Neoliberal Globalization, Education Policies and Strategies Adopted in Science Curriculum Reform in the United Arab Emirates: A Case Study Based on the Views of Ministry of Education Stakeholders

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Hind Abou Nasr Kassir

Student ID: 201203436

Master's in Education (British University in Dubai),

Masters in Biology (Lebanese University in Lebanon)

ABSTRACT

Globalization is a spatial concept defined as a group of social processes transforming our present social status from our own nationality into a global identity. The impact of neoliberal globalization is discernible in the way that it has projected its own framework to shape education in the Gulf and MENA region, in this case in modernizing curricula and social institutions, especially science curricula. Neoliberalism's influence from politics to economics has pushed states towards scientific and technological growth and encouraged competition between countries. The resultant modernization has reshaped the great traditions of Arab and Islamic societies and identities due to Western influences, thereby altering the Emirati profile, especially those students graduating from higher education.

In addition, higher education in the United Arab Emirates (UAE) is shaped by government legislation that aims to fulfill a global agenda. The goal is to place the UAE as a top-ranking country in different domains, especially in education. The national indicators in the UAE's state policy documents have been translated into total reforms that have shaped the basic education level up to higher education curricula, most notably in relation to science curricula. Hence, the main objective of this thesis is to explore the impact of neoliberal globalization on science curriculum reform in the UAE from the perspective of Science Curriculum Specialists (SCS) and Science Assessment Specialists (SAS) in the UAE's Ministry of Education (MoE), who have worked directly on the national science curriculum reform.

This qualitative exploratory study examines the impact of neoliberal globalization on the socio-cultural context that has shaped the UAE's policy design based on semi-structured interviews with the above specialists. The SCS and SAS interview responses have allowed insight into their complex views about curriculum reform, while the analysis presents an overall understanding of the participants' views on globalization's impact on science curriculum reform. The qualitative data collection based on semi-structured interviews conducted with 17 participants illuminates the processes and challenges that UAE MoE stakeholders experienced in order to generate a unique document. Furthermore, despite all the efforts made to shape the science curriculum national framework, the current study recommends measuring the impact of the same science curriculum based on students' skills at the higher education level. Furthermore, the study's findings indicate that neoliberal globalization has shaped the UAE's shift away from an oil-based country to a knowledge-based economy using education as a medium to reform all education curriculum documents, notably the science curriculum editorial, scope and content decisions, all in order to answer the policy requirements of UAE Vision 2021 and UAE Centennial 2071.

Keywords: Globalization; science education reform; education policy; science curriculum; neoliberalism; United Arab Emirates; UAE Ministry of Education

DECLARATION

The principal researcher, Hind Abou Nasr Kassir, hereby declares that this thesis/project work is original research and that, except for other people's work which has been duly acknowledged, this thesis has never been presented to this university or elsewhere for any degree. The researcher served as the sole author for the study, as a requirement for the degree of Education Doctoral Degree from the University of Liverpool. This thesis was completed under the supervision of Dr. Peter Kahn who kindly took the role of primary supervisor after Dr. Mariya Ivancheva who left for another campus; and of Dr. Jose Manuel Reis Jorge as secondary supervisor.

Signed: *Hind Gergi Abou Nasr Kassir*

DEDICATION

To my mother Souraya, my father Georges, for my soul companion Advisor Imad Al Kassir, and my siblings Maria, Antoine, Stephan as well as my sisters Mrs. Patricia Maalouf and Mrs. Solange Chakhtoura, my brothers Maitre Abdo Abou Nasr and Mr. Elias Abou Nasr, and my Two best friends and family Prof Therese Abou Nasr Nabhan and Prof Jeanette Abou Nasr Daccache for their love and support throughout my life journey. And last my dear sister and friend from another mother and country Mrs. Eman Al Kaabi who gave me the power without knowing to have all the optimism of the journey and my other dear companion who has inspired me on what is the real woman empowerment Mrs. Eman Manoot Mother of heroes.

This is a dream which came true to share this honor for all of them.

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LISTS OF ACRONYMS

ADEK: Abu Dhabi Education Knowledge

ADEC: Abu Dhabi Education Council

EmSAT: The Emirates Standardized Test

FTZ: Free-Trade Zones

CAA: The Commission for Academic Accreditation

CEPA: Communicative English Proficiency Assessment

ECC: Emirates Competency Certificate

GATS: General Agreement on Trade in Services

H.E.: Higher Education

IMF: International Monetary Fund

WTO: Word Trade Organization

MAG: Madares Al Ghad

MoF: Ministry of Finance

MoE: Ministry of Education

MOHESR: The Ministry of Higher Education and Scientific Research

NQA: National Qualification Authority

OECD: Organization for Economic Co-operation and Development

PMO: Prime Minister Office

PPP: Private Public Partnership

PIRLS: The Progress in International Reading Literacy Study

PISA: The Program for International Student Assessment

SAS: Science Assessment Specialist

SCS: Science Curriculum Specialist

STEAM: Science Technology Engineering Arts and Math

STEM: Science Technology Engineering and Math

TIMSS: Trends in International Mathematics and Science Study

UAE: United Arab Emirates

UNESCO: The United Nations Educational, Scientific and Cultural Organization

UAE2021: United Arab Emirates Vision and Mission 2021

UAE2071 Centennial: United Arab Emirates Vision and Mission 2071

Introduction

Neoliberalism is becoming a near hegemonic ideology and a dominant topic in the literature, particularly in educational research (Huang, 2012). Harvey (2009) characterises *neoliberalism* as being made up of a "bricolage of policies" (p.22) combining various forms of reactionary populism, economics, and politics, where all aims are engaged in the creative destruction of society's institutional frameworks and powers. Neoliberal theory as defined by Bourdieu (1998) is a "program of methodological destruction of the collective mindset" of the host country (p. 95). Neoliberalism has its theodicy, economic hegemony, and a social privilege that paved the way for a drastic change in education, moving away from being an academic tool to an economic medium (Mullen, English, Brindley, Ehrich, & Samier, 2013). Mullen et al. further explain that the economic ideology of neoliberalism has affected education systems, which reflect different countries' constituencies, alongside political and economic external forces discussed in Harvey (2016). Although I believe that the neoliberal mindset has brought with it certain implications for higher education in the UAE and as stated in Kahn and Lundgren-Resenterra (2021) of "a collective perspective" *on work at both private and governmental level*. That explains the reason behind the fact that higher education is seen as an investment in a given country's economy. Graduate employability is now conceptualized in terms of the extent to which a given student's capacity matches employment opportunities. Intellectuals throughout history have played pivotal roles in transforming education from its academic, cultural domain into an economic realm, one that now encompasses elements of staffing, policies, curriculum, and funding in both governmental and private sector institutions (Benda, 1969). Indeed, empirical research shows that neoliberalism has affected economic and education policy design all over the globe (Woessmann, 2011), including in the Middle East and Gulf region.

