05 ***P <.01

[a]Reference: Israeli

R^2 is the average over the 20 imputations.

CHAPTER 3

Perceptions of Science and Their Effects on Anticipated Discrimination in STEM for Minority High-School Students

Diamond, Aurel H. and Elyakim Kislev. 2020. "Perceptions of Science and Their Effects on Anticipated Discrimination in Stem for Minority High School Students." *Cambridge Journal of Education*. doi: 10.1080/0305764X.2020.1806989.

Cambridge Journal of Education

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/ccje20

Perceptions of science and their effects on anticipated discrimination in STEM for minority high-school students

Aurel H. Diamond & Elyakim Kislev

To cite this article: Aurel H. Diamond & Elyakim Kislev (2020): Perceptions of science and their effects on anticipated discrimination in STEM for minority high-school students, Cambridge Journal of Education, DOI: 10.1080/0305764X.2020.1806989

To link to this article: https://doi.org/10.1080/0305764X.2020.1806989

CAMBRIDGE JOURNAL OF EDUCATION
https://doi.org/10.1080/0305764X.2020.1806989

Routledge
Taylor & Francis Group

Perceptions of science and their effects on anticipated discrimination in STEM for minority high-school students

Aurel H. Diamond [a] and Elyakim Kislev [a,b]

[a]Federmann School of Public Policy, Hebrew University of Jerusalem, Jerusalem, Israel; [b]Harry S. Truman Research Institute for the Advancement of Peace, Hebrew University of Jerusalem, Israel

ABSTRACT

This paper investigates how different perceptions of STEM are related to the anticipated levels of discrimination in STEM-related fields for minority high-school students in Israel. Regression analyses of questionnaire data (N = 380) from Arab-Palestinian (minority) and Jewish (majority) high-school students are conducted. The results suggest that for all students, perceiving STEM as cooperative is associated with reduced anticipated discrimination. Perceiving STEM as global and international is also associated with reduced anticipated discrimination, but only for minority students with the highest levels of social distance from mainstream society. The paper argues that for students who experience high levels of social distance, perceiving STEM as global or international creates a 'global space' wherein the salience of the local-national context – which typically facilitates discrimination – is reduced. Accordingly, the paper addresses larger debates regarding the conditions under which the globalisation of education may be empowering and/or threatening for minority students.

ARTICLE HISTORY
Received 3 February 2020
Accepted 4 August 2020

KEYWORDS
Discrimination; high school; minorities; perceptions of science; science education

1. Introduction

The participation and success of minorities in the science, technology, engineering and mathematics (STEM) track are frequently hampered by concerns about diversity, discrimination and fairness in STEM-related fields. Studies show that anticipating discrimination, perceiving a lack of diversity, and racial and ethnic inequality reduce minority students' self-efficacy in STEM (Burke, 2007). For minority students, experiencing discrimination reduces interest in science in general, and leads to lower uptake and increased drop-out rates in STEM courses (Reyes, 2011). In addition, longitudinal studies of minority students in STEM find that even those who progress most easily through the STEM track report discrimination, creating challenges for integration and success (Fries-Britt, 2017).

These studies, amongst many others in STEM education research (for a summary, see: Museus, Palmer, Davis, & Maramba, 2011), show how discrimination directly contributes to reduced minority representation in STEM. Therefore, and particularly in light of

CONTACT Aurel H. Diamond aurel.diamond@mail.huji.ac.il Federmann School of Public Policy, Hebrew University of Jerusalem, Jerusalem 9190501, Israel
Supplemental data for this article can be accessed here.

continued calls to diversify STEM (National Science Board, 2018), it is valid and useful to seek interventions or social mechanisms that can reduce the impact of discrimination. Studies have explored, for example, the idea of identity-safe environments (Walton, Logel, Peach, Spencer, & Zanna, 2015), or policies that target discrimination in STEM (Wang & Degol, 2017), often focusing on post-secondary education. Relatively few, however, have researched the social antecedents of discrimination, particularly when it comes to school-aged children.

Accordingly, there is a need to identify factors that can reduce the anticipated levels of discrimination for minority high-school students in STEM. The current paper begins to address this need by investigating how different perceptions of STEM (McComas, 2017) may impact anticipated discrimination. In doing so, the paper complements research showing how perceptions of STEM impact educational outcomes and social views (Grossman & Porche, 2014; Hurtado & Cerezo, 2012), and proposes a potentially novel way of reducing anticipated discrimination in STEM for minorities.

In order to justify this approach, the paper first reviews literature that connects perceptions of STEM to discrimination in the STEM track. It then identifies two perceptions of STEM that may alleviate expectations of discrimination: (i) perceiving STEM as a collaborative endeavour that facilitates cooperation between groups; and (ii) perceiving STEM as a global and international pursuit that creates a shared context or space for learning and working. Data for this study comes from majority and minority high-school students in Israel. As such, the potential consequences of these perceptions are considered in the Israeli national context in particular. This provides the necessary background for the quantitative analyses, which – in contrast to many of the aforementioned studies – treat levels of anticipated discrimination as the dependent variable.

2. Perceptions of STEM and anticipated discrimination

Upon entering the STEM classroom, students encounter a unique social context to which they ascribe different qualities and traits (Aikenhead, 1996). This study is interested in how student perceptions of STEM may impact the levels of discrimination they are likely to anticipate as they move through the STEM track. Accordingly, it is instructive to review minority youth perceptions of STEM, and how they may relate to anticipating discrimination in the STEM track.

Students develop different understandings and perceptions of the nature of science and STEM throughout mandatory education (McComas, 2017). It is apparent that individual perceptions of STEM predict levels of engagement and interest in science education (Hurtado & Cerezo, 2012) and attitudes towards science (Snow & Dibner, 2016). Positive and negative perceptions of STEM are usually associated with positive and negative STEM education outcomes, respectively (Grossman & Porche, 2014).

In some contexts, studies indicate how STEM is perceived favourably by minority youth. These studies primarily highlight the ways in which minority students view STEM as a possible route for social and economic mobility. Indeed, pursuing STEM is associated with higher future earnings for minority students (Melguizo & Wolniak, 2012). One study, using six years of data from the National Educational Longitudinal Survey in the US, argues that youth may adopt 'strategic adaptation' by deliberately pursuing occupations 'where they can effectively cope with potential discrimination and other

disadvantages by achieving marketable credentials' (Xie & Goyette, 2003, p. 467). In light of more recent studies that demonstrate some minority groups' preferences to pursue STEM education (e.g. Basit, 2013), it is possible to suggest that STEM may be perceived positively amongst minority youth for two main reasons: as a deliberate strategy for avoiding discrimination; and as a means of socioeconomic mobility.

Conversely, the context of STEM is often perceived as negative, inequitable, discriminatory or unfair by minority youth (Johnson, 2012). Many factors contribute to the negative perceptions of STEM for minorities. For example, the lack of representation of minorities in advanced STEM studies contributes to the negative perceptions of higher-level STEM education (Museus et al., 2011). In addition, the overall STEM environment is further negatively impacted by low teacher expectations for minority youth (Ladson-Billings, 1997), perceived cultural irrelevance (Burke, 2007), stereotype threat (Spencer, Logel, & Davies, 2016) and lack of role models, as well as subdued levels of encouragement by teachers and parents (Fries-Britt, 2017). Each of these factors has a negative impact on the performance and uptake of minority youth in STEM, and has a direct or indirect relationship with discriminatory practices in the STEM track.

To that end, and given the relationship between positive perceptions of STEM and better educational outcomes for minority youth, many initiatives have attempted to improve the STEM environment for minorities by increasing the perceived chances of success, highlighting the value of STEM, providing suitable role models, using culturally relevant teaching methods, and providing increased exposure to STEM fields, amongst others (Museus et al., 2011). In addition, different diversity models have been applied in STEM in an attempt to improve minority access to STEM, albeit with varying results. For example, multicultural approaches to STEM education, which emphasise and value diversity, have been found to be associated with positive values and motivational orientations (Hachfeld, Hahn, Schroeder, Anders, & Kunter, 2015), though these are not necessarily translated into higher diversity in STEM (Le & Matias, 2019). In fact, it is arguable that the ways in which students perceive STEM may mediate the ways in which they experience STEM education, with some perceptions availing better educational outcomes (Çalışkan & Batı, 2020). To date, the literature identifies two perceptions of STEM that may be associated with reduced anticipated discrimination for minority youth. These are reviewed now.

2.1 Anticipated discrimination and the cooperative perceptions of STEM

One perception of STEM that might reduce anticipated discrimination for minority students could be through focusing on the collaborative or cooperative characteristics of STEM. Indeed, it is widely acknowledged that STEM fields and the scientific process are highly collaborative in nature (Lederman, 2013), and thus present opportunities for different racial, ethnic and national groups to work together (Martiniuk & Wires, 2011).

Therefore, perceiving STEM as collaborative might help students to perceive STEM more positively. The cooperation between groups in STEM provides a direct counter-example to some of the challenges that are often expected in STEM for minorities and emphasise tracks of inclusion in STEM. Although intergroup corporation does not guarantee the elimination of anticipated discrimination, it can reduce its expected impact in many cases (Hodari, Ong, Ko, & Kachchaf, 2014).

Moreover, emphasising cases where the participation of the minority group leads to positive results might also place importance on the role of the minorities in STEM fields. It is not only that minorities are included in STEM collaborations, but they are also needed for such joint efforts to succeed. Earlier studies show, for example, that following exposure to international STEM research cooperation initiatives, scientists report highly positive attitudes towards their own roles as well as towards the inclusion of people from other backgrounds (Langer, 2018). Thus, by providing counterexamples of exclusive practices and highlighting the positive role and contribution of minorities, perceiving intergroup cooperation is posited to be associated with reduced anticipated discrimination for minority youth.

2.2 Anticipated discrimination and the global perceptions of STEM

Second, the increasingly global nature of STEM and STEM education may impact the anticipated discrimination of students. Indeed, globalisation – the complex processes that encompass the exchanges of technology, people and information (McGrew & Lewis, 2013) – has impacted STEM education on several accounts (Chiu & Duit, 2011). First, progressing through the STEM track is increasingly dependent on the knowledge of mostly meta-cultural programming or technical languages (Heyman, 2016). Second, the exposure to the digital and technological spheres through STEM education has contributed to the globalisation of the STEM education environment (Nachmias, Mioduser, & Forkosh-Baruch, 2010). Third, the prominence and importance of global socio-scientific issues has connected scientific literacy and STEM education to global citizenship (Friedrichsen, Sadler, Graham, & Brown, 2016). In addition, and to that end, STEM is increasingly important as being part of the global effort to improve the human condition (Stromquist, 2002). Finally, and following the globalisation of STEM education research (McComas, 2014), international guidelines and standards as measured by tests such as TIMMS and PISA have standardised the content of STEM education across social and national groups.

Thus, while not all students will perceive the globalisation of STEM uniformly, it is apparent that for some, the STEM classroom presents a social context or space that may differ significantly from other subjects. Students can be understood as 'border-crossing' into the STEM space (Aikenhead, 1996), wherein the social order is distinct from that of the national context. Where STEM is perceived as global and international, the context of a global space makes the national and local context, which would usually place minorities at a disadvantage, less salient (Sassen, 2007; Sassen & Van Roekel-Hughes, 2008). While discrimination and exclusion might not disappear in global spaces, perceiving STEM as global is hypothesised to assist minority students partially or fully circumvent the specific challenges they face in the national or local context. Indeed, and for example, recent research has shown how perceiving STEM as globalised increases minority students' willingness to work and study with the outgroup (Diamond & Kislev, 2020).

Studies have also shown possible positive effects of perceiving STEM as global for women scientists. For instance, American women integrating into global STEM environments report that the gender-related disadvantages they face in their home country are much less apparent in global or international STEM (Zippel, 2017). This is explained by the fact that they are perceived first and primarily as Americans working in STEM, and

only second as women in STEM; the prestige of being an American scientist reduces the impact of gender-based discrimination. Analogously, and in the current study, minorities who are interested in proceeding in science may anticipate less discrimination in the STEM track if they expect to be addressed primarily as learner or 'doer' of science (Aschbacher, Li, & Roth, 2010), and only secondarily as a member of discriminated minority group.

It is important to note here that the impact of the global perceptions of STEM may not be uniform amongst all social groups or even amongst all types of minorities. In some instances, globalisation can also create threats to local identity and native culture at the individual and collective levels (Sharma & Sharma, 2010), which in turn can lead to increased social stratification (Igarashi & Saito, 2014). In the context of STEM education, this could translate as a less equitable and more hostile environment for minority students.

The current research therefore touches on two theoretical debates. First, it assesses how the different perceptions of STEM may impact anticipated discrimination amongst high-school students. Second, the research considers the conditions under which forces of globalisation are empowering, or, indeed, threatening for minority youth. The possible impact is explored through the social distance of minority students from the majority group. That is to ask: to what extent does social distance of minority students impact the relationship between different perceptions of science and anticipated discrimination in STEM? This question is examined using Israeli high-school students as a case study, as follows.

3. The Israeli context

This study focuses on high-school students in Israel. The population consists of a Jewish majority (76%) and Arab-Palestinian minority (21%), primarily consisting of Muslim, Christian and Druze communities (Central Bureau of Statistics, 2017).[1] There are significant majority–minority socioeconomic disparities in Israel, with Arab-Palestinians presenting lower levels of household income and expected years of education, as well as higher rates of poverty (Bleikh, Berrebi, & Brand, 2016). Indeed, more than half of all Arab-Palestinian families in Israel live in poverty, compared to approximately 20% of Jewish families, and more than 90% of Arab-Palestinian citizens are in the lowest three deciles of socio-economic rankings in Israel (Hai, 2013). In addition to these challenges, Arab-Palestinians face extra cultural and linguistic difficulties in progressing in higher education and the workforce that do not apply to most Jewish citizens (Al-Haj, 2002).

In the education system, there are also significant differences between Arab-Palestinian and Jewish citizens, who almost invariably attend separate Arabic- and Hebrew-language schools, respectively. In addition to reducing the chances of intergroup contact, the language-divided school system produces different results for the different groups. The latest PISA report indicates 144, 111 and 116-point gaps between Jewish and Arab-Palestinian students in reading, mathematics and science respectively (Bratslavsky, Lipfshtat, & Hilu, 2019). Similarly, the 2015 TIMMS report shows a 70-point gap between students at Arabic and Hebrew language schools (Glickman, 2017). As in other national contexts, structural, institutional and cultural factors contribute to the challenges facing minorities in STEM in Israel (Khamaisi & Abu-Saad, 2015).

Arab-Palestinian citizens of Israel also typically report high levels of discrimination and inequality. In a recent study, 39% of Arab-Palestinian respondents believe that Israeli

institutions are discriminatory, while 53% believe that there is only partially equality, and only 9% reported on complete equality and fairness (Radai, Elran, Makladeh, & Kornberg, 2015). Within the world of technology and STEM-based start-ups, Arab-Palestinians make up only 3–4% of workers, and lead only 1.8% of such companies (Schneider, 2018), a rate that is far from their percentage in the overall population.

3.1. Social distance and minority students in Israel

While the social context of STEM in particular may be unfavourable for minorities in Israel, it is important to note the diversity of experiences within the Arab-Palestinian community. In a recent poll, for instance, 30% of Arab-Palestinians in Israel identified as Israeli and 31% identified as Palestinian, while approximately one-third identified as neither, and 7% identified as both Israeli and Palestinian (Radai et al., 2015). Each of these identities carries a different level of social distance from the Jewish Israeli majority: critical positions of Israeli society are more likely to be adopted by Palestinian-identifying citizens, while Israeli-identifying Arab citizens are less strongly associated with negative feelings towards the state (Smooha, 2016).

In this sense, the social distance of Arab-Palestinian minorities from majority Israeli society can be understood as a function of their primary identity in Israeli society. To that end, students who identify as Palestinian experience higher levels of social distance than those who identify as Israeli. Social group salience and distance have been used to explain the experiences of women in science-related fields; indeed, gender-related discrimination and disempowerment are more prominent when gender identity is most central (Britton, 2017). Recent research suggests that similarly to gender salience, high-school students who experience the higher levels of social distance (i.e. minority students) are likely to anticipate higher levels of discrimination (Grossman & Porche, 2014). The current research therefore conjectures that a context which reduces the minority salience of these students may avail less anticipated discrimination.

To that end, it is hypothesised that the global perceptions of STEM have the largest potential effect on students with the highest levels of social distance (i.e. Palestinian-identifying students). Individuals from this group typically do not want to be included or do not see themselves as being accepted into the Israeli mainstream (Smooha, 2016). Therefore, for these students, circumventing the potential discrimination in STEM and the general national context by entering a global space offers the most significant shift. In contrast, it is hypothesised that minorities who identify as Israelis or Israeli-Arabs still see pathways to inclusion into Israeli societies.

4. Methods

The data used in this paper was collected using a questionnaire that was purposely designed and distributed to 380 Jewish (N = 134) and Arab (N = 246) high-school students in Israel in the 9th, 10th, 11th and 12th grades (ages 14–18). By this age, minority students have already had the chance to develop an interest in pursuing STEM and may be considering further education in a STEM topic (Aschbacher et al., 2010), but are also likely to be aware of potential discrimination in STEM, which likely affects their potential progress and success in the field. This study focuses on *anticipated* discrimination (rather than actual experiences of

discrimination), based on the understanding that personal first-hand experiences of discrimination in STEM are more likely to occur in post-secondary work and education. This is specifically relevant in Israel since Jewish majority and Arab-Palestinian minority students almost exclusively attend separate schooling.

The study includes two main demographics: Arab-Palestinian students and Jewish students. Amongst the Arab-Palestinian students, 42.3% identified primarily as Israeli, 35.4% as Palestinian and 22.3% as Arab. The Jewish students, who belong to Israel's majority social group, are included as a control in order to ascertain which effects and relationships are unique to minority groups in this context. All of the Jewish students identified primarily as Jewish, Israeli or Jewish Israeli.

Questionnaires for the Arab-Palestinian respondents were administered in person at five different high schools in the city of Jaffa. While this sample does not capture the full diversity of Arab-Palestinian society in Israel, it is assumed to be sufficiently demonstrative for the purposes of this study. The purpose of the questionnaire was explained to the students by their classroom teachers at the beginning of a school lesson, and then printed copies of the questionnaire were distributed. The voluntary and anonymous nature of the questionnaire was explained both orally and in writing. Ninety-two per cent of students chose to return questionnaires.

For the Jewish students' data, high-school teachers from all parts of the country distributed the questionnaire to students, who completed the questionnaires online voluntarily and anonymously. Students from 27 different municipalities returned answers. The students came from a variety of secular and religious Jewish backgrounds.

The current research investigates the nature of the relationship between the anticipated discrimination in STEM and cooperative and global perceptions of STEM fields. In order to do so, regression analyses were performed on the questionnaire data. The main dependent variable here is a measure of anticipated discrimination of STEM from the perspective of the students, and was measured by agreement with the questionnaire item: 'Success in STEM is according to professional criteria only, and not connected to racial, ethnic, religious, or national background.' Level of agreement with this statement was measured on a five-point Likert scale.

The two main independent variables used in the analyses indicate the extent to which the respondents view STEM as global and cooperative, respectively. The questionnaire included items that related to both the global and cooperative nature of STEM. The cooperative variable was given by agreement with the statement: 'There is cooperation between different groups of people in STEM in Israel' (1–5). Exploratory factor analysis was used to create a composite global variable, with two significant loadings: 'Work and studies in STEM in general provide opportunities to integrate into a global and international environment' (1–5); and 'Work and studies in STEM in Israel happen in a global and international environment' (1–5). Results from the Kaiser-Meyer-Olkin test ($a = 0.628$) support the validity of the global variable. Sensitivity analyses that regressed the data using each of the components of the composite variable separately (see Supplementary Table S4) revealed broadly similar results. The composite variable was therefore retained to better reflect a broader definition of perceiving STEM as global/international.

Since the literature review suggests that there may be diverging results depending on the type and salience of minority status, the study includes a categorical variable that represents the primary identity as indicated by the students. In increasing order of

anticipated social distance from the majority group, the possible answers included: Jewish/Jewish-Israeli; Arab-Israeli; Arab; and Palestinian. The global composite and cooperative variables were centred and regressed in interaction with this identity variable in order to check how primary identity may moderate the relationship between perception of STEM and anticipated discrimination.

This study is specifically interested in anticipated discrimination in STEM, leading to the choice of the dependent variable. However, it is possible that anticipated discrimination in STEM is related to experiences of discrimination in and satisfaction with Israeli society in general. Therefore, and in order to reduce the risk of conflating these effects, the analyses include independent variables to account for other measures of discrimination, social distance and general satisfaction. These include: feelings of being a minority; fluency in Hebrew (the official language of Israel); the extent to which minorities are perceived as equal citizens; and general happiness (all 1–5 Likert). Moreover, further independent variables were included in order to account for socioeconomic, demographic and scholastic variation. These were chosen using step-wise regression and include: age; sex (a dummy variable); perceived family income (1–5); the presence of a STEM role model in the immediate family (1–5); fluency in English (1–5); degree of religiosity (1–4); and general interest in STEM (1–5).

Since not all of the questionnaires were fully completed, multiple chained imputations were conducted in order to estimate missing values in the data. On the primary dependent and independent variables (including the cooperative and global variables, and measures of social distance), 3.75% of the data was incomplete. In order to ensure data reliability for this amount of missing data, 20 imputations were carried out (White, Royston, & Wood, 2011). Sensitivity analyses were also conducted in order to compare the regression analyses for the imputed data set with complete data entries only, as well as between truncated and non-truncated imputations (Rodwell, Lee, Romaniuk, & Carlin, 2014). Results in all cases were similar, and as such, the non-truncated imputations were used (Manly & Wells, 2015).

Finally, since the students come from six different groups (five schools and one online questionnaire), analyses were conducted in order to check whether to conduct multilevel analyses and include a school/group level. The intraclass correlation coefficient for the dependent variable between groups was insignificant (0.002, standard error 0.015), suggesting that a multilevel model would not improve the analyses. In addition, Tukey pairwise comparisons of the main dependent variable (Supplementary Table S6) indicate similarity between the six groups, suggesting that multiple regression without a school/group level is sufficient. For completeness, the study includes a breakdown of the dependent variable by group (Supplementary Table S5).

5. Results

Table 1 provides a summary of the data collected according to the primary identity of the students. The descriptive statistics indicate differences between the groups when it comes to feeling like a minority and perceiving discrimination in Israeli society. For both of these measures, Palestinian-identifying students rank the highest, followed by Arab, Arab-Israeli and Jewish-Israeli identifying students. In addition, Palestinian-identifying students had the lowest average belief that minority citizens are treated equally. In other words, amongst the minority student respondents, the Palestinian-identifying reported the highest levels of perceived discrimination, on average felt the most like minorities, and perceived the

Table 1. Summary of data according to primary identity.

Variable	Total sample	Jewish-Israeli	Arab-Israeli	Arab	Palestinian
N	380	134	104	55	87
% total	100	35.3	27.4	14.5	22.9
% female	56.3	60.4	52.9	43.6	62.1
Mean age	15.44	16.22	15.12	15.31	15.22
Mean perceived family income (1–5)	3.30	3.49	3.13	3.25	3.33
Mean family role model (1–5)	3.21	3.48	3.24	3.14	3.07
Mean feel like minority (1–5)	2.86	2.35	2.80	3.13	3.27
Mean perceived discrimination (1–5)	2.65	2.16	2.49	2.94	3.16
Mean fluent in Hebrew (1–5)	4.18	4.61	4.33	3.96	3.84
Mean fluent in English (1–5)	3.61	3.81	3.73	3.37	3.63
Mean happiness (1–5)	4.10	4.05	4.00	4.32	4.24
Mean equal citizens (1–5)	2.49	2.54	2.71	2.48	2.22
Mean degree of religiosity (1–4)	2.08	2.04	1.91	1.81	2.51
Mean interest in STEM (1–5)	3.64	3.55	3.80	3.39	3.63
Mean STEM is cooperative (1–5)	3.50	3.57	3.48	3.49	3.47
Mean global factor (1–5)	3.37	3.27	3.45	3.21	3.47
Mean STEM is non-discriminatory (1–5)	3.80	3.68	3.90	3.83	3.76

least amount of equal treatment, indicating the highest level of social distance. Israeli-identifying respondents, conversely, felt the least. Correspondingly, and amongst minority respondents, Israeli-identifying students perceived STEM as the least discriminatory, and Palestinian-identifying students the most. Jewish respondents, on the other hand, reported on lowest mean amongst all the groups for the item measuring whether STEM is non-discriminatory. Supplementary Table S1 provides a comparison of the descriptive statistics by sex.

Table 2 shows the coefficients of regression analyses for the anticipated discrimination in STEM. A positive and significant coefficient indicates a lower level of anticipated discrimination in STEM. The reference category for the identity variable is Jewish-Israeli students.

Model 1, the base model, regresses anticipated discrimination on the individual characteristics and primary identities of the students, and the two observed characteristics of STEM. Notably, having a higher perceived family income is positively associated with anticipated discrimination in STEM. This may be indicative of the fact that students from stronger socioeconomic backgrounds feel more capable of navigating the STEM track. In addition, higher fluency in Hebrew – the primary language of the Jewish majority in Israel – is also positively associated with perceiving STEM as non-discriminatory. This is also logical, since much of the perceived discrimination and one of the main barriers to progressing in Israeli STEM are connected to knowledge of the Hebrew language.

Models 2 and 3 present the potential relationship between the perception of STEM as cooperative and/or global and the anticipated discrimination in STEM, respectively. There is a strong and positive relationship between anticipated discrimination and the cooperative variable. To wit, there is a significant and positive relation between students who observe intergroup cooperation in STEM, and the belief that success in STEM is independent of racial, ethnic, religious or national background. Conversely, no significant relationship was found for the global variable.

Regarding social distance, Table 2 shows that feeling like a minority is on average positively associated with reduced anticipated discrimination in STEM. The same can be

Table 2. Coefficients and standard errors of regression of 'STEM is non-discriminatory'.

	Model 1		Model 2		Model 3	
Variable	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Individual characteristics						
Female	0.155	0.118	0.119	0.116	0.151	0.129
Age	0.170*	0.170	0.152*	0.086	0.167*	0.098
Family income	0.208**	0.078	0.190**	0.077	0.202**	0.072
Role model	0.006	0.043	−0.017	0.042	0.001	0.043
Feel like minority	0.112**	0.050	0.105**	0.049	0.112**	0.050
Fluent in Hebrew	0.289***	0.069	0.248***	0.068	0.286***	0.069
Fluent in English	−0.018	0.061	−0.007	0.060	−0.251	0.062
Happiness	0.041	0.079	0.016	0.077	0.040	0.079
Equal citizens	0.022	0.056	−0.015	0.056	0.021	0.056
Degree of religiosity	−0.104	0.074	−0.083	0.074	−0.105	0.074
STEM is interesting	0.099*	0.050	0.081	0.049	0.086	0.053
Identity[a]						
Arab	0.481**	0.202	0.425**	0.198	0.475**	0.202
Arab-Israeli	0.514***	0.178	0.486***	0.174	0.503***	0.178
Palestinian	0.280	0.280	0.222	0.196	0.271	0.200
Perception of STEM			0.249***			
Cooperative			0.249***	0.069		
Global					0.059	0.079
Intercept	−1.748	1.447	−1.781	1.417	−1.764	1.444
N	380		380		380	
R^2	0.172		0.204		0.174	

Notes: * p < .1; ** p < .05; *** p < .01; [a] Reference: Jewish-Israeli; R^2 is the average over the 20 imputations.

said for Arab and Arab-Israeli identifying respondents, who, in comparison to Jewish-Israeli respondents, perceive STEM as less discriminatory. For these students, who report higher levels than average of feeling like a minority than Jewish students, it could be that STEM represents an opportunity to enter a space that is fairer or less discriminatory in comparison to other fields in Israeli society. The exception here is Palestinian-identifying respondents, who perceive similar levels of anticipated discrimination to Jewish-Israeli respondents. This may reflect the fact that higher-salience minorities, such as the Palestinian-identifying respondents, may view STEM-related professions as a means for socioeconomic mobility (Lewin-Epstein, Kalev, Marantz, & Slonim, 2015).

Thus, two models appear to emerge. Minorities with reduced social distance from the majority (such as Israeli-identifying Arab-Palestinians), perceive STEM as less discriminatory, and as such may see STEM as a means for social and economic mobility in Israeli society. Second, and conversely, for high-distance minorities such as the Palestinian-identifying students who experience higher levels of animosity with the majority group, the challenges in STEM remain more apparent.

This leads us to examine whether STEM is a way of promoting integration into Israeli society for the first group, and for the second group, whether STEM could be a way of circumventing the challenges presented by the national context. Thus, Table 3 estimates these models of integration and circumvention.

Model 4 in Table 3 shows that perceiving STEM as global does not have any significant relationship with the level of anticipated discrimination in STEM. However, the interaction between the primary identity and the perceived globality of STEM indicates that for Palestinian-identifying students, this variable is influential and reduces anticipated discrimination. In comparison to the Jewish-Israeli students, the Palestinian-identifying

Table 3. Coefficients and standard errors of regression of 'STEM is non-discriminatory' by identity in interaction with perception of STEM.

	Model 4		Model 5		Model 6	
Variable	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Individual characteristics						
Female	0.130	0.118	0.131	0.117	0.100	0.117
Age	0.173*	0.087	0.156*	0.086	0.159*	0.085
Family income	0.200**	0.075	0.191**	0.077	0.188**	0.074
Role model	0.008	0.042	−0.016	0.042	−0.011	0.042
Feel like minority	0.108**	0.050	0.106**	0.049	0.102**	0.050
Fluent in Hebrew	0.300***	0.069	0.248***	0.068	0.261***	0.068
Fluent in English	−0.029	0.061	−0.006	0.060	−0.013	0.061
Happiness	0.039	0.079	0.022	0.077	0.018	0.077
Equal citizens	0.012	0.056	−0.013	0.056	−0.024	0.056
Degree of religiosity	−0.099	0.075	−0.079	0.074	−0.073	0.075
STEM is interesting	0.084	0.053	0.083	0.049	0.080	0.053
Identity[a]						
Arab	0.686	0.199	0.959	0.671	0.983	0.834
Arab-Israeli	1.097*	0.176	0.371	0.590	0.869	0.742
Palestinian	−0.879	0.650	−0.134	0.688	−1.065	0.831
Perception of STEM						
Global	0.034	0.128			−0.024	0.131
Cooperative			0.240**	0.199	0.250**	0.123
Identity*Global						
Arab	−0.061	0.199			−0.003	0.201
Arab-Israeli	−0.167	0.176			−0.166	0.178
Palestinian	0.343*	0.184			0.356*	0.185
Identity*Cooperative						
Arab			−0.151	0.182	−0.154	0.187
Arab-Israeli			0.034	0.161	0.063	0.166
Palestinian			0.103	0.188	0.025	0.190
Intercept	−1.801	1.492	−1.876	1.439	−1.857	1.471
N	380		380		380	
R^2	0.193		0.209		0.227	

Notes: * p < .1; ** p < .05; *** p < .01; [a] Reference: Jewish-Israeli; R^2 is the average over the 20 imputations.

students mark higher increases in the anticipated fairness of STEM as they increase the perceived globalisation of STEM. To put this in numbers, Table 1 gives the average perceived globality of STEM for Palestinian-identifying students and Jewish-Israeli students as 3.47. According to Model 4, if the average Palestinian-identifying student gains one point on the global variable, their perceived level of STEM as non-discriminatory will increase 0.343*3.47 = 1.19 points. No significant relationship exists for this interaction for the Arab and Israeli-identifying respondents.

Model 5 shows the interaction between primary identity and the perceived cooperation in STEM in Israel. As with the models in Table 2, perceiving intergroup cooperation in STEM is associated with lower anticipated discrimination in STEM, indicating the potential positive effect of cooperation on improving perceived STEM prospects for minorities. However, the interaction term shows that the relationship between anticipated discrimination and cooperation is the same for all of the identity groups in the sample. In other words, perceiving cooperation may be beneficial in this sense, but according to the results it affects minority and majority group students similarly. This is explicable since cooperation provides the opportunities for members of both groups to encounter each other. Model 6, which includes both the global and cooperative variables, gives similar results to Models 4 and 5.

For the interaction models in Table 3, it is important to note that these results are consistent when the Jewish and Arab-Palestinian data are regressed separately (these estimates are included in Supplementary Tables S2 and S3). Here, the interaction terms are significant for Arab-Palestinian identifying students in comparison to other Arab and Arab-Israeli students. The same effects discussed in Tables 2 and 3 are observed here at higher significance levels.

6. Discussion

This paper empirically tests how cooperative and global perceptions of STEM are related to anticipated levels of discrimination in the field. Unlike many previous studies which focus on top-down approaches to reducing discriminative practices in STEM education and employment as applied by majority group members, the current research focuses on the relationship between students' personal views of STEM and levels of anticipated discrimination. In particular, the research compares effects for groups with different levels of social distance from the majority group.

Three main findings emerge from the study. First, it is apparent that there is a significant and positive relationship between perceiving cooperation and reduced anticipated discrimination in STEM for Jewish majority students as well as for the Arab-Palestinian minority students. The effect is independent of primary group identity (i.e. social distance), which suggests that this relationship can be explained by the same mechanisms for both the majority and minority student groups who see cooperation as a remedy for exclusion. Indeed, there is ample empirical evidence demonstrating that cooperation in STEM between Jewish-Israelis and Arab-Palestinians can increase intergroup trust, foster positive relationships, reduce feelings of hostility, and positively impact the perception of the outgroup, despite the context of the regional conflict (e.g. Martiniuk & Wires, 2011). The current paper would complement these findings by suggesting that perceiving cooperation is associated with reduced levels of anticipated discrimination.

The second main finding of the paper concerns the potential impact of perceiving STEM as global or international. The results show that for the Palestinian-identifying minority group, perceiving STEM as global is positively and significantly associated with reduced anticipated discrimination in STEM. This finding provides a counterexample to claims suggesting that the global context is threatening for minority groups (Igarashi & Saito, 2014; Sharma & Sharma, 2010), by giving an instance where perceiving globalisation is associated with an improved perception of social climate. This may not be as positive as it sounds, since it might indicate that the intergroup tension is so high for the Palestinian-identifying minority group that they see STEM as a way to escape discriminatory practices they tackle in interacting with Israeli mainstream society. This mechanism might be in line with and even explain others who argue that the global context may actually be empowering for minorities (Sassen, 2007; Sassen & Van Roekel-Hughes, 2008).

To that end, it is instructive to consider the third main finding of this study, which concerns social distance. The study considered the Arab-Palestinian minority group according to degree of primary identity, in increasing levels of social distance from the majority group: Arab-Israeli identifying; Arab-identifying; and Palestinian-identifying.

The results can be used to suggest that social distance (as measured by group identity) may be a crucial mechanism in explaining the relationship between perceiving globalisation and anticipated discrimination.

For lower-salience minority groups, such as the Israeli-identifying and Arab-identifying minorities, the most significant trend has to do with the level of anticipated discrimination in STEM. Here, the findings show that Israeli and Arab-identifying minorities on average anticipate less discrimination and a fairer environment in STEM in comparison to the Jewish-majority students. While minorities in practice are often subject to discrimination in all fields of study and employment, this could suggest that for these students, the STEM track is perceived as less discriminatory than other areas. While the current research does not test this claim, it would complement other studies suggesting that minorities in Israel pursue STEM as a way of attaining socioeconomic mobility (Lewin-Epstein et al., 2015), as well as employment stability (Khamaisi & Abu-Saad, 2015; Mustafa, Arar, & Khamaisi, 2009). Since STEM presents an opportunity to improve social status, the context of STEM for these students may already be perceived as less discriminatory.

In contrast, for the high-salience minority group – in the case of this study, the Palestinian-identifying students – a different pattern emerges. In comparison to the lower-salience minorities, they anticipate higher levels of discrimination in STEM and anticipate similar levels of discrimination to the Jewish-majority students. Given the particularly charged and tense nature between Jewish-Israelis and Palestinians in Israel (Smooha, 2016), this could be explained by the polarity between the two groups, who as a result anticipate higher levels of discrimination for minority groups. However, as explained earlier, the Palestinian-identifying students are the only ones for whom perceiving globalisation is significantly associated with reduced anticipated discrimination, and this might be their only way out of this tension. This way of escape, or circumvention, is not required by the Jewish majority since they are in the dominant social position.