Like many other countries in the world, the Middle East and Gulf region have been significantly affected by neoliberal ideology (Huang, 2012), while the effects of neoliberal globalization have dramatically shaped the traditional social values of the Arabian Gulf, which has undergone extensive modernization in terms of governmental policies, education, and social values (Samier, 2021; Samier, 2013, cited in Mullen et al., 2013). Undoubtedly neoliberalism has affected education and curriculum reform in the Middle East and Gulf region, notably at a higher education level (Barnawi, 2017). Middle Eastern leaders have faced, like their international peers, the impact of globalization on education skills and the need to include these within their current mandates at a local level alongside the pressure to achieve sustainable growth according to their economic indicators, particularly through the support of technical knowledge areas such as mathematics, science and literacy which has led to reforms in both policy design and education in most countries wishing to be part of a new future (Woessmann, 2011).

The main objective of this thesis is to explore the impact of neoliberal globalization on science curriculum reform at a pre-tertiary level starting from Grade 9 in the United Arab Emirates (UAE), particularly as seen from the perspective of science curriculum specialists (SCS) and science assessment specialists (SAS) in the UAE's Ministry of Education (MoE), thereby generating recommendations for higher education. The study will also examine the impact of neoliberal globalization on the socio-cultural context by highlighting "hidden influences" on the UAE's policy design (Huang, 2012, p. 40). Finally, by examining the SCS and SAS perspectives on the reform, its expected outcomes, and their perceptions of the quality of these outcomes, the thesis indirectly illuminates the new profile of an Emirati higher education student, the latter being a result of neoliberalism's global impact and its influence on higher education policy.

1.1 Background of the Research

The United Arab Emirates is a country built on Arab values and nomadic roots. For the last decade, the UAE has experienced a far-reaching metamorphosis, which has turned the country away from being a desert society to facing towards a globalized world. Globalization has been defined as a group of social processes constantly transforming our societies (Hayek, 1991) and has been characterised by Harvey (2009) as a form of "creative destruction". Our nationality is moulding into a global identity at a substantial rate (Steger, 2017), while our own identity and culture supervene "an evolving dynamism" (p. 3) whose patterns are discernible between societies. The key for countries' individual success and competitiveness globally is moving towards a "global systemic shift" (Benedikter, 2015, p.1), causing socio-cultural changes in developing societies where family values – as well as other aspects – are heavily impacted and likely to be replaced by new global ones (Al-Issa, 2005). The appropriation of neoliberal values and policies in the UAE – and more specifically in Dubai – can illustrate the highly localized ways in which neoliberalism is inflected in the family context and cultural process, becoming a monolithic tool of the country's global integration (Kanna, 2010). For two decades in the UAE, pursuing higher education studies abroad was a privilege reserved only for Emirati males and not for Emirati female students who were not allowed to travel to access education for religious and cultural reasons (Abdulla,1984; Koolhaas, 2011). Further, if an Emirati female needs to travel, she has – as per the Islamic Shariaah – to be accompanied by a man from her own family called a "Mihram" to protect her from evil thoughts of her local community as a single woman travelling alone as well as inappropriate men who might either abuse or attack her when seeing her alone. Nowadays, female students in higher education make up seventy percent of the entire population of Emirati students and traveling to undertake their studies abroad is more flexible and depends on the individual Emirati family's openness (Kamal, 2021). The local need for quality tertiary education has pushed the country's

stakeholders to seek higher education reform that touches curriculum, operations, and sustainability, offers the best education to both female and male Emirati students not willing to pursue their higher education abroad. The neoliberal effect adds an evident need to move towards more flexibility in the Emirati graduate profile, resulting in a combination of neoliberal and patriarchal family values (Kanna, 2010). The adaptation of neoliberal concepts in the UAE involves a reinterpretation of traditional patriarchal structures in our local society and the ruling-family structure in our local constitutions, thereby impacting on students' orientations and perspectives as well as the students' social status in the UAE context (Kanna, 2010). Beginning with the transformation of education, neoliberalism's global impact is a complex phenomenon that consists of a broad range of factors including political, social, economic, cultural, religious, and legal issues (Mullen et al., 2013). From a critical perspective, the UAE – in education terms – has possible been affected by economic globalization, colonizing forces as well as a range of multilevel political structures and forces affecting education that go far beyond curricular or staffing issues (Mullen et al., 2013). I agree with Mullen et al. (2013) that there is a critique of education under neoliberalism available that is much deeper than curricular or staffing problems, but rather places indigenous attitudes, values, and concerns at the centre of the argument. This could mean that the core Emirati culture, values, and the Islamic faith are at risk when it comes to the required transformation. Therefore, the question of how to maintain these values needs to assume a central role (Mullen et al., 2013).

After the international COVID-19 pandemic beginning in February 2019, the world has witnessed a "re-globalization" (Benedikter et al., 2021, p. 2) going beyond neoliberalism's typical economic ideology, one which has touched all levels of society. Fitzsimons (2014) asserts that neoliberal globalization has impacted on education and used the latter as an economic medium to advance modernization in research and development and as a tool to avoid a given society's objection to change. Globalization puts pressure on states and limits

policymaking either vertically or horizontally (Henry et al., 2001). Vertically – in other words international alignment – touches on social media and images, and horizontally at social levels such as movements, traditions, education, and culture (Henry et al., 2001; Yeates, 1999). Neoliberalism, thus, combines hegemonic discourses and practices to achieve the status of a worldview "doxa" (Bourdieu, 1999; Patrick, 2013). Chopra (2003) refers to the neoliberal doxa as an "unquestionable orthodoxy that operates as if it were the objective truth" (p. 419) focussed on achieving one goal, namely the monetary and psychological enslavement and subjugation of nation-states and citizen-subjects alike through new policy design. Neoliberal globalization has an impact that touches the micro level of the individual and interpersonal relations as well as meso-level interactions and social structures, in addition to the macro level including social and educational institutions operating through international economic forces and other states' foreign policies (Mullen et al., 2013). Therefore, policies and political decisions affect education reforms at curriculum and content levels (Woessmann, 2011). In education terms, this includes the need for a reformed curriculum, new teaching styles, revisiting the MoE's organizational culture, the classroom context and, even more so, the strategic purpose of a modern Muslim Arab state (Mullen et al., 2013). It is important to explore any linkages between globalized networks and education and its wider contexts in order to understand how and if the UAE is compromising its Arab Gulf values through Westernization.

The complex nature of the country's environment affects the way a curriculum is implemented as well as its outcomes (Ryder, 2015), including in the UAE. De Boer et al. (2021) have explained that globalization has created a global war for talent in Generation Z – i.e. people born 2012-2020 – while education policy is part of public policy and public administration traditions are deeply rooted in political governance systems, legislation, and economic, labour, social and cultural policies. The COVID-19 pandemic has caused slowing down in terms of "global trade and impacted specific international segments"; Altman and

Bastian (2020, p. 8) argue that globalization in all its guises is resilient and (de Boer et al., 2021) suggest it is "far from dead". For Abella (2008), globalization is still interconnecting the world and business and there is no turning back. Education is the tool used by the public organization system in many countries to follow neoliberalism as an ideology (Bleiklie et al., 2017), including in the Middle East (Gobert, 2019). Furthermore, during the COVID-19 pandemic UAE science teachers found themselves forced to integrate technology as a must-have instruction mode for efficient scientific online delivery, another mandate of neoliberal ideology is to have science and technology as a core concept in the societies of tomorrow (Al Darayseh, 2020). The current study will shed light on the Middle East and UAE contexts, where politics, culture, and education are closely intertwined and work together in relation to building young people's personalities.

1.1.1 The Middle East and UAE Contexts

The Middle East and the Arabic peninsula region are complex areas with a distinctly complex matrix of security, religion, politics, and economics dynamics (Ulrichsen, 2011, 2016). The prevailing policy systems in these countries are not disconnected from their origins but have evolved and developed in line with their cultures; however, casting aside barriers has impacted each country's local characteristics given globalization's compressive effects (Raadschelders & Vigoda-Gadot, 2015). The horizontal effect of neoliberal globalization in the MENA region has produced an ecosystem in which education operates to support a multilevel network of political and economic structures of the country that the UAE – in one way or another – is held hostage (Samier, 2013). The Arab Peninsula countries have a political economy immersed deeply in a socio-economic development model that is state-centric and led while showcasing a profoundly conventional system of state-sponsored support (Ulrichsen, 2011, 2016). These countries are governed by their policy regimes, their constitutions, their

cultures, and their religion that form certain pillars in the production of knowledge, skills, and professional practices, making higher education policy part of public administration and placing extra emphasis on the policy studies framework used in and affecting higher education reform (Samier, 2020).

The UAE is a federal government based on the country's constitution and ruled by a royal family which was originally the leading tribal family (Said, 2006). To maintain their success, the UAE's leaders have followed a unique interpretation of the neoliberal model based on their existing constitutional federal government (Soederberg et al., 2005). In addition, the UAE is dealing delicately with challenges related to identity, cultural and religious beliefs, trials brought by international pressures exerted by the global economy (Rizvi & Lingard, 2006). Moreover, their membership of the Organization for Economic Co-operation and Development (OECD) has brought about a move towards a knowledge-based economy that markets education as a consumable. Rizvi and Lingard (2010) explain that global neoliberal policies are adaptable to the local needs of the country and require tools and instruments derived from the local market in order to expand; education is a tool of the political economy. They go on to explain that global neoliberal policies find their way into countries through "a textual" form but stay within a given nation's framework while hiding behind a broader discourse that assumes an authoritative status (p.12). Authority in the UAE is based in the ruling family, and both citizens and Emirati nationals follow UAE Vision 2021 and continue to implement the focal indicators of UAE Centennial 2071 (New Delhi Times, 2020).

The Ministry of Education is a federal government entity. In the UAE, power over education is distributed between both the government and the Emirates, the latter having seven rulers (Ruban, 2012) while there are three-four major education institutions: 1) the Ministry of Education (MoE), a federal government entity that surveys the Dubai and Northern Emirates public schools; 2) the Abu Dhabi Education Council (ADEC 2010, 2012; ADEK, 2018), a

federal government entity whose remit covers the Abu Dhabi public and private schools; and 3) Dubai's Knowledge and Human Development Authority, a regulatory body of the government of Dubai that oversees the educational quality of Dubai private schools only; and 4) the Sharjah Private Schools Authority (SPEA), a quality regulation body for the Sharjah Private Education Authority established by His Royal Highness Sheikh Sultan Al Quasimi to audit the private schools in the Sharjah Emirates only (Ruban, 2012). In September 2017, ADEK and the MoE merged into one federal education system authority. By doing this, both entities unified their policies and action plans within a unique, comprehensive UAE school model called the "Emirati Schools". The primary purpose behind this merging was to empower the higher education (Ministry of Education, 2019) and it was split in 2021 back into two different entities. In June 2021, after the COVID-19 pandemic, the Prime Minister's cabinet office announced the establishment of the Emirates School Establishment (ESE) as a privately managed education institution overseeing the operational areas of the public schools in Dubai and the Northern Emirates. It kept the Ministry of Education as a headquarters for policy design and regulation drafting (Gulf News, 2021). The ESE underlines the market-driven education system focusing on technical and vocational education while undercutting the importance of humanities and social sciences (Ahmed, 2021). All of this growth and transformational change in the UAE's education policies and governance are focussed on empowering youth and establishing a solid ground for higher education to reach global competitiveness.