To contextualise this in the case of this study: it could be that Palestinian-identifying students anticipate higher levels of discrimination in Israeli STEM than they do in global STEM. Given the high levels of animosity that arise as a result of the regional conflict (Hasson, Porat, Shani, & Halperin, 2017), it could be argued that there is indeed a better social climate for Palestinian-identifying students outside of the Israeli national context. By comparison, the lower-salience minorities may see STEM as an opportunity for progress, promotion or integration into Israeli society. In any case, the results help explain the findings of other studies on high schools in Israel indicating that minority students are, on the whole, more interested in science in general, and more motivated to pursue STEM in higher education (Diamond, 2020).

The relevance of social distance in this study reflects recent research regarding the gender salience of women in STEM, who are also disadvantaged and a statistical minority in this field. It is argued that the gender salience of women can be reduced by entering international work places (Zippel, 2017). Similarly, this current study shows that the same may be true for ethnic minorities with high levels of social distance, such as the Palestinian-identifying students. Here, the results may suggest that global and international perceptions of STEM present a context wherein minority salience is reduced. Where minority salience is reduced, the anticipated discrimination that is associated with minority salience is lessened.

In other cases, some studies show that the gender salience of women is reduced for those who see themselves primarily as scientists, and only secondarily as a gender minority (Britton, 2017). This compares with low-salience ethnic minorities, such as the Arab- and Israeli-identifying minorities. It might be that these groups perceive STEM as less discriminatory in comparison to the majority and high-salience minority groups because they expect to be evaluated primarily based on their knowledge and skills as scientists, and only secondarily (or not at all) based on their minority status.

As such, and in conclusion, the results of this study would suggest that adopting a more globalised perception of STEM may be beneficial in reducing anticipated levels of discrimination for minority students. Accordingly, pedagogies and curricula that emphasise the global nature of STEM may be effective in improving minority access and success in STEM fields. The causality of this relationship should be the subject of future studies.

7. Limitations and conclusions

While acknowledging the limitations of self-reported data and the generalisability of the specific Israeli case study, as well as the limitations in the ability to determine causation using regression models, the study provides insights that may inform future research and teaching practices. First, and specifically regarding the minority students' anticipated discrimination in STEM, the paper highlights the potential of fostering a global and international perspective of science within the science classroom. Though highlighting the global aspects of science will not eliminate discriminative practices in STEM fields, the results suggest that this may reduce the anticipated discrimination. In turn, minority students – particularly those who experience great social distance from the majority – may feel more empowered, or at least less discouraged from pursuing STEM as a result of discrimination. Second, the study touches on an important debate regarding whether global spaces are threatening (Sharma & Sharma, 2010) or empowering (Sassen & Van Roekel-Hughes, 2008) for minorities by providing an example wherein the context of globalisation may seem less discriminatory for minority students. Given that minorities in other national contexts who experience high levels of social distance also anticipate high levels of discrimination in STEM (National Science Board, 2018; Reinhold, Holzberger, & Seidel, 2018), it is reasonable to suggest that these findings may be consistent outside of Israel. This, however, would need to be tested empirically. This is particularly important, since the current study does not directly measure the extent to which experiences of discrimination in general in Israel impact anticipation of discrimination in STEM in particular.

Finally, the study raises questions about what it means for minorities to be in the context of science education. For one, Aikenhead (1996) conceptualised the science classroom as a unique space with its own social order and cultural orientation; students are described as 'border crossing' into the subculture of science, with diverging consequences. Further studies may develop the understanding of the consequences of this subculture of science by expanding from the global-cooperative comparison made in this paper. In doing so, it will be possible to develop a better understanding of how minority students perceive science, and how this impacts their trajectories on the STEM track.

Note

1. The remaining 3% are classified as 'others', and include primarily Christian and Muslim citizens who do not speak Arabic at home.

Acknowledgments

The authors would like to thank the Truman Research Institute, PresenTense Israel and the Center for the Study of Multiculturalism and Diversity for continued support throughout the duration of this research. Aurel H. Diamond is grateful to the Israel Institute and the Federmann School of Public Policy for scholarships that supported his PhD studies while working on this manuscript.

Disclosure statement

No potential conflict of interest was reported by the author.

Funding

This work was supported by Israel Institute Doctoral Grants (GL20314; GL20475) awarded to the first author.

ORCID

Aurel H. Diamond http://orcid.org/0000-0001-6038-186X

References

Aikenhead, G. S. (1996). Science education: Border crossing into the subculture of science. *Studies in Science Education*, *27*(1), 1–52.

Al-Haj, M. (2002). Multiculturalism in deeply divided societies: The Israeli case. *International Journal of Intercultural Relations*, *26*(2), 169–183.

Aschbacher, P. R., Li, E., & Roth, E. J. (2010). Is science me? High school students' identities, participation and aspirations in science, engineering, and medicine. *Journal of Research in Science Teaching*, *47*(5), 564–582.

Basit, T. N. (2013). Educational capital as a catalyst for upward social mobility amongst British Asians: A three-generational analysis. *British Educational Research Journal*, *39*(4), 714–732.

Bleikh, H., Berrebi, C., & Brand, G. (2016). *Poverty and inequality in Israel: Trends and decompositions*. Jerusalem: Taub Center.

Bratslavsky, R., Lipfshtat, N., & Hilu, G. (2019). *PISA 2018: Israel*. Jerusalem, Israel, Retrieved from http://cms.education.gov.il/EducationCMS/Units/Rama/MivchanimBenLeumiyim/PISA_2018.htm

Britton, D. M. (2017). Beyond the chilly climate: The salience of gender in women's academic careers. *Gender & Society*, *31*(1), 5–27.

Burke, R. J. (2007). Women and minorities in STEM: A primer. In R. J. Burke & M. C. Mattis (Eds.), *Women and minorities in science, technology, engineering, and mathematics: Upping the numbers* (pp. 3–27). Northampton, MA: Edward Elgar.

Çalışkan, İ., & Batı, K. (2020). Designing multicultural teaching and learning environments in science education. In B. Arslan-Cansever & P. Önder-Erol (Eds.), *Sociological perspectives on educating children in contemporary society* (pp. 207–228). Hershey, PA: IGI Global.

Central Bureau of Statistics. (2017). *Statistical Abstract of Israel*. Jerusalem, Israel: https://cbs.gov.il/reader/shnatonenew_site.htm

Chiu, M.-H., & Duit, R. (2011). Globalization: Science education from an international perspective. *Journal of Research in Science Teaching*, *48*(6), 553–566.

Diamond, A. H. (2020). The social reproduction of science education outcomes for high school students in Israel. *British Journal of Sociology of Education*. DOI: 10.1080/01425692.2020.1806040

Diamond, A. H., & Kislev, E. (2020). High school students' perceptions of science and attitudes towards intergroup cooperation. *Compare: A Journal of Comparative and International Education*. https://doi.org/10.1080/03057925.2020.1748494

Friedrichsen, P. J., Sadler, T. D., Graham, K., & Brown, P. (2016). Design of a socio-scientific issue curriculum unit: Antibiotic resistance, natural selection, and modeling. *International Journal of Designs for Learning*. doi:7(1)doi:10.14434/ijdl.v7i1.19325

Fries-Britt, S. (2017). It takes more than academic preparation: A nuanced look at black male success in STEM. *Journal of African American Males in Education*, *8*(1), 6–22.

Glickman, H. (2017). *Main findings from the Trends in International Mathematics and Science Study (TIMSS) 2015 for Israel*. Jerusalem. Retrieved from http://meyda.education.gov.il/files/Rama/TIMSS_2015_SUMMARY_En_f.pdf

Grossman, J. M., & Porche, M. V. (2014). Perceived gender and racial/ethnic barriers to STEM success. *Urban Education*, *49*(6), 698–727.

Hachfeld, A., Hahn, A., Schroeder, S., Anders, Y., & Kunter, M. (2015). Should teachers be colorblind? How multicultural and egalitarian beliefs differentially relate to aspects of teachers' professional competence for teaching in diverse classrooms. *Teaching and Teacher Education*, *48*, 44–55.

Hai, A. (2013). *Arab citizen employment in Israel: Critical concern and great potential*. Tel Aviv: Inter-Agency Task Force on Israeli Arab Issues.

Hasson, Y., Porat, R., Shani, D., & Halperin, E. (2017). *Intergroup relations within Israeli society*. Herzliya: IDC Herzliya.

Heyman, J. B. (2016). *Pathways into STEM among low-income, urban immigrant emergent bilingual/multilingual young adults: Opportunity, access, and persistence* (PhD). Columbia University, New York, NY.

Hodari, A. K., Ong, M., Ko, L. T., & Kachchaf, R. R. (2014) *New enactments of mentoring and activism: U.S. women of color in computing education and careers*. Paper presented at the Proceedings of the tenth annual conference on International computing education research, Glasgow, Scotland

Hurtado, M. C., & Cerezo, J. A. L. (2012). Political dimensions of scientific culture: Highlights from the Ibero-American survey on the social perception of science and scientific culture. *Public Understanding of Science*, *21*(3), 369–384.

Igarashi, H., & Saito, H. (2014). Cosmopolitanism as cultural capital: exploring the intersection of globalization, education and stratification. *Cultural Sociology*, *8*(3), 222–239.

Johnson, D. R. (2012). Campus racial climate perceptions and overall sense of belonging among racially diverse women in STEM majors. *Journal of College Student Development*, *53*(2), 336–346.

Khamaisi, R., & Abu-Saad, I. (2015). *Education and territory: Charged issues*. Ra'anana: The Open University of Israel.

Ladson-Billings, G. (1997). It doesn't add up: African American students' mathematics achievement. *Journal for Research in Mathematics Education*, *28*(6), 697–708.

Langer, S. (2018). Crossing divides: Science towards peace in the Middle East. *Chemistry International*, *40*(3), 51–53.

Le, P. T., & Matias, C. E. (2019). Towards a truer multicultural science education: How whiteness impacts science education. *Cultural Studies of Science Education*, *14*(1), 15–31.

Lederman, N. G. (2013). Nature of science: Past, present, and future. In S. K. Abell, K. Appleton, & D. L. Hanuscin (Eds.), *Handbook of research on science education* (pp. 845–894). New York, NY: Routledge.

Lewin-Epstein, N., Kalev, A., Marantz, E., & Slonim, S. (2015). *Arab Israeli pharmacists in the Israeli labor market*. Jerusalem: Taub Center.
Manly, C. A., & Wells, R. S. (2015). Reporting the use of multiple imputation for missing data in higher education research. [journal article]. *Research in Higher Education*, *56*(4), 397–409.
Martiniuk, A. L. C., & Wires, S. M. (2011). Reflections on peace-through-health: The first Canadian, Israeli and Palestinian maternal and child health programme for medical students. *Medicine, Conflict, and Survival*, *27*(4), 197–204.
McComas, W. F. (2014). Globalization of science education. In W. F. McComas (Ed.), *The language of science education: An expanded glossary of key terms and concepts in science teaching and learning* (p. 44). Rotterdam: SensePublishers.
McComas, W. F. (2017). Understanding how science works: The nature of science as the foundation for science teaching and learning. *School Science Review*, *98*(365), 71–76.
McGrew, A. G., & Lewis, P. (2013). *Global politics: Globalization and the nation-state*. Hoboken, NJ: John Wiley & Sons.
Melguizo, T., & Wolniak, G. C. (2012). The earnings benefits of majoring in STEM fields among high achieving minority students. *Research in Higher Education*, *53*(4), 383–405.
Museus, S. D., Palmer, R. T., Davis, R. J., & Maramba, D. C. (2011). *Racial and ethnic minority student success in STEM education: ASHE higher education report*. Hoboken, NJ: Wiley.
Mustafa, M., Arar, K., & Khamaisi, R. (2009). Higher education among minorities: The case of the Arab minority in Israel. In R. Khamaisi (Ed.), *Arab society book* (Vol. 3, pp. 204–226). Bnei Brak: Hakibbutz Hameuchad - Sifriat Poalim.
Nachmias, R., Mioduser, D., & Forkosh-Baruch, A. (2010). ICT use in education: Different uptake and practice in Hebrew-speaking and Arabic-speaking schools in Israel. *Journal of Computer Assisted Learning*, *26*(6), 492–506.
National Science Board. (2018). *Science & engineering indicators 2018*. Alexandria, VA: National Science Foundation.
Radai, I., Elran, M., Makladeh, Y., & Kornberg, M. (2015). The Arab citizens in Israel: Current trends according to recent opinion polls. *Strategic Assessment*, *18*(2), 101–116.
Reinhold, S., Holzberger, D., & Seidel, T. (2018). Encouraging a career in science: A research review of secondary schools' effects on students' STEM orientation. *Studies in Science Education*, *54*(1), 69–103.
Reyes, M.-E. (2011). Unique challenges for women of color in STEM transferring from community colleges to universities. *Harvard Educational Review*, *81*(2), 241–263.
Rodwell, L., Lee, K. J., Romaniuk, H., & Carlin, J. B. (2014). Comparison of methods for imputing limited-range variables: A simulation study. *BMC Medical Research Methodology*, *14*(57), 1–11.
Sassen, S. (2007). *A sociology of globalization*. New York, NY: W. W. Norton & Company.
Sassen, S., & Van Roekel-Hughes, A. (2008). Deciphering the global: Its spaces, scales and subjects. *Social Thought & Research*, *29*, 3–18. Retrieved from http://www.jstor.org/stable/23250060
Schneider, A. (2018). *Arab citizens' integration into Israeli high-tech: Achievements and emerging issues*. New York, NY: Inter Agency Task Force on Israeli Arab Issues.
Sharma, S., & Sharma, M. (2010). Globalization, threatened identities, coping and well-being. *Psychological Studies*, *55*(4), 313–322.
Smooha, S. (2016). *Index of Arab-Jewish relations in Israel 2015*. Haifa: University of Haifa.
Snow, C. E., & Dibner, K. A. (Eds.). (2016). *Science literacy: Concepts, contexts, and consequences*. Washington, DC: National Academies Press.
Spencer, S. J., Logel, C., & Davies, P. G. (2016). Stereotype threat. *Annual Review of Psychology*, *67*, 415–437.
Stromquist, N. P. (2002). *Education in a globalized world: The connectivity of economic power, technology, and knowledge*. Lanham, MD: Rowman & Littlefield.
Walton, G. M., Logel, C., Peach, J. M., Spencer, S. J., & Zanna, M. P. (2015). Two brief interventions to mitigate a "chilly climate" transform women's experience, relationships, and achievement in engineering. *Journal of Educational Psychology*, *107*(2), 468–485.

Wang, M.-T., & Degol, J. L. (2017). Gender gap in science, technology, engineering, and mathematics (STEM): Current knowledge, implications for practice, policy, and future directions. *Educational Psychology Review*, *29*(1), 119–140.
White, I. R., Royston, P., & Wood, A. M. (2011). Multiple imputation using chained equations: Issues and guidance for practice. *Statistics in Medicine*, *30*(4), 377–399.
Xie, Y., & Goyette, K. (2003). Social mobility and the educational choices of Asian Americans. *Social Science Research*, *32*(3), 467–498.
Zippel, K. (2017). *Women in global science*. Stanford, CA: Stanford University Press.

Supplementary Tables

Supplementary Table S1. *Summary of data according to sex*

Variable	Total Sample	Female	Male
N	380	214	166
% total	100	56.3	43.7
% female	56.3	100	0
Mean age	15.44	15.44	15.45
Mean perceived family income (1-5)	3.30	3.22	3.38
Mean family role model (1-5)	3.21	3.17	3.26
Mean feel like minority (1-5)	2.86	2.97	2.75
Mean perceived discrimination (1-5)	2.65	2.68	2.62
Mean fluent in Hebrew (1-5)	4.18	4.17	4.19
Mean fluent in English (1-5)	3.61	3.52	3.71
Mean happiness (1-5)	4.10	4.08	4.13
Mean equal citizens (1-5)	2.49	2.40	2.58
Mean degree of religiosity (1-4)	2.08	2.03	2.14
Mean interest in STEM (1-5)	3.64	3.56	3.73
Mean STEM is cooperative (1-5)	3.50	3.60	3.39
Mean global factor (1-5)	3.37	3.36	3.37
Mean STEM is non-discriminatory (1-5)	3.80	3.89	3.70

Supplementary Table S2. *Coefficients and standard errors of regression of "STEM is non-discriminatory" by identity in interaction with Perception of STEM: Minority (Arab-Palestinian) students only*

	Model 7		Model 8		Model 9	
Variable	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Individual Characteristics						
Female	0.092	0.145	0.047	0.143	0.016	0.144
Age	0.122	0.148	0.121	0.144	0.146	0.143
Family income	0.209**	0.098	0.199**	0.095	0.193**	0.090
Role model	0.025	0.052	0.003	0.052	0.010	0.051
Feel like minority	0.138**	0.063	0.145**	0.062	0.142**	0.062
Fluent in Hebrew	0.293***	0.079	0.248***	0.078	0.263***	0.077
Fluent in English	-0.085	0.069	-0.065	0.067	-0.074	0.066
Happiness	0.051	0.108	0.034	0.103	0.040	0.103
Equal citizens	0.001	0.070	-0.030	0.068	-0.044	0.067
Degree of religiosity	-0.135	0.095	-0.106	0.094	-0.089	0.095
STEM is interesting	0.123*	0.064	0.113*	0.061	0.109*	0.062
Identity[a]						
Arab	-0.046	0.192	-0.087	0.189	0.079	0.079
Palestinian	-0.231	0.187	-0.272	0.182	-1.884**	0.820
Perception of STEM						
Global	0.060	0.095			-0.210	0.134
Cooperative			0.243***	0.083	0.323**	0.120
Identity[a]***Global**						
Arab					0.188	0.205
Palestinian					0.540***	0.189
Identity[a]***Cooperative**						
Arab					-0.237	0.187
Palestinian					-0.071	0.186
Intercept	-0.635		-0.861	2.172	-0.812	2.246
N	246		246		246	
R^2	0.218		0.247		0.279	

* P < .1 ** P < .05 *** P < .01

[a]Reference: Israeli-identifying minority students

R^2 is the average over the 20 imputations

Supplementary Table S3. *Coefficients and standard errors of regression of 'STEM is Non-Discriminatory': Majority (Jewish-Israeli) students only*

	Model 10		Model 11	
Variable	Coef.	Std. Err.	Coef.	Std. Err.
Individual Characteristics				
Female	0.164	0.204	0.167	0.199
Age	0.160	0.110	0.144	0.109
Family income	0.184	0.110	0.170	0.106
Role model	-0.036	0.076	-0.053	0.076
Feel like minority	0.037	0.089	0.034	0.087
Fluent in Hebrew	0.234	0.156	0.229	0.153
Fluent in English	0.120	0.127	0.127	0.124
Happiness	0.035	0.106	0.007	0.107
Equal citizens	0.084	0.111	0.034	0.116
Degree of religiosity	-0.039	0.114	-0.032	0.113
STEM is interesting	0.012	0.093	0.018	0.077
Perception of STEM				
Global	0.057	0.149		
Cooperative			0.242*	0.124
Intercept	-1.626	1.994	-1.714	1.960
N	134		134	
R^2	0.135		0.160	

* P < .1 ** P < .05 *** P < .01

R^2 is the average over the 20 imputations

Supplementary Table S4. *Coefficients and standard errors of regression of "STEM is non-discriminatory" by identity in interaction with Perception of STEM, according to separate components of the composite 'global' variable (labelled "G1" and "G2")*

	Model 12		Model 13	
Variable	Coef.	Std. Err.	Coef.	Std. Err.
Individual Characteristics				
Female	0.102	0.117	0.130	0.116
Age	0.161*	0.085	0.164*	0.086
Family income	0.190**	0.074	0.169**	0.073
Role model	-0.007	0.042	-0.025	0.042
Feel like minority	0.101**	0.050	0.112**	0.050
Fluent in Hebrew	0.258***	0.068	0.252***	0.061
Fluent in English	-0.012	0.061	-0.012	0.060
Happiness	0.014	0.078	0.012	0.077
Equal citizens	-0.019	0.055	-0.016	0.056
Degree of religiosity	-0.076	0.075	-0.092	0.070
STEM is interesting	0.087	0.053	0.056	0.051
Identity[a]				
Arab	0.512	0.543	0.944	0.667
Arab-Israeli	0.866*	0.502	1.128**	0.574
Palestinian	-0.715	0.547	-0.396	0.517
Perception of STEM				
STEM is global/international ("G1")	-0.053	0.095		
STEM in Israel is global/international ("G2")			0.177*	0.107
Cooperative	0.256***	0.069	0.206***	0.070
Identity*G1				
Arab	-0.020	0.142		
Arab-Israeli	-0.095	0.128		
Palestinian	0.262*	0.143		
Identity*G2				
Arab			-0.139	0.192
Arab-Israeli			-0.175	0.151
Palestinian			0.187	0.162
Intercept	-1.820	1.452	-2.264	1.452
N	380		380	
R^2	0.219		0.232	

* P < .1 ** P < .05 *** P < .01

[a]Reference: Jewish-Israeli

R^2 is the average over the 20 imputations

Supplementary Table S5. *Mean values of "STEM is non-discriminatory" by school/group. The five Arab-Palestinian (minority) schools are labelled A-E, and the Jewish (majority) group is labelled F.*

School/group	N	Mean of "STEM is non-discriminatory" (1-5)
A	61	3.802
B	41	3.996
C	65	3.791
D	33	4.132
E	46	3.601
F	134	3.682
Total	380	3.798

Supplementary Table S6. *Tukey pairwise comparison of "STEM is non-discriminatory" by school/group. The five Arab-Palestinian (minority) schools are labelled A-E, and the Jewish (majority) group is labelled F.*

			Tukey		**Tukey**	
School/group comparison	Contrast	Std. Err.	t	P>|t|	95% confidence interval	
B vs. A	0.328	0.238	1.38	0.742	-0.355	1.010
C vs. A	0.189	0.206	0.92	0.942	-0.402	0.780
D vs. A	0.479	0.249	1.93	0.388	-0.234	1.192
E vs. A	0.089	0.231	0.39	0.999	-0.573	0.752
F vs. A	0.105	0.180	0.58	0.992	-0.411	0.621
C vs. B	-0.138	0.233	-0.59	0.991	-0.806	0.529
D vs. B	0.152	0.272	0.56	0.994	-0.627	0.930
E vs. B	-0.238	0.256	-0.93	0.938	-0.970	0.494
F vs. B	-0.223	0.210	-1.06	0.897	-0.826	0.380
D vs. C	0.290	0.244	1.19	0.842	-0.409	0.989
E vs. C	-0.100	0.226	-0.44	0.998	-0.747	0.548
F vs. C	-0.085	0.173	-0.49	0.997	-0.581	0.412
E vs. D	-0.390	0.265	-1.47	0.685	-1.150	0.371
F vs. D	-0.375	0.222	-1.68	0.543	-1.012	0.263
F vs. E	0.015	0.203	0.07	1.000	-0.565	0.595

CHAPTER 4

Minority Youth Acculturation in Third Spaces: An Ethnography of Arab-Palestinian High School Students Visiting the Israeli Innovation Sector

Diamond, Aurel H. 2020. "Minority Youth Acculturation in Third Spaces: An Ethnography of Arab-Palestinian High School Students Visiting the Israeli Innovation Sector." *Journal of Ethnic and Migration Studies*. doi: 10.1080/1369183X.2020.1847055.

Journal of Ethnic and Migration Studies

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/cjms20

Minority youth acculturation in third spaces: an ethnography of Arab-Palestinian high school students visiting the Israeli innovation sector

Aurel H. Diamond

To cite this article: Aurel H. Diamond (2020): Minority youth acculturation in third spaces: an ethnography of Arab-Palestinian high school students visiting the Israeli innovation sector, Journal of Ethnic and Migration Studies

To link to this article: https://doi.org/10.1080/1369183X.2020.1847055

Published online: 25 Nov 2020.

JOURNAL OF ETHNIC AND MIGRATION STUDIES
https://doi.org/10.1080/1369183X.2020.1847055

Minority youth acculturation in third spaces: an ethnography of Arab-Palestinian high school students visiting the Israeli innovation sector

Aurel H. Diamond

Federmann School of Public Policy, Mount Scopus Campus, Jerusalem, Israel

ABSTRACT

Processes of acculturation occur when there is a need to reconcile minority identity with the hegemonic majority culture. What acculturation strategies do minority students adopt in social contexts that are not dominated by either the minority or majority cultures? In order to address this question, this paper offers an ethnographic account of three classes of Arab-Palestinian minority high school students aged 15–17 over the course of 21 months in Israel before, during and after participation in a programme designed to increase understanding of and exposure to the innovation sector. I argue that this curricular programming, which exposes students to internationalisation, globalisation and multinationalism, constitutes a 'third space' that is distinct from both the Arab-Palestinian home/family context and the hegemony of Jewish-majority society in Israel. Within this third space, some Arab-Palestinian students adopt strategies of acculturation that are distinct from their strategies in mainstream Israeli society. The opportunity to partially circumvent or leave the context of Israeli society within third spaces facilitates this distinction. The paper accordingly develops a schema that links theories of acculturation to third space theory, and provides empirical examples of how third spaces can facilitate unique strategies of acculturation.

ARTICLE HISTORY
Received 12 May 2020
Accepted 2 November 2020

KEYWORDS
acculturation; secondary education; minority students; Israel; third space

Introduction

A rich literature on theories of acculturation outlines the plurality of ways in which individuals reconcile minority identity with hegemonic majority culture (Chun and Akutsu 2003; Berry and Sam 1997; Berry 2008). Most studies on minority youth acculturation consider the experiences of minority students when encountering the hegemonic majority culture through their schools and government-mandated national curricula (Moffitt, Juang, and Syed 2019). However, and particularly in light of the emergence of technology and globalisation (Allatt 2018), a growing number of students are exposed to social spaces that are in many ways distinct from their national context, their schools and their home environments. Minority youth therefore acculturate in different types of 'third spaces' that reconcile the differences between that of the

CONTACT Aurel H. Diamond aurel.diamond@mail.huji.ac.il

ingroup (the 'first space', usually manifested by the home, family or community), with that of the outgroup ('second space') (Levy 2008; Moje et al. 2004). In the context of diversifying societies, it is important to investigate the extent to which individual patterns of minority acculturation diverge when exposed to different social contexts. Yet, very few empirical studies follow the acculturation of minority youth in different types of third spaces.

To that end, and in order to draw links between theories of acculturation and third space theory (Bhabha and Rutherford 2006; Soja 1998; Gutiérrez 2008), this paper offers an ethnographic account of Arab-Palestinian[1] high school students from a school in Jaffa, Israel, as they participate in curriculum programming that is designed to acquaint them with the country's science, technology, entrepreneurship, and innovation fields (henceforth: 'the innovation sector'). Increasing minority participation in the innovation sector is of great interest in Israel, where the Arab-Palestinian minority make up less than 3 percent of innovation sector workers, despite constituting nearly 21 percent of the overall population (Scheindlin 2016). In light of these inequalities, many high schools in Israel incorporate exposure to and teaching of the innovation sector as part of their curricula. Curriculum programming ranges from lessons about entrepreneurship and innovation lead by the school teachers, to computer programming workshops and fieldtrips to tech companies. The premise is that exposure to the innovation sector is likely to improve student interest, uptake and success in related fields.

With this in mind, the current paper is driven primarily by one question: how do minority students reconcile the context of the innovation sector in Israel with their own cultures, values, and narratives? The paper argues that the innovation sector curriculum programming facilitates the creation of a third space, and that participating minority-group students are required to acculturate in this third space accordingly. The findings suggest how some individuals prefer divergent acculturation strategies for the second space (i.e. majority Jewish-Israeli society) and the third space (i.e. the innovation sector programming). The paper therefore contributes to the literature by providing an empirical account of acculturation in third spaces, and facilitating a theoretical discussion that links third space theory to theories of acculturation.

Minority identities and acculturation strategies in Israel

In Israel, Arab-Palestinian citizens make up 20.9 percent of the population, of whom 84.8, 7.8 and 7.4 percent self-define as Muslim, Druze and Christian respectively (Central Bureau of Statistics 2019). Minority identity is in Israel is multi-faceted, typically comprising of often-conflicting aspects, including national (Palestinian), civic (Israeli), religious (Muslim/Christian/Druze) and local community identities (Amara 2017). Many factors contribute to the social and cultural distance between Jews and Arab-Palestinians, including: higher rates of minority poverty (Hai 2013); the context of conflict (Nasie, Diamond, and Bar-Tal 2016); ideological divisions regarding the Jewish nature of the country (Ghanem and Rouhana 2001); religious differences (Tatar 2004); separate Arabic- and Hebrew-language education systems (Khamaisi and Abu-Saad 2015); and social distance that results in feelings of alienation, discrimination and racism (Al-Haj 2012).

Thus, and following exposure to the majority Jewish-Israeli culture, Arab-Palestinian citizens of Israel undergo processes of social and psychological change – that is, *acculturation* – in order to adapt and adjust to the new environment and context. The literature usually identifies four different acculturation strategies that are classified according to high and low priority to maintain ingroup identity and high and low importance to seek relationships between groups (Berry and Sam 1997). For those who seek to preserve their ingroup cultural identity, these strategies include: *integration*, where individuals adopt aspects of the dominant cultural norms (i.e. biculturalism: Huynh, Nguyen, and Benet-Martínez 2011); and *separation*, where individuals reject the dominant culture and frequently form social enclaves. For minorities who place lower importance on maintaining unique group identity, types of acculturation include: *assimilation*, whereby dominant culture norms take precedence over the minority culture; and *marginalisation*, when individuals reject both the dominant culture and their culture of origin.

Studies over the last several decades have depicted many identity-focussed models by which Arab-Palestinian minorities acculturate to Jewish-Israeli society (for comprehensive summaries, see Horenczyk and Ben-Shalom 2006; Amara 2017). Though these studies do not exclusively use Berry and Sam's acculturation framework (1997), parallels between the identity models and acculturation strategies can be made. The first of these models, the *bipolar model*, points at high tension or total incompatibility between the Palestinian national identity and the Israeli civic identity, mainly as a result of the regional conflict (Kimmerling 2008). Here, identifying with one side of the conflict, Israeli or Palestinian, precludes identifying with the other, and is thus associated with separative and assimilative acculturation strategies. Other studies have developed *integration* models that do not assume necessary independence of civil and national identities. For example, a study that investigated the components of Arab-Palestinian identities in Israel found that respondents consistently express combinations of Palestinian, pan-Arab, Israeli, religious, clan and local community identities (i.e. integrative acculturation: Amara and Schnell 2004). Other studies propose a model of *accentuated* identity that suggests that the only truly internalised identity amongst minorities in Israel is Palestinian, while Israeli civic identity is a practicality or necessity given the geopolitical circumstances (Rouhana and Huneidi 2017). Accentuated identities thus typically avail to separation and/or marginalisation strategies of acculturation (Amara 2017). Finally, Suleiman (2002) developed a *double-marginality* model in order to reconcile the marginalisation that Arab-Palestinians experience due to simultaneous exclusion from both Jewish society in Israel and Palestinian society in the Palestinian territories and diaspora (Ayalon and Sagy 2011). The peripherality of identity facilitates marginalisation acculturation strategies for Arab-Palestinians in Israel (Al-Haj 2002). Table 1 summarises the parallels drawn here between studies on Arab-Palestinian identities in Israel and the theoretical framework of acculturation used in this paper. It should be noted that these models are highly nuanced and that individuals may adopt seemingly contradictory aspects of different approaches, depending on context.

Third spaces for minority youth in Israeli high schools

In researching the acculturation of minority youth, it is instructive to view school curricula through the lens of 'third space theory' (Bhabha 1994; Soja 1998). Third space

Table 1. Summary of studies presenting identity models for Arab-Palestinian minorities in Israel and their associated acculturation strategies. Further studies that account each of the identity models can be found in comprehensive reviews (e.g. Horenczyk and Ben-Shalom 2006; Amara 2017).

Identity model	Primary attributes	Associated acculturation strategies
Bipolar model (e.g. Kimmerling 2008)	Identifying as Palestinian precludes the possibility of identifying as Israeli (and vice versa)	Separative; assimilative
Integrative model (e.g. Amara and Schnell 2004)	Identities comprising of components that simultaneously reflect Israeli, Palestinian and other components	Integrative
Accentuated model (e.g. Rouhana and Huneidi 2017)	Emphasis on centrality of Palestinian identity; Israeli civic connection identity is a necessary practicality	Separative; marginalisation
Double-marginality (e.g. Suleiman 2002)	Challenges in identifying with either one of Palestinian and Israeli societies and narratives	Marginalisation

theory, emerging from sociolinguistic and postcolonial research, has been used to explain the breaking-down of perceived cultural, linguistic, temporal and space boundaries between contexts for individuals who negotiate their identities between two distinct spaces. In third spaces – which connect between the two negotiated contexts – individuals construct hybrid meanings of their realities in order to reconcile their combined cultural experiences (Gutiérrez 2008) and eliminate cultural hegemony of the majority (Wallace 2004). Third space theory has been used increasingly in the context of minority education (Moje et al. 2004; Levy 2008) in order to refer to the lived cultural context of students who create third spaces to navigate the disparities between their home context (first space) and school lives (second space).

In Israel, education is largely segregated since almost all Jewish parents send their children to Hebrew-language school, while Arab-Palestinian parents send their children to Arabic-language schools. As a result, Jewish and Arab-Palestinian youth in Israel are unlikely to meet and form friendships during their school years, even in mixed Jewish/Arab-Palestinian cities (Gibton 2011). Thus while studies often discuss third spaces that negotiate the difference between home (first) and school (second) cultures for minority students (Levy 2008), the Israeli context facilitates the possibility of a different framing. The Ministry of Education promotes curricula that reinforce the Jewish-Israeli cultural hegemony, even in Arabic-language schools (Al-Haj 2012). The schools can therefore be seen as facilitating a third space where minority students negotiate between Arab-Palestinian (first) and Israeli-Jewish (second) cultures. The tensions between these two spaces frequently result in the marginalisation and separation of Arab-Palestinian students (Makarova and Birman 2016).

The innovation sector programming as a third space

Schools, however, are not the only spaces wherein Arab-Palestinian youth establish their identities in Israeli society. This article directs attention to minority youth access and exposure to global and international platforms and contexts that do not reflect majority-hegemonic culture in the same way as the school curricula. Exposure to the innovation sector, which is characterised by advances in science and technology, arguably shapes global contexts whose cultures and social order are distinguishable from majority society due to the prevalence of meta-cultural languages and values, and cooperation with international contacts (Sassen and Van Roekel-Hughes 2008). The

emphasis on science and technology reduces the salience of national identity in this context (Drori et al. 2003).

Yet, seeing as high school students are too young to be employed in the innovation sector, this study follows the experiences of students as they learn about the innovation sector in school lessons and visit it on fieldtrips over the course of their studies, viewing this experience as a third space. While this research does not follow long-term student exposure to the innovation sector, emerging studies demonstrate how even intermittent contact with global publics can significantly impact the social experiences of minority students in Israel. Indeed, studies on science education in Israeli high schools show how students who perceive science to be global and international feel more positively about intergroup cooperation and integration (Diamond and Kislev 2020a), and anticipate less discrimination in science-related education and careers (Diamond and Kislev 2020b). There is also evidence to suggest that perceiving science as global and international can lead to improved educational outcomes and increased motivation for higher education (Diamond 2020).

These studies suggest how the context of science education and the innovation sector can create a unique social context characterised by the 'global' nature of science and technology in general, and thus indicate the possible value of considering acculturation in third spaces. They argue that science and technology assist in creating a global space that allows individuals to experience a transformative sense of themselves in relation to the cultures of both their homes/families, and the rest of society. The data collection and analyses below were therefore guided by two directions: (i) the framing of the innovation sector programming as a third space and (ii) patterns of acculturation within this context.

Methodology, methods and data

The data for this paper are part of a larger study on the experiences of minority youth in Israel as they learn about the innovation sector through extra-curricular programmes, for which I conducted ethnographic observations of innovation sector programming, regular school lessons, recess time and general activities at five high schools in the city of Jaffa between October 2017 and June 2019. I was introduced to the students and teachers as a university researcher completing an evaluation of students' opinions and experiences of said programming, and the aims of my research were declared. My research required the trust and confidence of both students and teachers, and as such I assumed a 'middle-manager' role (Gansen 2017), wherein my goals were not to be more aligned with either the teachers or students, but to build rapport with all groups simultaneously. In addition, and in order to establish my role as balanced in this context, students and teachers were assured that my role was independent of the school and any of the extra-curricular programming. Moreover, as discussed below, the analyses take into account as best as possible the impact of my identity as a Jewish-Israeli man.

Whilst the larger study included data from five schools, this paper reports on findings exclusively from *Ironi Samekh High School* (a pseudonym[2]) in Jaffa, which meets several criteria that improve the relevance of this case to others. Most importantly, the school is publicly funded and follows the Ministry of Education curriculum for Arabic-language schools; some schools were excluded for following the Hebrew curriculum, being

privately funded, or being affiliated with an international church movement. In addition, the school lies on the border between several neighbourhoods and attracts families from a wide diversity of socioeconomic status (SES). Finally, I carried out more than half of the total observations at Ironi Samekh, making this dataset the richest of the participating schools. I followed three classes that constituted 67 students, whose characteristics are summarised in Table 2.

Data on this paper focusses primarily on student experiences as they participated in curriculum programming that is designed to acquaint them with the innovation sector. Once a week for four weeks, students in grades 10 and 11 (15–17 years old) received a 2-hour lesson on entrepreneurship, start-ups, high-tech and the Israeli innovation sector. I observed four cycles of this programme in two other schools before arriving at Ironi Samekh.

In total, I collected approximately 400 hours of observational data (260 of which at Ironi Samekh) during classroom times, recess, parent–teacher evenings and on school fieldtrips to tech companies. These consisted primarily of open-ended observations (Wragg 2013). During frontal teaching time, I typically sat at the back of the classroom recording my observations through fieldnotes in a portable notebook (Emerson, Fretz, and Shaw 2011). Audio recordings of formal lessons were used to supplement fieldnotes in subsequent analyses, and direct dialogue between myself and students was recorded where appropriate and informed consent was possible. During recess, group-work time in lessons, and on fieldtrips, I adopted the role of a reactive observer. As a reactive observer, I joined individuals and groups of individuals upon their invitation, and listened intently to their conversations (Cohen, Manion, and Morrison 2013). I took care, however, to avoid selection bias through this approach, and equally noted the behaviour patterns and dialogues, where possible, of students and teachers who were less keen to seek direct interaction with me.

I coded my field notes and transcriptions of the audio recordings collected throughout the study. Axial codes (Strauss and Corbin 1997) based on each of the acculturation strategies and identity models presented in Table 1 were assigned and used in the analysis of narratives, as below. For completeness, Appendix A includes selected excerpts from the analyses in order to demonstrate how the definitions were translated into codes.

Table 2. Summary of characteristics of classes observed and their teachers. The classes are given pseudonyms that correspond to the first three letters of the Arabic alphabet.

Class	Grade and age	Number and gender of students	Teacher characteristics
Class *Alif*	Grade 10 (15–16 years old)	24 students (11 girls, 14 boys)	Male, mid-thirties, born and raised in Jaffa. Studied science at an Israeli university. Religious Muslim. Vocal about Palestinian politics, hostile views of Israeli society
Class *Ba*	Grade 10 (15–16 years old)	26 students (14 girls, 12 boys)	Female, late fifties. From a small village in the north, moved to Jaffa after studying literature to live with her husband. Secular Muslim, high SES. Enjoys speaking Hebrew and has many Jewish friends
Class *Ta*	Grade 11 (16–17 years old)	17 students (10 girls, 7 boys)	Female, early thirties, traditional and moderately religious Muslim family but is secular herself. Raised in Jaffa, where she stayed while she commuted for her degree in science teaching. Involved in local Arab-Palestinian political parties

Data and narrative smoothing

The study follows the students' preferred acculturation strategies and how they possibly change as they learn about and gain exposure to the innovation sector. I therefore present an *analysis of narratives* (Gubrium and Holstein 2008) that aims to reflect these changes, with a grounded theory approach to data analysis (Strauss and Corbin 1997). It should be noted that an analysis of narratives is distinct from narrative analysis. Unlike narrative analysis, which focusses on the narratives of an individual or a small group, an analysis of narratives uses content analysis and assigns codes to narratives over larger groups of research participants. An analysis of narratives is therefore suitable for this research, given the large number of students I observed.

Initial data (primarily in the form of field notes) were used to refine the research focus and codes for the acculturation strategies of the participants ('narrative smoothing': Polkinghorne 1995). Regarding variation in gender, scholastic ability, and SES, the students quoted in the findings were chosen to give a representative sample, as best as possible, of the classes I accompanied. Finally, it should be noted that the findings described represent the projected student acculturation strategies over the period of observation only. Acculturation is an ongoing process, and further longitudinal analyses would be required to establish preferred acculturation strategies over the long term.

Researcher identity

Especially within the Israeli context, and due to societal tensions and the wider context of conflict, as well as disparities in religion, ethnicity, race and language, there are tensions that impede the establishment of relationships and trust between the researcher and the field. These tensions can result in biased or orientalist accounts of the Palestinian people (Furani and Rabinowitz 2011). Therefore, and particularly as a Jewish-Israeli researcher, emphasising and demonstrating the impartial – or at least non-sanctioning – nature of my role was paramount to facilitating a positive rapport between myself, the students, and the teachers. Participants were aware that I was a university researcher with no official connection to school or municipality, and that I was not being paid or rewarded to do this work. In order to further demonstrate my impartiality, I was careful to avoid endorsing or showing disapproval of any of the students' comments, opinions and behaviour. Although it is impossible to completely erase the impact of my identity or role as a researcher in Arabic-language schools, I noted the extent of the trust cultivated when students confided in me about family issues or negative opinions about their peers and teachers, and when teachers invited me to attend parent-teacher evenings or shared opinions about the school management and community gossip.

In addition, women face nuanced gender-related obstacles and discrimination in the Israeli innovation sector. Findings from the larger study (of which the current research is a part of, as mentioned above) demonstrate how the highly gendered nature of the innovation sector impact the experiences of young women and girls. They reflect the intersectionality between gender and race of Arab-Palestinian women in Israeli business contexts (Kanaaneh 2002). All data collection and analyses therefore take into account the gendered context of the Israeli innovation sector for Arab-Palestinian students, and my position as a Jewish-Israeli man collecting this data.

To that end, I researched across differences (Gunaratnam 2003), and at least initially was perceived by participants as an outsider. Despite the possible insights gained from being perceived as a more 'objective' external observer (Bonner and Tolhurst 2002), the dynamics of Jewish/Arab-Palestinian relations in Israel risks eliciting biased, 'expected', or unnuanced communication between myself and the field. In order to reduce this risk, I conducted in-depth triangulation interviews with two science teachers at Ironi Samekh (one male, one female, both aged 30–40) once every 2 months throughout the project. These interviews were used to corroborate my analyses and reduce the risk of biased narratives.

Findings

The findings and analyses are organised chronologically in order to reflect students' changing narratives and experiences over the duration of the programme in three sections. In the first section, I provide background on the school context and students' attitudes to Israeli society before the programming. The account of this context is instructive for addressing the research questions. The second section recounts student experiences of the lessons on the innovation sector. Finally, the third section follows student experiences on the tech company fieldtrip, thus facilitating a comparative discussion regarding the students' acculturation strategies.

I. Ironi Samekh and the City of Jaffa

The cities of Tel Aviv and Jaffa[3] merged in 1950 to form the municipality Tel Aviv-Yafo. The Hebrew-speaking, newly-Israeli Tel Aviv-Yafo municipality took responsibility for the residents of Jaffa. Today, of the approximately 450,000 residing in the municipality, around 46,000 reside in Jaffa, of whom 35 percent are Arab-Palestinian citizens of Israel. Until the merger with Tel Aviv, Jaffa had an Arab-Palestinian majority; today, is a highly heterogeneous urban space with many young and/or wealthy Jewish newcomers. The changing demographics of Jaffa create places pressure on Arab-Palestinian residents whose local identity with the city is paramount. Indeed, the risk of being priced out of Jaffa due to gentrification is a threat to identity that creates political tension (Schipper 2015).

Jaffa's Arabic-language schools therefore play a central role in maintaining the heterogeneous ethnic balance in the area, and amongst the small Arab-Palestinian community, schools take centre-stage. Ironi Samekh has approximately 550 pupils in grades 7 through 12 in 27 classes. Around 70 percent of students receive high school matriculation certificates, compared to the 45 percent nationwide-average; this is despite the local population being ranked in the fourth quintile for SES. Virtually all of the students are Arab-Palestinian citizens of Israel, with more than 95 percent identifying as Muslim. According to the principal, the school has a 'modern Islamic ethos', and is highly welcoming to its Christian students.

The principal of Ironi Samekh met me at the school gates on my first visit to the grounds. 'This school, just like the city of Yaffa, is all about contrasts', he noted. Indeed, many juxtapositions were immediately apparent just standing in the entrance hall. On the outside, the local streets are named after renowned rabbis and Hebraic-

biblical characters; Israeli brands and chains dominate the neighbourhood; the school t-shirts worn as uniform are emblazed with the Tel Aviv-Yafo municipality logo; and even the name of the school is in Hebrew.[4] Yet, after passing the armed guard – a standard practice at Israeli schools – the first glimpse of the school told me a lot about contrasting worlds. On one side of the hall was a large collage of student posters on the works of the renowned Palestinian poet, Mahmoud Darwish, and on the other side, a painted mural of Jerusalem's Al-Aqsa Mosque and romanticised stories about *Haram Al-Sharif*.[5] The inclusion of Darwish's poem *ID Card* was especially pertinent since just 6 months beforehand, Israel's then-Defence Minister criticised the reading of this poem on national radio, comparing his works to those of Hitler. Both symbols of Palestinian nationalism in the middle of a Jewish-Israeli urban space reflect the contrast between the school and its surroundings, and the teachers' desires to instil political and cultural awareness and Palestinian narratives within Israeli spaces.

Contrasts are also reflected in the linguistic experiences of the students of Ironi Samekh: citizenship, literature and social sciences are taught in Arabic, while mathematics and science are instructed in Hebrew. I was surprised to understand that according to the teachers, and the students themselves, many of the younger generation claim higher proficiency in Hebrew than in Arabic, particularly when it comes to reading and writing. Therefore, and although some interactions were in Arabic or English, I was usually addressed in Hebrew.

Views of Israeli society

Even the bell at Ironi Samekh sets the school apart from the Jewish-Israeli reality outside. Between each lesson, the tannoy system sounds out a few bars from songs by the famous Lebanese singer, Fairouz. The students at Ironi Samekh are Israeli citizens and thus barred from visiting Lebanon, yet the school connects them to the wider Arab world even through the choice of school bell.

During my first month at Ironi Samekh, I found myself in the schoolyard at the end of the first recess of the day. Almost all of the students heard Fairouz and took that as a signal to head to their next lesson. Yet a group of four boys, who I identified from one of my classes, lingered outside chatting quietly. One of them, Walid, called me over and asked jokingly: 'don't you have a lesson to attend?'. I smiled and told him that I could ask him the exact same question. The boys laughed, offered a high-five, and insisted that I sit with them; they wanted to know what I thought about the school so far. I told them that thanks to the school bell I started listening to Fairouz at home, and as is often the case in Israel, the conversation turned quickly to identity and politics. They were surprised and seemingly flattered that an outsider like me took a liking to Arab culture and music. Walid lead the conversation:

> Find me another Jew who puts Arabic music on their Spotify.
>
> Do you think I am the only one?
>
> … well, maybe not, but you know what it's like. They [Israeli Jews] like visiting us in Yaffa to go for hummus, or to find shops and garages that are open on Saturday, but don't really see us eye-to-eye. What does this have to do with Fairouz?

> Look, we are Israeli enough to eat and live together [with Jews], but not enough to have clean streets and new roads [the street sewers overflowed earlier that week]. We are Arab enough to have hummus restaurants and good music, but not Arab enough to visit Fairouz in Lebanon.

Another boy, Samir, added that this was frustrating since he has cousins in Lebanon, presumably descendants of the 1948-war refugees, that he has never met. Walid and his friends explained their positionality in a relaxed manner with confidence that I would not normally expect from 15-year-olds.

According to their teachers, Walid and his friends are 'misfits' and not really integrating well into the school or the local community, and for this reason the teachers do not argue when they choose to miss lessons. As I learnt in the following months, the boys – although bright and highly social – come from a poorer part of Jaffa, and perform badly in their academic studies. Walid and other students from the same neighbourhood, despite relating positively to national, civic, religious, and local aspects of their identity separately, often express feelings of being 'neither here nor there'. They manifest expressions of marginalisation (Suleiman 2002). In the above conversation, Walid and his friends simultaneously expressed frustration with Israeli authorities (who neglect infrastructure issues in Jaffa) and with Lebanese authorities (who do not permit Arab-Palestinian citizens of Israel to enter Lebanon). The same students also were the least excited about the prospect of learning about the innovation sector, and almost always gave neutral responses when asked about the upcoming programming.

Different narratives emerged amongst academically-able students. Before any of the innovation sector lessons began, I observed computer science workshops that comprised of high-achieving students from my classes (10 girls and 8 boys). At the beginning of one of the first lessons, the teacher asked the class where they think they can work if they become proficient at computer programming. It was early in the morning and the classroom was dark, so the students required some coaxing. The answers started pouring in, and the students named over a dozen tech companies. The teacher pointed out which of those companies had offices in Israel, to the great enthusiasm of the students. Some of the students mentioned family members, friends, or acquaintances working at said companies. This exemplified the coexistence of the Palestinian-Islamic ethos of the school, and the displays of Al-Aqsa and Darwish on the one hand, and the normalisation of the Israeli milieu and excitement about Israel-based tech companies on the other.

I used these workshops to ask students what they knew about the innovation sector and what they thought about the upcoming programming. A conversation with Layla, 16, showed how some students with integrative aspirations are more optimistic about their futures than Walid and his friends. During the computer science class, Layla – who wears a hijab and comes from a more religiously conservative background – shared with me her excitement about receiving top grades on her class assignment. She wants to pursue a degree in computer science. While it was clear that Layla enjoys the computing class, she was particularly motivated by the financial reward: '… the salary will allow me to stay in Yaffa.' Her family, who live in the wealthiest part of the city, do not have any land to build a new apartment for Layla, so once she gets married, she explained, she will need to rent and eventually buy something in the quickly-gentrifying neighbourhoods. I asked why this was important:

> Actually, I don't mind who my colleagues and friends are, I like meeting different types of people. As long as I can still be me. I will always be *hijabi* [wear a hijab], I will always be Muslim, I will always be from Yaffa.
>
> What does this have to do with money?
>
> If I do not make a Tel Aviv salary, how will I be able to stay in Yaffa?

Here, the threat on the local aspect of Layla's identity and her connection to Jaffa informs her acculturation strategy.

In the computer science class, the talented students sought paths to coexistence for their Israeli civic realities and national, religious and local identities. Half of the students in the class were coded as preferring integration strategies (Amara and Schnell 2004), for example, as indicated by positive reactions to prospective Israeli workplaces. In addition, a large minority adopted, like Layla, accentuated identities that make space for the Israeli reality, but treat it mainly as a practicality that must be reconciled with the more important, non-Israeli components of the self.

II. Learning about the innovation sector

Students received three preparatory lessons before going on their fieldtrip to Tel Aviv. The first lesson, delivered by an outside speaker from a local NGO, invariably opened with the question: 'Who has heard of the 'Start-up Nation'?' Almost none of the students were able or willing to say much at all, reflecting their potential exclusion from Israel's otherwise well-known innovation sector. Even amongst adults, a recent survey found that only 42 percent of Arab-Palestinians have heard of high-tech entrepreneurship, compared to 87 percent of Jewish-Israelis (Scheindlin 2016). This may seem surprising given Jaffa's closeness to the innovation district in Tel Aviv, but the geographic proximity seems meaningless given the huge socioeconomic disparity from Ironi Samekh's neighbourhood. Indeed, and following conversations with teachers and students, it became clear that many students – particularly those from poorer families – leave their neighbourhoods very infrequently, let alone the city of Jaffa. These lessons therefore, for the majority of the students, present first exposures to the innovation sector.

Depending on the lesson and teacher, students were given three different examples of entrepreneurship through which they learnt about the innovation sector. Through each example, students were encouraged to think about what problems they as young people face in Jaffa, and how they could use technology or create a start-up that would address their issues. The first example was international: young entrepreneurs developed an affordable way of addressing iron deficiencies amongst rural Cambodians and thus improved public health in their local communities. The second example was national: it recounted the success of Israeli-born Arab-Palestinian Nuseir Yassin ('Nas') and his highly popular video blog, *Nas Daily*. The third example was local: students learned about the life of Mohammad Asfour, born in Jaffa, his role in developing USB technology, and his highly successful tech career.

Student reactions to these examples were discernible by their general attitudes to Israeli society, which, as discussed, were often correlates of SES and academic ability. Weaker students, and in particular those who adopt separative or marginalisation

acculturation strategies, were the most enthusiastic. For these students, Nas and Mohammad act as role models and give examples of where someone like them may fit in and succeed. One week after hearing about Nas, I sat with Walid, Samir, and their friends again in the schoolyard at lunchtime, and asked what they thought about the lesson: 'Did you see that … [Nas] has more followers than there are people in the whole of Palestine!' I agreed that it was impressive, and asked what they would do about it. They discussed the possibility of making a video blog, and moved on to the option of applying to work for Nas so they could move to California and 'mix in' with all of the Americans in Silicon Valley. This possibility seemed like an opportunity to leave their current social context where they experience and feel exclusion.

Layla and her secular friend Noor – who was also in the computing class – overheard my conversation with the boys and approached to offer their opinions. They liked Nas, but were quick to qualify their support. Noor asked the boys: 'great, but why can't he do all this from home? Why does he have to work from California? Look at [Mohammad Asfour], he *has* to work abroad sometimes but still lives in Yaffa'. For Noor, Layla, and other students who are especially keen on preserving their Palestinian identities within Israel, Mohammad was more impressive since he, in their eyes, stayed very close to his local community despite his success.

Reactions to the example from Cambodia shed light on what is happening in the case at hand. The teacher instructed the students to discuss where and how they would implement the Cambodian technology in other contexts. Students keen on retaining their minority group identities in Israel, invariably thought about how the technology could help people in Jaffa, Palestine, or Arab-Palestinian communities in Israel. Some were optimistic about maintaining a Palestinian identity and integrating into an innovation context, whilst others like Noor retained a pragmatic stance towards the examples given, and were careful to establish how to maintain group identity (i.e. separative or marginalisation strategies of acculturation: Rouhana and Huneidi 2017).

Yet, students who place lower emphasis on retaining group identity, like Walid and his friends, sought contexts outside of Israel/Palestine. Zahra, a grade 10 student with average marks, told me that she would go to the Maldives: 'People in Israel don't struggle with malnutrition, so we would make more money there. I also really want to see the islands!' I asked which job she would take in the project. After a few moments of deliberation, she responded confidently: 'A scientist. I'll work with Cambodians, Indians, everyone … ' Zahra was keen to assimilate into the project as an individual coming to work on a scientific project. Zahra, Walid, and other students who experienced double-marginality, found the examples from the innovation sector to be opportunities to fit in, assimilate, or even develop a new identity as a scientist or entrepreneur. Zahra's attitude is a manifestation of how the innovation sector provides a different social context, or a 'third space', that commands different strategies of acculturation for some students.

III. The innovation sector social space

After learning about entrepreneurship and the innovation sector through the examples mentioned, students spent the last two preparatory lessons making a business plan to present to employees at the innovation company fieldtrip to Tel Aviv. The

communications company, *WeTech*, employs over 40,000 people in 35 countries including 200 in Tel Aviv, around five percent of which are Arab-Palestinian citizens of Israel. Students are given a short tour of the high-rise office building before meeting three employees for an open discussion about working at WeTech.

For the students, the fieldtrip to WeTech was one of border crossing through a number of spaces: geographically from Jaffa to Tel Aviv; politically from an Arab-Palestinian community to Jewish-Israeli Tel Aviv; socioeconomically from a poor neighbourhood to the wealthy innovation district; and culturally from their school to the offices of a large global company. Indeed, Khamaisi and Abu-Saad (2015) describe how the disconnect between Arab-Palestinian communities and wider society creates palpable and charged borders that increase the separation between Jewish and Arab-Palestinian citizens of Israel. Yet for most students, the overwhelming emotion on the 25-minute bus ride from the school to WeTech was excitement. Students' conversations on the bus made it apparent that they usually have no reason to visit this wealthy part of Tel Aviv, and that they were keen to flaunt the experience to their peers and families as they posted live updates from their trip on social media accounts.

On one occasion, whilst stuck in traffic, the students asked the driver to switch from an Arabic-language to a Hebrew-language radio station, after which they started singing along to popular Israeli songs. I noticed Samir singing along, and in the moment, our conversation about Fairouz and Lebanon seemed very distant; it became clear that outside the school, community, and neighbourhood context, the students freely and enthusiastically participate in at least some aspects of Israeli culture in ways that I had not witnessed at school. This event was one of many that indicated how outside the school context, students seemed readier to integrate aspects of Israeli culture with their own, resulting in more assimilative or integrative acculturation strategies.

The excitement of border-crossing continued throughout the tours of WeTech, during which students laughed frequently, took photographs with their phones, and paid little attention to the tour guide who mainly spoke about the good working conditions at the company. However, the tone of the visits shifted immediately once the discussion with the workers began, with differences between questions directed at Jewish and Arab-Palestinian workers.

Questions directed at Arab-Palestinian workers primarily concerned navigating the workspace as a minority from one of two directions, where students sought to affirm views they had developed throughout the preparatory lessons. On the one hand, and particularly (but not exclusively) from students with lower heritage-culture maintenance, there was interest in asserting identification with WeTech. Students wanted to know whether the employees felt comfortable in their workplace. For example, George, one of the few Christian students at the school, asked to the great interest of his peers and teachers whether being Arab made it difficult to feel part of the company. The employees (who were all Arab-Palestinian that time) explained – to the apparent relief of their student visitors – how being Arab did not conflict with their career choices. On the other hand, there was wide and general interest in how one could maintain Palestinian, religious, and community identity. Ahmed, who comes from a religiously observant family, engaged the whole class when he challenged Fatima, a religious woman and programmer from the north of Israel, on balancing societal roles and expectations in the company. He was surprised that she could move away from her town before marriage

in pursuit of a career that might make religious observance challenging. After Fatima assured the class that she was able to pray and that the cafeteria supplied halal meals, the students' attitudes seemed to shift. Ahmed later expressed to his teacher, with mild surprise, that he was impressed that Fatima stayed 'loyal to her community' despite the obvious challenges, and said that he aspired to do the same. In subsequent conversations, I asked students how they remembered Fatima. They used exclusively positive adjectives, referring to her as 'intelligent', 'diligent' and 'pious'. I noticed that female students keen on maintaining Palestinian national identity (like Layla and Noor) showed particular high admiration for Fatima, describing her path into WeTech as an example they may like to emulate. These instances provide examples of how students who would not normally ascribe to Israeli culture may be prepared to integrate or assimilate in the WeTech company environment.

Questions directed at Jewish employees were similar insofar as students also used the discussion as an opportunity to assert the centrality of WeTech in the employees lives and identities: 'Are you proud of working here?'; 'Are most of your friends from WeTech?'; 'Do you really spend 12 hours a day here? And enjoy it?'. To a certain extent, the discussions also addressed how Arab-Palestinian employees integrate into the company. Questions regarding language almost always rose, from students of all SES backgrounds and academic abilities: 'Do I need to know English?'; 'Are the meetings in Hebrew?'; 'Do employees speak Arabic?'. The trip organisers anticipated these questions, and employees were instructed, where appropriate, to mention that WeTech has offices in many Arab countries, and as such speaking Arabic is in fact an asset. This generated great enthusiasm amongst the students who understood the possibility of integrating Arab-Palestinian identity with the culture of WeTech (or other innovation companies) to their advantage.

The fragility of this balance of minority culture and that of WeTech, however, was demonstrated in an argument between a Jewish employee, Omer, and Ahmed. Omer, a computer engineer in his late thirties, described his path from his military career in an intelligence unit into the innovation industry. He spoke in Hebrew and peppered his speech with Arabic slang. Although this is common in the Hebrew vernacular, Omer was translating words that Jewish-Israelis typically would not integrate in their speech; the words included a seemingly random assortment of adjectives and room objects that one might learn in a basic spoken Arabic class. The students' responses ranged from bemused to quietly awkward. Tensions surfaced when Omer handed out snacks to the students, taking care to mention that they were vegetarian, halal, and using his idiosyncratic Arabic interjections, '*zaki*' [tasty]. This irked many students, including Ahmed, who interjected in Hebrew: 'of course it's halal, *Bamba*[6] is always halal!' Before Omer could respond, Ahmed turned to his teacher in Arabic: 'why does he think he can patronise us like this?'. The teacher tried to explain Omer's good intentions and asked for Ahmed's patience, but it was already too late. Ahmed started ridiculing Omer, and other students vocalised their discomfort and joked about Omer's lack of understanding of Arabs. It took the teachers and employees 6 minutes to take control of the situation, by which time Ahmed had been accompanied out of the room by his teacher.

One week later, I saw Ahmed back at Ironi Samekh and gently broached the subject:

I'm sorry about what happened at WeTech.

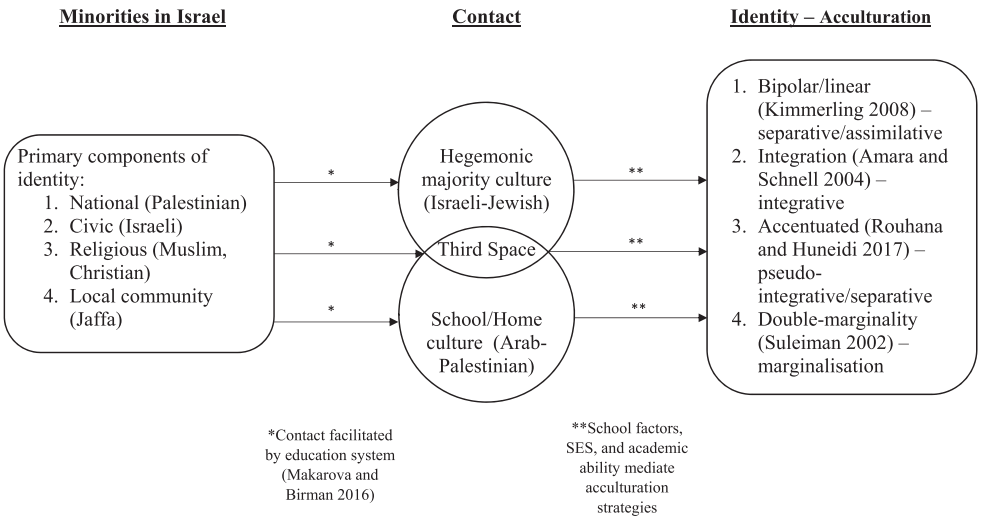


Figure 1. Schematic presentation of the acculturation processes of the study participants.

… [Omer] really had it coming, he deserved to be made a joke of.

Yes, I see … you and your friends really ridiculed him.

Don't you see, Aurel [the author]? Of course we made fun of him, he was making fun of us!

We digressed and I asked Ahmed whether he still wants to work in a tech company, as he had told me during the preparatory classes. He told me that he does, but would prefer to work at an Arab tech park, such as the one in Nazareth[7], or maybe move to the UAE or another Arab country; at this point, it became clear that Ahmed was seeking to leave the Israeli context.

Ahmed's confrontation with Omer was a critical example of how the overlap of the hegemonic Jewish-Israeli culture in the innovation sector can encourage students to revert to acculturation strategies that are adopted with the rest of Jewish-Israeli society. In Ahmed's case, the clash between his identity and the WeTech context led him to prefer separative acculturation (Kimmerling 2008). While some of the students in the room were less affected by the confrontation and retained their third-space acculturation strategies, others reverted to both accentuated and double-marginality approaches following this incident. The final section of this article develops a schema (Figure 1) for understanding these patterns and differences.

Conclusions and limitations

Figure 1 summarises and illustrates the acculturation strategies of Ironi Samekh students in the innovation-sector programming. The particular case of Jaffa is unique in Israel due to its ethnic/religious and socioeconomic heterogeneity. As such, this research is limited in its ability to comment on student acculturation strategies outside of Jaffa. Nonetheless, and as shown in Figure 1, the findings can be used to propose a theoretical framework that shows how exposure to a third space can mediate student acculturation strategies.

Student identities comprise a number of components, including nationality, civic identity, religious belonging and belonging to the local community. Through the education system, they come into contact with Israeli society in general, and in the case of Ironi Samekh, the innovation sector. This study finds that many high-SES and high-achieving students seek ways to maintain their own heritage through acculturation (separation/integration), typically adopting integrative or accentuated Israeli/Palestinian identities. Meanwhile, lower SES and less able students placed less emphasis on identity preservation, and adopted assimilative or marginalisation acculturation strategies, resulting occasionally in marginalisation. To that end, this study suggests that acculturation in the innovation sector, as a third space, is likely related to SES and academic ability, ostensibly since they are requirements for integrating into the innovation sector. However, this explanation, as well as the generalisability of this study beyond the case presented, need to be supported by further research.

The main theoretical insights from this study are in the form of understanding acculturation patterns in the context of third space theory. This study builds on findings from previous research on third space theory in education (Levy 2008; Moje et al. 2004) by showing how contact with additional social contexts, such as that of the innovation sector, changes the nature of the third space (created by the school) for some students, thus resulting in diverging strategies of acculturation. Indeed, the study provides an account where minority acculturation strategies differ between social spaces in the same national context. Here, the innovation sector programming is sufficiently distinct from mainstream society that it gives some students the opportunity to adopt favourable acculturation strategies. That is, students were willing to adopt aspects of the innovation sector culture, even if they were apprehensive about general Israeli culture or placed strong emphasis on preserving their own minority identities. To that end, the innovation sector programming may provide students with access to global spaces that may, in some circumstances, be empowering for minority groups (Sassen and Van Roekel-Hughes 2008).

Yet, the ability of engaging students in innovation sector curriculum programming to create a new third space is bounded. Indeed, a central limitation of the study presented is its pointwise exposure to the innovation sector. While the findings were informative, they cannot guarantee longitudinal effects once the programming is over. Moreover, and as the trips to WeTech revealed, the innovation sector is not perceived as truly distinct from the hegemonic majority culture. In fact, incidents such as the confrontation between Omer and Ahmed show how the overlap between the third space and mainstream society actually end up reinforcing marginalisation or separation acculturation strategies for some students. Thus, and in particular for the low-SES and low-achieving students in this study, the innovation sector programming as a third space may actually be better represented as a vehicle for delivering a social context that poses identity threat. In this case, the third space assists in the reproduction of social distance between the minority and majority groups.

Nonetheless, insofar as the global context of the innovation sector allows students to negotiate between Arab-Palestinian and Jewish-Israeli culture, this study presents connections between third space theory and theories of acculturation. The emergence of a third space that is less threatening than the second space (i.e. national context) can reduce the risk of marginalisation for some students. Here, the findings reflect both reviews (Sassen and Van Roekel-Hughes 2008; Drori et al. 2003) and empirical studies

(Diamond 2020; Diamond and Kislev 2020b, 2020a) that show how spaces characterised by globalisation can, in some circumstances, reduce the salience of a negative national context. These findings should therefore encourage further studies on minority acculturation in global contexts, and the use of third space theory to analyse such processes.

Notes

1. Refers to the Arab-Palestinian minority in Israel. Minority communities in Israel self-define their nationality in different ways according to context as combinations of Arab, Arab-Palestinian, Palestinian, Arab-Israeli or Israeli, amongst others. I use the term Arab-Palestinian throughout the paper in order to encompass as wide a range of populations as possible whilst minimising the risk of identity erasure (Furani and Rabinowitz 2011).
2. Pseudonyms are given to all schools, companies and research participants.
3. The city is referred to as *Yafo* in Hebrew, and *Yaffa* in Arabic. Except for in quotes, I use the English vernacular 'Jaffa'.
4. *Ironi* is Hebrew for 'municipal'. Many high schools in the municipality are named after a Hebrew letter. *Ironi Samekh* can be roughly translated from Hebrew as 'Municipal School "S."'.
5. Usually referred to by Jews as *Har HaBayit*, or the Temple Mount in Hebrew. Entitlement to Haram Al-Sharif/Har HaBayit is, for many Israelis and Palestinians, a highly sensitive issue.
6. A popular Israeli peanut snack.
7. A predominantly Arab-Palestinian city in northern Israel.

Acknowledgments and funding details

I would like to thank my doctoral advisor, Elyakim Kislev, and my committee members, Michal Frenkel and Limor Samimian-Darash, for their guidance in the planning of this research. I would also like to thank Ben Kasstan and the anonymous reviewers for their insightful and invaluable feedback on earlier versions of this paper. Finally, I am grateful to the Israel Institute for the awarding of a Doctoral Fellowship (grant numbers GL20314 and GL20475), and to the Federmann School of Public Policy for a doctoral scholarship that facilitated the completion of this research.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Israel Institute [Grant Numbers GL20314, GL20475].

ORCID

Aurel H. Diamond http://orcid.org/0000-0001-6038-186X

References

Al-Haj, Majid. 2002. "Multiculturalism in Deeply Divided Societies: The Israeli Case." *International Journal of Intercultural Relations* 26 (2): 169–183.

Al-Haj, Majid. 2012. *Education, Empowerment, and Control: The Case of the Arabs in Israel*. Albany, NY: Suny Press.

Allatt, Pat. 2018. "Critical Discussion: Globalisation and Empowerment." In *Youth, Citizenship and Empowerment*, edited by Helena Helve, and Claire Wallace, 255–261. London: Taylor & Francis.

Amara, Muhammad. 2017. *Arabic in Israel: Language, Identity and Conflict*. London and New York: Routledge.
Amara, Muhammad, and Izhak Schnell. 2004. "Identity Repertoires among Arabs in Israel." *Journal of Ethnic and Migration Studies* 30 (1): 175–193. doi:10.1080/1369183032000170222.
Ayalon, Ariel, and Shifra Sagy. 2011. "Acculturation Attitudes and Perceptions of Collective Narratives: The Case of Israeli Arab Youth." *Youth & Society* 43 (3): 819–844. doi:10.1177/0044118(11411150.
Berry, John W. 2008. "Globalisation and Acculturation." *International Journal of Intercultural Relations* 32 (4): 328–336. doi:10.1016/j.ijintrel.2008.04.001.
Berry, John W., and David L. Sam. 1997. "Immigration, Acculturation, and Adaptation." *Applied Psychology: An International Review* 46 (1): 5–68.
Bhabha, Homi K. 1994. *The Location of Culture*. London: Routledge.
Bhabha, Homi K., and Jonathan Rutherford. 2006. "Third Space." *Multitudes* 26 (3): 95–107. doi:10.3917/mult.026.0095.
Bonner, Ann, and Gerda Tolhurst. 2002. "Insider-outsider Perspectives of Participant Observation." *Nurse Researcher* 9 (4): 7–19.
Central Bureau of Statistics. 2019. "Press Release." Jerusalem: State of Israel.
Chun, Kevin M., and Phillip D. Akutsu. 2003. "Acculturation among Ethnic Minority Families." In *Acculturation: Advances in Theory, Measurement, and Applied Research*, 95–119. Washington, DC: American Psychological Association.
Cohen, Louis, Lawrence Manion, and Keith Morrison. 2013. *Research Methods in Education*. London: Routledge.
Diamond, Aurel H. 2020. "The Social Reproduction of Science Education Outcomes for High School Students in Israel." *British Journal of Sociology of Education* 41 (7): 1029–1046. doi:10.1080/01425692.2020.1806040.
Diamond, Aurel H., and Elyakim Kislev. 2020a. "High School Students' Perceptions of Science and Attitudes Towards Intergroup Cooperation." *Compare: A Journal of Comparative and International Education*, doi:10.1080/03057925.2020.1748494.
Diamond, Aurel H., and Elyakim Kislev. 2020b. "Perceptions of Science and Their Effects on Anticipated Discrimination in STEM for Minority High School Students." *Cambridge Journal of Education*, doi:10.1080/0305764X.2020.1806989.
Drori, Gili S., John W. Meyer, Francisco O. Ramirez, and Evan Schoffer. 2003. *Science in the Modern World Polity: Institutionalization and Globalization*. Stanford, CA: Stanford University Press.
Emerson, Robert M., Rachel I. Fretz, and Linda L. Shaw. 2011. *Writing Ethnographic Fieldnotes. 2nd ed*. Chicago, IL: University of Chicago Press.
Furani, Khaled, and Dan Rabinowitz. 2011. "The Ethnographic Arriving of Palestine." *Annual Review of Anthropology* 40 (1): 475–491. doi:10.1146/annurev-anthro-081309-145910.
Gansen, Heidi M. 2017. "Researcher Positionality in Participant Observation with Preschool Age Children: Challenges and Strategies for Establishing Rapport with Teachers and Children Simultaneously." In *Researching Children and Youth: Methodological Issues, Strategies, and Innovations*, edited by Ingrid E. Castro, Melissa Swauger, and Brent Harger, 81–102. Bingley: Emerald Publishing Limited.
Ghanem, As'ad, and Nadim N. Rouhana. 2001. "Citizenship and the Parliamentary Politics of Minorities in Ethnic States: The Palestinian Citizens of Israel." *Nationalism and Ethnic Politics* 7 (4): 66–86.
Gibton, Dan. 2011. "Post-2000 Law-Based Educational Governance in Israel: From Equality to Diversity?" *Educational Management Administration & Leadership* 39 (4): 434–454. doi:10.1177/1741143211406559.
Gubrium, Jaber F., and James A. Holstein. 2008. "Narrative Ethnography." In *Handbook of Emergent Methods, Edited by Sharlene Nagy Hesse-Biber and Patricia Leavy*, 241–264. New York, NY: The Guilford Press.
Gunaratnam, Yasmin. 2003. *Researching 'Race' and Ethnicity: Methods, Knowledge and Power*. London: Sage.