The UAE has followed a neoliberal globalization agenda, and this has been translated into the policy design of UAE Vision 2021's mission and the UAE2071 centennial (Kanna, 2011). The implementation of both policies is gradual yet also rapid, focusing on reforming higher education using the primary school curricula and policies as a medium for change in order to secure beneficial outcomes at the higher education level (Kanna, 2011). Koolhaas (2011) explains that the phenomenon of Dubai's radical transformation of primary schools in

order to impact the quality of higher education is a profoundly multifaceted and ambiguous programme with both positive and negative connotations. In fact, as a member of the World Trade Organization (WTO) from 1996 and an OECD country, the UAE's results in the Program for International Student Assessment (PISA) and the Progress in International Reading Literacy Study (PIRLS) have shown the need to focus more on students' literacy in science and mathematics while highlighting the need to empower the learning environment, which are indicators for the need to reform a given country's education policies and design. The OECD (2009) has stated that UAE students scored lower than the OECD average in reading, mathematics, and science in PISA testing while also reflecting low-level comprehension of scientific texts and analytical concepts in PIRLS. These results communicate the need to empower basic education schooling quality in terms of the science curriculum, mathematics, and language awareness, thereby impacting positively higher education scales of measurements, especially in terms of literacy and numeracy (OECD, 2009). These results have compelled the UAE to take immediate steps to empower students from their younger ages upwards to achieve the skills-building required and to go ahead with a total reform from early years to higher education from 2010, which is still ongoing.

The UAE implemented neoliberalism's homogenization. The UAE is committed – like all similar countries under severe penalties – to leave behind bureaucracy and neo-corporatist methods (Soederberg et al., 2005). For example, in an initial strategic document, UAE Vision 2021 (UAE Government, 2018), that religion is a mandate stated in official documents as the soul of Emirati identity. However, UAE Centennial 2071 does not include this clause as a mandate in UAE policy (UAE Government, 2021). Harvey (2016) explains that hailing from the neoliberal managerial class, the state's policies reflected a desire for a multinational modernity beyond the restrictions implied by local Gulf society and the Muslim religion. This policy has been translated into an education curriculum reform that affects the

Emirates' social and cultural patterns (Samier, 2013). Samier (in Mullen et al., 2013) explains that the copious materialism brought about by the new neoliberal ideology directly contradicts Islamic faith and the UAE's very concept of nationality and citizenship.

Understandably, the policy design in the Arabian Gulf state is evolving in line with market needs, and its implementation can be wildly different in different areas and ecosystems (Ulrichsen, 2011). The UAE has rigorously implemented changes in the policy from 2012 onwards in order to place the country on the global map politically and economically (Huang, 2012). The policy changes have been followed by partnerships between both the public and private sectors to guarantee the flow of investment into the higher education market and the establishment of reputable western educational franchises. Thus, leaving the private entities to bear the sole responsibility for the governance of high schools while having them pursue lucrative educational businesses in the region (Lindblom, 1977; Kamal, 2021). Essentially, the private public partnerships (PPP) allow private international education consultancy firms in the UAE or quasi-governmental firms such as the Knowledge Fund Establishment or Abu Dhabi grant, to lead sustainable investment growth that supports the development of the UAE's education sector either at pre-tertiary or tertiary levels. The main task of PPPs is to solve partnership problems between the private and public sector in order to improve the UAE education system. These firms' committees actively participate in planning and funding strategic initiatives locally, regionally and internationally to provide quality education for all while improving academic outcomes (ADEK, 2012), a scenario that is a part of the global drive towards a "global educational community" (Astiz, Wiseman, & Baker, 2002, p. 22).

The UAE is characterised by a combination of services and factors that have resulted in a heterogeneous context where education is a business service with menus; an integral component of the UAE's strategic plan is that each nationality is served with a tailored education system affiliated with country of origin in addition to higher education universities

affiliated to or having branches of international campuses, thereby deepening the provision of higher education tourism (Barnawi, 2017).

1.1.2 Education in the UAE's Strategic Plans

Education is the cornerstone of the UAE's strategic plans and is the tool for the growth of all sectors, it is the cohesive implement to develop policy documents such as the UAE Vision 2021 (Kazim, 2000) and the UAE Centennial 2071. The UAE Vision 2021's mission requires: (1) an education system that empowers personalized learning aligned with OECD recommendations (2018a); (2) a curriculum that facilitates personalized learning and encourages students to nurture their interests and establish links between learning experiences and opportunities; and, finally, (3) entrepreneurship through innovation. The UAE stakeholders' curriculum design specialists – especially the science and mathematics specialists concerned with tailoring the document and assessment – need to focus on building the twenty-first century skills, attitudes, values, and areas of knowledge that Emirati students need to thrive in the 2030 job market and to be accepted by Ivy League universities (Bates, 2019; OECD, 2018a). The new trends in curriculum reform promoted by the global market intend to offer students a choice and a voice to foster their educational learning skills (Copper, 2017). In addition, the education curriculum needs to be modernized in all Arab regions to follow the global flow (Asfour, 2006). Asfour argues that globalization has affected the Arab and Gulf regions in terms of linguistics to the extent that this modernization is perceived as a necessity to reach the lofty status of western modernization or what he has dubbed "Americanization" (p. 142). The UAE Vision 2021 policy mandate, namely, to achieve a global student profile has emphasised the English language as a medium of instruction for scientific content in higher education as well as basic education institutions, which in turn has impacted on the UAE's education outcomes and expectations (Kazim, 2000). The linguistic shift from Arabic to

English in the sciences has brought to the content cultural elements and identity features that are new to the Arab world such as new acronyms, the extinction of some rural Emirati dialects, and the inclusion of English terminologies within the Arabic daily discourse of business (Asfour, 2006). The UAE Vision 2021 policy mandate has been followed by a complete curriculum reform that started at the early basic levels of schooling to reach higher education institutions, introducing new science and mathematics curricula in English based on standards to which teachers must be trained to adapt gradually (Ridge et al., 2016).