Gutiérrez, Kris D. 2008. "Developing a Sociocritical Literacy in the Third Space." *Reading Research Quarterly* 43 (2): 148–164. doi:10.1598/RRQ.43.2.3.
Hai, Avivit. 2013. *Arab Citizen Employment in Israel: Critical Concern and Great Potential*. Tel Aviv, Israel: Inter-Agency Task Force on Israeli Arab Issues.
Horenczyk, Gabriel, and Uzi Ben-Shalom. 2006. "Acculturation in Israel." In *The Cambridge Handbook of Acculturation Psychology*, edited by David L. Sam, and John W. Berry, 294–310. Cambridge: Cambridge University Press.
Huynh, Que-Lam, Angela-MinhTu D. Nguyen, and Verónica Benet-Martínez. 2011. "Bicultural Identity Integration." In *Handbook of Identity Theory and Research*, edited by Seth J. Schwartz, Koen Luyckx, and Vivian L. Vignoles, 827–842. New York, NY: Springer New York.
Kanaaneh, Rhoda Ann. 2002. *Birthing the Nation: Strategies of Palestinian Women in Israel. Vol. 2*. Berkeley, CA: Univ of California Press.
Khamaisi, Rassem, and Ismael Abu-Saad. 2015. *Education and Territory: Charged Issues, Arab Society in Israel. Ra'anana*. Israel: The Open University of Israel.
Kimmerling, Baruch. 2008. *Clash of Identities: Explorations in Israeli and Palestinian Societies*. New York, NY: Columbia University Press.
Levy, Rachael. 2008. "'Third Spaces' are Interesting Places: Applying 'Third Space Theory' to Nursery-Aged Children's Constructions of Themselves as Readers." *Journal of Early Childhood Literacy* 8 (1): 43–66. doi:10.1177/1468798407087161.
Makarova, Elena, and Dina Birman. 2016. "Minority Students' Psychological Adjustment in the School Context: an Integrative Review of Qualitative Research on Acculturation." *Intercultural Education* 27 (1): 1–21. doi:10.1080/14675986.2016.1144382.
Moffitt, Ursula, Linda P. Juang, and Moin Syed. 2019. ""We Don't Do That in Germany!" A Critical Race Theory Examination of Turkish Heritage Young Adults' School Experiences." *Ethnicities* 19 (5): 830–857. doi:10.1177/1468796818788596.
Moje, Elizabeth Birr, Kathryn Mcintosh Ciechanowski, Katherine Kramer, Lindsay Ellis, Rosario Carrillo, and Tehani Collazo. 2004. "Working Toward Third Space in Content Area Literacy: An Examination of Everyday Funds of Knowledge and Discourse." *Reading Research Quarterly* 39 (1): 38–70. doi:10.1598/RRQ.39.1.4.
Nasie, Meytal, Aurel Harrison Diamond, and Daniel Bar-Tal. 2016. "Young Children in Intractable Conflicts: The Israeli Case." *Personality and Social Psychology Review* 20 (4): 365–392. doi:10.1177/1088868315607800.
Polkinghorne, Donald E. 1995. "Narrative Configuration in Qualitative Analysis." *International Journal of Qualitative Studies in Education* 8 (1): 5–23. doi:10.1080/0951839950080103.
Rouhana, Nadim N., and Sahar S. Huneidi. 2017. *Israel and its Palestinian Citizens: Ethnic Privileges in the Jewish State*. Cambridge: Cambridge University Press.
Sassen, Saskia, and Ada Van Roekel-Hughes. 2008. "Deciphering the Global: Its Spaces, Scales and Subjects." *Social Thought & Research* 29: 3–18.
Scheindlin, Dahlia. 2016. "Entrepreneurship and Arab Citizens of Israel: A Society Ripe for Change." In *MasarUp: The Council for Arab Entrepreneurship*. Tel Aviv, Israel: PresenTense Israel.
Schipper, Sebastian. 2015. "Urban Social Movements and the Struggle for Affordable Housing in the Globalizing City of Tel Aviv-Jaffa." *Environment and Planning A: Economy and Space* 47 (3): 521–536. doi:10.1068/a140249p.
Soja, Edward W. 1998. "Thirdspace: Journeys to Los Angeles and Other Real-and-Imagined Places." *Capital & Class* 22 (1): 137–139. doi:10.1177/030981689806400112.
Strauss, Anselm, and Juliet M. Corbin. 1997. *Grounded Theory in Practice*. Thousand Oaks, CA: Sage.
Suleiman, Ramzi. 2002. "Minority Self-Categorization: The Case of the Palestinians in Israel." *Peace and Conflict: Journal of Peace Psychology* 8 (1): 31–46.
Tatar, Moshe. 2004. "Diversity and Citizenship Education in Israel." In *Diversity and Citizenship Education: Global Perspectives*, edited by James A. Banks, 377–405. San Francisco, CA: Jossey-Bass.
Wallace, Carolyn S. 2004. "Framing new Research in Science Literacy and Language use: Authenticity, Multiple Discourses, and the "Third Space"." *Science Education* 88 (6): 901–914.
Wragg, Ted. 2013. *An Introduction to Classroom Observation. Classic ed*. London and New York: Routledge.

Appendix A. Excerpts of ethnographic field notes with their assigned codes. The definitions used for each of the codes are available in the literature review.

Date	Time	Location	Student(s)	Student characteristics	Context	Notes/quotes (excerpts)	Codes
30/10/17	9:40	Schoolyard	Walid, Samir, Abdul, Muhammad	Teachers described them as 'misfits'. Poor grades, living in low-SES parts of Jaffa	Bell rang for class and I had a break. Four male students stayed in the schoolyard and called me over	Discussion about Fairouz and frustration about inability to visit Lebanon. Walid: 'Look, we are Israeli enough to eat and live together [with Jews], but not enough to have clean streets and new roads [the street sewers overflowed earlier that week]. We are Arab enough to have hummus restaurants and good music, but not Arab enough to visit Fairouz in Lebanon'	marginalisation; double marginality
7/2/18	8:45	Computer classroom	Layla	Religious, wears a hijab, conservative background. Wealthy family. Wants to study computer science	Computer science workshops with high-achieving students (10 girls and 8 boys)	In a conversation about why she wants to study computer science, on whether a diverse work environment would be problematic: 'Actually, I don't mind who my colleagues and friends are, I like meeting different types of people. As long as I can still be me. I will always be hijabi [wear a hijab], I will always be Muslim, I will always be from Yaffa'	separation; integration; accentuated identity
13/2/18	11:20	Schoolyard	Noor	Secular, close friends with Layla. Strong Palestinian identity; wears a Palestinian flag bracelet.	Interjected a conversation I was having with Walid, Samir, and friends. They expressed their appreciation of Nas and Noor interjected disapprovingly	Great, but why can't he do all this from home? Why does he have to work from California? Look at [Mohammad Asfour], he has to work abroad sometimes but still lives in Yaffa	separation; accentuated identity
5/11/18	9:10	Class homeroom	Zahra	Zahra usually feels marginalised by both Israeli and Palestinian society	Innovation-sector programme, first lesson. Discussion on iron deficiencies in Cambodia	I asked Zahra where she wanted to work on her innovations and inventions. She told me that she would go to the Maldives: 'People in Israel don't struggle with malnutrition, so we would make more money there. I also really want to see the islands! … I'll work with Cambodians, Indians, everyone … '	Assimilation

18/12/18	15:15	WeTech conference room	George	Christian and high SES family. Exceptionally fluent in Hebrew, French, and English. Told me he 'passes' as Jewish and that he enjoys this racial/ethnic ambiguity	Visit to WeTech, questions directed to employees Fatima, Khaled, and Tal	George usually emphasised his assimilation in Jaffa and the wider Israeli milieu. He surprised me when he asked the Arab-Palestinian panellists whether being Arab made it difficult to be part of the country, and whether they had to hide any of their identity, indicating that in this instance he may have shifted from assimilative to more integrative approaches, or previously hidden desire to maintain his Arab identity	Integration

CHAPTER 5

A Globalisation Diversity Ideology

This chapter presents a single-authored manuscript that, on the date of submission of this thesis, was under peer review at *Cross Cultural & Strategic Management*.

A Globalization Diversity Ideology

Abstract

Current reviews of diversity ideologies and models compare the strengths and weaknesses of colourblindness, multiculturalism, and polyculturalism ideologies in facilitating positive diversity. Yet, and even with the introduction of polyculturalism, there is still a need to identify diversity ideologies that empower minority groups without triggering status threat among dominant groups, and vice versa. By considering the relationships between globalization and diversity, this paper provides a framework for proposing a globalization diversity ideology. The globalization ideology, like polyculturalism and multiculturalism, focuses on the connections between groups due to interaction and exchange, but similar to colourblindness, lessens the importance of racial and ethnic backgrounds. A shared global context and global identities distinguish the proposed globalization ideology from the already-established ideologies. The paper reviews empirical studies that indicate how the globalization diversity ideology may reduce the impact of discrimination and racism, and facilitate positive intergroup contact. The studies demonstrate how in some cases, globalization diversity can reduce the salience of the local or national context, thus providing ethnic and racial minorities with a path for negotiating hostile intergroup relations. These studies indicate how a globalization ideology for diversity may differ from colourblindness, multiculturalism, and polyculturalism ideologies. The paper recommends the development of an empirical instrument for measuring and implementing a globalization diversity ideology. The successful development of a globalization ideology would facilitate a four-way approach to diversity ideologies and models that would expand on the existing multiculturalism-colorblindness-polyculturalism paradigm.

Keywords: diversity, globalization, multiculturalism, colorblindness, polyculturalism

Introduction

Patterns of migration, internationalization, and globalization are rapidly diversifying populations in almost every national context. For employers, educators, policymakers, and indeed diversity scholars, these processes raise important questions regarding which models of diversity foster harmonious integration between people while minimizing the risks of systematically disadvantaging or disempowering any one particular social group (Plaut, 2010). A rich literature on diversity ideologies and models has emerged, usually comparing the impacts of identity blindness (i.e. colorblindness), which minimizes the importance of racial, ethnic, or social group membership, with identity consciousness (i.e. multiculturalism), that acknowledges, values, and respect groups differences (Plaut, Thomas, & Goren, 2009; Plaut, Thomas, Hurd, & Romano, 2018). Empirical research on diversity models has largely followed a colorblindness vs. multiculturalism paradigm, whereby each approach has advantages and disadvantages for different social groups (Cho, Tadmor, & Morris, 2018; Wolsko, Park, Judd, & Wittenbrink, 2000). In many cases, multicultural approaches are often more strongly favored by members of non-dominant groups, but may trigger discrimination, racism, threat, and bias in some social settings (Kaiser et al., 2013; Plaut, Garnett, Buffardi, & Sanchez-Burks, 2011). Conversely, groups who more likely to endorse colorblind models of diversity are often less quick to notice racism and discrimination (Ryan, Hunt, Weible, Peterson, & Casas, 2007), thus placing ethnic and racial minorities at a disadvantage (Apfelbaum, Norton, & Sommers, 2012; Apfelbaum, Pauker, Sommers, & Ambady, 2010).

The traditional colorblindness-multiculturalism dichotomy therefore creates a seemingly unappealing tradeoff, with each diversity model clearly empowering some social groups while disadvantaging others. In an attempt to expand on this paradigm, scholars have introduced polyculturalism – an ideology that focuses on the relationships, connections, and interactions between social groups – as a possible third diversity model (Morris, Chiu, & Liu, 2015; Rosenthal & Levy, 2012). While studies show that endorsement of polyculturalism can explain unique variance in a wide variety of social attitudes, the efficacy of polycultural models of diversity are, as with colorblind and multicultural models, inconsistent across social groups (Bernardo et al., 2016; Healy, Thomas, & Pedersen, 2017; Rosenthal & Levy, 2016). Hence, and even with the introduction of polyculturalism, there is potential great value in synthesizing additional diversity

ideologies that empower a wide range of social groups while minimizing the risk of status threat, discrimination, and racism in ways that are unique from colorblindness, multiculturalism, and polyculturalism.

Parallel to the literature on diversity ideologies and models, scholars of globalization are engaging in debates on the impacts of globalization on different social groups. Under some contexts, studies show how processes of globalization can create intergroup threat (Sharma & Sharma, 2010), particularly when it is a reflection of imperialism/colonialism and its consequences (Smith, 2016). Yet, there are growing arguments that propose that globalization can provide a social environment that is distinct from the national context, and that this environment produces positive sociopsychological outcomes in some contexts (Sassen, 2007; Sassen & Van Roekel-Hughes, 2008). While the links between globalization and diversity are well-established (Abu-Laban & Gabriel, 2002), the relationship between globalization and its associated spaces, scales, and subjects with diversity *ideologies* is currently under-addressed by diversity and inclusion research.

To that end, this article provides a theoretical discussion of the relationships between globalization and diversity, and in doing so proposes a globalization diversity ideology that is distinct from colorblindness, multiculturalism, and polyculturalism. While it is unlikely that any new diversity ideology will present a panacea to managing diversity in all situations, the proposed globalization ideology may reduce the instances wherein some groups profit at the expense of others, and, as explained below, be effective in fostering positive diversity in contexts where intergroup relations are particularly hostile.

The paper is split into three main sections. The first provides a brief review of existing diversity ideologies. The following section bridges the gap between globalization and diversity ideology research, and in doing so provides a clear definition of the proposed globalization diversity ideology. Finally, and in order to illustrate the potential impact of the proposed ideology, the paper reviews existing studies that indicate the contexts wherein globalization can foster positive diversity. In doing so, this paper engages with discourses that view globalization both as a possible source of empowerment (Anderson, 2011; Sassen, 2007), and equally as a product of colonialism and subjugation (Banerjee & Linstead, 2001; Weiss, 2015).

Diversity Ideologies and Models

The literature highlights three different ideological approaches to diversity. The origins and definitions of each ideology, as well as their established strengths and weaknesses, are briefly summarized below. For clarity in this paper, the implementation of a diversity ideology is referred to as its corresponding diversity model.

Colorblindness and Multiculturalism

The traditional paradigm in diversity models considers ideologies that advocate different levels of group difference salience. Colorblindness ideologies, which generally are associated with low group difference salience, suggest ignoring, or at least reducing the significance of group categories and membership. Colorblindness is based on the belief that prejudice is a result of group category differences, the impacts of prejudice can be reduced by de-emphasizing group differences (Allport, 1954). Decades of research has resulted in different forms of colorblindness (Rosenthal & Levy, 2010), including: colorblindness that focuses emphasizing similarities, or a common ingroup between individuals from different groups (Nier et al., 2001); an assimilative approach to colorblindness that supports members of all groups adopting the mainstream or dominant culture (Neville, Lilly, Duran, Lee, & Browne, 2000); and colorblindness that minimizes between-group differences by viewing people as unique individuals, rather than as members of specific groups (Schofield, 1986).

Colorblindness has also been described as manifesting through two separate dimensions. Neville, Awad, Brooks, Flores, and Bluemel (2013) propose that colorblind racial ideologies can, on the one hand, be characterized by *color-evasion*, which denies potential racial differences and emphasizes similarities. Color-evasion strategies, which effectively minimize or deny the existence and impact of 'race', can increase racial microaggressions towards minorities and increase discomfort in the presence of diversity (Sue, Bucceri, Lin, Nadal, & Torino, 2009). On the other hand, *power-evasion* colorblindness denies racism "by emphasizing the belief that everyone has the same opportunities" (Neville et al., 2013, p. 457). Power-evasion downplays the role that social structures and racism play in society, and in doing so can lead to increased prejudice among the majority groups, and heightened internalized oppression among minorities (Speight, Hewitt, & Cook, 2016).

Alternatively, and by typically promoting higher group difference salience, multiculturalism ideologies of diversity promote and value the maintenance of separate group identities. Multiculturalism recognizes group differences, and asserts that exposure to and appreciation of different social groups promotes positive social attitudes (Gutmann, 1994; Modood, 2016). As with colorblindness, multiculturalism can be implemented in a number of ways. For instance, multiculturalism can simply promote learning about diversity and the differences between social groups (Wolsko, Park, & Judd, 2006). In other cases, multicultural ideologies can highlight and promote the benefits and contributions of diversity in general (Bloemraad, Korteweg, & Yurdakul, 2008; Vorauer, Gagnon, & Sasaki, 2009). Finally, other forms of multiculturalism can facilitate nondominant or minority groups maintaining their uniqueness while integrating into the larger social context (Berry, 2005, 2011). These three forms of multiculturalism are referred to as "important differences", "appreciate contributions", and "maintain cultures", respectively (Rosenthal & Levy, 2012).

Due to the seemingly polar approaches to diversity that colorblindness and multiculturalism offer, it is common practice for empirical studies to directly compare the efficacy of both ideologies. While recognizing the range of definitions of colorblindness and multiculturalism in diversity research (Plaut, Cheryan, & Stevens, 2015), meta-analyses and comprehensive reviews of existing literature facilitate the summary of which social groups tend to support which ideologies, and the circumstances under which each ideology may remedy or trigger discrimination, racism, and poor intergroup relations. Broadly speaking, members of the majority or socially dominant group are more likely to endorse colorblind ideologies (Ryan et al., 2007). Indeed, colorblindness can remedy issues of discrimination and racism thorough promoting the ideal of an equitable society where group membership or minority status do not predict social outcomes (Knowles, Lowery, Hogan, & Chow, 2009). At the same time, however, reviews find that colorblindness can disadvantage minority groups since it can lead to reduced sensitivity to racism and discrimination, increase social dominance of the majority group, and increase identity threat among minorities (Apfelbaum et al., 2012). On the other hand, multiculturalism is usually more strongly endorsed by ethnic and racial minorities (Wolsko et al., 2006). While members of the socially dominant group do endorse multiculturalism in some cases, it can also create majority-group threat when it is perceived as impacting national identity (Verkuyten, 2005), or when it triggers feelings of exclusion since multiculturalism is associated primarily with minority groups

(Plaut et al., 2011). Thus, and while multiculturalism can empower minority groups, lead to greater detection of explicit racism and discrimination, and encourage positive intergroup communication, it can also have a negative impact when it sparks feelings of threat and exclusion among the majority or socially dominant group, which in as of itself leads to social hostility.

Yet, it is essential to recognize that the colorblindness-multiculturalism paradigm is not a zero-sum game where dominant groups might benefit while non-dominant groups are exposed to disadvantage, and vice-versa. There are also many cases and contexts where support for either ideology has diverging or mixed results (extensive details and nuances can be seen in meta-analyses and theoretical reviews, e.g.: Plaut et al., 2018; Rattan & Ambady, 2013; Sasaki & Vorauer, 2013; Whitley & Webster, 2019)

To that end, neither colorblindness or multiculturalism are universally effective at facilitating positive and constructive diversity, since each approach has advantages and disadvantages for different social groups, depending on the context presented. While the plethora of studies comparing colorblind and multicultural ideologies provide important insights in facilitating diversity, they often present a dichotomy whereby each choice can be favored by the socially dominant group while being rejected by minorities, or vice versa.

Polyculturalism

In light of the mixed findings and theoretical concerns regarding the colorblindness-multiculturalism duality (Ryan, Casas, & Thompson, 2010; Verkuyten, 2009), the literature has considered polyculturalism as a third diversity ideology that distances debates from the colorblindness-multiculturalism duality. The polyculturalism ideology was first proposed by scholars (Flint, 2006; Kelley, 1999; Prashad, 2002, 2003) who analyzed the historical connections between different groups, arguing that intercultural relations have long been part of social norms. To that end, polyculturalism, much like multiculturalism, recognizes group differences, but instead of focusing on and valuing these differences, polyculturalism emphasizes the connections between groups due to past and present intergroup contact, communication, and influence. Polyculturalism diversity ideologies are analogous to policies that encourage dialogue and interaction between distinct social groups, placing particular value on mutual influence (see "interculturalism" in: Morris et al., 2015).

Following the establishment of polyculturalism as a diversity ideology, a growing number of studies have evaluated its efficacy in a variety of circumstances. Studies have found polyculturalism to have positive, albeit mixed impacts, on diversity and intergroup contact (e.g. Osborn, Sosa, & Rios, 2020). For example, studies show that endorsement of polyculturalism is associated with reduced prejudice towards sexual minorities (Healy et al., 2017) and less sexist attitudes (Rosenthal, Levy, & Militano, 2014). Furthermore, a series of studies on 694 racially diverse undergraduate students in the US (Rosenthal & Levy, 2012) found that endorsement of polyculturalism to be significantly correlated with many measures of positive intergroup contact, including lower social dominance orientation, greater willingness for intergroup contact, and stronger appreciation for and comfort with diversity, for all ethnic groups.

While early studies on polyculturalism suggest its efficacy in a number of situations, some studies provide mixed results, particularly outside the US context. In Colombia, a study on 423 adults shows how endorsement of polyculturalism is positively associated with better attitudes towards people from other countries and friendship intentions towards immigrants (Rosenthal, Ramirez, Levy, & Bernardo, 2019). However, endorsement of polyculturalism was also positively associated with higher social dominance orientation (SDO), which frequently leads to increased racism and poor intergroup dynamics (Pratto, Sidanius, & Levin, 2006). Similarly, studies on high school and college students in the Philippines (N=302) found polyculturalism to be positively associated with more positive attitudes to people from other countries and higher SDO, simultaneously (Bernardo, Rosenthal, & Levy, 2013).

In a review of studies on polyculturalism, Rosenthal and Levy (2013) suggest that one of the potential drawbacks of this ideology is its focus on potentially negative or damaging histories. For example, if polyculturalism draws attention to historical ties between groups, then highlighting negative relationships or oppression between groups – be it through wars, colonization, slavery, genocide, or otherwise – could be damaging for intergroup relations. The possibility of such an option can help explain some of the mixed results above, as well as in the US. For instance, studies on 394 adults in the US found endorsement of polyculturalism to be negatively associated with intergroup anxiety and support policies that negatively impact Muslim Americans such as racial profiling and limiting tourist visas from Islamic countries (Rosenthal, Levy, Katser, & Bazile, 2015). Given the social tension surrounding Muslim Americans – particularly post 9/11 – these

results may present somewhat contrasting patterns for Muslim and Black Americans, though neither of these studies compare the groups directly.

Summary: Future Directions for Diversity Models

The short review above highlights that none of the three commonly evaluated ideologies are universally effective at fostering positive diversity. In light of this reality, scholars have recommend combined approaches that integrate a variety of aspects from different models (Rosenthal & Levy, 2010, 2012). However, it is not clear that adopting such an approach, or indeed implementing polyculturalism diversity models, will be effective in all contexts, especially if there are deeply entrenched intergroup tensions or a history of conflict, racism, or discrimination. There is therefore a need to consider widening the scope of existing diversity ideologies, and in particular, identifying diversity ideologies that may be effective in challenging circumstances.

Globalization and Diversity

While there is no singular accepted definition, globalization broadly refers to the exchange of people, technology, and information, and the resulting increasing links and interconnections and transcend geographic and cultural borders. For clarity, this paper considers globalization as a complex *process* rather than a tangible *outcome* (e.g. Held & McGrew, 2007; McGrew & Lewis, 2013; Sutton, 2012).

The premise of this paper is that a potentially effective way of addressing some of the challenges or limits that arise from dichotomous (or indeed, with polyculturalism: trichotomous) approaches to diversity may come from considering theories of globalization in the context of diversity ideologies. The reasons for adopting such an approach are twofold. The first reason lies within how globalization and diversity are intrinsically related to one another: while processes of exchange in globalization lead to increased diversity, the diversification of any social context leads to increased exchanges between groups, thereby accelerating globalization. In other words, the processes and outcomes of globalization and diversity are distinct, and in a form of co-production where each influences the other simultaneously (Hay & Marsh, 2000).

As such, discourse on diversity ought to be considered in the context of its co-productant, globalization. Indeed, since diversity and globalization can be seen as two distinct but related phenomena, a discussion of the relationships between them is legitimate and likely to have

consequences for diversity ideologies and theories. Scholars have already adopted such an approach, noting the relationship between globalization and diversity (Kim & Bhawuk, 2008). In particular, Berry (2008) adopted this stance in a theoretical paper that considers the relationships between globalization and acculturation. The paper proposed that the assimilation of non-dominant social groups is not a necessary consequence of globalization; a claim that has been since supported by empirical studies (e.g. Gillespie, McBride, & Riddle, 2010; Ozer & Schwartz, 2016). These studies indicate how considering acculturation in the context of globalization facilitated further development of theories of acculturation. Accordingly, the current paper suggests that considering diversity in the context of globalization can provide insights for the development of diversity ideologies.

The second reason for considering globalization and diversity together can be understood by considering literature on the context of globalization. Indeed, processes of globalization occur in contexts whose social order and context are increasingly distinct from that of the traditional local or national context (Appadurai, 1996; Sassen, 2003). In other words, the social context of globalization creates *global spaces* wherein the social context of globalization has diverging consequences for minority and non-dominant social groups (Sassen, 2007). In some contexts, it is possible that global spaces provide individuals with the opportunity to temporally or culturally 'leave' a disadvantageous social context, thus creating a way in which globalization can be a source of empowerment (Sassen & Van Roekel-Hughes, 2008). Indeed, globalization, its outcomes, and its spaces can facilitate the creation of a form of "intercultural personhood" that facilitates positive dynamics of stress-management, adaptation, and growth for individuals in the face of diversity (Jones, 2009; Kim, 2008).

Conceptual analyses of how globalization, globalism, and global spaces impacts relations between social have also been framed as consequences of *The Cosmopolitan Canopy*. Through urban ethnographies, sociologists have described how public spaces in cities and urban centers have become increasingly racially, ethnically, and socially diverse (Anderson, 2011). Instead of suggesting that this amounts to social tension, the resulting 'cosmopolitan canopy' offers "respite and an opportunity for diverse peoples to come to do their business" (Anderson, 2004, p. 14). Cosmopolitan canopies in this sense can be viewed as urban global spaces with potentially positive consequences for intergroup contact. Indeed, studies of diverse schools in the UK argue how the cosmopolitan canopy can contribute to social mixing, conviviality, and cross-group friendships

(Hollingworth & Mansaray, 2012); in the Indonesian-Philippine archipelago, cosmopolitan canopies can facilitate cross-ethnic and inter-religious harmonies in urban centers (Lawrence, 2011); and studies of favelas in Brazil argue that globalized cosmopolitan canopies can facilitate the shared goal of civic improvement between social groups (Lima, 2019).

In particular, the context of globalization has also been linked to diversity through diversity management theory, which promotes a work culture that reflects diversity in wider society (Ewoh, 2013). Where society is characterized by globalization, diversity management theory suggests recreating and fostering global culture in the workplace, since such an approach is likely to promote equality and acceptance of racial and ethnic minorities (Özbilgin, Jonsen, Tatli, Vassilopoulou, & Surgevil, 2013). These theories suggest that globalization facilitates the identification of common meanings and values that can potentially promote mutual understanding (Mor Barak, 2016). In particular, adopting a global work culture or identity are suggested to promote better intergroup relations in the work context (Shokef & Erez, 2006). A similar theoretical stance was proposed in order to use the common context of globalization and migration in order to facilitate positive diversity in urban centers that are characterized by migration (Landis, 2008). To that end, globalization in the context of diversity management theory and migration arguably reflect similar ideas to theories about the context of global spaces.

These studies raise important questions: in the instances where global spaces avail positive diversity outcomes, what kind of diversity ideologies and models represent their social reality? To what extent is globalization-induced diversity similar to the three well-established ideologies and models? And, particularly given the extensive evidence that globalization and global spaces can incur identity threat and disempowerment for minority and non-dominant social groups (Roach, 2017; Sharma & Sharma, 2010), under what context might ‘globalization diversity’ may be effective? In order to answer these questions, and indeed provide the necessary theoretical groundwork for the development and testing of a globalization diversity instrument, the paper now uses the definition of globalization and global spaces in order to conject potential traits of a globalization diversity ideology.

Defining a Globalization Diversity Ideology

A unique globalization diversity ideology can be synthesized by considering the two axes upon which lie the already-established diversity ideologies. The first axis for diversity ideologies is

given by group difference salience, with colorblindness and multiculturalism lying at opposing ends of this scale. The second axis concerns the denial or acceptance of asymmetrical interactions and influences between groups. Indeed, many (though not all) articulations of colorblindness and deny the asymmetrical roles and influences that different groups have on one another either by acknowledging group categories while ignoring status, or by ignoring group categories entirely (i.e. power evasion and color evasion, respectively: Neville et al., 2013). Similarly, critics of multicultural diversity note that many manifestations of multiculturalism do not sufficiently acknowledge power disparities and unequal participation between different social groups (Barry, 2002; Pakulski, 2014).

In contrast to most manifestations of multiculturalism and colorblindness, polyculturalism broadly acknowledges asymmetries between groups. By focussing on "the many connections among groups due to past and present interactions and mutual influence" (Rosenthal & Levy, 2010, pp. 223-224), polyculturalism is distinct from multiculturalism and colorblindness since the historical context of group interactions and mutual influence reflect and acknowledge group asymmetries. This distinction contributes to the particular efficacy of polyculturalism in intergroup relations where other diversity models may create challenges or trigger negative social responses.

Based on the analogy of two axes or dimensions of diversity, polyculturalism and multiculturalism are similar in their higher levels of group difference salience, but different in that the former is typically more effective at acknowledging group asymmetries. Colorblindness fills a third rubric by placing low emphasis on group difference salience and ignoring group asymmetries. Yet, with two independent axes or dimensions, simple arithmetic leads to four possible diversity ideologies, implying a potential ideological gap that could be used to identigy a fourth diversity ideology.

Based on the analogy of two axes or dimensions of diversity, the 'missing' ideology has two main characteristics: first, it places low importance on group membership; but second, does so while acknowledging potential asymmetries in status and interactioins. In this way, the missing ideology is related to colorblindness as polyculturalism is related to multiculturalism, but it is distinct from colorblindness on its ideological focus. Table 1 (overleaf) illustrates these ideological differences.

For illustration and comparative purposes, Table 1 includes examples of items that have been used to measure colorblindness, multiculturalism, and polyculturalism ideologies (for further

examples of items and instruments, see: Hahn, Banchefsky, Park, & Judd, 2015; Rosenthal & Levy, 2012, p. 16). Note that while the two axes are portrayed in the table as discrete, the many variations of diversity ideologies means that in practice differences between various versions of the same ideologies means that they are not always clearly in one category. The table should be viewed as four quadrants, with significant variation within each quadrant and potential overlap between different quadrants.

Table 1. Diversity ideology definitions and example measures/items according to group difference salience and primary focus of ideology

	Low group difference salience	**High group difference salience**
Denial of asymmetrical interactions	Colorblindness: "Ethnic and cultural group categories are not very important for understanding or making decisions about people"; "Racial and ethnic group memberships do not matter very much to who we are" (Rosenthal & Levy, 2012, p. 16).	Multiculturalism: "All cultures have their own distinct traditions and perspective"; "Each ethnic group has its own strengths that can be recognized" (Rosenthal & Levy, 2012, p. 16).
Acknowledgement of asymmetrical interactions	Globalization (proposed): "Different cultural groups play valuable roles in creating a wider global society"; "My racial, ethnic, or cultural group is part of a global and international community of people and nations"; "I belong to a global and international community of people and nations".	Polyculturalism: "Different cultural groups impact one another, even if members of those groups are not completely aware of the impact"; "Different racial, ethnic, and cultural groups influence each other" (Rosenthal & Levy, 2012, p. 16).

This paper argues that the missing ideology – which has been labelled *globalization* – reflects the type of diversity that manifests in global contexts and global spaces. Empirical examples of globaliztion diveristy are given below in order to support this argument. However, in the absence of an agreed and tested measure for globalization diversity, it is instructive first to consider practical definitions and questionnaire items that reflect it.

To that end, by considering social identity theory (Tajfel & Turner, 1986) and social categorization theory (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987), it is possible to suggest that example items may focus on the development of a shared global or international identity

(Lisak & Erez, 2009; Shokef & Erez, 2006). This categorization is distinct from colorblindness insofar as it is not necessarily assimilationist; indeed, and unlike colorblindness, focus on a shared global identity does not contradict forms of acculturation that recognize, or in some cases even celebrate group differences (i.e. integration, separation, or marginalization in global acculturation models: Berry, 2008; Harush, Lisak, & Erez, 2016). Alternatively, and in light of the discussion on globalization, these items may also: focus on the connections between different individuals (rather than groups or cultures); reflect the mutual influence that individuals have on one another in shared global spaces; and focus on the exchange and movement of people from all parts of the world. Each of these possibilities reflects different aspects of globalization while offering approaches to diversity that are ostensibly distinct from the three established ideologies. To that end, Table 1 shows the potential similarties and differences between a globalization diversity ideology and colorblindness, multiculturalism, and polyculturalism ideologies.

While the proposed globalization ideology ostensibly reflects processes of globalization and the unique social context of global spaces (Sassen & Van Roekel-Hughes, 2008), it is important to recognize that the development of an empirical measure for this ideology may not necessarily reflect every definition of globalization, or indeed the literature on global spaces. Moreover, such an ideology measure, even if successfully constructed, may not necessarily explain for unique variance in measures of intergroup relations, discrimination, racism, or other social phenomenon, when compared with existing ideologies. Indeed, it is important to note studies that partially conflate or find strong relationships between support of globalization and each one of: multiculturalism (e.g. Moghaddam, 2008); the convergence and merging of cultures (i.e. as a form of colorblindness, see: Niezen, 2008); and endorsement of polyculturalism (e.g. Hao, Li, Peng, Peng, & Torelli, 2016). Therefore, and in order to substantiate the value of pursuing the development of a globalization ideology measure, the paper reviews empirical research that reflect diversity in the context of globalization.

Globalization Diversity Ideologies in Empirical Studies

Research that demonstrate how the context of globalization can facilitate diversity has been conducted in primarily two contexts. The first concerns studies in globalization, business, and diversity management, and the second includes studies on diversity in science, technology, engineering, and mathematics (STEM). Broadly speaking, the studies link the development of

global identities, the endorsement of globalization, or the emergence of global spaces to positive sociopsychological outcomes. Although none define a globalization diversity ideology or construct the concept of a globalization diversity model, it is possible to juxtapose the definitions proposed into this paper into the context of the studies, and as such build a case for the formal development of a globalization diversity ideology.

Globalization Diversity and Global Identities in Management

Examples of globalization diversity are evident in a group of studies that connects the development of a global or international identity with positive social outcomes in diversity management settings. Notably, studies propose that a sense of global identity facilitates the identification of inter-group similarities and positive teamworking norms (Glikson & Erez, 2013), and that perceived membership of a common 'global ingroup' increases feelings of shared identity (Lisak & Erez, 2009). In addition, a study on 317 MBA students of 32 nationalities found that individuals who score higher on measures of global identity and characteristics are more likely to emerge as leaders in diverse work settings (Lisak & Erez, 2015). In each of these examples, positive outcomes emerge where individuals can identify a shared global work setting (i.e. a shared global space) or a shared global identity. In these studies, the focus on commonality causes individuals from different groups to favour and attribute positive traits to one another (see also: van Dijk, Meyer, van Engen, & Loyd, 2017).

Additional studies on MBA students are instrumental in demonstrating the potential impact of globalization diversity particularly on intergroup contact. One study assigned 317 MBA students into 83 nationality-diverse teams to complete a series of managerial tasks (Harush, Lisak, & Glikson, 2018). Structural equation modelling indicated that the salience of global identity indirectly reduces levels of relational conflict, through the measured levels of perceived proximity. That is, individual who espouse a global identity – and see it as a shared space that increases their proximity to individuals from different outgroups – experience more positive intergroup contact. Of interest here is the fact that the measures used in this study focus on the global as a shared construct or identity, but without deliberately highlighting group difference salience (i.e., globalization diversity in Table 1). Using the terminology define above, the impacts of globalization diversity in this study are mediated by the perceived proximity between participants.