Given the urgency of accomplishing the education policy reform and achieving the highest scores in Trends in International Mathematics and Science Study (TIMSS) and reach the highest PISA and PIRLS rankings, the UAE imported from different institutional cultures advanced western education science curricula, then staffing alongside models, discourses, and practices (Abdeseelem, 2020). Neoliberalism has significantly altered education and affected its governance worldwide (Harvey, 2016). The UAE has offered education as one of its community services to Emirati residents and provided schools for all adopting a common core curriculum in Mathematics. The Next Generation of Science Standards (NGSS) aligns local UAE education with American standards, thereby placing even greater emphasis on the process by adding the College board as a mandate for the "elite" stream of students (Al Hammadi, 2019, Gulf News year?]). The Russian-UAE Partnership has supported the UAE's ambitious vision, which culminated in the grand mission to send and welcome back Hazza' Al Mansouri, the UAE's first astronaut, after he spent eight days in space and most of his preparation years in Russia (October 2019, Gulf News). This pioneering event for the Arab world has dramatically pushed forward space education and studies programmes in the UAE and the region as a whole; to answer the General Agreement on Trade in Services (GATS) agreement, and as part of the education policy implementation has created education tracks and vocational-technical pipelines at basic schooling level that will form a continuum with HE students'

choices (Al Yahyaei, 2021). Sixteen political agreements were signed between the UAE and the People's Republic of China, dealing with the global environment changes and especially the climate change crisis, science advances, including artificial intelligence, technology (notably digital technology), and cultural and trade exchanges. During his visit to China, the UAE's president, Sheikh Zayed, offered donations to China for the establishment of the UAE Arabic Teaching and Arabic Islam Research Centre at Beijing Foreign Studies University (Wam, 2019). Furthermore, the UAE's Minister of Education, Hussain Bin Ibrahim Al Hammadi, and the Confucius Institute's Deputy Chief Executive, Ma Jianfei, signed an agreement to introduce Chinese as a language featured in the UAE education curricula (Wam, 2019).

UAE higher education has altered considerably over the last decade, most notably in relation to the science and technology domains, opening up affiliation opportunities for high-calibre universities to relocate locally and offer their own curricula to local residents and Emiratis (Barnawi, 2013). Quality assurance bodies have been introduced by the Commission for Academic Accreditation (CAA), the latter using binary inter-related standards-based quality assurance processes: the first one is institutional licensure and the second one is programme accreditation (CAA, 2021). The CAA committee assesses education quality, thereby assuring the local community that the licensed institutions and the accredited programmes of all campuses in the UAE offer high standards (CAA, 2021). The UAE's MoE and Ministry of Higher Education (henceforth MoHE) have broken new ground by offering artificial intelligence (AI) curricula and inaugurated the Artificial Intelligence University in 2019 in Dubai under the patronage of H.H. Sheikh Mohammad bin Rashid al Maktoum. However, the CAA's core task could not start before the total reform of all public and private education institutions at a basic education, pre-tertiary, and reaching higher education levels. Therefore, until the education changes reach the higher education context and build a knowledgeable

human capital, the UAE higher education are staffed by expatriates who are primarily advised by their main universities campus and secondly recruited by the main core headquarters to ensure the quality of the instructed curriculum notably technology and sciences (Ridge et al., 2016; El Baroudi, 2021).

The immediate action to reform the education field has also had negative connotations; skilled professionals are very proficient in standards-based curriculum drafting, however, they know little about the UAE's religion and culture (Abdalla & Al-Homoud, 2001). Moreover, recruited expatriates who manage schools and instruct the new curricula brought with them social practices and mind sets, thereby putting the essence of the local Emirati religion and culture at risk (Abdalla & Al-Homoud, 2001). Further, the assessment implemented during the reform seeks to measure attainment of the standard curriculum's learning outcomes quantitatively through students' achievements from the day they start the academic year, via diagnostic assessment, until the end of the year, via central assessment, and compare these results versus national indicators in higher education settings (Al Ali, 2014); these types of quantitative measures lack a qualitative profiling of the Emirati graduate and his views of the new curriculum's aesthetics, content, and strategies. In conclusion, it seems crucial to review the reform from its start in basic schooling in order to understand better the impact of globalization on the education reform as a whole.

The MoE, therefore, instructed a reform of all its curriculum documents in basic schooling from Kindergarten until Year 13 in 2012 (science is part of this content and is our focus in this thesis). The new science curriculum replaces the knowledge-oriented content and requires teaching pedagogies based on hands-on scientific inquiry and a focus on attaining designated standards (Shakera et al., 2021). Modernization is accomplished via a shift from Bedouin traditions towards materialism, secularization, and urbanization (Samier, in Mullen et al., 2013; Rugh, 2007). Materialism as a form of pedagogy welcomes a pedagogical framework

that places the emergent learner and the material body as the central concern of the whole teaching and learning experience (Reddington, et al., 2018). On the relational dimensions of the individual, a pedagogy based on materialism invites individuals in the field of education to increasingly consider other possibilities for children and youth who need special attention, which forms part of the UAE's policy of inclusiveness regarding students with special needs (Reddington et al., 2018). Therefore, higher education schools in the UAE welcome a materialist pedagogy to follow the entanglements that might bedevil each child during his learning journey (Reddington et al., 2018). Modernized teaching methods that include more resources such as simulations, tools leading towards the individual attaining innovative perspectives on the one hand, might also result in students deviating from the norms of a given society on the other if the teachers are transferring certain values and not only communicating content and knowledge (Osuji et al., 2021). As a consequence of the UAE's "ready-made" science curriculum and western staffing, the state's education institutions acquired new cultural expertise, which has affected the implementation of deliverables and expected outcomes, and the impact is even more profound when it comes to basic education reform (Al Nahyan, 2005, p. 90). The latter concerns the collective values of the curriculum itself as advised in Khan et al. (2021) as well teachers' perceptions of the post-reform science curriculum's practices and pedagogies as outlined in Ryder et al. (2015).

If the science education aims to create de-politicized citizens ready to participate in a neoliberal market economy (Hoeg & Bencze, 2017), technology is the key to the UAE's fiscal health and global competitiveness. For this reason, the UAE's MoE stakeholders have decided to sign a seven-year agreement in 2016 with McGraw-Hill Education, the first western science academic content provider, to adapt the science education textbook taught in the United States of America for the UAE to align with the latest science curriculum standards framework known as the New Generation Science Standards (NGSS) (Shakera et al., 2021). The NGSS standard-

based science curriculum aims to support students' higher-order thinking (Shakera et al., 2021). Furthermore, the US textbook is perfectly in line with the NGSS framework both horizontally and vertically and can guarantee students' academic progression and choices, thereby helping them to develop scientific skills and ways of knowing (Anderson et al., 2001). As a result, the tool to implement the ready-made content of science, technology, engineering and mathematics, and arts (STEAM) is the STEM teaching strategy that supports the construction of the higher-order cognitive skills and entrepreneurship skills needed to achieve amidst the advances required when using global assessment tools (Anderson et al., 2001). In addition, the innovative transformation of the science curriculum introduces concepts from robotics and coding that work in tandem with the established science curricula (Hoeg & Bencze, 2017). Active approach pedagogies exhibit dynamism while their design and strategies introduce a new way of teaching and learning to replace the static one while presenting possibilities to support diversified knowledge, actions and practices (Cannella, 2005). The only concern that might appear in relation to these changes is how Emirati graduates will identify themselves after science curriculum changes when it comes to collective values as identified in Kahn et al. (2021).

The high speed at which the UAE education policy has changed and its impact on the MoE science curriculum framework is not an error-free journey and questions the significance of the UAE's science curriculum reform implementation and its impact on the social context (Shakera et al., 2021), thus posing a conundrum in that it might have been created in a context not yet ready for the changes required by modernization (Ridge et al., 2017), a leap that does not match the pace of the real, grounded context of the UAE's higher education and non-tertiary institutions. The higher education curriculum policy reforms have affected primary education, which started its own review of the curricula taught to students in the early nineties after the end of the British governance and in response to the needs of the local education market and

the World Trade Organization (WTO) and OECD's global education requirements (Shakera et al., 2021; Owais et al., 2020). Globalization affects all of the UAE's social services, including education (Dale, 1999). Some of the impact of globalization on design changes to education policies are at a constitutional level such as government legislation and tolerance regarding organizational cultures and mixed gender settings (Al Ali, 2014).

The education reform of UAE public schools is intended to offer quality education for Emiratis while allowing local education institutions to compete with their peers locally, notably privately owned institutions, both regionally and even globally (Gray, 2016). As a result, the UAE has adopted norms found in the education systems of advanced capitalist countries from the Global North: firstly, to keep social and cultural content related to UAE practices; secondly to open up the UAE education market to international students; and finally, to create self-contained education for local Emiratis. These links between the accountability regime of schools and the broader political and economic transformation of UAE society ushered in by proponents of the neoliberal doctrine of governance have been much discussed (Apple, 2001; Lipman, 2004; Luke, 2004; Hursh, 2007). In neoliberalism, social and human activity is thought to be most effectively and rationally organized when it is refracted through the structure of the capitalist market (De Lissovoy, 2013). This blend of technological innovation bolstered by a neoliberal technology of governance in the UAE has opened doors to 117 Western and European affiliated universities leading to an inflation in the number of universities in a very demanding market – some of them being registered in the UAE's free-trade zones (FTZ). The FTZs located in the seven Emirates of the UAE exempt business owners from import and export taxes, grants them full ownership of their businesses, and allows them to share profits with their board members, along with exemptions from taxes imposed on institutions, and offers them housing and loan support (MoF, 2021). The FTZ concept that emerged from the business field of education offers a highly profitable opportunity for investors and Emirati

locals who wish to own a local, highly reputable enterprise (Kamal, 2021). This open market and easy access to the UAE is an attractive context for Western universities to establish themselves (Kamal, 2018). The UAE's diverse context also offers a broad range of curricula, including Australian, Canadian, Swiss, American, and French designed programmes (Kamal, 2018).

To conclude, the heterogeneity of the science curriculum authors' ethnic backgrounds allows the implementation of a wide range of tried and tested ideologies in conjunction with an abundance of human capital in these fields of scientific expertise. The young Gulf country has opened up a plethora of school businesses and offered a range of curriculum choices. Therefore, the Emirati youth have experienced a radical change in values as well as social and cultural behaviours over the last two decades, which has involved moving towards a "modernized Emirati brand [with] specific features" (Barnawi, 2015, p.259).

1.1.3 A global Emirati profile

As mentioned, the Emirati youth have experienced a radical shift for the last two decades in terms of a move towards a "modernized Emirati brand" (Barnawi, 2015) mentioned above. The Emirati youth who studied in the elite universities of the United States and the United Kingdom returned to take up leading positions at affiliated branches of Western companies in their own country. Their new profile has left them with a profound feeling of empowerment compared to their local peers and, with their newly acquired modernized identity, they became trendsetters (Gray, 2016). This shift towards a more modern lifestyle is becoming an increasingly common phenomenon in daily life in the UAE, especially in Dubai. Despite the attempt of the UAE to align modern notions of its citizens' merits, the effect of modernization brought about by globalization has resulted in pronounced educational and professional aspirations existing alongside traditional Emirati notions of familial responsibility and communality (Harvey, 2009); indeed, Burke et al. (2011) have labelled it the "destructive,

creative model" (p. 17). This "creative destruction dimension of neoliberalism" comes with a template that individuals need to follow, and its result is a state involution (Bourdieu, 1998, p. 34), potentially leading to the destruction of public services and a drift towards individualism (Bourdieu, 1999, p. 182). The degrading of a public service ethos in favour of individualism has had the effect of introducing ever-increasingly stark divisions of labour, a more polarized society, and changed Emirati ways of life, attachment to the land, habits of the heart, and ways of thought respectively (Harvey, 2006). Therefore, educational investment on any level is essential in order to support education reforms in all countries.

Moreover, any investment in education needs to re-examine the core purpose of education, its principles, and the social morality and ethical values behind these practices (Rudd & Goodson, 2017). However, the world financial crisis of 2008 alongside new neoliberal technologies has placed neoliberal values at the heart of education and imposed concepts such as financialization, privatization, deregulation, international competition, and de-industrialization, while insisting that neoliberalism as an ideology exerts a hegemony via via political, economic, and cognitive discourses (Babb, 2006). The current thesis identifies the profound impact of neoliberal-inspired globalization on curricular reform and furthers the re-contextualization of Emirati social structures through policy changes. This study will not discuss teachers' views of the curriculum reform; instead, it will focus on the views of the SCS and SAS. The former might be a topic to explore at a later stage as studies demonstrate that teachers are frequently frustrated by the outcomes of science education policy reform in higher education (Ryder & Banner, 2013; Sarason, 1990), whereas any reform implementation is dependent on teachers' perception of reforms, either positively or negatively. Teachers' views can drastically affect the curriculum implementation and later its potential impact on students (Porter et al., 2015).