While these studies point at the possible advantages of a globalization diversity model, there is some heterogeneity within the samples. In each of the studies, participants who do not experience the global space or endorse its contents and characteristics do not experience the reported benefits of such an approach to diversity. As such, it is important to note the possibility of fostering global identities through educational and training projects. To that end, an additional study followed MBA and graduate students (N=1221) from 17 universities in 12 countries as they participated in an online 4-week diversity training module (Erez et al., 2013). Data regarding participants' global identities[1] and cultural intelligence[2] were collected prior to participation, at the end of the taught contents, and six months following completion. Hierarchical linear modelling found that the training immediately increased both cultural intelligence and measures of global identity across participating countries, with significant effects being recorded six months later. While this study does not establish a causal relationship between global identities and cultural intelligence, it demonstrates how it is possible to develop global identities, and is therefore indicative of the possibility of implementing globalization diversity models through training. Particularly given recent studies indicating a relationship between cultural intelligence and global identities (Yari, Lankut, Alon, & Richter, 2020; Yüksel & Eres, 2018), this study provides evidence regarding both the feasibility and potential impacts of a globalization diversity ideology.

Globalization Diversity in the Context of STEM

Examples of globalization diversity are also apparent in studies that investigate discrimination, inequality, and intergroup relations in the context of STEM. These studies note that the global, universal, or international contexts of STEM work or studies facilitate positive intergroup contact. Some of these examples are of particular importance for understanding the potential of globalization diversity since they provide empirical investigations of globalization diversity for minority populations with no prior selection; indeed, the studies in diversity management may have hidden selection effects since they focus primarily on MBA students or professionals who have strong educational backgrounds, and do not take minority groups into special account.

For example, two recent studies conducted on minority high school students in Israel aged 14-18 collected questionnaire data to test the relationships between different perceptions of STEM

[1] As measured by the Global Identity scale (Shokef & Erez, 2006, 2015).
[2] As measured by the Cultural Intelligence scale (Ang et al., 2007).

with willingness to work and study with the outgroup (Diamond & Kislev, 2020a), and anticipated discrimination in STEM fields (Diamond & Kislev, 2020b). In the former study, where data was collected for minority students (N=246), willingness to work and study with the outgroup was regressed on the extent to which students perceived STEM to be global and international. The analyses found agreement with these statements to be significantly associated with a willingness to work or study with the outgroup. At the same time, the study finds that cooperative perceptions of STEM (as measured by agreement with the statement "There is cooperation between different groups of people in STEM in Israel": Diamond & Kislev, 2020a, p. 8) are not associated with willingness to integrate with the outgroup. In the latter of the two studies, a similar approach was used to examine the relationships between perceptions of STEM and anticipated discrimination, comparing results for minority and majority-group students (N=380). This study found that global and international perceptions of STEM to be associated with reduced levels of anticipated discrimination, but only for students with the highest levels of minority salience. Similarly, Diamond (2020b) found global perceptions of STEM to be significantly associated with better educational outcomes. In these studies, Diamond and Kislev argue that the students, by entering the global context of STEM, minority students are able to partially circumvent the local/national context that is characterized by poor intergroup relations, and a lack of interest (or indeed rejection) of shared social spaces (see: Smooha, 2016). Of particular interest is the significant relationship between what appears to be an endorsement of a 'global and international' environment and positive attitudes to intergroup cooperation, while its multiculturalism/polyculturalism counterpart (i.e. the perception of STEM as cooperative, that highlights group difference salience) is insignificant. To that end, these studies indicates how a possible form of a globalization diversity ideology may be effective where multiculturalism or polyculturalism-based approaches are ineffective. Moreover, they reflect the success of STEM-based peace projects attribute their success to the 'global', 'international', or 'universal' nature of STEM (e.g. Cohen, 2005; Langer, 2018; Martiniuk & Wires, 2011; Sriharan et al., 2009) as a means for bridging between rival groups.

Similar conclusions can also be drawn from qualitative research conducted in Israel. One ethnographic study on minority youth (aged 15-18) visiting high-tech companies as part of an extra-curricular program found that student encounters with STEM employees increased academic motivation and interest in STEM careers (Diamond, 2020a). According to the study, minority

students became interested in STEM as a way of achieving social equality through being considered as ‘equals’ in their chosen profession (i.e. low group difference salience), and through espousing identity with a global company that could afford socioeconomic mobility (i.e. a shared global identity). Similarly, a study conducted on nurses, nursing assistants, and physicians working in hospitals and retirement homes included 44 interviews with minority (N=37) and majority-group (N=7) employees, and sought to establish how they cope with manifestations of the regional conflict in professional circumstances (Darr, 2018). In order to mitigate the impact of racism, all of the workers agreed that religious, national, and cultural divides play a minimal role in their day-to-day work and social ties with colleagues, thus facilitating professional relationships that might not have occurred outside of the hospital or retirement home setting (coined "the neutral work environment", see: Darr, 2018, p. 840). When instances of racism do occur, for example with patients, the participants adopt *split-ascription* strategies in order to abstract and distance themselves from the reality of ethno-national conflict and social tension.

In both of these examples, the youth and healthcare workers, respectively, seek and adopt strategies that would allow them to separate their social positionality in their work environment from the structural discrimination, and allows people from different groups to focus on the importance of the cooperation and relationships between them. In both studies, the globalization of STEM (Drori, Meyer, Ramirez, & Schoffer, 2003) facilitates minimizing social group differences together with the focus on connections and relationships between workers, or shared identities as STEM professionals. They are thus reflective of a possible globalization ideology for diversity. These strategies and stances adopted by the participants in both studies do not erase the presence of institutional discrimination or negative consequences of the ethno-national conflict, but provide a possible way of addressing some of its associated challenges.

Globalization diversity for minorities in STEM can also be seen in research on women working in STEM in global contexts. Interviews (N=121) conducted researchers in STEM fields from five continents establish how women can partially avoid gender-based discrimination by entering the global sphere (Zippel, 2017). The global context of STEM can reduce the gender salience for women by placing emphasis on research capabilities or prestige, rather than minority salience. Zippel’s (2017) analyses indicate both low importance on group difference (e.g. being perceived first as scientists, or belonging to a prestigious research institution, rather than women or minorities), while focusing on the importance of shared identities, connections, interactions,

cooperation, and mutual influence between individuals from different contexts. Accordingly, the diversity presented here – that assists in reducing some cases of gender-based discrimination – may be congruent with the proposed globalization diversity ideology (see: Table 1).

Discussion, Conclusions, and Future Directions

This paper aims to provide the necessary theoretical groundwork to facilitate the expansion of the colorblindness-multiculturalism-polyculturalism paradigm in diversity ideologies and diversity models research. The review of existing theoretical and relevant empirical studies should encourage scholars to consider the potential development of an instrument for a globalization diversity ideology and corresponding globalization diversity model, thus creating a four-model approach to analyzing diversity. Yet, the limitations of this review and existing empirical research raise several important questions that should guide this process.

First, and while the distinction between globalization diversity and other ideologies are theoretically clear, this does not guarantee its uniqueness. Indeed, the studies reviewed here do not check for correlations between endorsement of globalization diversity and other ideologies. Indeed, emerging studies have found correlations between polyculturalism and positive views of globalization (Bernardo, 2019), and as such, the development of a globalization diversity ideology will require future studies to establish its uniqueness from existing ideologies. Moreover, with few exceptions (e.g. Diamond & Kislev, 2020a; Diamond & Kislev, 2020b), the studies included do not compare the impacts of globalization diversity with other models. Thus, in order to establish potential benefits of the globalization ideology, future studies will need to check whether endorsement of globalization diversity models can account for unique variance in measures of social wellbeing.

Second, the available empirical studies are relatively limited in the scope of their social contexts (i.e. management diversity and STEM). This could ostensibly be attributed to the fact that the globalization of business (Jones, 2009) and STEM (Drori et al., 2003) avail to the creating of global spaces and promotion of globalization diversity. Nonetheless, the limited range of these studies raises the question whether globalization diversity would be impactful in other situations. As such, future research needs to establish the potential relevance of the globalization ideology in additional settings.

Third, it is notable that many of the empirical studies on globalization diversity in STEM rely on data from Israel (i.e. Darr, 2018; Diamond, 2020a; Diamond & Kislev, 2020a, 2020b; Martiniuk & Wires, 2011; Sriharan et al., 2009). While this highlights the need to investigate globalization diversity in other national contexts, it may also give an initial indication of the contexts wherein globalization diversity ideologies may be most effective. Indeed, many of these studies argue that the global aspects of STEM present a route for leaving the national context; since the national context is heavily characterized by the Israeli-Arab conflict, the global context reduces the salience of its negative effects. To that end, it may be that globalization diversity is more effective when it provides such a route to circumvent intergroup tensions, or avoid institutional discrimination or racism. Indeed, the STEM example outside of Israel demonstrates how the global, in some cases, can help women in global STEM careers reduce the negative impacts of gender-based discrimination (Zippel, 2017). As such, future studies on globalization diversity in a variety of national and social contexts are likely to contribute to the debates on when and under which circumstances globalization is empowering and/or threatening for different social groups (Anderson, 2011; Sassen & Van Roekel-Hughes, 2008; Sharma & Sharma, 2010; Smith, 2016). The establishment of a globalization diversity ideology would provide an additional angle for addressing these debates.

Once these limitations are addressed, a globalization diversity ideology may assist, in some contexts, in addressing a key challenge in diversity research: choosing diversity models that do not empower one social group at the potential expense of another (Plaut et al., 2018). While the introduction of polyculturalism improved on the options available in the colorblindness-multiculturalism dichotomy, the three-way approach still necessitates adopting different aspects of different models to suit each situation (Rosenthal & Levy, 2010, 2012). The introduction of a fourth option – the globalization ideology – will broaden the choices available.

References

Abu-Laban, Y., & Gabriel, C. (2002). *Selling diversity: Immigration, multiculturalism, employment equity, and globalization*. Toronto: University of Toronto Press.

Allport, G. W. (1954). *The nature of prejudice*. Cambridge, MA: Perseus Books.

Anderson, E. (2004). The Cosmopolitan Canopy. *The Annals of the American Academy of Political and Social Science, 595*(1), 14-31. doi:10.1177/0002716204266833

Anderson, E. (2011). *The cosmopolitan canopy: Race and civility in everyday life*: WW Norton & Company.

Ang, S., Van Dyne, L., Koh, C., Ng, K. Y., Templer, K. J., Tay, C., & Chandrasekar, N. A. (2007). Cultural Intelligence: Its Measurement and Effects on Cultural Judgment and Decision Making, Cultural Adaptation and Task Performance. *Management and Organization Review, 3*(3), 335-371. doi:10.1111/j.1740-8784.2007.00082.x

Apfelbaum, E. P., Norton, M. I., & Sommers, S. R. (2012). Racial Color Blindness: Emergence, Practice, and Implications. *Current Directions in Psychological Science, 21*(3), 205-209. doi:10.1177/0963721411434980

Apfelbaum, E. P., Pauker, K., Sommers, S. R., & Ambady, N. (2010). In Blind Pursuit of Racial Equality? *Psychological Science, 21*(11), 1587-1592. doi:10.1177/0956797610384741

Appadurai, A. (1996). *Modernity at large: Cultural dimensions of globalization*. Minneapolis, MI: University of Minnesota Press.

Banerjee, S. B., & Linstead, S. (2001). Globalization, Multiculturalism and Other Fictions: Colonialism for the New Millennium? *Organization, 8*(4), 683-722. doi:10.1177/135050840184006

Barry, B. (2002). *Culture and equality: An egalitarian critique of multiculturalism*. Cambridge, MA: Harvard University Press.

Bernardo, A. B. I. (2019). Polyculturalism and perceived effects of globalization in Macau. *Social Behavior and Personality: an international journal, 47*(7), 1-7. doi:10.2224/sbp.8129

Bernardo, A. B. I., Rosenthal, L., & Levy, S. R. (2013). Polyculturalism and attitudes towards people from other countries. *International Journal of Intercultural Relations, 37*(3), 335-344. doi:10.1016/j.ijintrel.2012.12.005

Bernardo, A. B. I., Salanga, M. G. C., Tjipto, S., Hutapea, B., Yeung, S. S., & Khan, A. (2016). Contrasting Lay Theories of Polyculturalism and Multiculturalism: Associations With Essentialist Beliefs of Race in Six Asian Cultural Groups. *Cross-Cultural Research, 50*(3), 231-250. doi:10.1177/1069397116641895

Berry, J. W. (2005). Acculturation: Living successfully in two cultures. *International Journal of Intercultural Relations, 29*(6), 697-712. doi:10.1016/j.ijintrel.2005.07.013

Berry, J. W. (2008). Globalisation and acculturation. *International Journal of Intercultural Relations, 32*(4), 328-336. doi:10.1016/j.ijintrel.2008.04.001

Berry, J. W. (2011). Integration and multiculturalism: Ways towards social solidarity. *Papers on social representations, 20*(1), 1-21.

Bloemraad, I., Korteweg, A., & Yurdakul, G. (2008). Citizenship and immigration: Multiculturalism, assimilation, and challenges to the nation-state. *Sociology, 34*(1), 153.

Cho, J., Tadmor, C. T., & Morris, M. W. (2018). Are All Diversity Ideologies Creatively Equal? The Diverging Consequences of Colorblindness, Multiculturalism, and Polyculturalism. *Journal of cross-cultural psychology, 49*(9), 1376-1401. doi:10.1177/0022022118793528

Cohen, M. M. (2005). The Arava Institute for Environmental Studies: Nature Knows No Borders. *Palestine-Israel Journal of Politics, Economics, and Culture, 12/13*(4), 52-54.

Darr, A. (2018). Palestinian Arabs and Jews at work: Workplace encounters in a war-torn country and the grassroots strategy of 'split ascription'. *Work, Employment and Society, 32*(5), 831-849. doi:10.1177/0950017017711141

Diamond, A. H. (2020a). Minority Youth Acculturation in Third Spaces: An Ethnography of Arab-Palestinian High School Students Visiting the Israeli Innovation Sector. *Journal of Ethnic and Migration Studies*. doi:10.1080/1369183X.2020.1847055

Diamond, A. H. (2020b). The Social Reproduction of Science Education Outcomes for High School Students in Israel. *British Journal of Sociology of Education, 41*(7), 1029-1046. doi:10.1080/01425692.2020.1806040

Diamond, A. H., & Kislev, E. (2020a). High School Students' Perceptions of Science and Attitudes Towards Intergroup Cooperation. *Compare: A Journal of Comparative and International Education*. doi:10.1080/03057925.2020.1748494

Diamond, A. H., & Kislev, E. (2020b). Perceptions of Science and Their Effects on Anticipated Discrimination in STEM for Minority High School Students. *Cambridge Journal of Education*. doi:10.1080/0305764X.2020.1806989

Drori, G. S., Meyer, J. W., Ramirez, F. O., & Schoffer, E. (Eds.). (2003). *Science in the Modern World Polity: Institutionalization and Globalization*. Stanford, CA: Stanford University Press.

Erez, M., Lisak, A., Harush, R., Glikson, E., Nouri, R., & Shokef, E. (2013). Going Global: Developing Management Students' Cultural Intelligence and Global Identity in Culturally Diverse Virtual Teams. *Academy of Management Learning & Education, 12*(3), 330-355. doi:10.5465/amle.2012.0200

Ewoh, A. I. E. (2013). Managing and Valuing Diversity:Challenges to Public Managers in the 21st Century. *Public Personnel Management, 42*(2), 107-122. doi:10.1177/0091026013487048

Flint, K. (2006). Indian–African Encounters: Polyculturalism and African Therapeutics in Natal, South Africa, 1886–1950s∗. *Journal of Southern African Studies, 32*(2), 367-385. doi:10.1080/03057070600656382

Gillespie, K., McBride, J. B., & Riddle, L. (2010). Globalization, Biculturalism and Cosmopolitanism:The Acculturation Status of Mexicans in Upper Management. *International Journal of Cross Cultural Management, 10*(1), 37-53. doi:10.1177/1470595809359581

Glikson, E., & Erez, M. (2013). Emotion Display Norms in Virtual Teams. *Journal of Personnel Psychology, 12*(1), 22-32. doi:10.1027/1866-5888/a000078

Gutmann, A. (1994). *Multiculturalism*. New Jersey: Princeton University Press.

Hahn, A., Banchefsky, S., Park, B., & Judd, C. M. (2015). Measuring Intergroup Ideologies: Positive and Negative Aspects of Emphasizing Versus Looking Beyond Group Differences. *Personality and Social Psychology Bulletin, 41*(12), 1646-1664. doi:10.1177/0146167215607351

Hao, J., Li, D., Peng, L., Peng, S., & Torelli, C. J. (2016). Advancing Our Understanding of Culture Mixing. *Journal of cross-cultural psychology, 47*(10), 1257-1267. doi:10.1177/0022022116670514

Harush, R., Lisak, A., & Erez, M. (2016). Extending the Global Acculturation Model to Untangle the Culture Mixing Puzzle. *Journal of cross-cultural psychology, 47*(10), 1395-1408. doi:10.1177/0022022116670261

Harush, R., Lisak, A., & Glikson, E. (2018). The bright side of social categorization: The role of global identity in reducing relational conflict in multicultural distributed teams. *Cross Cultural & Strategic Management, 25*(1), 134-156. doi:10.1108/CCSM-11-2016-0202

Hay, C., & Marsh, D. (2000). Introduction: Demystifying Globalization. In C. Hay & D. Marsh (Eds.), *Demystifying Globalization* (pp. 1-17). London: Palgrave Macmillan UK.

Healy, E., Thomas, E., & Pedersen, A. (2017). Prejudice, polyculturalism, and the influence of contact and moral exclusion: A comparison of responses toward LGBI, TI, and refugee groups. *Journal of Applied Social Psychology, 47*(7), 389-399. doi:doi:10.1111/jasp.12446

Held, D., & McGrew, A. G. (2007). *Globalization theory: Approaches and controversies* (Vol. 4): Polity Cambridge.

Hollingworth, S., & Mansaray, A. (2012). Conviviality under the Cosmopolitan Canopy? Social mixing and friendships in an urban secondary school. *Sociological Research Online, 17*(3), 195-206. doi:10.5153/sro.2561

Jones, A. (2009). Theorizing Global Business Spaces. *Geografiska Annaler. Series B, Human Geography, 91*(3), 203-218. doi:10.1111/j.1468-0467.2009.00315.x

Kaiser, C. R., Major, B., Jurcevic, I., Dover, T. L., Brady, L. M., & Shapiro, J. R. (2013). Presumed fair: Ironic effects of organizational diversity structures. *Journal of personality and social psychology, 104*(3), 504-519. doi:10.1037/a0030838

Kelley, R. D. G. (1999). The people in me. *Utne Reader, 95*, 79-81.

Kim, Y. Y. (2008). Intercultural personhood: Globalization and a way of being. *International Journal of Intercultural Relations, 32*(4), 359-368. doi:10.1016/j.ijintrel.2008.04.005

Kim, Y. Y., & Bhawuk, D. P. S. (2008). Globalization and diversity: Contributions from intercultural research. *International Journal of Intercultural Relations, 32*(4), 301-304. doi:10.1016/j.ijintrel.2008.06.001

Knowles, E. D., Lowery, B. S., Hogan, C. M., & Chow, R. M. (2009). On the malleability of ideology: Motivated construals of color blindness. *Journal of personality and social psychology, 96*(4), 857-869. doi:10.1037/a0013595

Landis, D. (2008). Globalization, migration into urban centers, and cross-cultural training. *International Journal of Intercultural Relations, 32*(4), 337-348. doi:10.1016/j.ijintrel.2008.04.003

Langer, S. (2018). Crossing divides: Science towards peace in the Middle East. *Chemistry International, 40*(3), 51-53. doi:10.1515/ci-2018-0331

Lawrence, B. B. (2011). The Cosmopolitan Canopy of East Maritime SE Asia: Minority citizenship in the Phil-Indo Archipelago. *Comparative Islamic Studies, 7*(1-2), 67-104. doi:10.1558/cis.v7i1-2.67

Lima, I. (2019). Canopy Places: How Does It Feel? The Good Life in Rio de Janeiro. In T. Delaney & T. Madigan (Eds.), *A Global Perspective on Friendship and Happiness* (pp. 135-140). Malaga, Spain: Vernon Press.

Lisak, A., & Erez, M. (2009). *Leaders and followers in multi-cultural teams: their effects on team communication, team identity and team effectiveness*. Paper presented at the Proceedings of the 2009 international workshop on Intercultural collaboration, Palo Alto, California, USA.

Lisak, A., & Erez, M. (2015). Leadership emergence in multicultural teams: The power of global characteristics. *Journal of World Business, 50*(1), 3-14. doi:10.1016/j.jwb.2014.01.002

Martiniuk, A. L. C., & Wires, S. M. (2011). Reflections on peace-through-health: the first Canadian, Israeli and Palestinian maternal and child health programme for medical

students. *Medicine, Conflict and Survival, 27*(4), 197-204. doi:10.1080/13623699.2011.645146
McGrew, A. G., & Lewis, P. (2013). *Global politics: globalization and the nation-state*. Hoboken, NJ: John Wiley & Sons.
Modood, T. (2016). Multiculturalism. In G. Ritzer (Ed.), *The Blackwell Encyclopedia of Sociology* (pp. 1-4). Hoboken: Wiley.
Moghaddam, F. M. (2008). *Multiculturalism and intergroup relations: Psychological implications for democracy in global context*. Washington, DC: American Psychological Association.
Mor Barak, M. E. (2016). *Managing diversity: Toward a globally inclusive workplace*. London: Sage Publications.
Morris, M. W., Chiu, C.-y., & Liu, Z. (2015). Polycultural Psychology. *Annual review of psychology*, *66*(1), 631-659. doi:10.1146/annurev-psych-010814-015001
Neville, H. A., Awad, G. H., Brooks, J. E., Flores, M. P., & Bluemel, J. (2013). Color-blind racial ideology: Theory, training, and measurement implications in psychology. *American Psychologist, 68*(6), 455-466. doi:10.1037/a0033282
Neville, H. A., Lilly, R. L., Duran, G., Lee, R. M., & Browne, L. (2000). Construction and initial validation of the Color-Blind Racial Attitudes Scale (CoBRAS). *Journal of Counseling psychology*, *47*(1), 59-70. doi:10.1037/0022-0167.47.1.59
Nier, J. A., Gaertner, S. L., Dovidio, J. F., Banker, B. S., Ward, C. M., & Rust, M. C. (2001). Changing Interracial Evaluations and Behavior: The Effects of a Common Group Identity. *Group Processes & Intergroup Relations, 4*(4), 299-316. doi:10.1177/1368430201004004001
Niezen, R. (2008). *A world beyond difference: Cultural identity in the age of globalization*. Hoboken, NJ: John Wiley & Sons.
Osborn, H. J., Sosa, N., & Rios, K. (2020). Perceiving demographic diversity as a threat: Divergent effects of multiculturalism and polyculturalism. *Group Processes & Intergroup Relations*, 1-18. doi:10.1177/1368430219880606
Özbilgin, M., Jonsen, K., Tatli, A., Vassilopoulou, J., & Surgevil, O. (2013). *Global diversity management*. Oxford: Oxford University Press.
Ozer, S., & Schwartz, S. J. (2016). Measuring globalization-based acculturation in Ladakh: Investigating possible advantages of a tridimensional acculturation scale. *International Journal of Intercultural Relations, 53*, 1-15. doi:10.1016/j.ijintrel.2016.05.002
Pakulski, J. (2014). Confusions about multiculturalism. *Journal of Sociology*, *50*(1), 23-36. doi:10.1177/1440783314522190
Plaut, V. C. (2010). Diversity Science: Why and How Difference Makes a Difference. *Psychological Inquiry*, *21*(2), 77-99. doi:10.1080/10478401003676501
Plaut, V. C., Cheryan, S., & Stevens, F. G. (2015). New frontiers in diversity research: Conceptions of diversity and their theoretical and practical implications. In M. Mikulincer, P. R. Shaver, E. Borgida, & J. A. Bargh (Eds.), *APA Handbook of Personality and Social Psychology* (Vol. 1, pp. 593-619). Washington, DC: American Psychological Association.
Plaut, V. C., Garnett, F. G., Buffardi, L. E., & Sanchez-Burks, J. (2011). "What about me?" Perceptions of exclusion and Whites' reactions to multiculturalism. *Journal of personality and social psychology, 101*(2), 337-353. doi:10.1037/a0022832
Plaut, V. C., Thomas, K. M., & Goren, M. J. (2009). Is Multiculturalism or Color Blindness Better for Minorities? *Psychological Science, 20*(4), 444-446. doi:10.1111/j.1467-9280.2009.02318.x

Plaut, V. C., Thomas, K. M., Hurd, K., & Romano, C. A. (2018). Do Color Blindness and Multiculturalism Remedy or Foster Discrimination and Racism? *Current Directions in Psychological Science, 27*(3), 200-206. doi:10.1177/0963721418766068

Prashad, V. (2002). *Everybody was Kung Fu fighting: Afro-Asian connections and the myth of cultural purity*. Boston, MA: Beacon Press.

Prashad, V. (2003). Bruce Lee and the anti-imperialism of Kung Fu: A polycultural adventure. *positions: east asia cultures critique, 11*(1), 51-90.

Pratto, F., Sidanius, J., & Levin, S. (2006). Social dominance theory and the dynamics of intergroup relations: Taking stock and looking forward. *European review of social psychology, 17*(1), 271-320. doi:10.1080/10463280601055772

Rattan, A., & Ambady, N. (2013). Diversity ideologies and intergroup relations: An examination of colorblindness and multiculturalism. *European Journal of Social Psychology, 43*(1), 12-21. doi:10.1002/ejsp.1892

Roach, S. C. (2017). *Cultural autonomy, minority rights and globalization*. Oxford: Routledge.

Rosenthal, L., & Levy, S. R. (2010). The Colorblind, Multicultural, and Polycultural Ideological Approaches to Improving Intergroup Attitudes and Relations. *Social Issues and Policy Review, 4*(1), 215-246. doi:doi:10.1111/j.1751-2409.2010.01022.x

Rosenthal, L., & Levy, S. R. (2012). The relation between polyculturalism and intergroup attitudes among racially and ethnically diverse adults. *Cultural Diversity and Ethnic Minority Psychology, 18*(1), 1-16. doi:10.1037/a0026490

Rosenthal, L., & Levy, S. R. (2013). Thinking about mutual influences and connections across cultures relates to more positive intergroup attitudes: An examination of polyculturalism. *Social and Personality Psychology Compass, 7*(8), 547-558. doi:doi.org/10.1111/spc3.12043

Rosenthal, L., & Levy, S. R. (2016). Endorsement of Polyculturalism Predicts Increased Positive Intergroup Contact and Friendship across the Beginning of College. *Journal of Social Issues, 72*(3), 472-488. doi:10.1111/josi.12177

Rosenthal, L., Levy, S. R., Katser, M., & Bazile, C. (2015). Polyculturalism and attitudes toward Muslim Americans. *Peace and Conflict: Journal of Peace Psychology, 21*(4), 535-545. doi:10.1037/pac0000133

Rosenthal, L., Levy, S. R., & Militano, M. (2014). Polyculturalism and Sexist Attitudes:Believing Cultures are Dynamic Relates to Lower Sexism. *Psychology of Women Quarterly, 38*(4), 519-534. doi:10.1177/0361684313510152

Rosenthal, L., Ramirez, L., Levy, S. R., & Bernardo, A. B. (2019). Polyculturalism: Viewing cultures as dynamically connected and its implications for intercultural attitudes in Colombia. *Avances en Psicología Latinoamericana, 37*(1), 133-151.

Ryan, C. S., Casas, J. F., & Thompson, B. K. (2010). Interethnic Ideology, Intergroup Perceptions, and Cultural Orientation. *Journal of Social Issues, 66*(1), 29-44. doi:doi:10.1111/j.1540-4560.2009.01631.x

Ryan, C. S., Hunt, J. S., Weible, J. A., Peterson, C. R., & Casas, J. F. (2007). Multicultural and Colorblind Ideology, Stereotypes, and Ethnocentrism among Black and White Americans. *Group Processes & Intergroup Relations, 10*(4), 617-637. doi:10.1177/1368430207084105

Sasaki, S. J., & Vorauer, J. D. (2013). Ignoring Versus Exploring Differences Between Groups: Effects of Salient Color-Blindness and Multiculturalism on Intergroup Attitudes and

Behavior. *Social and Personality Psychology Compass, 7*(4), 246-259. doi:10.1111/spc3.12021
Sassen, S. (2003). Globalization or Denationalization? *Review of International Political Economy, 10*(1), 1-22. doi:10.1080/0969229032000048853
Sassen, S. (2007). *A sociology of globalization*. New York and London: W. W. Norton & Company.
Sassen, S., & Van Roekel-Hughes, A. (2008). Deciphering the global: Its spaces, scales and subjects. *Social Thought & Research, 29*, 3-18.
Schofield, J. W. (1986). Causes and consequences of the colorblind perspective *Prejudice, discrimination, and racism.* (pp. 231-253). San Diego, CA, US: Academic Press.
Sharma, S., & Sharma, M. (2010). Globalization, threatened identities, coping and well-being. *Psychological Studies, 55*(4), 313-322. doi:10.1007/s12646-010-0048-8
Shokef, E., & Erez, M. (2006). Global Work Culture and Global Identity, as a Platform for a Shared Understanding in Multicultural Teams. In C. Ya-Ru (Ed.), *National Culture and Groups* (Vol. 9, pp. 325-352): Emerald Group Publishing Limited.
Shokef, E., & Erez, M. (2015). Cultural intelligence and global identity in multicultural teams. In S. Ang & L. Van Dyne (Eds.), *Handbook of cultural intelligence* (2nd ed., pp. 195-209). New York: Routledge.
Smith, J. (2016). *Imperialism in the twenty-first century: Globalization, super-exploitation, and capitalism's final crisis*. New York: NYU Press.
Smooha, S. (2016). *Index of Arab-Jewish relations in Israel 2015*. Haifa: University of Haifa.
Speight, S. L., Hewitt, A. A., & Cook, H. R. (2016). Color-blind racial ideology and internalized racism among people of color *The myth of racial color blindness: Manifestations, dynamics, and impact.* (pp. 191-205). Washington, DC, US: American Psychological Association.
Sriharan, A., Abdeen, Z., Bojrab, D., David, S., Elnasser, Z., Patterson, T., . . . Noyek, A. (2009). Academic medicine as a bridge to peace: Building Arab and Israeli cooperation. *Academic Medicine, 84*(11), 1488-1489. doi:10.1097/ACM.0b013e3181baa22d
Sue, D. W., Bucceri, J., Lin, A. I., Nadal, K. L., & Torino, G. C. (2009). Racial microaggressions and the Asian American experience. *Asian American Journal of Psychology, S*(1), 88-101. doi:10.1037/1948-1985.S.1.88
Sutton, J. (2012). *Competing in capabilities: the globalization process*. Oxford: Oxford University Press.
Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. In S. Worchel & G. W. Austin (Eds.), *Psychology of Intergroup Relations* (pp. 7-24). Chicago: Nelson-Hall.
Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D., & Wetherell, M. S. (1987). *Rediscovering the social group: A self-categorization theory*. Oxford: Basil Blackwell.
van Dijk, H., Meyer, B., van Engen, M., & Loyd, D. L. (2017). Microdynamics in Diverse Teams: A Review and Integration of the Diversity and Stereotyping Literatures. *Academy of Management Annals, 11*(1), 517-557. doi:10.5465/annals.2014.0046
Verkuyten, M. (2005). Ethnic group identification and group evaluation among minority and majority groups: testing the multiculturalism hypothesis. *Journal of personality and social psychology, 88*(1), 121. doi:10.1037/0022-3514.88.1.121

Verkuyten, M. (2009). Self-esteem and multiculturalism: An examination among ethnic minority and majority groups in the Netherlands. *Journal of Research in personality, 43*(3), 419-427. doi:10.1016/j.jrp.2009.01.013

Vorauer, J. D., Gagnon, A., & Sasaki, S. J. (2009). Salient Intergroup Ideology and Intergroup Interaction. *Psychological Science, 20*(7), 838-845. doi:10.1111/j.1467-9280.2009.02369.x

Weiss, A. (2015). The racism of globalization. In D. Macedo & G. Panayota (Eds.), *Globalization of Racism* (pp. 134-153). New York: Routledge.

Whitley, B. E., & Webster, G. D. (2019). The Relationships of Intergroup Ideologies to Ethnic Prejudice: A Meta-Analysis. *Personality and Social Psychology Review, 23*(3), 207-237. doi:10.1177/1088868318761423

Wolsko, C., Park, B., & Judd, C. M. (2006). Considering the tower of Babel: Correlates of assimilation and multiculturalism among ethnic minority and majority groups in the United States. *Social Justice Research, 19*(3), 277-306. doi:10.1007/s11211-006-0014-8

Wolsko, C., Park, B., Judd, C. M., & Wittenbrink, B. (2000). Framing interethnic ideology: Effects of multicultural and color-blind perspectives on judgments of groups and individuals. *Journal of personality and social psychology, 78*(4), 635-654. doi:10.1037/0022-3514.78.4.635

Yari, N., Lankut, E., Alon, I., & Richter, N. F. (2020). Cultural intelligence, global mindset, and cross-cultural competencies: A systematic review using bibliometric methods. *European Journal of International Management, 14*(2), 210-250. doi:10.1504/EJIM.2020.105567

Yüksel, A., & Eres, F. (2018). The Correlation between Global Citizenship Perceptions and Cultural Intelligence Levels of Teachers. *Universal Journal of Educational Research, 6*(5), 1069-1076. doi:10.1080/02188791.2012.738679

Zippel, K. (2017). *Women in global science*. Stanford, California: Stanford University Press.

CONCLUSION

Chapters 1-4 (Diamond 2020a, Diamond 2020b, Diamond and Kislev 2020a, Diamond and Kislev 2020b) of this thesis together provide empirical insights into the effects of globalisation in STEM education on Arab-Palestinian minority high school students in Israel, with a particular focus on students from Jaffa. Chapter 5 (Diamond under review) provides a theoretical review that connects the theoretical findings from the previous chapters to wider scholarly discussions on diversity models and ideologies. Considered together, the articles presented as chapters of this thesis provide general theoretical insights regarding the context of globalisation and global spaces for minority students, with possible consequences for policymakers.

Accordingly, this conclusion chapter summarises the findings of the thesis and lays out general theoretical insights, as well as policy recommendations that emerge from the data analyses. This chapter also includes reflections regarding the methods and methodological approach adopted in the empirical work, alongside limitations of the research I conducted. Indeed, in discussing the main findings and insights, it is important to draw attention to the limitations and validity issues of the studies I conducted, as discussed in each of the chapters, respectively. The main findings, insights, and policy recommendations described below are subject to these limitations. As such, this chapter should be read with these possible limitations in mind, whose consequences are discussed explicitly and at length below. Finally, and in light of the limitations described, the thesis concludes with recommendations for future directions of research.

1. Main findings and general theoretical insights

Chapter 1 (Diamond 2020a) compares the patterns of social reproduction of interest in science, science self-efficacy, and aspirations for studying science at university for the Arab-Palestinian and Jewish students in the questionnaire dataset (N=380). The findings of this chapter can be split into two categories, the first of which relates to general differences between majority and minority students in Israeli STEM education. These findings are important for contextualising gaps in secondary STEM education in Israel for the remainder of the thesis, since studies that compare STEM education outcomes for Jewish and Arab-Palestinian students, though available, are typically related to the intersectionality between gender and minority status (Forgasz and Mittelberg 2012, Mittelberg 1999, Nasser and Birenbaum 2005), or offer primarily descriptive differences (Bratslavsky, Lipfshtat and Hilu 2019).

To that end, Chapter 1 contributes to the literature by showing how minority-majority differences in Israeli STEM education are in many ways comparable to other national contexts. Most notably, I discuss the 'science debt' in Israel, whereby minority students in Israel are typically more interested in science and have higher science aspirations, despite having reduced science capital in general, mirroring the science debt that minority students experience in other contexts (such as the UK: Archer et al. 2020). These findings hold in my analyses whether comparing directly between Arab-Palestinian (minority) and Jewish (majority) students, or by using the 'minority' composite and factor variables that encompass various aspects of minority status in the education system. In addition, my analyses in Chapter 1 demonstrate differences in the social reproduction of science university aspirations, whereby family SES and some forms of science capital (DeWitt, Archer and Mau 2016) predict better outcomes for Jewish students only.