1.2 Statement of the Problem

The fundamental objective of the globalization of HE is to support rapid and extensive diffusion of science technology, innovative knowledge and ideas across societies (Baburajan, 2011). Globalization helps to disseminate advances in science education and technology to travel to other societies and build skilful and competent members of societies who can meet the demands of the 2030 labour market (Baburajan, 2011). Globalization also helps to construct global standards for a sustainable quality of education (Lauder et al., 2006). Historically, the UAE's Ministry of Higher Education and Scientific Research (MOHESR) governed the administration and management of the UAE's higher education sector to become one of the most highly ranked universities regionally and worldwide (Ridge & Farah, 2017); in 2022 the UAE's HE leadership first governs UAE education policy from early years through to the graduate level (Hussein, 2022).

The word "curriculum" is defined by Voogt et al. (2019) as a learner's plan for understanding the structuring of the content and objectives of learning. James et al. (2011) view a curriculum as a medium to shape learners' experiences, including communicating valued knowledge and promoting an individual's personal growth. National curricula are often based on common standards defined by a state's leaders in alignment with a nation's national policy, vision, and mission while adopting a subject-centred design approach (Alshannag et al., 2021). Authors like Wu et al. (2015) have argued that comprehensive decisions regarding content and instructional strategies should be conducted at a national level and explicitly linked with a given curriculum's learning outcomes and purpose (Wu et al., 2015). The UAE's science curriculum is in many ways an extension of the former science curriculum developed in the announcement of the union of the Emirates (MoE, 2020). However, it prescribes in more detail what should be taught in terms of core content while specifying knowledge requirements for every subject. The curriculum could be described as focusing more heavily on assessing students' mastery of

the subject matter and results than its predecessor (Sundberg & Wahlström, 2012; Wahlström & Sundberg, 2015).

The curriculum serves as the primary method of establishing values and forming skills, making it the principle tool for both building national identities and incorporating cosmopolitan/globalized values, two dynamics that often come into tension in curricula (Ryder, 2015). The implementation of the reformed curriculum has taken place at different levels within the national educational zone and UAE schools and families. The efficacy of curriculum implementation needs to be assessed at each level (McLaughlin, 1990) and in particular has to be considered by community members directly in research to explore real-world evolutionary processes, while hopefully positively impacting communities (Stephan et al., 2021). Finding the correct balance in terms of nurturing all aspects of learners is essential, even though – and depending on the learner's developmental stage – this balance can change dramatically (James et al., 2011). Finding the balance between the learner and the curriculum is mainly the work of teachers as agents of implementation: many teachers during a reform implementation refer to knowledge requirements, the core content, and the syllabus, as the curriculum as their starting point and has the strongest impact on their teaching (Lundqvist et al., 2021). Alshannag et al. (2021) assert that education systems in the UAE must be flexible and dynamic in line with the changing demands of their learners' growth, context, and the changing world around them. UAE policymakers use education as a critical tool to secure, preserve and transmit core components of national identity and values (Alshannag et al., 2021). However, it has been claimed by Hayes and Butterworth (2001, cited in Maguire, 2002) that, due to globalization, expatriate teaching staff are often resistant of the science and policy reforms, leaving policymakers with a dilemma regarding the science curriculum's implementation (Maguire, 2002). Whether this is the case or not is open to speculation, however the UAE and its context replicates what Maguire (2002) describes as a high level of dissatisfaction with working

conditions, intensification, and policy overload as well as unhappiness with the pressures and stresses of attempting to meet the high demands of globalisation in an education setting (Mullen, 2002, cited in Maguire, 2002).

While the MOHESR has not openly impacted the shaping of curriculum policy at the pre-tertiary (K-12 level), the impact of higher education policies in the UAE have nevertheless exercised influence over the K-12 curriculum (Ridge & Farah, 2017). From 2001-2007, the Common Educational Proficiency Assessment (CEPA) of English introduced by the MOHESR was considered a requirement for all Grade 12 public school students to enter schools in the UAE and to determine whether they required a foundation year to strengthen their English language skills before enrolling at the UAE's major public HEIs, all of which conduct instruction in English (Ismail, 2008). The first administration of the CEPA exam in the UAE identified a misalignment between the exam and textbook content alongside teachers' poor readiness, which pushed the MOHESR to look again at the pre-tertiary English language curriculum framework to address these issues earlier than Grade 12 (Ismail, 2008). Likewise, further curricular changes had to be made in other disciplines such as mathematics and the sciences when the MOHESR subsequently launched two new CEPA assessments, requiring CEPA for mathematics and sciences in 2006 and for Arabic in 2009 (Institute of Applied Technology Dubai, n.d.; MOHESR, 2010). Moreover, the three largest UAE public universities – namely, the Higher Colleges of Technology, UAE University, and Zayed University – used CEPA as an admissions requirement. It was only in 2017 that the MoE announced the Emirates Standardized Test (EmSAT) to replace the CEPA but still requires a revisiting of curriculum attainment and students' performance in literacy and numeracy in relation to languages and science respectively (Pennington, 2017). The higher education proficiency entrance exam helped to push the MOHESR to place even more emphasis on reshaping what students learn at pre-tertiary and senior levels, not only in terms of English but also in mathematics and the

sciences while targeting literacy as a main goal (Ridge, Kippels, & Elasad, 2017). Therefore, and as per the literature (Maguire, 2002; Ridge et al., 2019; Kamal, 2018), pre-tertiary education is the first factor that impacted the UAE's higher education curriculum and has been a determining factor for students' success at higher education, therefore the current thesis explores the views of those stakeholders who have worked on the science curriculum reform to answer the country's higher education policy demands and requirements.

Furthermore, after uniting MOHESR and the MoE under one ministry, a joined hand between ministries is established to pave the way for a closer alignment between higher and pre-tertiary education, especially regarding two main aims: 1) developing an English medium curriculum for mathematics, English, and science; and 2) improving curriculum assessment regarding the English language skills of students wishing to join schools in the UAE, thus allowing to avoid a time-consuming foundation year (Pennington, 2016a). As a result, the curriculum reform moved towards a more comprehensive document that involved a new standards-based curriculum taught by native English-speaking teachers, with more emphasis on critical thinking and problem-solving skills compared to rote memorization (Pennington, 2016a). Another index turns us back to the terms and conditions of science reform in pre-tertiary education, therefore this study is more focused on the science curriculum reform that took place at a pre-tertiary levels in response to not only higher education demands, but was also aimed at the job market as well as global trends.