I explain these contextual findings by discussing institutional discrimination in Israeli STEM education. Indeed, the science debt for Arab-Palestinian students could be explained by structural differences whereby minority schools in Israel have reduced access to appropriate teachers, tools, and funding required to ensure student success in STEM (Al-Haj 2012). Similarly, typical patterns of social reproduction that would normally predict a positive and significant relationship between family background and educational outcomes may be disrupted in Israel where anticipation and experience of discrimination in education and employment prevent educational capital from being actualised (for example, in Israel: Arar and Haj-Yehia 2016, and in England: Moote et al. 2019). Though plausible, particularly given the results suggesting the role that knowledge of Hebrew plays in STEM education outcomes, this thesis does not directly assess this argument. Nonetheless, the second main finding from Chapter 1 would also align with the argument of institutional discrimination.

Indeed, the second finding from Chapter 1 (Diamond 2020a) shows a significant and positive relationship between perceiving STEM as global and better STEM education outcomes. The argument here is that students who experience and perceive STEM as global exhibit better STEM education outcomes since global spaces give them the opportunity to partially leave the national context; where this is characterised by racism and/or discrimination, the context of a global space (Sassen and Van Roekel-Hughes 2008) is particularly beneficial for discriminated minorities, such as Arab-Palestinian students in Israel. These results are evident from the significant coefficients for regressions on the 'social distance' composite variable, which reflects

the extent to which the students perceive STEM as global and international. In this way, Chapter 1 provides contextual information on Jewish/Arab-Palestinian differences in secondary STEM education in Israel, as well as the initial indication that global spaces in STEM may be related to increased interest in STEM, higher self-efficacy in STEM, and higher aspirations to pursue a university degree in STEM.

Yet, the ability of the 'social distance' composite variable to draw wider conclusions on the impact of globalisation and global spaces in STEM education is limited, particularly since its components combine both aspects of globalisation in STEM as well as preparedness to integrate and cooperate with different social groups. It could be that the prospect of cooperating or collaborating with the outgroup – and not the global aspects of STEM – are responsible for the better educational outcomes (Forsyth 2009, Tobin 2016). In order to examine this possibility, Chapters 2 (Diamond and Kislev 2020b) and 3 (Diamond and Kislev 2020a) investigate and compare the impacts of cooperative and global aspects of STEM separately.

Specifically, Chapter 2 (Diamond and Kislev 2020b) delineates the relationship between different perceptions of STEM and intergroup attitudes. As above, this study considers two possible perceptions of STEM – 'global' and 'collaborative' – and uses regression analyses to see how they relate to willingness to work and study with the outgroup for the Arab-Palestinian minority students in my questionnaire sample (N=246).

Since STEM is intrinsically and increasingly reliant upon cooperation between different groups of people (Chiu and Duit 2011), it is possible that there could be a selection effect whereby students interested in STEM are already more inclined to integrate with the outgroup. Therefore, and in addition to the demographic variables included in these regressions, my analyses opened with regressing preferring socially homogeneous on interest in STEM in general. Results aligned with the literature and this reasoning and hypothesis, indicating feeling like a minority was positively associated with preference for homogeneous environments, and interest in STEM was negatively associated with such a preference. Yet, when considering different characteristics of STEM (labelled as 'perceptions' in: Diamond and Kislev 2020b), the collaborative aspects of STEM seemed to be unrelated to the preferred type of social environment. Indeed, the results suggested that perceiving STEM as global and international was associated with readiness to integrate into mixed social environments.

Chapter 3 (Diamond and Kislev 2020a) adopts a similar approach to Chapter 2 (Diamond and Kislev 2020b), but this time the main dependent variable was not related to the preferred work/study environment, but rather the levels of anticipated discrimination in STEM. Chapter 3 builds on Chapter 2 in two ways: first, and by using the same collaborative and global composite variables, it tests the same theoretical idea for a different social parameter (i.e. anticipated discrimination); and second, by including the Jewish students' questionnaire data (N=380 in total), it facilitates a discussion on how and whether social distance and minority salience might mediate these relationships.

The results in Chapter 3 reflect those of its antecedent, but also add important nuances. On the whole, and arguably in line with literature on intergroup relations (in Israel: Berger et al. 2016, and in general: Everett 2013), collaborative[1] perceptions of STEM were found to be significantly associated with reduced anticipation of discrimination for all students. As in with Chapter 2, global perceptions of STEM were found to be associated with more positive social outcome; reduced anticipated discrimination in STEM, in this case. However, this relationship was only significant for minority students who identified primarily as Palestinian; arguably the subgroup with the largest amount of social distance from Jewish-majority society in Israel.

The role that social distance may have in mediating the relationship between entering a subspace within science (Aikenhead 1996) characterised by globalisation and improved social outcomes for minorities has consequences for debates on global spaces and globalisation in general. Indeed, these findings could be explained by the suggestion that global spaces are empowering for minority groups in circumstances whereby individuals use the global space as a way of temporally leaving the national context and integrating in an environment whose social order is less damaging, or even advantageous (Sassen 2007, Sassen and Van Roekel-Hughes 2008). Chapter 3 argues that this is indeed the case, since Palestinian-identifying minority students who arguably face the highest prospects of discrimination in Israeli society (Smooha 2016), stand to gain the most by 'leaving' this national context. The results therefore not only shed light on the conditions that are conducive to create potentially empowering situations for minorities and minority students in the context of globalisation, but also support the idea that globalisation has impacted the context of STEM education in ways that are distinct from other subjects (Carter 2012, Clothey, Mills and Baumgarten 2010).

[1] Labelled 'cooperative' in this chapter. The change was made upon editorial request during peer review.

To that end, Chapters 1, 2, and 3 are linked in the way by arguing how global spaces are conducive to better social outcomes for minority students in situations where global spaces allow these students to reduce the salience of or particularly circumvent a disadvantageous or discriminatory national context. Here, the global space was delivered through STEM education (e.g. Bencze and Carter 2011, Fensham 2011, Kuukkanen 2011), minority salience was measured by a composite variable (Chapter 1), an independent variable on feelings of being a minority (Chapter 2), and a dummy variable on primary identity (Chapter 3), and the challenging national context was the social divisions apparent between Jewish and Arab-Palestinian citizens in Israel (e.g. Agbaria 2018, Ghanem 2001, Khamaisi and Abu-Saad 2015). While by no means a fully comprehensive evaluation on the impacts of global spaces on minority students in Israel, these findings together contribute to the literature by providing concrete empirical examples as to when globalisation can be leveraged for minority empowerment, while reducing the risk of group threat (Sharma and Sharma 2010).

Yet, the evidence supporting better social outcomes for minority groups in global spaces in Chapters 1-3 is exclusively quantitative. As such, it is not possible to rule out selection effects whereby more globally-inclined individuals have better social outcomes in the first place, nor is it possible to establish the causality or determine the directionality of these relationships. For this reason, this thesis includes qualitative evidence that bolsters and adds important nuances to the discussions of the quantitative analyses in Chapters 1-3 (Diamond 2020a, Diamond and Kislev 2020a, Diamond and Kislev 2020b).

Specifically, Chapter 4 (Diamond 2020b) presents an ethnographic study of an Arabic-language high school in Jaffa, Israel. For 21 months, I followed three classes of Arab-Palestinian minority students before, during, and after participation in a curricular programme designed to acquaint them with Israel's innovation sector. The innovation sector, as characterised by STEM, multinationalism, and globalisation, creates an opportunity for the students to experience a global space that straddles their school environments and wider society. I thus frame the innovation sector programming as a global context using third space theory (Bhabha and Rutherford 2006, Soja 1998), and use theories of acculturation (Berry and Sam 1997, Berry 2008) to examine the social trajectories of the students as they encounter globalisation in the innovation sector.

The analysis of narratives (Polkinghorne 1995) in Chapter 4 suggests the possibility of divergence in patterns of acculturation in the hegemonic Israeli, Jewish context when compared

with acculturation in the third (global) space. In many instances, Arab-Palestinian students who experience double-marginalisation in Jewish-Israeli society (Suleiman 2002a, Suleiman 2002b) indicate inclinations towards integration or assimilation in global spaces, such as that provided by the innovation sector. Here, the innovation sector acts a 'third' space by bridging between the Arab-Palestinian home/community (first) and Jewish-Israeli (second) spaces. Yet, it was also apparent that this was not the case for all participants: it appeared that students from low-SES backgrounds, as well as students with records of low academic achievement, actually revert to marginalisation immediately upon confrontation with social tension in the third (global) space.

Chapter 4 therefore echoes the findings of Chapters 1-3 by showing how global contexts can positively impact the acculturation strategies of students over an extended period of time, and could be used to argue the case for global spaces as empowering for minorities in some circumstances. Importantly, and despite the apparent moderating role that SES and academic achievement appear to play in this relationship, the study suggests at least anecdotally that there could be some element of causation to the statistical associations found in Chapters 1-3. Here, I note that all of the questionnaire data for Arab-Palestinian participants came from the school presented in Chapter 4 ('Ironi Samekh': Diamond 2020b) and similar schools from the same city (Jaffa). While the focus on one context limits my ability to comment on the experiences of minorities in global spaces in Israel in general, it facilitates considering my quantitative and qualitative analyses alongside one another. To that end, while Chapters 1-3 provide correlative evidence of the impact of global spaces in STEM education on minorities in Israel, Chapter 4 provides some first steps towards a causational argument in this respect.

In order to more solidly establish the potential of globalisation and global spaces as a means of positively impacting the social outcomes of minorities, it will be necessary to gather further empirical evidence, with a particular focus on data in other national contexts, outside of STEM, and not within the realms of education. Anecdotal studies to this effect have been published, but to the best of my knowledge at the time of writing this thesis, have not been collated to argue this case.

Chapter 5 (Diamond under review) therefore offers a theoretical review of studies wherein global spaces and globalised contexts facilitate positive social outcomes for as wide as a range of social groups as possible, using Chapters 1-4 (Diamond 2020a, Diamond 2020b, Diamond and Kislev 2020a, Diamond and Kislev 2020b) as central examples. I use these studies to connect the

findings from Chapters 1-4 to the diversity ideology literature, and in particular propose the development of a *globalisation diversity ideology*. The proposed globalisation ideology, unlike multiculturalism, and akin to colourblindness, does not place high importance on group difference salience. Yet unlike colourblindness, and akin to polyculturalism, the proposed globalisation ideology recognises asymmetrical relationships between groups.

The contributions of Chapter 5 are thus threefold. First, and importantly for this thesis, Chapter 5 connects the findings of the previous chapters to the wider literature on diversity, and to studies on global spaces outside the context of STEM education in Israel. Second, it is amongst the first publications to collate a series of empirical studies whereby global spaces seemingly facilitate positive social outcomes for some social groups. Third, and particularly regarding the literature on diversity models and ideologies, Chapter 5 offers a potential way of expanding on the existing multiculturalism-colourblindness-polyculturalism paradigm, which though efficient in facilitating diversity, often produces diversity models that benefit some groups at the expense of others (Plaut, Thomas and Goren 2009, Plaut et al. 2018, Rosenthal and Levy 2010). As explicated within chapter itself (Diamond under review), the introduction of the globalisation diversity ideology aims to present first steps at addressing the calls from scholars (e.g. Cho, Tadmor and Morris 2018, Rosenthal and Levy 2012) to expand existing diversity paradigms.

To summarise, and notwithstanding the limitations and validity issues that are discussed later in this chapter, the main chapters of this thesis first demonstrate that for some minority students in Israel, the context of STEM classroom is perceived as distinct from Jewish-Israeli society. This social context is one that is characterised by globalisation (Bencze and Carter 2011, Carter 2005, Carter 2012, Chiu and Duit 2011, Clothey, Mills and Baumgarten 2010, DeBoer 2011, Fensham 2011, McComas 2014, Stacey et al. 2018). By border-crossing into this context (Aikenhead 1996), students enter a global space (Sassen 2007, Sassen and Van Roekel-Hughes 2008) whose social order is different to that of the national context. Within Israel, where the national/majority hegemonic context is often challenging for minority students, the opportunity to 'leave' or partially circumvent some of the consequences of group relations is potentially advantageous for Arab-Palestinian minority students, under some circumstances. The chapters therefore provide empirical examples of where globalisation can act as an equalising force, rather a source of group threat (Sharma and Sharma 2010). The chapters each discuss some of the possible conditions that may mediate and/or facilitate this relationship. These discussions can be

used to make policy recommendations, as well as make suggestions for further research, as laid out below.

2. Policy evaluation and recommendations

Inequalities in access to and success in STEM persist for minority groups in a wide range of national contexts (Museus et al. 2011, Xie, Fang and Shauman 2015), despite many policy programmes and attempts to close these gaps (e.g. Archer et al. 2020, National Science Board 2018). Despite attempts to reform STEM education in order to improve diversity in STEM fields (Drew 2015), many countries do not met their own policy-based goals for diversification of STEM (see, for example: Bybee 2010). The issue of increasing minority success in the STEM track is an especially pressing issue for countries facing shortages of STEM workers, raising potential negative consequences for both the economy and national security (Burrell 2020). Whereas human capital shortages in STEM fields can be linked to the underrepresentation of minority groups in STEM education (Varma 2018), it is topical and important to discuss how the research presented in this thesis can be used to shape policy and support minority student success in STEM.

Indeed, and as mentioned throughout Chapters 1-4, the Arab-Palestinian minority in Israel are underrepresented in STEM and related fields (Scheindlin 2016) due to economic, structural, and institutional inequities (Al-Haj 2012). In general, the combination of a reduced minority representation in STEM in Israel, combined with an ageing population of Former Soviet Union immigrants (whose arrival contributed to the growth of the STEM sector in Israel: Gorodzeisky and Semyonov 2011), and the growing size and importance of tech sectors has results in serious human capital shortages particularly in Israel. At the time of data collection for this thesis, there was a shortage of approximately 10,000 engineers and programmers, and in order to keep up with the current growth rate of the innovation sector, the Ministry of Economy set aims to double the number of STEM professionals to at least 500,000 in the space of just ten years (Israel Innovation Authority 2017).

This section of the conclusion therefore provides policy insights and recommendations that can be inferred from Chapters 1-5. The studies here assist in policy design: first, by contextualising some minority-majority differences in Israeli STEM education (Chapter 1: Diamond 2020a); second, by conceptualising the role that globalisation and global spaces can play for students in STEM education success (Chapters 2-3: Diamond and Kislev 2020a, Diamond and Kislev 2020b);

third, by evaluating extra-curricular STEM-related programming (Chapter 4: Diamond 2020b); and fourth, by laying out a possible new approach to diversity that can be implemented in STEM education (Diamond under review). By expanding on the discussion and conclusion sections of each of these chapters, I provide here policy recommendations and consequences at the local school-level in Israel (i.e. school and municipal policy), the national level in Israel (i.e Ministry of Education policy), and general recommendations that emerge international for contexts outside of Israel. Thus, I aim to complement emerging studies (Cheung 2018, van Griethuijsen et al. 2015) that seek to establish factors that increase minority students' success in STEM education.

2.1 Municipal and school policies in Israel

The working assumption of most schools, governments, and education-based policy fora posits that policies should be adopted in order to encourage and facilitate diversity and success of minority students in STEM education, as well as education in general (OECD Directorate for Education and Skills 2018). Israel is no exception, with Ministry of Education reports instructing schools to take steps in this regard, including: recruiting talented teachers to the socioeconomic periphery; the funding of extra-curricular STEM-based activities; professional development for teachers in diversifying participation of students; supporting high school workshops on continuing to higher education; and encouraging all students, particularly those from the socioeconomic periphery, to pursue the most comprehensive mathematics courses (*chamesh yehidot* or 'five units' in Hebrew) in high school (see, for example: Kimhi and Horowitz 2015, Yozma 2018). While the number Arab-Palestinian students pursuing more advanced STEM courses in high school has risen in recent years (Blass 2017, Manny-Ikan 2013, Manny-Ikan et al. 2016), they remain low, and these trends have not been translated into proportionate representation in STEM fields and in the economy in general (Lewin-Epstein and Semyonov 2019). In other words, the education policies in place are arguably bringing modest success, at best.

Based on the research conducted for this thesis, I suggest an opportunity for improving the efficacy of education policies in this respect will come by reframing what policymakers assume to be the reasons for the underrepresentation of Arab-Palestinian students in STEM. The policies highlighted above, for the most-part, have two implicit assumptions: that Arabic-language schools are under-equipped and less prepared to support students in pursuing higher level STEM; and that Arab-Palestinian students are less interested in STEM. While the former is certainly a well-

established challenge in minority education in Israel (Agbaria 2018, Khamaisi and Abu-Saad 2015, Mustafa, Arar and Khamaisi 2009), my research suggests that the latter is not the case.

Indeed, the findings from Chapter 1 (Diamond 2020a) suggest that Arab-Palestinian students are, on average, more interested in STEM in general and have higher aspirations for higher education STEM, and this is despite being less likely to have a STEM professional or role model in the family. Arab-Palestinian students therefore experience 'science debt' (Archer et al. 2020), and Israel is similar to other contexts where minority students are underrepresented in STEM despite being more interested (van Griethuijsen et al. 2015). Hence, and whilst policies and programmes that aim to improve Arab-Palestinian interest in STEM may have a positive impact, they do not directly address the issues that these minority students face: policies based on descriptive analyses of STEM education performance (such as analyses of PISA reports: Bratslavsky, Lipfshtat and Hilu 2019) miss important nuances. Furthermore, policies that assume that Arab-Palestinian minority students are less interested in STEM can be criticised as orientalist (Furani and Rabinowitz 2011), insofar as they make this assumption based on otherness without empirically verifying whether it is actually the case.

Instead of a focus on improving interest and aspirations in STEM, this thesis highlights issues that are more specific for Arab-Palestinian students. Both Chapter 1 (Diamond 2020a) and Chapter 3 (Diamond and Kislev 2020a) suggest that the role that discrimination in STEM, education, and Israeli society in general significantly moderate STEM education outcomes. Without addressing the challenges of anticipated and perceived discrimination in STEM and STEM education in Israel, I argue that the success of policies to improve Arab-language education will be limited. Indeed, and as is raised in Chapter 4 (Diamond 2020b), there were many instances whereby students became more interested in STEM and integration as an acculturation strategy (Berry 2011) following the innovation sector programming, but reverted to strategies of separation and marginalisation when faced with clear forms or discrimination (see, for example, the incident between Omer and Ahmed on p.14 of Chapter 4).

Based on these analyses, I can make suggestions for schools and municipal-level policymakers seeking to improve Arab-Palestinian participation and success in STEM. Following the arguments presented in Chapter 4, it is important to note that improving student interest or high school uptake in STEM is likely limited in its impact later on the STEM track unless students are well prepared to deal with diversity and discrimination. I therefore recommend taking steps to

address discrimination by providing the students with tools for dealing with these challenges. Extensive and rich literature on the topic of addressing discrimination for minority students in STEM can assist in policymaking there. Academic reports suggest: programming and policies for empowering minority students; providing continued training for teachers on how to support minority students in discriminatory contexts; supporting programming that provides ingroup STEM role models for minority students; and many others (for a comprehensive review, see: Museus et al. 2011).

The contribution that this thesis has in this regard is the potential impact of global contexts and global spaces for Arab-Palestinian students in STEM. Indeed, and as is evident particularly in Chapter 2 and Chapter 3, perceiving STEM as global is not only associated with reduced anticipated discrimination for Arab-Palestinian students (Diamond and Kislev 2020a), but in many instances is also associated with greater willingness to integrate with the outgroup (that is, integrate into Jewish-Israeli society: Diamond and Kislev 2020b). The analyses presented here suggest the possibility that global spaces (Sassen and Van Roekel-Hughes 2008), in some contexts, can be leveraged to the benefit of minorities (see also in Chapter 5: Diamond under review). Thus, at the school level, pedagogical changes that encourage the framing of STEM as global and international (Carter 2005, Carter 2012, Tobin 2016) may be particularly effective at improving Arab-Palestinian representation in Israeli STEM. Such endeavours may also include appropriate teacher training and development, or the funding of programmes that contextualise STEM as global and international (such as the programme presented in Chapter 4). Regarding the feasibility of such an approach in Israel and particularly in Jaffa, a recent study of school management in Jaffa suggests that characteristics of internationalisation are already manifested in school culture (Yemini 2014); what remains is to adapt these manifestations to the betterment of educational outcomes.

2.2 National and Ministry of Education policies in Israel

While school and municipal-level policies and programmes can be adjusted in order to impart students with tools for dealing with discrimination in STEM and STEM education, policies at the national level can be devised in order to reduce the salience and impact of said discrimination in the first place.

Research on the education system in Israel has identified how Arabic-language schools are institutionally disadvantaged through inadequate funding (Agbaria 2018, Jabareen and Agbaria

2011). While all schools receive centralised funding from the Ministry of Education, they are also heavily reliant on the extent to which local municipalities are able to supplement this funding: whereas primarily Arab-Palestinian municipalities are typically less economically prosperous, the result is that Arabic-language schools are less well-funded than Hebrew-language schools on the whole (Al-Haj 2012, Arar 2012, Arar and Haj-Yehia 2016). As a result, Arabic-language schools often lack the funding and resources necessary in order to teach higher level STEM classes in high school, creating additional challenges for Arab-Palestinian students who want to pursue post-secondary STEM. This challenge has been noted by policy reports (for example: Blass 2017), and was anecdotally evident at the schools where I conducted ethnographic research, where science teachers complained how a lack of funding, resources, and adequately trained teachers creates issues for promoting STEM. The ultimate result is that many Arab-Palestinian students end up believing that pursuing STEM is out of their reach. Lack of adequate funding hence arguably contributes to an oppositional culture (Ogbu 2008) to STEM, whereby Arab-Palestinian students believe that STEM is simply ‘not for them’.

The Israeli government recognised the challenges facing Arabic-language education and Arab-Palestinian society in general, and in 2015 approved a 15 billion NIS plan to invest in the development of minorities in Israel between the years 2016-2020 (see "Decision 922": Prime Minister's Office 2017). While it is still too early to fully assess how these investments may have impacted STEM education in Arabic-language schools, results from the 2018 PISA studies show that the majority-minority gaps in science and mathematics in Israel are the widest in the OECD (Bratslavsky, Lipfshtat and Hilu 2019). Moreover, critics of Decision 922 have noted that some of the conditions to receive the funding made it difficult to access change. For instance, local municipalities are required to match at least 20 percent of all funding allocated to formal education, and at least 50 percent of all funding allocated to informal education, meaning that many schools simply did not see any increase in funding as a result of this policy. Indeed, and albeit anecdotally, in the schools where I conducted ethnographic studies, school management claim to have not received any increases in funding since 2015. Based on these circumstances, it is apparent that there is a need to provide additional funding for Arabic-language STEM education: new funding could be more effective if it were provided in a targeted fashion, without preconditions (such as matching) which make it difficult or impossible for schools to directly benefit.

Discrimination can also be addressed at the individual-level through policies that recognise the particular challenges for Arab-Palestinian students who want to pursue STEM education. One possible way of addressing both institutional disadvantage and anticipated discrimination is through affirmative action policies in progression to higher education. Specifically for STEM subjects in Israel, such policies could relax entry requirements for students applying from schools who do not offer the highest levels of science and mathematics courses, as well as students applying from low-SES areas. The latter is particularly important for Arab-Palestinian students in Israel, since availability of funding for courses and fluency in Hebrew assist students in preparing for the university entrance aptitude examinations (Arar and Haj-Yehia 2013). Critics of affirmative action policies in Israel note concerns that such programmes may harm the meritocratic nature of such courses. Yet, a recent study of 41,483 undergraduate students between 2003-2015 at the Hebrew University of Jerusalem indicates that the 5 percent of students who were admitted through affirmative action policies were equally as likely to complete their courses as the remainder of students who were admitted through ordinary procedures (Rotem, Yair and Shustak 2020). These analyses, as well as reported successes of other affirmative action programmes at Israeli universities (Alon and Malamud 2014), should abate concerns.

Furthermore, and tandem to the aforementioned school-level policies and results of Chapters 2 and 3 in particular, it may be possible to moderate the anticipated discrimination for Arab-Palestinian students by creating collaborative (Diamond and Kislev 2020a) and/or global (Diamond and Kislev 2020b) spaces within the education system through the implementation of intercultural education policies (Faas, Hajisoteriou and Angelides 2014). Whereas Jewish and Arab-Palestinian students learn in de-facto separate school systems, the most feasible way of facilitating intercultural education without having to reform the entire education system – an unrealistic goal for the Israeli education system – would be through the promotion and funding of extra-curricular activities.

Chapter 2 highlights initiatives and organisations that have already in practice facilitated intercultural encounters in STEM environments, with positive results for Jewish, Arab-Palestinian, and Jordanian participants (for example: Cohen 2005, Martiniuk and Wires 2011, Skinner et al. 2005, Sriharan et al. 2009, Wiesel et al. 2007). Here, I suggest drawing particular attention to intercultural STEM programming aimed at youth in Israel, such as Tech2Peace and the Middle East Entrepreneurs of Tomorrow: the reported positive impact of these programmes on minority

youth (e.g. Middle East Entrepreneurs of Tomorrow 2020) are corroborated by the findings of Chapter 2, that suggest why such programming may be helpful (Diamond and Kislev 2020b). Policy that supports STEM-based intercultural education could be supported by globalisation diversity models (as proposed in Chapter 5: Diamond under review), though its exact nature would need to be informed by further research.

2.3 International policy consequences

All of the data analysed for this thesis come from Israel, with much of it coming specifically from the city of Jaffa. Therefore, and as discussed further in the limitations section below, there are some challenges in generalising results and generating policy recommendations for contexts further afield. Nonetheless, by considering the particular circumstances of the Arab-Palestinian minority in Israel, this thesis yields some modest policy suggestions for other national contexts.

To that end, it is instructive to highlight the ways in which STEM education for minorities in Israel is similar to other contexts. Indeed, analyses of international assessments such as TIMSS and PISA (Bratslavsky, Lipfshtat and Hilu 2019, Glickman 2017, Martin et al. 2011), as well as international reviews of minorities in STEM education (Xie, Fang and Shauman 2015) indicate that Israel is one of many national contexts where minority groups students perform less well in STEM examinations, and are underrepresented in STEM, particularly in higher education and STEM careers. Moreover, this thesis finds that like in other contexts, that this is despite the fact that minorities in Israel are more interested in STEM (van Griethuijsen et al. 2015), with this disparity being attributable (at least in part) to discrimination (in Israel: Diamond 2020a, Diamond and Kislev 2020a, and internationally: Museus et al. 2011). In other words, Israel is in many ways similar other countries where there is science debt due to discrimination (such as the UK: Archer et al. 2020). For these countries, the aforementioned policy recommendations at the school/municipal and national levels may be appropriate.

At the same time, specific characteristics regarding the Israeli context make it an instructive case study for other instances. With particular regard to the arguments made regarding global spaces, the analyses in Chapters 2, 3, and 4 (Diamond 2020b, Diamond and Kislev 2020a, Diamond and Kislev 2020b) suggest that the global nature of STEM is beneficial for minority students by providing a route to reduce the salience of the national context of social conflict and

discrimination, thus (at least partially) circumventing associated challenges. Similar and parallel arguments have been made for some women in global science careers (Zippel 2017).

To that end, the above policy suggestions may be particularly relevant in two sets of circumstances, both of which lead to particularly tense majority-minority relations, with consequences for education. First, the Arab-Palestinian minority in Israel can be understood as an *involuntary* minority (see: Ogbu and Simons 1998) insofar as members of this group did not actively choose to be citizens or residents of Israel, where they are by default a minority group. In this way, recommendations for Arab-language education in Israel may be applicable for involuntary minorities in other national contexts (Bailey and Weininger 2002, Shdema and Martin 2020). Policies recommendations will likely need to be adjusted for *voluntary* minorities, whose preferred strategies of acculturation within educational frameworks differ significantly (Fuligni 2001).

Second, it is important to note the extent to which tensions between Jewish and Arab-Palestinian citizens in Israel are a result of the ongoing regional conflict, which creates social divisions even amongst children as young as three years old (Nasie, Diamond and Bar-Tal 2016). The efficacy of promoting intercultural education, global diversity, and tackling discrimination through policy therefore may be more potent in regions where minority-majority relations are shaped by the context of conflict. Comparable context in this sense may include post-conflict Cyprus (Hajisoteriou and Angelides 2013), Ireland (Bryan 2010), Georgia (Tabatadze and Gorgadze 2013), and others (for reviews of countries where education systems are shaped by the context of conflict, see: Bar-Tal, Diamond and Nasie 2017, and for countries where intercultural education policies have been used to address conflict-related issues, see: Bleszynska 2008).

Moreover, and independent of the relevance of the Israel-specific policy recommendations to other national contexts, all of the empirical chapters of this thesis provided clear evidence that many high school students would choose to describe STEM as global and international. These results are likely a reflection of the way in which globalisation is shaping STEM education (Carter 2008, Carter 2012, Chiu and Duit 2011). Thus, policymakers are likely to benefit from considering the impacts that the globalisation of STEM education has on students in any context (Moore et al. 2011, Stacey et al. 2018, Tobin 2016, Zeidler 2014).

Finally, the results of my studies may assist in improving the planning and design of international large-scale assessments (ILSAs) in education such as TIMSS and PISA. Collectively,

the four empirical chapters show how sociological measures related to STEM may be important indicators of educational outcomes. Specifically, and first, Chapter 1 (Diamond 2020a) indicated the value of considering science capital in exploring diversity and equality issues in STEM. Taken together with the pioneering and emerging studies on science capital (Archer et al. 2012, Archer et al. 2015, Moote et al. 2019), an argument could be made for including a measure of science capital in ILSAs. Second, Chapters 2 and 3 (Diamond and Kislev 2020a, Diamond and Kislev 2020b) provide empirical evidence showing how perceptions of STEM could be indicative of divergent educational outcomes. Taken together with larger-scale international studies on perceptions of STEM (e.g. van Griethuijsen et al. 2015), it is possible to argue the potential benefits of including perceptions of STEM – or indeed, distinct fields of STEM – as a part of ILSAs. Such additions may assist researchers in uncovering additional nuances in STEM education outcomes for students globally.

3. Reflections on methods and methodological approach

The analyses presented in each of the main chapters of this thesis are subject to the methods and methodological approaches employed and their respective limitations. These limitations moderate both the general insights that can be drawn from the research, as well as the breadth of policy recommendations that can be made, as above. Each chapter therefore includes methodological reflections where appropriate. These reflections are considered holistically here and used to contextualise the following subsections on research limitations and proposed directions for future research.

3.1 Use of mixed methods

This thesis presents one theoretical and four empirical articles, of which three employ quantitative methods and one adopting a qualitative approach. As described in the introduction chapter, I adopted an 'integrated mixed design' (Teddlie and Tashakkori 2009:151), wherein different types of data, methods, and analyses were used iteratively to inform each stage of the data collection and analysis. Considering the quantitative and qualitative analyses in this thesis together was intrinsically motivated by the fact that I conducted ethnographic observations and collected my questionnaire data for Arab-Palestinian students at the same high schools. Moreover, the different quantitative the quantitative, qualitative, and theoretical review chapters are considered together

in this conclusion chapter in order to synthesise general theoretical insights and produce policy recommendations. While there are debates regarding what precisely constitutes mixed methods research (Greene 2008, Mertens 2014), I suggest that the applicability of my recommendations, as well as general considerations regarding the reliability and validity of my results, are improved by considering the implications of mixed methods analyses.

Amongst the multiple controversies in mixed methods design and analysis (Cohen, Manion and Morrison 2013, Creswell and Clark 2011, Johnson and Onwuegbuzie 2004), I draw attention to three particular questions raised by Creswell (2011) that are relevant to my research design. The first question regards whether there is added value in using mixed methods for drawing conclusions from the analyses. In the case of the studies presented in this thesis, the potential for the added value of mixed methods is implicit in the way that the quantitative analyses – primarily multiple regressions – can be used to assert statistical associations and correlations only. As discussed in each of the quantitative chapters (Diamond 2020a, Diamond and Kislev 2020a, Diamond and Kislev 2020b), the multiple regressions are limited in their ability to assert causality or directionality. The ethnographic study, however, followed groups of students over 21 months, and an analysis of narratives (Polkinghorne 1995) was used to suggest how global context do indeed impact students, thus strengthening the arguments presented in the quantitative chapters (1-3). Likewise, the argument presented in the ethnographic chapter (4) are strengthened by the quantitative results that suggest similar patterns, but with a reduced (but not eliminated) risk of biased analyses (Cohen, Manion and Morrison 2013). In addition, whereas one of the concerns in mixed methods research arises when analyses of data from incongruous populations are compared (Wagner et al. 2012), there was added value in using mixed methods in this thesis insofar as much of the qualitative and quantitative data came from the same population. Thus, and while the empirical chapters of this thesis cannot be used to draw broad theoretical conclusions, they strengthen each other's claims and hence create a compelling argument for comparing analyses from different types of data.

Yet, implicit in the idea that different types of data can shape the same theoretical claims from opposing directions is a stance of post-positivism. Indeed, the second question that must be addressed regarding mixed methods analyses regards whether this research stance privileges post-positivism (Giddings and Grant 2007). In the case of this thesis, I was motivated to include both quantitative and qualitative methods based on the assumption that my values, background, and

beliefs as a researcher were likely to impact my analyses, arguably reflecting some of the values of post-positivism. Therefore, in all of the analyses presented in this thesis, particularly those in this conclusion chapter, I take the impact of this paradigm into account by highlighting that my methodological decisions were pragmatic for the field of research and research questions (Onwuegbuzie, Gerber and Schamroth Abrams 2017). In addition, and as a balance, the inclusion of the theoretical review that defines a globalisation diversity ideology (Chapter 5: Diamond under review), addresses these concerns by discussing how global spaces might be manifested in the 'real' and 'observable' worlds, respectively (that is, critical realism as a response to post-positivism: Patomaki and Wight 2000).

Assuming that the use of mixed methods is appropriately justified, the third question that must be addressed regards the misappropriation of individual research methods and designs. Specifically, this thesis combines ethnographic and quantitative analyses. Many scholars justifiably criticise the use of quantitative data alongside ethnographic analyses due to ontological disjuncture that would ultimately lead to false conclusions (Cohen, Manion and Morrison 2013). Yet, recent years have seen the emergence of quantitative ethnography as a research methodology (Shaffer 2017), and a growing number of research projects support the use of ethnographic methods to strengthen quantitative data analyses (Travers 2014). In this sense, considering the quantitative and qualitative analyses together in the conclusion assisted above in the general discussion on the impact of global spaces for minority students. Concerns of misappropriating research methods are limited in this thesis since none of the chapters used two research methods concurrently.

3.2 Researcher positionality

Reflection is also required with regard to my positionality and beliefs regarding the research topic of this thesis. Underpinning the framing of the above studies is the problematisation of the position of minority students in STEM education (Museus et al. 2011, Xie, Fang and Shauman 2015). Implicit in this position is my belief that improving minority student success and integration in STEM education is a worthwhile goal. Specifically within Israel, this pertains to closing gaps in STEM and educational achievement between Jewish and Arab-Palestinian students (for instance, as noted by: Bratslavsky, Lipfshtat and Hilu 2019, Glickman 2017). Therefore, the chapters

presented in this thesis can be understood through the lens of critical research (Alvesson and Deetz 2020).

While my implicit beliefs in this regard are ostensibly in line with the goals of the government, school system, and Ministry of Education (Prime Minister's Office 2017, The Authority for Measurement and Evaluation in Education 2018), it is important to consider my positionality as a researcher and how this may have impacted analyses (Jeffrey and Walford 2004). To that end, I go into depth regarding the potential impact of my identity on the current research in the methodology section of Chapter 4 (Diamond 2020b); the discussion here is equally relevant to the general conclusion chapter, and can be applied to the other main chapters of this thesis.

In addition, I draw attention to additional aspects of my 'self' in conducting this research (Reinharz 2011). Indeed, my observation and analyses are influenced by my experiences as a former educator in Israel and in the UK, and also by my belief in the need to improve the Arabic-language education in Israel. In this sense, I adopt a critical stance in favour of improved equality (Hammersley 2004) that directs my techniques and analysis. Moreover, my research position was impacted by my background as a non-native Israeli, and having an only elementary command of spoken Arabic. On this note, I align myself with researchers who conduct research in populations that they do not originate from (Gunaratnam 2003, Robertson 2002). However, I note that my previous experience in researching in Israeli schools and educational contexts (Nasie, Diamond and Bar-Tal 2016, Nasie, Bar-Tal and Diamond 2017), my experience as an elementary school English teacher in Israel in 2012-13, the length of my time in Israel since immigration (8 years at the time of writing), and fluent command of Hebrew reduce, to some extent, the social and cultural distance I experience in this context. Nonetheless, the consequences of researching as an outsider, as above, are discussed in the methodology section of Chapter 4 (Diamond 2020b).

3.3 Specificity of research data

In addition to reflections regarding the research methodology and my own positionality, I also suggest considering the impact of the specificity Israeli research context on general analyses.

Regarding researching inequalities in STEM education, the Israeli case study is instructive due to the high contrast between the high levels of social, economic, and education inequality (Al-Haj 2012, Arar 2012) in comparison to the opportunity and status in STEM in Israel (Tawil 2015). This contrast is especially apparent when comparing the low levels socioeconomic mobility in

Jaffa with the opportunity in STEM and other fields available in neighbouring Tel Aviv (Khamaisi and Abu-Saad 2015, Scheindlin 2016). Research in this context can thus serve as an instructive case study for other societies shaped by persistent inequality between minority and majority groups.

Regarding theoretical questions on the impact of global spaces in minorities, the choice of STEM as an agent for delivering globalisation and global contents was discussed extensively in the main chapters of this thesis (see also: Aikenhead 1996, Appadurai 1996, Carter 2012, Chiu and Duit 2011, Drori et al. 2003, Zippel 2017). Yet, and as mentioned earlier in this conclusion chapter, the particular context in Israel – as characterised by large sociocultural distance between majority and minority groups – heavily impacts the general interpretation of the empirical data. On the one hand, the use of Israel as a case study is informative insofar as it tests theories regarding the ability of global spaces to reduce the salience of other social contexts (Sassen 2007, Sassen and Van Roekel-Hughes 2008). On the other hand, and however plausible the explanation, the methods cannot be described as directly measuring the impact of global spaces on students. The general theoretical discussions and policy recommendations were worded accordingly in order to reflect this uncertainty, and the particularity of the data used is discussed further as a limitation below.

4. Research limitations

In light of the discussions above, and following the discussions of limitations in each of the respective main chapters (Diamond 2020a, Diamond 2020b, Diamond and Kislev 2020a, Diamond and Kislev 2020b, Diamond under review), the following section summarises the general limitations of the research presented in this thesis.

4.1 Lack of generalisability

As above, the specificity of the context of Israel impacted the way in which I interpreted and analysed results. By taking this specificity into account, I was able to engage in general theoretical discourse in each of the chapters of this thesis. In particular, Chapter 5 (Diamond under review) sought to situate some of the theories I discussed within the literature on diversity ideologies and models, specifically outside the realms of education research.

Nonetheless, the specificity of the data significantly limits the generalisability of the results presented and conclusions drawn in this thesis. Particularly since most of the data came from the

city of Jaffa, care must be taken when generalising results, even for other locations in Israel. Indeed, Jaffa is in many ways uniquely positioned in Israel given its proximity to the highly prosperous Tel Aviv, and the ethnic and religious heterogeneity of its neighbourhoods (Schipper 2015). Moreover, I adopted the view that by focussing specifically on one city as a case study (Cohen, Manion and Morrison 2013), I could better facilitate the integration of methods and data.

Yet, the approach of focussing on Jaffa resulted in a relatively small sample size (N=380) of students. Amongst the Arab-Palestinian students, all participants came from similar low-SES backgrounds of the same city; while my analyses take family SES into account, it is possible that relative homogeneity could have impacted results. This is a particularly important limitation to consider since the Jewish student participants (N=134) came from schools around the country and were arguably more diverse in terms of SES. In ideal conditions, I could have included Jewish participants from Jaffa only in order to present a thorough case study, but I was unfortunately unable to gain access to Hebrew-language high schools in the city and therefore was forced to seek Jewish participants elsewhere. In Chapters 1 (Diamond 2020a) and 3 (Diamond and Kislev 2020a), where I analyse data from Jewish participants, I therefore explicitly state the different ways in which data was collected.

To that end, and though the number of participants is appropriate for the quantitative analyses presented in Chapters 1-3 (Diamond 2020a, Diamond and Kislev 2020a, Diamond and Kislev 2020b), it is important to recognise that a larger sample could have yielded additional insights. Additional students from Jaffa would have facilitated a more in-depth case study, whilst a larger sample from a wider range of locations in Israel could have yielded more generalisable results. Further research is required to assert the relevance of the theories investigated in this thesis in other contexts, both nationally and internationally.

The research is also limited in the way it focusses specifically on STEM education as a global space. While the literature consistently establishes STEM and STEM education as agents of globalisation (Chiu and Duit 2011, DeBoer 2011, Drori et al. 2003, Fensham 2011, Shankar 2003, Stacey et al. 2018), it is important to note the possibility that STEM may not be unique in this sense. Indeed, it is possible to arguments that in other school subjects, curricula contents deliver globalised and internationalised content that could also create global spaces. Such subjects could include, just for example, music education (Jones 2007), art and visual education (Tavin and Hausman 2004), or language education (Block and Cameron 2002). With particular regard to

language education, the teaching of the English language, which though not neutral, can provide for many students a path to globalised publics (Fujimoto-Adamson 2006). Thus, and particularly since English (and other school subjects) can be used to promote national hegemonies (Awayed-Bishara 2015), it is important to consider the extent to which STEM education may (or may not) be unique in this context.

Finally, the theoretical generalisability of the research is also limited when considering the age range of participants (14-18). I focussed on high school students for two reasons: first, since it avoids some of the pitfalls of self-selection that would be inevitable for university students studying STEM beyond mandatory education, or adults working in STEM professions; and second, since by this age students have usually asserted their interest (or lack thereof) in STEM, and began to form science identities (Aschbacher, Li and Roth 2010). Yet, this cannot determine whether global spaces in STEM can impact younger students, older students, or indeed STEM workers in the same way. Indeed, conflicting evidence exists regarding the impact of science-based workplaces on minority employees (Darr 2018, Zippel 2017). It is therefore difficult to project the conclusions drawn from this thesis on different age groups without carrying out additional empirical studies.

4.2 Self-reported data

The questionnaire used for Chapters 1-3 was reliant on self-reported data. While using self-reported items simplified data collection and reduced the cost of the research, there are notable disadvantages. Self-reported data is liable to issues of reliability and validity of measurement, since participants' responses are impacted by environmental factors, mood, participant honesty, ability to interpret the questions, response and sampling bias, rating scales, amongst other issues (Rosenman, Tennekoon and Hill 2011).

Regarding the questionnaire distributed for this thesis, many items could have been measured more objectively, had additional time and financial resources been made practically available. For example, these could include measures such as: actual family income (rather than perceived family SES); actual test scores (rather than self-evaluations in scholastic abilities); and longitudinal data that tracks whether students actually went on to pursue higher education at all, and whether this was in a STEM subject (rather than self-reported interest in higher education).

In order to mitigate some of the bias issues regarding self-reported data, the pilot phase of the questionnaire (N=103, as described in the methods sections of Chapters 1-3) included a step whereby teachers discussed the questionnaire items with the participants in order to assert whether the students' understood the questions. Items that were interpreted ambiguously were reworded and adjusted in order to reduce multiplicity of meaning (Krosnick 2018), thus reducing (though not eliminating) issues of reliability and validity (Cohen, Manion and Morrison 2013). In addition, some of the reliability and validity issues were mitigated by including qualitative ethnographic data for comparison (i.e. Chapter 4: Diamond 2020b), that were used in this conclusion chapter to triangulate some of the theoretical suggestions claimed in the quantitative chapters (Onwuegbuzie, Gerber and Schamroth Abrams 2017). Nonetheless, future studies can be improved by reducing reliance on self-reported data.

4.3 Questionnaire design

The pilot studies of the questionnaire revealed difficulties in retrieving data from student participants, who frequently lost interest and did not complete longer versions of the questionnaire. I therefore chose to reduce the number of items on the questionnaire in order to facilitate data collection, but this compromise came at the price of data richness. Many of the variables and concepts used in Chapters 1-3 were reduced to single questionnaire items for this reason, such as the reduced and over-simplified form of science capital (DeWitt, Archer and Mau 2016), as discussed in Chapter 1 (Diamond 2020a), or the simplification of items regarding student minority identity as Arab, Arab-Israeli, or Palestinian in Chapters 2 and 3 (Diamond and Kislev 2020a, Diamond and Kislev 2020b). Another example includes the ways in which I measured social distance either as a composite variable of two questionnaire items in Chapter 1 (Diamond 2020a), or as a direct function of student primary identity in Chapter 3 (Diamond and Kislev 2020a). Though tested and reliable measures of social distance (e.g. Mather, Jones and Moats 2017) could have improved the validity of these analyses, I opted for these estimations as a means of ensuring successful data collection. Similarly, additional items could have been used to measure students' perceptions of globalisation in STEM and STEM education (see 'student perceptions of globalisation' in: Das 2007, or indeed, general 'global identity' in: Shokef and Erez 2006). The nature of these variables therefore must be listed as a research limitation.

In addition, the need to reduce the length of the questionnaire resulted in very limited questions on non-STEM subjects. Given the potential limitation of the specificity of STEM (as discussed above), the lack of questionnaire items in this regard reduces the data's ability to deduct more generalised conclusions. Similarly, additional items on family/sibling/parent statistics, school grades, and further demographic information could have improved the coefficients of determination (R^2) that were calculated in the regression analyses, reducing the potential impact of unexplained variance.

Yet, and despite the measures I took to improve the questionnaire accessibility, not all of the questionnaires came back fully completed. As is explained at length in the methods sections of Chapters 1-3, I was required to perform imputations on the data in order to account for missing values (Manly and Wells 2015). While my sensitivity analyses appear to suggest that the use of imputation techniques was appropriate, it is possible that these imputations could have introduced effect bias or impacted the representativeness of the statistical regressions (White, Royston and Wood 2011).

Finally, it is important to note that the size and distribution of the sample did not facilitate the inclusion of a classroom-level variable. Indeed, some of the class sizes of the Arab-Palestinian participants were small, with too few participants (fewer than 20) for conducting reasonable multilevel analysis. Regarding the Jewish students, data came from different schools and classrooms from around Israel, with some class groups reporting fewer than 10 participants. Therefore, and while my sensitivity analyses indicate that school level was insignificant (see the Supplemental Tables in Chapter 3: Diamond and Kislev 2020a), these analyses recognise that my data may not reflect important classroom-level differences.

4.4 Cross-sectional data

The analyses presented in this thesis were also limited by the cross-sectional nature of the data. The quantitative data, which were all collected at individual time points, cannot be used to analyse change over time, and as such cannot be used to determine causation, effect, or directionality of any significant associations or relationships. Moreover, the data were collected in a cross-sectional fashion over the course of two academic years, creating some risk that the context of the questionnaires could have changed over time. Though some of these concerns can be mitigated by considering the qualitative and quantitative analyses together, they cannot be eliminated without

the inclusion of longitudinal data. This is particularly true since the ethnographic study I conducted only includes 21 months of observations; for critical researchers and policymakers interested in improving Arab-Palestinian integration and success in Israeli STEM, longitudinal data would need to extend after high school, beyond university, and arguably into the first years in the workforce. The lack of longitudinal data is taken into account as a limitation in the analyses and discussions of each of the chapters.

4.5 Challenges in factor analyses

Exploratory and confirmatory factor analyses were used in Chapters 1-3 to produce composite variables that represented global perceptions of STEM (Diamond and Kislev 2020a, Diamond and Kislev 2020b) as well as different aspects of minority status (see 'minority factor variables' in: Diamond 2020a). The use of factor analyses to generate said variables assisted in capturing broader concepts of both globalisation and minority status in the studies. Yet, some limitations must be taken into account.

For the factor analyses conducted in Chapters 1-3, the Kaiser-Meyer-Olkin tests yielded results that were always acceptable, thus supporting the use of the resulting composite variables. (Cerny and Kaiser 1977). However, the majority of these test results were in ranges that are normally deemed ‘acceptable’ or ‘good’, but not ‘excellent’ by contemporary standards (Watkins 2018). Consequentially, there is a risk that some of the factor/composite variables represented non-causal structure in the data, leading to questions of reliability and validity. In order to limit the risk of such issues, I conducted parallel analyses (Hayton, Allen and Scarpello 2004) in order to determine which loadings to retain, and included sensitivity analyses that separated the composite variables into their individual components (see the appendices and supplementary tables in: Diamond and Kislev 2020a, Diamond and Kislev 2020b).

While the parallel and sensitivity analyses do not indicate any significant issues with the factor/composite variables used in the regressions, they suggested in most cases retaining relatively small numbers of variables. The thin composition of these variables should be seen as a limitation, insofar as the factor analyses cannot be interpreted as capturing broad definitions of global perceptions of STEM and/or minority status, respectively.

4.6 Field specificity within STEM

The generalisability of this research is also limited due to differences between different types of STEM education fields. That is, the study of natural sciences such as physics, chemistry, and biology are likely to create various social contexts that could, in principle, differ significantly from other STEM fields such as engineering, mathematics, computer science, and so forth. This creates challenges in generalising my doctoral research, which groups STEM disciplines together.

On the one hand, the decision to group STEM disciplines together in this research project can be justified by the expansive literature on STEM and STEM education that considers the social – and in particular, educational – context of STEM disciplines collectively due to the similarities of social issues between disciplines, particularly when it comes to minority participation and success (Burke 2007, Xie, Fang and Shauman 2015). Indeed, investigating STEM disciplines together has been a norm amongst educational research scholars for decades (Hurd 2000), particularly since the US National Science Foundation promoted the STEM acronym in the early 2000s (as coined by: Ramaley 2002). The grouping of STEM disciplines availed great progress in educational research, particularly with respect to minority groups in STEM education (Gonzalez and Kuenzi 2012). Moreover, and particularly when considering the context of the schools in my research sample, many of the STEM disciplines were taught in the same class, and not every school offered ever discipline. My ability to distinguish between the social context of each discipline was therefore limited. Hence, and owing to the expansive aforementioned research on minority students (and adult professionals: Zippel 2017) that considers STEM disciplines together, I do not consider this to be a point of major concern.

On the other hand, however, it is important to recognise the likelihood that different STEM disciplines create different social environments. Indeed, scholars discuss the uniqueness of each STEM discipline (e.g. Ernest et al. 2016, Svoboda and Passmore 2013), with significant cultural, social, and epistemological differences between even very close fields (e.g. differences between mathematics and statistics, as found by my own study: Diamond and Stylianides 2017). In the context of this research in particular and the study of globalisation and global spaces, it could be that some STEM disciplines exhibit diverging results when it comes to the impact of globalisation. Accordingly, future studies may yield additional insights by considering the impact of globalisation in STEM disciplines separately.

5. Proposed future directions of research

The methodological reflections and limitations of the research discussed above open many routes for future research. In the first instance, future research can be designed and conducted in order to address some of the aforementioned limitations by conducting similar studies in other urban and national contexts, including additional questionnaire items that better capture the concepts investigated, seeking longitudinal data, and incorporating the use of measurable data (as opposed to self-reported data). The additional questionnaire items and longitudinal observations required may, as discussed above, present challenges in collecting data from high school students. Hence, future projects to this effect may be made for feasible by focussing on each of the chapter topics separately. While each chapter suggests directions for future research in their respective conclusions, four general directions for future research and their potential theoretical value are described here.

5.1 Social reproduction, discrimination, and general educational debt

The first direction for developing the research presented in this thesis is an extension of the results of Chapter 1 (Diamond 2020a), that found differences in the social reproduction of STEM education outcomes for Arab-Palestinian and Jewish students. The findings suggest that minorities in Israel experience science debt (Archer et al. 2020), whereby minorities exhibit lower achievement in STEM despite being more interested in the first place. Two questions that require further investigation are raised here.

First, it is important to ask what mechanisms might be moderating or preventing the usual processes of social reproduction for Arab-Palestinians in Israel, and minority students in general: indeed, when considering the extensive literature on social reproduction and STEM education (for example, Bourdieu and Passeron 1990, Claussen and Osborne 2013), Chapter 1 is surprising in suggesting that parent or immediate family member occupation are associated with STEM aspirations for majority students, but not minority students. While this result could possibly be explained by the relatively narrow definitions of the questionnaire items – a validity issue I discussed in the chapter itself – it is also arguable that discrimination could play an important part in weakening the links between science capital from the family and individual STEM aspirations. The hypothesis here, as explained in Chapter 1, is that science capital cannot be easily translated into STEM education outcomes for minority students if societal and/or institutional discrimination

create difficult or insurmountable challenges in progressing in the STEM track. It is well established that such discrimination negatively impacts minorities and women in STEM (Grossman and Porche 2014). The question at hand here, which requires direct investigation, is whether the impact of discrimination is large enough to disrupt the influence of family and science capital, which is otherwise understood to be very strong.

Second, and in seeking to gain insights on the divergent patterns of social reproduction of STEM education outcomes as seen in Chapter 1, future research should consider the extent to which these patterns are unique specifically to STEM education. Studies could compare the interest, performance, and aspirations for majority and minority students in STEM and non-STEM subjects. To that end, it would be possible to compare issues in science debt with 'education debt' in general (Ladson-Billings 2006). In particular, by considering possible mechanisms that moderate education outcomes for minority students (such as discrimination), it would be possible to gain a more nuanced understanding of how and why disparities in different academic disciplines persist between social groups. The data from my PhD facilitate some preliminary analyses in this respect, particularly when taking into account the analyses on anticipated discrimination in STEM from Chapter 3 (Diamond and Kislev 2020a). Yet, the collection of additional data and uses of databases such as TIMSS, PISA, and the ESS will avail more complete research in this sense.

5.2 Global spaces in comparative contexts

The general theoretical discussion in this conclusion chapter highlights how global spaces and contexts, in certain circumstances, can have positive impacts for minority groups. Yet, this interpretation is highly dependent on the specific context of the education system in Israel, and the argument that global spaces could be beneficial where they give minority groups the opportunity to reduce the salience of a disadvantageous national context. Zippel (2017) made parallel arguments regarding the professional mobility of women pursuing international and global science careers, particularly if the global contexts were more favourable to gender equality than the national origin contexts. Nonetheless, the reasons why global spaces appear to possibly benefit minority students in Israeli STEM education are not explicitly identified by the chapters of this thesis.

To that end, I suggest pursuing comparative research on global spaces in contexts outside of Israel, both within the realm of STEM education and broader afield. Whereas global contexts

are often framed as providing a source of identity threat for minority groups (Edwards and Usher 2007, Sharma and Sharma 2010), it is feasible that they are only beneficial in instances where the presumptive 'threat' of globalisation is outweighed by the challenges of the national context. This argument was investigated and supported by analyses in Chapters 2-3, who by considering minority salience as possible mediating variables, determined that the relationship between perceiving globalisation and more positive social outcomes was strongest for minorities who experienced the largest amount of social distance. Future studies can improve the robustness of this argument through comparative research that includes contexts that are both similar and different to Israel in terms of social tensions and distance between groups.

5.3 Ages of research participants

The choice to focus on high school students in this thesis was motivated by the advantages of investigating a group that had not self-selected into STEM (i.e. university students), but had already reached an age where opinions regarding and interest in STEM develop and diverge (Aschbacher, Li and Roth 2010). Yet, in order to maximise the insights into the underrepresentation of minority groups in STEM fields, it is important to investigate both university students and STEM professionals in order to build a holistic understanding about how the globalisation of STEM and STEM education may be impacting individuals at different stages in the STEM track.

Studies on students in higher education and employees in STEM professions will complement the research presented in this thesis, since as well as investigating the impacts of the globalisation of STEM further in the STEM track, will do so in contexts where different social groups mix. Indeed, the research in this thesis is shaped by the mostly homogeneous nature of mandatory education in Israel, meaning that university and/or the workplace are often the first place where Jewish and Arab-Palestinian students/employees study and work together. The contact between the two social groups is likely to impact social repertoires (Dovidio, Gaertner and Kawakami 2003, Forsyth 2009, Paluck, Green and Green 2018). In this sense, Israel is similar to other contexts where minority youth live in mostly homogeneous communities. Thus, future studies could make comparisons between heterogeneous environments and minority serving institutions (Palmer, Maramba and Gasman 2013). By piecing together research from school-aged students, university students, and employees in STEM – in both ethnically/racially homogeneous

and heterogeneous environments – it will be possible reach a more holistic understanding of the integration of minorities into STEM education and STEM-related employment and the impacts of global spaces in this regard, with the ability to take issues of self-selection bias into greater account.

5.4 Globalisation diversity models

Chapter 5 (Diamond under review) raises the possibility of developing a globalisation diversity ideology that acknowledges the asymmetrical nature of interactions between groups without emphasising group difference salience. The formal conceptualisation of a new diversity ideology that would complement the existing multiculturalism/colourblindness/polyculturalism paradigm (Morris, Chiu and Liu 2015) requires extensive empirical investigation. As discussed in the conclusion of Chapter 5, the development of a research instrument that measures 'globalisation diversity' would need to be validated as sufficiently unique. Where a globalisation diversity model is established as sufficiently unique in comparison to existing diversity models, it could be used comparatively to test the potential efficacy of globalisation diversity (i.e. globalisation and global spaces) in facilitating positive diversity (for examples of studies comparing diversity models, see: Plaut et al. 2018, Rosenthal and Levy 2012).

This research must also take into account the possibility that the proposed globalisation diversity might not be unique. Indeed, studies have indicated how multiculturalism, polyculturalism, and colourblindness are related to processes of globalisation (Bernardo 2019, Petrovski, Mirasciev and Petrova-Gjorgjev 2011). Should this be the case, future considerations on the relationships between and co-production of globalisation and diversity might contribute to refinements of existing models. Such an approach could add additional nuances to the definitions of established diversity models, in a similar way that Berry (2008) gained insights by discussing theories of acculturation in the context of globalisation.

6. Summary

The research presented in this thesis is based on a central premise: that processes of globalisation have significantly impacted the context of STEM education, and that the resulting globalised context is likely to impact the social and educational trajectories of minority students in diverse ways, depending on the context. Considering these processes in the context of Arab-Palestinian high school education in Israel produced insights on disparities in STEM education and theories

regarding global spaces, and provided a possible new direction for inquiry in diversity research. Equally as important, the research presented here further establishes the potential impact of the growing role of globalisation in STEM education.

Notwithstanding contemporary resistance and opposition to globalisation (Graff and Korolczuk 2017), advances in technology and communication are likely to continue shaping education, facilitating easy access to global spaces for an increasingly wide range of children and youth (Rubene 2018, Spring 2014). This thesis demonstrated the value of considering the impact of global spaces in educational contexts, at least for one particular case study. Further research in this direction will contribute to theoretical understandings of globalisation and inequality for minority students in STEM. Consequences for educators and policymakers interested in improving the quality of education – both in STEM and in general – will follow.

REFERENCES

Agbaria, Ayman K. 2018. "The 'Right' Education in Israel: Segregation, Religious Ethnonationalism, and Depoliticized Professionalism." *Critical Studies in Education* 59(1):18-34. doi: 10.1080/17508487.2016.1185642.

Aikenhead, Glen S. 1996. "Science Education: Border Crossing into the Subculture of Science." *Studies in Science Education* 27(1):1-52. doi: 10.1080/03057269608560077.

Al-Haj, Majid. 2012. *Education, Empowerment, and Control: The Case of the Arabs in Israel*. Albany, NY: Suny Press.

Alon, Sigal and Ofer Malamud. 2014. "The Impact of Israel's Class-Based Affirmative Action Policy on Admission and Academic Outcomes." *Economics of Education Review* 40:123-39. doi: 10.1016/j.econedurev.2014.02.004.

Alvesson, Mats and Stanley Deetz. 2020. *Doing Critical Research*. Newbury Park, CA: SAGE Publications Limited.

Appadurai, Arjun. 1996. *Modernity at Large: Cultural Dimensions of Globalization*. Minneapolis, MI: University of Minnesota Press.

Arar, Khalid. 2012. "Israeli Education Policy since 1948 and the State of Arab Education in Israel." *Italian Journal of Sociology of Education* 4(1).

Arar, Khalid and Kussai Haj-Yehia. 2013. "Higher Education Abroad: Palestinian Students from Israel Studying in Jordanian Universities." *Journal of Applied Research in Higher Education* 5(1):95-112.

Arar, Khalid and Kussai Haj-Yehia. 2016. "The Context of the Palestinian Arab Minority in Israel (Pami)." Pp. 11-22 in *Higher Education and the Palestinian Arab Minority in Israel*. New York: Palgrave Macmillan US.

Archer, Louise, Jennifer DeWitt, Jonathan Osborne, Justin Dillon, Beatrice Willis and Billy Wong. 2012. "Science Aspirations, Capital, and Family Habitus: How Families Shape Children's Engagement and Identification with Science." *American Educational Research Journal* 49(5):881-908. doi: 10.3102/0002831211433290.

Archer, Louise, Emily Dawson, Jennifer DeWitt, Amy Seakins and Billy Wong. 2015. "'"Science Capital": A Conceptual, Methodological, and Empirical Argument for Extending Bourdieusian Notions of Capital Beyond the Arts." *Journal of Research in Science Teaching* 52(7):922-48. doi: 10.1002/tea.21227.

Archer, Louise, Julie Moote, Emily Macleod, Becky Francis and Jennifer DeWitt. 2020. "Aspires 2: Young People's Science and Career Aspirations, Age 10–19." Vol. London, UK: UCL Institute of Education.

Aschbacher, Pamela R., Erika Li and Ellen J. Roth. 2010. "Is Science Me? High School Students' Identities, Participation and Aspirations in Science, Engineering, and Medicine." *Journal of Research in Science Teaching* 47(5):564-82. doi: 10.1002/tea.20353.

Awayed-Bishara, Muzna. 2015. "Analyzing the Cultural Content of Materials Used for Teaching English to High School Speakers of Arabic in Israel." *Discourse & Society* 26(5):517-42. doi: 10.1177/0957926515581154.

Bailey, Thomas and Elliot B. Weininger. 2002. "Performance, Graduation, and Transfer of Immigrants and Natives in City University of New York Community Colleges." *Educational Evaluation and Policy Analysis* 24(4):359-77. doi: 10.3102/01623737024004359.

Bar-Tal, Daniel, Aurel Harrison Diamond and Meytal Nasie. 2017. "Political Socialization of Young Children in Intractable Conflicts: Conception and Evidence." *International Journal of Behavioral Development* 41(3):415-25. doi: 10.1177/0165025416652508.

Bencze, Larry and Lyn Carter. 2011. "Globalizing Students Acting for the Common Good." *Journal of Research in Science Teaching* 48(6):648-69. doi: 10.1002/tea.20419.

Berger, Rony, Joy Benatov, Hisham Abu-Raiya and Carmit T. Tadmor. 2016. "Reducing Prejudice and Promoting Positive Intergroup Attitudes among Elementary-School Children in the Context of the Israeli–Palestinian Conflict." *Journal of School Psychology* 57:53-72. doi: 10.1016/j.jsp.2016.04.003.

Bernardo, Allan B. I. 2019. "Polyculturalism and Perceived Effects of Globalization in Macau." *Social Behavior and Personality: an international journal* 47(7):1-7. doi: 10.2224/sbp.8129.

Berry, John W. and David L. Sam. 1997. "Immigration, Acculturation, and Adaptation." *Applied Psychology: An International Review* 46(1):5-68.

Berry, John W. 2008. "Globalisation and Acculturation." *International Journal of Intercultural Relations* 32(4):328-36. doi: 10.1016/j.ijintrel.2008.04.001.

Berry, John W. 2011. "Integration and Multiculturalism: Ways Towards Social Solidarity." *Papers on Social Representations* 20(1):1-21.

Bhabha, Homi K. and Jonathan Rutherford. 2006. "Third Space." *Multitudes* 26(3):95-107. doi: 10.3917/mult.026.0095.

Blass, Nachum. 2017. "The Academic Achievements of Arab Israeli Pupils." Vol. Jerusalem, Israel: Taub Center.

Bleszynska, Krystyna M. 2008. "Constructing Intercultural Education." *Intercultural Education* 19(6):537-45.

Block, David and Deborah Cameron. 2002. *Globalization and Language Teaching*. Abingdon: Routledge.

Bourdieu, Pierre and Jean-Claude Passeron. 1990. *Reproduction in Education, Society and Culture, 2nd Ed*, Edited by R. Nice. Thousand Oaks, CA, US: Sage Publications, Inc.

Bratslavsky, Ron, Nurit Lipfshtat and Georgette Hilu. 2019. "Pisa 2018: Israel." Vol. Jerusalem, Israel: Israeli Ministry of Education.

Bryan, Audrey. 2010. "Corporate Multiculturalism, Diversity Management, and Positive Interculturalism in Irish Schools and Society." *Irish Educational Studies* 29(3):253-69. doi: 10.1080/03323315.2010.498566.

Burke, Ronald J. 2007. "Women and Minorities in Stem: A Primer." Pp. 3-27 in *Women and Minorities in Science, Technology, Engineering, and Mathematics: Upping the Numbers*, edited by R. J. Burke and M. C. Mattis. Northampton, MA: Edward Elgar Publishing.

Burrell, Darrell Norman. 2020. "An Exploration of the Cybersecurity Workforce Shortage." Pp. 1072-81 in *Cyber Warfare and Terrorism: Concepts, Methodologies, Tools, and Applications*: IGI Global.

Bybee, Rodger W. 2010. "Advancing Stem Education: A 2020 Vision." *Technology and Engineering Teacher* 70(1):30-35.

Carter, Lyn. 2005. "Globalisation and Science Education: Rethinking Science Education Reforms." *Journal of Research in Science Teaching* 42(5):561-80. doi: 10.1002/tea.20066.

Carter, Lyn. 2008. "Globalization and Science Education: The Implications of Science in the New Economy." *Journal of Research in Science Teaching* 45(5):617-33. doi: 10.1002/tea.20189.

Carter, Lyn. 2012. "Globalisation and Science Education: Globalism, Postcolonialism and Sustainability Moves and Counter-Moves." in *Second International Handbook of Science Education*, Vol. 24, edited by B. Fraser, K. Tobin and C. J. McRobbie. Dordrecht: Springer Science & Business Media.

Cerny, Barbara A. and Henry F. Kaiser. 1977. "A Study of a Measure of Sampling Adequacy for Factor-Analytic Correlation Matrices." *Multivariate Behavioral Research* 12(1):43-47. doi: 10.1207/s15327906mbr1201_3.

Cheung, Derek. 2018. "The Key Factors Affecting Students' Individual Interest in School Science Lessons." *International Journal of Science Education* 40(1):1-23. doi: 10.1080/09500693.2017.1362711.

Chiu, Mei-Hung and Reinders Duit. 2011. "Globalization: Science Education from an International Perspective." *Journal of Research in Science Teaching* 48(6):553-66. doi: 10.1002/tea.20427.

Cho, Jaee, Carmit T. Tadmor and Michael W. Morris. 2018. "Are All Diversity Ideologies Creatively Equal? The Diverging Consequences of Colorblindness, Multiculturalism, and Polyculturalism." *Journal of Cross-Cultural Psychology* 49(9):1376-401. doi: 10.1177/0022022118793528.

Claussen, Stephanie and Jonathan Osborne. 2013. "Bourdieu's Notion of Cultural Capital and Its Implications for the Science Curriculum." *Science Education* 97(1):58-79.

Clothey, Rebecca, Michelle Mills and Jacqueline Baumgarten. 2010. "A Closer Look at the Impact of Globalization on Science Education." *Cultural Studies of Science Education* 5(2):305-13. doi: 10.1007/s11422-010-9258-6.

Cohen, Louis, Lawrence Manion and Keith Morrison. 2013. *Research Methods in Education*. London: Routledge.

Cohen, Michael M. 2005. "The Arava Institute for Environmental Studies: Nature Knows No Borders." *Palestine-Israel Journal of Politics, Economics, and Culture* 12/13(4):52-54.

Creswell, John W. 2011. "Controversies in Mixed Methods Research." Pp. 269-84 in *The Sage Handbook of Qualitative Research*, Vol. 4, edited by N. K. Denzin and Y. S. Lincoln. New York: SAGE

Creswell, John W. and Vicki L. Plano Clark. 2011. *Designing and Conducting Mixed Methods Research*. London, UK: Sage.

Darr, Asaf 2018. "Palestinian Arabs and Jews at Work: Workplace Encounters in a War-Torn Country and the Grassroots Strategy of 'Split Ascription'." *Work, Employment and Society* 32(5):831-49. doi: 10.1177/0950017017711141.

Das, G. S. 2007. "Student Perception of Globalization: Results from a Survey." *Global Business Review* 8(1):1-11. doi: 10.1177/097215090600800101.

DeBoer, George E. 2011. "The Globalization of Science Education." *Journal of Research in Science Teaching* 48(6):567-91. doi: 10.1002/tea.20421.

DeWitt, Jennifer, Louise Archer and Ada Mau. 2016. "Dimensions of Science Capital: Exploring Its Potential for Understanding Students' Science Participation." *International journal of science education* 38(16):2431-49. doi: 10.1080/09500693.2016.1248520.

Diamond, Aurel H. and Andreas J. Stylianides. 2017. "Personal Epistemologies of Statisticians in Academia: An Exploratory Study." *Statistics Education Research Journal* 16(2):335-61.

Diamond, Aurel H. 2020a. "The Social Reproduction of Science Education Outcomes for High School Students in Israel." *British Journal of Sociology of Education* 41(7):1029-46. doi: 10.1080/01425692.2020.1806040.

Diamond, Aurel H. 2020b. "Minority Youth Acculturation in Third Spaces: An Ethnography of Arab-Palestinian High School Students Visiting the Israeli Innovation Sector." *Journal of Ethnic and Migration Studies*. doi: 10.1080/1369183X.2020.1847055.

Diamond, Aurel H. and Elyakim Kislev. 2020a. "Perceptions of Science and Their Effects on Anticipated Discrimination in Stem for Minority High School Students." *Cambridge Journal of Education*. doi: 10.1080/0305764X.2020.1806989.

Diamond, Aurel H. and Elyakim Kislev. 2020b. "High School Students' Perceptions of Science and Attitudes Towards Intergroup Cooperation." *Compare: A Journal of Comparative and International Education*. doi: 10.1080/03057925.2020.1748494.

Diamond, Aurel H. under review. "A Globalization Diversity Ideology." *Cross Cultural & Strategic Management*.

Dovidio, John F., Samuel L. Gaertner and Kerry Kawakami. 2003. "Intergroup Contact: The Past, Present, and the Future." *Group Processes & Intergroup Relations* 6(1):5-21. doi: 10.1177/1368430203006001009.

Drew, David E. 2015. *Stem the Tide: Reforming Science, Technology, Engineering, and Math Education in America*. Baltimore: JHU Press.

Drori, Gili S., John W. Meyer, Francisco O. Ramirez and Evan Schoffer, eds. 2003. *Science in the Modern World Polity: Institutionalization and Globalization*. Stanford, CA: Stanford University Press.

Edwards, Richard and Robin Usher. 2007. *Globalisation & Pedagogy: Space, Place and Identity*. Abingdon: Routledge.

Ernest, Paul, Ole Skovsmose, Jean Paul van Bendegem, Maria Bicudo, Roger Miarka, Ladislav Kvasz and Regina Moeller. 2016. *The Philosophy of Mathematics Education*. London: Springer Nature.

Everett, Jim A. C. 2013. "Intergroup Contact Theory: Past, Present, and Future." *The Inquisitive Mind*.

Faas, Daniel, Christina Hajisoteriou and Panayiotis Angelides. 2014. "Intercultural Education in Europe: Policies, Practices and Trends." *British Educational Research Journal* 40(2):300-18. doi: 10.1002/berj.3080.

Fensham, Peter J. 2011. "Globalization of Science Education: Comment and a Commentary." *Journal of Research in Science Teaching* 48(6):698-709. doi: 10.1002/tea.20426.

Forgasz, Helen J. and David Mittelberg. 2012. "Israeli Jewish and Arab Students' Gendering of Mathematics." Pp. 203-25 in *Towards Equity in Mathematics Education: Gender, Culture, and Diversity*, edited by H. Forgasz and F. Rivera. Berlin, Heidelberg: Springer Berlin Heidelberg.

Forsyth, Donelson R. 2009. *Group Dynamics*. Boston, MA: Cengage Learning.

Fujimoto-Adamson, Naoki. 2006. "Globalization and History of English Education in Japan." *Asian EFL Journal* 8(3):259-82.

Fuligni, Andrew J. 2001. "A Comparative Longitudinal Approach to Acculturation among Children from Immigrant Families." *Harvard Educational Review* 71(3):566-78.

Furani, Khaled and Dan Rabinowitz. 2011. "The Ethnographic Arriving of Palestine." *Annual review of anthropology* 40(1):475-91. doi: 10.1146/annurev-anthro-081309-145910.

Ghanem, As'ad. 2001. *Palestinian-Arab Minority in Israel, 1948-2000, The: A Political Study*. Albany, NY: SUNY Press.

Giddings, Lynne S. and Barbara M. Grant. 2007. "A Trojan Horse for Positivism?: A Critique of Mixed Methods Research." *Advances in Nursing Science* 30(1):52-60.

Glickman, Hagit. 2017. "Main Findings from the Trends in International Mathematics and Science Study (Timss) 2015 for Israel." Vol. Jerusalem: The National Authority for Measurement & Evaluation in Education (RAMA).

Gonzalez, Heather B. and Jeffrey J. Kuenzi. 2012. "Science, Technology, Engineering, and Mathematics (Stem) Education: A Primer." Congressional Research Service, Library of Congress.

Gorodzeisky, Anastasia and Moshe Semyonov. 2011. "Two Dimensions to Economic Incorporation: Soviet Immigrants in the Israeli Labour Market." *Journal of Ethnic and Migration Studies* 37(7):1059-77. doi: 10.1080/1369183X.2011.572483.

Graff, Agnieszka and Elżbieta Korolczuk. 2017. "Towards an Illiberal Future : Anti-Genderism and Anti-Globalization." *Global Dialogue* 7(1):27-30.

Greene, Jennifer C. 2008. "Is Mixed Methods Social Inquiry a Distinctive Methodology?". *Journal of mixed methods research* 2(1):7-22.

Grossman, Jennifer M. and Michelle V. Porche. 2014. "Perceived Gender and Racial/Ethnic Barriers to Stem Success." *Urban Education* 49(6):698-727. doi: 10.1177/0042085913481364.

Gunaratnam, Yasmin. 2003. "Researching 'Race' and Ethnicity: Methods, Knowledge and Power." London: Sage.

Hajisoteriou, Christina and Panayiotis Angelides. 2013. "The Politics of Intercultural Education in Cyprus: Policy-Making and Challenges." *Education Inquiry* 4(1):103-23.

Hammersley, Martyn. 2004. "Should Ethnographers Be against Inequality? On Becker, Value Neutrality, and Researcher Partisanship." Pp. 25-44 in *Ethnographies of Educational and Cultural Conflicts: Strategies and Resolutions*, edited by B. Jeffrey and G. Walford. Oxford: Elsevier.

Hayton, James C., David G. Allen and Vida Scarpello. 2004. "Factor Retention Decisions in Exploratory Factor Analysis: A Tutorial on Parallel Analysis." *Organizational Research Methods* 7(2):191-205. doi: 10.1177/1094428104263675.

Hurd, Paul DeHart. 2000. "Science Education for the 21st Century." *School Science and Mathematics* 100(6):282-88. doi: 10.1111/j.1949-8594.2000.tb17321.x.

Israel Innovation Authority. 2017. "Annual Innovation Report." Vol. Jerusalem, Israel: Ministry of Economy.

Jabareen, Yousef T. and Ayman K. Agbaria. 2011. "Education on Hold: Israeli Government Policy and Civil Society Initiatives to Improve Arab Education in Israel." Vol. Nazareth, Israel: Dirasat, Arab Center for Law and Policy.

Jeffrey, Bob and Geoffrey Walford. 2004. *Ethnographies of Educational and Cultural Conflicts: Strategies and Resolutions*. Oxford: Elsevier.

Johnson, R. Burke and Anthony J. Onwuegbuzie. 2004. "Mixed Methods Research: A Research Paradigm Whose Time Has Come." *Educational Researcher* 33(7):14-26.

Jones, Patrick M. 2007. "Music Education for Society's Sake: Music Education in an Era of Global Neo-Imperial/Neo-Medieval Market-Driven Paradigms and Structures." *Action, Criticism, and Theory for Music Education* 6(1):1-28.

Khamaisi, Rassem and Ismael Abu-Saad. 2015. *Education and Territory: Charged Issues*. Ra'anana, Israel: The Open University of Israel.

Kimhi, Eyal and Arik Horowitz. 2015. "The Importance of High School Mathematics in Higher Education and for the Future Careers of Students." Vol. Jerusalem, Israel: Taub Center.

Krosnick, Jon A. 2018. "Questionnaire Design." Pp. 439-55 in *The Palgrave Handbook of Survey Research*, edited by D. L. Vannette and J. A. Krosnick. Cham: Springer International Publishing.

Kuukkanen, Jouni-Matti. 2011. "I Am Knowledge. Get Me out of Here! On Localism and the Universality of Science." *Studies in History and Philosophy of Science* 42(4):590-601. doi: 10.1016/j.shpsa.2011.09.005.

Ladson-Billings, Gloria. 2006. "From the Achievement Gap to the Education Debt: Understanding Achievement in U.S. Schools." *Educational Researcher* 35(7):3-12. doi: 10.3102/0013189x035007003.

Lewin-Epstein, Noah and Moshe Semyonov. 2019. *The Arab Minority in Israel's Economy: Patterns of Ethnic Inequality*. Abingdon: Routledge.

Manly, Catherine A. and Ryan S. Wells. 2015. "Reporting the Use of Multiple Imputation for Missing Data in Higher Education Research." *Research in Higher Education* 56(4):397-409. doi: 10.1007/s11162-014-9344-9.

Manny-Ikan, Edith. 2013. "Science Education in Israel: Trends, Challenges, and Opportunity for Change." Vol. Jerusalem: The Henrietta Szold Institute.

Manny-Ikan, Edith, Fadia Nasser-Abu Alhija, Dana Rosen and Tzipi Bashan. 2016. "Learning Five Units of Mathematics in Arab Society." Vol. Jerusalem, Israel: The Henrietta Szold Institute.

Martin, Michael O., Ina VS Mullis, Pierre Foy and Alka Arora. 2011. "Creating and Interpreting the Timss and Pirls 2011 Context Questionnaire Scales." *Methods and Procedures in TIMSS and PIRLS*:1-11.

Martiniuk, Alexandra L. C. and Shannon M. Wires. 2011. "Reflections on Peace-through-Health: The First Canadian, Israeli and Palestinian Maternal and Child Health Programme for Medical Students." *Medicine, Conflict and Survival* 27(4):197-204. doi: 10.1080/13623699.2011.645146.

Mather, Darin M., Stephen W. Jones and Scott Moats. 2017. "Improving Upon Bogardus: Creating a More Sensitive and Dynamic Social Distance Scale." *Survey Practice* 10(4):1-10.

McComas, William F. 2014. "Globalization of Science Education." Pp. 44-44 in *The Language of Science Education: An Expanded Glossary of Key Terms and Concepts in Science Teaching and Learning*, edited by W. F. McComas. Rotterdam: SensePublishers.

Mertens, Donna M. 2014. *Research and Evaluation in Education and Psychology: Integrating Diversity with Quantitative, Qualitative, and Mixed Methods*. New York: Sage Publications.

Middle East Entrepreneurs of Tomorrow. 2020, "Meet Our Impact", Jerusalem. (https://meet.mit.edu/our-impact/).

Mittelberg, David. 1999. "Confidence in Mathematics and Its Consequences: Gender Differences among Israeli Jewish and Arab Youth." *Gender and Education* 11(1):75-92.

Moore, Kelly, Daniel Lee Kleinman, David Hess and Scott Frickel. 2011. "Science and Neoliberal Globalization: A Political Sociological Approach." *Theory and Society* 40(5):505-32.

Moote, Julie, Louise Archer, Jennifer DeWitt and Emily MacLeod. 2019. "Who Has High Science Capital? An Exploration of Emerging Patterns of Science Capital among Students Aged 17/18 in England." *Research Papers in Education*:1-21. doi: 10.1080/02671522.2019.1678062.

Morris, Michael W., Chi-yue Chiu and Zhi Liu. 2015. "Polycultural Psychology." *Annual Review of Psychology* 66(1):631-59. doi: 10.1146/annurev-psych-010814-015001.

Museus, Samuel D., Robert T. Palmer, Ryan J. Davis and Dina C. Maramba. 2011. *Racial and Ethnic Minority Student Success in Stem Education: Ashe Higher Education Report*: John Wiley & Sons.

Mustafa, Mohanned, Khalid Arar and Rassem Khamaisi. 2009. "Higher Education among Minorities: The Case of the Arab Minority in Israel." Pp. 204-26 in *Arab Society Book*, Vol. 3, edited by R. Khamaisi. Bnei Brak: Hakibbutz Hameuchad - Sifriat Poalim.

Nasie, Meytal, Aurel Harrison Diamond and Daniel Bar-Tal. 2016. "Young Children in Intractable Conflicts: The Israeli Case." *Personality and Social Psychology Review* 20(4):365-92. doi: 10.1177/1088868315607800.

Nasie, Meytal, Daniel Bar-Tal and Aurel Harrison Diamond. 2017. "The Political Socialization of Young Children in Intractable Conflicts: The Israeli Case." *Megamot* 52(1):317-58.

Nasser, Fadia and Menucha Birenbaum. 2005. "Modeling Mathematics Achievement of Jewish and Arab Eighth Graders in Israel: The Effects of Learner-Related Variables." *Educational Research and Evaluation* 11(3):277-302. doi: 10.1080/13803610500101108.

National Science Board. 2018. "Science & Engineering Indicators 2018." Vol. Alexandria, VA: National Science Foundation.

OECD Directorate for Education and Skills. 2018. "The Future of Education and Skills: Education 2030." Vol. *OECD*. Paris: OECD.

Ogbu, John U. and Herbert D. Simons. 1998. "Voluntary and Involuntary Minorities: A Cultural-Ecological Theory of School Performance with Some Implications for Education." *Anthropology & Education Quarterly* 29(2):155-88.

Ogbu, John U. 2008. *Minority Status, Oppositional Culture, & Schooling*. New York: Routledge.

Onwuegbuzie, Anthony J., Hannah R. Gerber and Sandra Schamroth Abrams. 2017. "Mixed Methods Research." Pp. 1-33 in *The International Encyclopedia of Communication Research Methods*, edited by J. Matthes, C. S. Davis and R. F. Potter. Hoboken, NJ: Wiley.

Palmer, Robert T., Dina C. Maramba and Marybeth Gasman. 2013. *Fostering Success of Ethnic and Racial Minorities in Stem: The Role of Minority Serving Institutions*. New York, NY: Routledge.

Paluck, Elizabeth Levy, Seth A. Green and Donald P. Green. 2018. "The Contact Hypothesis Re-Evaluated." *Behavioural Public Policy*:1-30. doi: 10.1017/bpp.2018.25.

Patomaki, Heikki and Colin Wight. 2000. "After Postpositivism? The Promises of Critical Realism." *International Studies Quarterly* 44(2):213-37.

Petrovski, Vlado, Snezana Mirasciev and Emilija Petrova-Gjorgjev. 2011. "Multiculturalism, Globalization and the Implications on Education." *Procedia - Social and Behavioral Sciences* 15:1366-71. doi: 10.1016/j.sbspro.2011.03.294.

Plaut, Victoria C., Kecia M. Thomas and Matt J. Goren. 2009. "Is Multiculturalism or Color Blindness Better for Minorities?". *Psychological Science* 20(4):444-46. doi: 10.1111/j.1467-9280.2009.02318.x.

Plaut, Victoria C., Kecia M. Thomas, Kyneshawau Hurd and Celina A. Romano. 2018. "Do Color Blindness and Multiculturalism Remedy or Foster Discrimination and Racism?". *Current Directions in Psychological Science* 27(3):200-06. doi: 10.1177/0963721418766068.

Polkinghorne, Donald E. 1995. "Narrative Configuration in Qualitative Analysis." *International journal of qualitative studies in education* 8(1):5-23. doi: 10.1080/0951839950080103.

Prime Minister's Office. 2017. "Decision 922: Government Activity for the Economic Development of Minority Populations 2016-2020." Jerusalem, Israel: Government of Israel.

Ramaley, Judith A. 2002. "New Truths and Old Verities." *New Directions for Higher Education* 2002(119):15-22. doi: 10.1002/he.63.

Reinharz, Shulamit. 2011. *Observing the Observer: Understanding Our Selves in Field Research*. Oxford, UK: Oxford University Press.

Robertson, Jennifer. 2002. "Reflexivity Redux: A Pithy Polemic on" Positionality"." *Anthropological Quarterly* 75(4):785-92.

Rosenman, Robert, Vidhura Tennekoon and Laura G Hill. 2011. "Measuring Bias in Self-Reported Data." *International Journal of Behavioural and Healthcare Research* 2(4):320-32.

Rosenthal, Lisa and Sheri R. Levy. 2010. "The Colorblind, Multicultural, and Polycultural Ideological Approaches to Improving Intergroup Attitudes and Relations." *Social Issues and Policy Review* 4(1):215-46. doi: 10.1111/j.1751-2409.2010.01022.x.

Rosenthal, Lisa and Sheri R. Levy. 2012. "The Relation between Polyculturalism and Intergroup Attitudes among Racially and Ethnically Diverse Adults." *Cultural Diversity and Ethnic Minority Psychology* 18(1):1-16. doi: 10.1037/a0026490.

Rotem, Nir, Gad Yair and Elad Shustak. 2020. "Open the Gates Wider: Affirmative Action and Dropping Out." *Higher Education*. doi: 10.1007/s10734-020-00556-9.

Rubene, Zanda. 2018. "The Portret of a Contemporary Child and Youngster in the Global Education Space." *International Journal of Smart Education and Urban Society (IJSEUS)* 9(3):17-26.

Sassen, Saskia. 2007. *A Sociology of Globalization*. New York and London: W. W. Norton & Company.

Sassen, Saskia and Ada Van Roekel-Hughes. 2008. "Deciphering the Global: Its Spaces, Scales and Subjects." *Social Thought & Research* 29:3-18.

Scheindlin, Dahlia. 2016. "Entrepreneurship and Arab Citizens of Israel: A Society Ripe for Change." *MasarUp: The Council for Arab Entrepreneurship.* PresenTense Israel, Tel Aviv, Israel.

Schipper, Sebastian. 2015. "Urban Social Movements and the Struggle for Affordable Housing in the Globalizing City of Tel Aviv-Jaffa." *Environment and Planning A: Economy and Space* 47(3):521-36. doi: 10.1068/a140249p.

Shaffer, David Williamson. 2017. *Quantitative Ethnography*. Madison, WI: Cathcart Press.

Shankar, Ramamurti. 2003. "Globalization and Science: A Speeded-up Virtuous Cycle." in *Yale Global*. New Haven: Yale University.

Sharma, Sagar and Monica Sharma. 2010. "Globalization, Threatened Identities, Coping and Well-Being." *Psychological Studies* 55(4):313-22. doi: 10.1007/s12646-010-0048-8.

Shdema, Ilan and Deborah Martin. 2020. "Place Identity among Native Minorities: Lessons from Arabs in Israel." *Geographical Review*:null-null. doi: 10.1080/00167428.2020.1852405.

Shokef, Efrat and Miriam Erez. 2006. "Global Work Culture and Global Identity, as a Platform for a Shared Understanding in Multicultural Teams." Pp. 325-52 in *National Culture and Groups*, Vol. 9, *Research on Managing Groups and Teams*, edited by C. Ya-Ru: Emerald Group Publishing Limited.

Skinner, Harvey, Ziad Abdeen, Hani Abdeen, Phil Aber, Mohammad Al-Masri, Joseph Attias, Karen B. Avraham, Rivka Carmi, Catherine Chalin, Ziad El Nasser, Manaf Hijazi, Rema Othman Jebara, Moien Kanaan, Hillel Pratt, Firas Raad, Yehudah Roth, A. Paul Williams and Arnold Noyek. 2005. "Promoting Arab and Israeli Cooperation: Peacebuilding through Health Initiatives." *The Lancet* 365(9466):1274-77. doi: 10.1016/S0140-6736(05)74817-0.

Smooha, Sammy. 2016. *Index of Arab-Jewish Relations in Israel 2015*. Haifa: University of Haifa.
Soja, Edward W. 1998. "Thirdspace: Journeys to Los Angeles and Other Real-and-Imagined Places." *Capital & Class* 22(1):137-39. doi: 10.1177/030981689806400112.
Spring, Joel. 2014. *Globalization of Education: An Introduction*. Abingdon: Routledge.
Sriharan, Abi, Ziad Abdeen, Dennis Bojrab, Shukri David, Ziad Elnasser, Tim Patterson, Robert Shprintzen, Harvey Skinner, Yehudah Roth and Arnold Noyek. 2009. "Academic Medicine as a Bridge to Peace: Building Arab and Israeli Cooperation." *Academic Medicine* 84(11):1488-89. doi: 10.1097/ACM.0b013e3181baa22d.
Stacey, Oliver, Giulia De Lazzari, Hilary Grayson, Hazel Griffin, Emily Jones, Amanda Taylor and David Thomas. 2018. "The Globalization of Science Education and Science Curricula: Discussion and Conclusions." Pp. 73-88 in *The Globalization of Science Curricula*, edited by O. Stacey, G. De Lazzari, H. Grayson, H. Griffin, E. Jones, A. Taylor and D. Thomas. Cham: Springer International Publishing.
Suleiman, Ramzi. 2002a. "Minority Self-Categorization: The Case of the Palestinians in Israel." *Peace and Conflict: Journal of Peace Psychology* 8(1):31-46.
Suleiman, Ramzi. 2002b. "Perception of the Minority's Collective Identity and Voting Behavior: The Case of the Palestinians in Israel." *The Journal of Social Psychology* 142(6):753-66.
Svoboda, Julia and Cynthia Passmore. 2013. "The Strategies of Modeling in Biology Education." *Science & Education* 22(1):119-42. doi: 10.1007/s11191-011-9425-5.
Tabatadze, Shalva and Natia Gorgadze. 2013. "Intercultural Education Research in Primary Grades of Georgia." Vol. 9941041997. Tbilisi, Georgia: ERIC.
Tavin, Kevin and Jerome Hausman. 2004. "Art Education and Visual Culture in the Age of Globalization." *Art Education* 57(5):47-53.
Tawil, Yoël. 2015. "A "Start-up Nation": On Performance and Creativity in Israel." *Ethnologie française* 45(2):223-33. doi: 10.3917/ethn.152.0223.
Teddlie, Charles and Abbas Tashakkori. 2009. *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences*. Los Angeles: Sage.
The Authority for Measurement and Evaluation in Education. 2018. "Meitsav Report 5778: Main Findings." Vol. Jerusalem: State of Israel Ministry of Education.
Tobin, Kenneth. 2016. "Collaborating on Global Priorities: Science Education for Everyone—Any Time and Everywhere." *Cultural Studies of Science Education* 11(1):27-40. doi: 10.1007/s11422-015-9708-2.
Travers, Max. 2014. "Using Ethnographic Methods to Strengthen Quantitative Data - Explaining Juvenile Detention Rates in Three Australian States." *BMS: Bulletin of Sociological Methodology / Bulletin de Méthodologie Sociologique* (124):66-76.
van Griethuijsen, Ralf, Michiel W. van Eijck, Helen Haste, Perry J. den Brok, Nigel C. Skinner, Nasser Mansour, Ayse Savran Gencer and Saouma BouJaoude. 2015. "Global Patterns in Students' Views of Science and Interest in Science." *Research in Science Education* 45(4):581-603.
Varma, Roli. 2018. "U.S. Science and Engineering Workforce: Underrepresentation of Women and Minorities." *American Behavioral Scientist* 62(5):692-97. doi: 10.1177/0002764218768847.
Wagner, Karla D., Peter J. Davidson, Robin A. Pollini, Steffanie A. Strathdee, Rachel Washburn and Lawrence A. Palinkas. 2012. "Reconciling Incongruous Qualitative and Quantitative Findings in Mixed Methods Research: Exemplars from Research with Drug Using

Populations." *International Journal of Drug Policy* 23(1):54-61. doi: 10.1016/j.drugpo.2011.05.009.
Watkins, Marley W. 2018. "Exploratory Factor Analysis: A Guide to Best Practice." *Journal of Black Psychology* 44(3):219-46. doi: 10.1177/0095798418771807.
White, Ian R., Patrick Royston and Angela M. Wood. 2011. "Multiple Imputation Using Chained Equations: Issues and Guidance for Practice." *Statistics in Medicine* 30(4):377-99. doi: 10.1002/sim.4067.
Wiesel, Torsten, Peter Agre, Kenneth J. Arrow, Michael Atiyah, Edouard Brézin, Faouzia Farida Charfi, Claude Cohen-Tanoudji, Abdallah Daar, Francois Jacob, Daniel Kahneman, Yuan Tseh Lee, Ida Nicolaisen, Sari Nusseibeh, Harald Reuter, Yoav Shoham, John Sulston, Michael Walzer and Menahem Yaari. 2007. "The Israeli-Palestinian Science Organization." *science* 315(5808):39-39. doi: 10.1126/science.315.5808.39b.
Xie, Yu, Michael Fang and Kimberlee Shauman. 2015. "Stem Education." *Annual Review of Sociology* 41(1):331-57. doi: 10.1146/annurev-soc-071312-145659.
Yemini, Miri. 2014. "Internationalization of Secondary Education—Lessons from Israeli Palestinian-Arab Schools in Tel Aviv-Jaffa." *Urban Education* 49(5):471-98. doi: 10.1177/0042085913478622.
Yozma. 2018. "The Future of Education and Skills." Vol. 1. Jerusalem, Israel: The Center for Knowledge and Research in Education.
Zeidler, Dana L. 2014. "Socioscientific Issues as a Curriculum Emphasis: Theory, Research, and Practice." Pp. 697-726 in *Handbook of Research on Science Education*, Vol. 2, edited by N. G. Lederman and S. K. Abell. Abingdon: Routledge.
Zippel, Kathrin. 2017. *Women in Global Science*. Stanford, California: Stanford University Press.

APPENDIX

Questionnaire

The appendix overleaf includes a copy of the final version of the questionnaire used in the data collection for this thesis.

שאלון תלמידים

שאלות רקע

1. מין: ז / נ / אחר/אין תשובה
2. שנת לידה: _____
3. איפה נולדת? _____
4. דת: נוצרי / מוסלמי / דרוזי / יהודי / אין תשובה / אחר: _____
5. בהשוואה לממוצע, ההכנסה של משפחתך היא:

נמוכה בהרבה	נמוכה	דומה	גבוהה	גבוהה בהרבה	לא יודע / אין תשובה

אנא דרגו את מידת הסכמתך עם ההצהרות הבאות:

	לא מסכים בכלל	לא מסכים	מסכים במידה חלקית	מסכים	מסכים מאוד
נושא- **מדעים והעולם הגדול**					
6. לימודים במדעים, טכנולוגיה, הנדסה או מתמטיקה יקנו לי הזדמנויות להשתלב בסביבה גלובלית (עולמית)	1	2	3	4	5
7. עבודה בתחום המדעים בישראל מתקיימת בסביבה עולמית/גלובלית ובינלאומית	1	2	3	4	5
8. אני רוצה לעבוד בסביבה עולמית/ גלובלית ובינלאומית	1	2	3	4	5
9. מתקיים שיתוף פעולה בין קבוצות שונות בחברה הישראלית בתחומי המדעים	1	2	3	4	5
10. מתקיים שיתוף פעולה בין קבוצות שונות בעולם הרחב בתחומי המדעים	1	2	3	4	5
נושא- **השפעת העולם הגדול**					
11. הצלחה בתחומי המדעים היא לפי קריטריונים מקצועיים ללא קשר למוצא, דת ולאום	1	2	3	4	5
12. אני מרגיש שיש אפליה בתחומי המדעים על רקע עדתי או דתי	1	2	3	4	5
נושא- **מצב המדינה ולימודים בתחומי המדעים**					
13. אני מרגיש מיעוט בחברה הישראלית	1	2	3	4	5
14. אני מרגיש מופלה על רקע אתני/עדתי בישראל	1	2	3	4	5
15. אעדיף ללמוד מדעים בסביבה אחידה (רק יהודים / רק ערבים) מאשר ללמוד מדעים בסביבה ערבית-יהודית משותפת	1	2	3	4	5
16. אני מרגיש שבהשכלה גבוהה בתחומי המדעים הייתי מופלה בקבלה ללימודים	1	2	3	4	5
נושא- **שפה**					
17. אני שולט בשפה העברית.	1	2	3	4	5
18. אני שולט בשפה האנגלית.	1	2	3	4	5
19. אני מרגיש שהשפה היא מחסום בפני השתלבות בחברה הישראלית.	1	2	3	4	5
נושא- **עמדות**					
20. בעקבות הלימודים שלי בתחום המדעים אני רואה את ישראל באור חיובי יותר.	1	2	3	4	5
21. קיים שיתוף פעולה בין יהודים וערבים בתחומי המדעים בישראל.	1	2	3	4	5
נושא- **השפעה על ההכנסה**					
22. לימודים בתחומי המדעים עשוים להעלות את השכר העתידי שלי.	1	2	3	4	5

נושא- **חינוך**					
23. אני רוצה ללמוד באוניברסיטה או במכללה (תואר אקדמי / השכלה גבוהה).	1	2	3	4	5
24. אני רוצה ללמוד תואר אקדמי בתחום המדעים (למשל: מתמטיקה, הנדסה, מדעי הטבע, רפואה, מדעי המחשב, וטרינריה, רוקחות).	1	2	3	4	5
25. תחומי המדעים מעניינים אותי.	1	2	3	4	5
26. יש לי קרוב מפשפחה או חבר טוב שהצליח בתחומי המדעים.	1	2	3	4	5

שאלות אישיות:

27. באופן כללי אני שמח ומרוצה מהחיים שלי.

מסכים מאוד	מסכים	מסכים במידה חלקית	לא מסכים	לא מסכים בכלל

28. איך אתה מעריך את היחסים היום בין האזרחים הערבים והיהודים?

טובים מאוד	טובים במידה מספקת	לא טובים במידה מספקת	בכלל לא טובים	אין תשובה

29. איך היית מגדיר את זהותך מתוך האפשרויות הבאות? סמנו את התשובה הרלוונטית ביותר.

ערבי	ישראלי
ערבי ישראלי	יהודי
ערבי פלסטיני	יהודי ישראלי
פלסטיני	אין תשובה / אחר:

30. הממשלה מתייחסת למיעוטים כאזרחים שווים.

מסכים מאוד	מסכים	מסכים במידה חלקית	לא מסכים	לא מסכים בכלל

31. אני שבע רצון מהיותי אזרח ישראלי.

מסכים מאוד	מסכים	מסכים במידה חלקית	לא מסכים	לא מסכים בכלל

32. איזו מבין הזהויות הבאות היא החשובה ביותר עבורך?

היותך אזרח ישראלי	היותך מוסלמי, נוצרי, דרוזי, או יהודי	היותך בן לעם הפלסטיני או בן לעם היהודי	אין תשובה

33. ביחס לשמירת הדת, האם אתה חושב שאתה היום:

דתי מאוד	דתי	דתי במידה מסוימת	לא דתי

שאלות חינוך

34. לכמה יחידות לימוד (יח"ל) **מתמטיקה** אתה נרשם / תירשם? 3 / 4 / 5
35. לכמה יחידות לימוד (יח"ל) **אנגלית** אתה נרשם / תירשם? 3 / 4 / 5
36. לכמה יחידות לימוד (יח"ל) **מחשבים** אתה נרשם / תירשם? 0 / 3 / 4 / 5
37. לכמה יחידות לימוד (יח"ל) **מדעים** (פיזיקה/כימיה/ביולוגיה) אתה נרשם / תירשם?
פחות מ-3 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / יותר מ-10
38. איך אתה מעריך את יכולותיך **במתמטיקה** בהשוואה לסטודנטים אחרים בגילך?

הרבה מעל הממוצע	קצת מעל הממוצע	ממוצע	קצת מתחת לממוצע	הרבה מתחת לממוצע

39. איך אתה מעריך את יכולותיך **באנגלית** בהשוואה לסטודנטים אחרים בגילך?

הרבה מעל הממוצע	קצת מעל הממוצע	ממוצע	קצת מתחת לממוצע	הרבה מתחת לממוצע

40. איך אתה מעריך את יכולותיך **במדעים** בהשוואה לסטודנטים אחרים בגילך?

הרבה מעל הממוצע	קצת מעל הממוצע	ממוצע	קצת מתחת לממוצע	הרבה מתחת לממוצע

תודה על השתתפותך!

Cambridge Journal of Education), גם מציגים ניתוחי רגרסיה של נתוני השאלונים. מחקרים אלו מצאו קורלציות מובהקות בין תפיסות גלובליות ובינלאומיות של תחומי ה-STEM לבין הפחתה באפליה שאליה מצפים התלמידים בתחומי ה-STEM, וכן עם הנכונות לשתף פעולה עם קבוצת החוץ. מנגד, ניתוח נתוני השאלונים מראה כי קורלציות אלו מובהקות אך ורק בקרב תלמידים וקבוצות עם מרחק חברתי גבוה ותחושות מיעוטיות מוגברות. מאמרים אלו טוענים כי המחשות של גלובליזציה ומרחבים גלובליים, כפי שמובא לידי ביטוי על ידי תחומי ה-STEM, מקנים לתלמידים מקבוצות מיעוט דרך לעקוף אפליה חברתית וממסדית, המשליך על יכולת ניידות חברתית וחינוכית.

המאמר הרביעי, שכותרתו "אקולטורציה של נערים בקבוצות מיעוט במרחבים שלישיים: ניתוח אתנוגרפי של תלמידים ערבים-פלסטינים בביקורים במגזר היזמות בישראל" (פורסם ב-*Journal of Ethnic and Migration Studies*), מציע ניתוח אתנוגרפי של תלמידי תיכון המשתתפים בתכנית חינוכית אשר מציעה סיורים בחברות יזמות גדולות בתל אביב, בתמיכת עיריית תל אביב-יפו. רבים מן התלמידים תופסים את החברות הללו כגלובליות ובינלאומיות. ההקשר הגלובלי מקנה קונטקסט ייחודי לאקולטורציה עם השלכות מתבדלות לתלמידים מקבוצות מיעוט.

המאמר החמישי, שכותרתו "אידאולוגית הגלובליזציה למגוון" (בשיפוט ב-*Cross Cultural & Strategic Management*) משתמש בתוצאות המחקרים הקודמים בעבודת התזה על מנת למקם גלובליזציה כמושג בספרות על מודלים למגוון. כך המאמר מציע להחיל את המחקר שנעשה בעבודת התזה בהקשר החינוכי בהקשרים מחוץ למערכת החינוך וחקר החינוך.

יחד, חמשת המאמרים מראים כיצד תחומי ה-STEM יכולים לייצר קונטקסט גלובלי (או 'מרחב גלובלי') עבור חלק מהתלמידים. בהקשר זה ובתנאים מסוימים, מרחבים גלובליים עשויים להשפיע לטובה על הישגים חינוכיים ולהאיץ ניידות חברתית עבוד תלמידים מקבוצות מיעוט. לפיכך, עבודת התזה מתייחסת לדיונים על אודות השפעותיהם של מהלכים של גלובליזציה על קבוצות מיעוט. עבודת התזה תורמת לדיון דרך הבאת דוגמאות אמפיריות לכך מהפרספקטיבה של חינוך ה-STEM, שעד כה היו חסרות מהספרות. התזה מסתיימת בהמלצות מדיניות העולות מחמשת המאמרים.

תקציר

החינוך בתחומי המדעים (science, technology, engineering, and mathematics [STEM]) עבר שינויים רבים בשנים האחרונות כתוצאה מתהליכי גלובליזציה. כך למשל, לימוד שפות מדעיות ותוכנות מטא-תרבותיות חדשות, נגישותו וזמינותו של מידע חדש והעלאת המודעות לאתגרים הנובעים מסוגיות חברתיות-מדעיות גלובליות השפיעו כולן על חשיבות תחומי ה-STEM במערכת החינוך. לאור זאת, חוקרות וחוקרים רבים טוענים כי תחומי ה-STEM יכולים להוות סוכן שמפגיש תלמידות ותלמידי בית-ספר תיכון עם גלובליזציה ותכנים גלובליים.

מחקרים קיימים מתייחסים לשאלה כיצד חינוך בתחומי ה-STEM משפיע על תלמידים מחוץ לבית הספר, תוך התמקדות בטענה שהצלחה בתחומי ה-STEM יכולה ליצור ניידות חברתית ויציבות כלכלית. אך כמעט ואין מחקרים שמתייחסים לשאלה כיצד ההיבטים הגלובליים של תחומי ה-STEM משפיעים על ההישגים החינוכיים והניידות החברתית של תלמידות ולתמידי בית ספר. לכאורה, זה מציג דיון תיאורטי רחב יותר: עם מי ובאלו תנאים מיטיבים מהלכים של גלובליזציה ולמי אותם המהלכים מזיקים? במיוחד בנוגע לקבוצות מיעוט, הספרות דנה באפשרות למסגר את גלובליזציה ככח להעצמת קבוצות דלות משאבים מחד, וכמקור לאיום חברתי מאידך.

עבודת התזה נועדה לתרום לדיון המתגבש סביב הנושא כיצד הליכי גלובליזציה משפיעים על קבוצות מיעוט, תוך התמקדות בלימודי STEM כמקרה בוחן. מבחינת מתודולוגיה, העבודה מנתחת נתוני שאלונים שחולקו בין תלמידות ותלמידים (N=380) בתיכונים דוברי עברית וערבית בישראל, וכן ניתוח אתנוגרפי של 21 חודשים של תצפיות בבית ספר תיכון בעיר יפו. הניתוח בוחן את הקשר האפשרי בין תפיסות גלובליות ובינלאומיות של STEM לבין הישגים חינוכיים, דפוסים של תירבות (אקולטורציה), תחושות אפליה וגישות ליחסים בין-קבוצתיים. המקרה הישראלי מועיל תודות לשילוב בין אי-השוויון החברתי, כלכלי וחינוכי לבין המעמד הגבוה של תחומי ה-STEM בישראל וההזדמנויות הכלכליות-חברתיות שהן יכולות להקנות למי שמתמקצעים בהם.

עבודת התזה מוגשת כאסופה של חמישה מאמרים אקדמיים. המאמר הראשון, שכותרתו "השעתוק החברתי של הישיגים בחינוך המדעים בקרב תלמידי תיכון בישראל" (פורסם ב-*British Journal of Sociology of Education*), בוחן את השעתוק החברתי של הישגים חינוכיים בתחומי המדעים בקרב תלמידי תיכון יהודים וערבים-פלסטינים. ניתוח רגרסיות של נתוני השאלונים מציע כי יש קורלציה מובהקת בין תפיסות גלובליות של תחומי ה-STEM, התעניינות מוגברת ב-STEM ותחושות של מסוגלות עצמית ב-STEM, ובין שאיפות גבוהות יותר לרכוש השכלה גבוהה בתחומי ה-STEM. בנוסף, למרות שתלמידים ערבים-פלסטינים מתעניינים יותר בתחומי ה-STEM (בממוצע), הון מדעי ומעמד חברתי-כלכלי גבוה מנבאים שאיפות לרכוש השכלה גבוהה בתחומי ה-STEM בקרב התלמידים היהודים בלבד. על כן, הניתוחים מספקים מידע קונטקסטואלי חשוב על היחס בין תלמידים יהודים וערבים-פלסטינים בישראל, וכן אינדיקציה ראשונית לקשר בין תפיסות של תחומי ה-STEM כגלובליים לבין שיפור בהישגים חינוכיים של התלמידים.

המאמר השני, שכותרתו "תפיסות של מדעים ועמדות כלפי שיתוף פעולה בין קבוצות" (פורסם ב-*Compare: A Journal of Comparative and International Education*), והמאמר השלישי אשר כותרתו "תפיסות של מדעים והשפעותיהן על אפליה צפויה בתחומי המדעים בקרב תלמידי תיכון" (פורסם ב-

עבודה זו נעשתה בהדרכתו של

ד״ר אליקים כסלו

השפעות הגלובליזציה של החינוך בתחומי המדעים על תיכונים דוברי ערבית בישראל

חיבור לשם קבלת תואר דוקטור בפילוסופיה

מאת אוראל דיאמונד

מוגש מחדש לסנט האוניברסיטה העברית בירושלים

מרץ 2021

השפעות הגלובליזציה של החינוך בתחומי המדעים על תיכונים דוברי ערבית בישראל

חיבור לשם קבלת תואר דוקטור בפילוסופיה

מאת אוראל דיאמונד

מוגש מחדש לסנט האוניברסיטה העברית בירושלים

מרץ 2021