Students who seek scientific employment and wish to be enrolled in scientific fields in high school will have to follow the advanced stream which has more emphasis on physics and chemistry (Pennington, 2017). The MoE's reform timeline can be broken down into three implementation cycles, starting at a primary level during 2010-2011 and was intended to reach the senior levels by 2016-2017 in order to impact on students' higher education foundation years (Pennington, 2015). It is self-evident that providing the most appropriate science

curriculum in public schools is essential to creating a generation of citizens skilled in science and technology as per global market needs and preparing job readiness (Ismail, 2018). To that end, the curriculum must be conceptualized in holistic terms, namely as more than just what should be taught, but also consider how it should be taught and assessed. Without a comprehensive approach, curriculum development will continue to be understood solely in terms of textbook development. This thesis suggests the need to address fundamental issues surrounding science curriculum reform in the UAE from a practitioner research perspective and given this researcher's simultaneous insider and outsider status. This status offers the opportunity to develop in-depth views of the SCS and SAS – both involved in the science curriculum reform – and undertaken by a researcher who used to do the same task and wear the same hat. The science curriculum reform answers the policy reforms required by MOHESR in relation to expanding the scope of curriculum content, implementing effective evaluation strategies and investing in long-term local curriculum development capacity (Ridge & Farah, 2017).

As mentioned earlier in the introduction, the science curriculum reform is primarily imported from North American academic culture and offers challenges in terms of its implementation (Al Issa, 2005). It is true that the post-reform science curriculum document has adopted a learner-centred design that provides greater flexibility in a variety of contexts and allows unprecedented levels of inclusivity for all learners (Alshannag et al., 2021). However, the approaches used in the UAE's curriculum design followed Yeung's (2012) three levels of evolution: knowledge-centred subject content, student/learner-centred, and finally problem-based, which is commonly known as the project-based approach. The UAE science curriculum reform has moved from knowledge-centred content – commonly known as the traditional approach where students are guided to a thinking methodology, sometimes even dictated to – to a student-centred approach that engages the learner in his own exploration of the content

(Amadio et al., 2015). Fullan (2006) explains that effective curriculum reform at all levels – including higher education – is related to a clear vision and is based on "effective theories" that focus on the individual's evolution within his intellectual system and cultural context (p. 7). Therefore, the choice of disciplines and the flexibility of their sequencing are vital elements of any curriculum design, while allowing the learners more accountability and ownership in relation to their learning (Yeung, 2012), the focus here being on science. Given the diversity of goals ascribed by science education reforms globally, the key question concerns the extent to which the science curriculum reform of higher education starting with basic school level students can support the Emirati youth.

Emirati youth have been a subject of this drastic educational reform intended to shape entrepreneurial mindsets and inspire students to strive to reach top positions worldwide by brushing off what was seen by politicians and policymakers as a form of parochialism inherited from nomadic culture, in which even more rebellious attitudes were encouraged and implied by curriculum reforms (Gallagher, 2019). There was no space left to establish their own learning through individualized choice before the science curriculum reform (Ridge et al., 2016). The reform of any education curriculum must set its focus on cementing values that combine national/traditional and cosmopolitan/modern identity (not usually in comfortable proximity to each other), while empowering education practices at both micro and macro levels, which can then be used to improve teaching practices (Beacco et al., 2016). Focusing on values and identity is pivotal in making sure that the UAE's national identity does not fade away under the forces of globalization (Owais et al., 2020). Kann (2011) describes the modernized young Emirati male wearing a white "kandura" – the traditional white attire of the Emirati man and an exclusive hallmark of his authentic national identity – holding a Starbucks coffee cup in one hand and wearing a Mont Blanc watch on the other, donning the finest Western perfume while riding in a Lamborghini car; this image continues with the Emirati

woman wearing a black knitted "Abbaya" – the traditional black clothing of Emirati women, nowadays a fashionable dress adorned with glitter and other luxurious accessories – walking around with her Harvey Nichols' shopping bag, her luxury brand handbag slung over her shoulder, Rolex watch on her wrist, while shopping at the Dubai Mall and adorned with Louis Vuitton accessories. The relentless dominance of Western policies and ideologies in the UAE has imposed its own patterns and views (Owen, 2004), reflecting a seismic shift when it comes to the introduction of foreign innovations such as the announcement of new policies (Mulcahy, 2017); 'poster child' images of neoliberal modernity have become so omnipresent in Emirati day-to-day life that the media and popular culture consumed by people shape behavioural attitudes that are not identified by residents as a foreign set of values imposed from the outside (Harvey, 2016).

To conclude this section, the current research will explore the impact of neoliberal globalization on education policies and how both have been reflected in the choices integrated into the science curriculum document and if they have affected teaching habits as highlighted by Lidar et al. (2020) and Ryder et al. (2018). This suggests that if the UAE's science curriculum reform has been executed at the exclusive behest of the country's leaders without the impact of global economic trends, particularly when these trends are not fully integrated with existing teaching and learning habits as well as being inculcated in the operational education management of the Emirati youth. Education reforms in this context will not be regarded as a problem or challenge.

1.3 Purpose and Question of the Study

Globalization is an ongoing process that defines all political and economic governance types. It involves people's movements and the sharing of knowledge, ideas, goods, and capital across national borders (Pipia, 2017). Globalization is presented as "obviously" happening

(Maguire, 2002, p. 262-263), as an "inevitable" force and a process that is enabled via scientific and technological innovations in tandem with labour market deregulation (Carter, 2008; Maguire, 2002, p.265). Moutstatsos (2018) defines globalization as the "relentless pursuit" of unprecedented global interconnectivity and the integration of countries all over the world while encompassing areas ranging from macro-economic policies to socio-cultural traits (p.3). The Brazilian social theorist Boaventura de Sousa Santos (2006) claims that there is no initial global position but rather a concept of globalization that involves the successful globalization of a particular local culture. Therefore, globalization is supposed to catalyse the faster flow of capital beyond national borders and regulations (Moutstatsos, 2018). The UAE is a visual representation of all these definitions, namely a country with a visionary leadership that shows care for its people.

Probably the greatest benefit of globalization to UAE HE is the mobility of academic staff (UAE education, 2008). The UAE's HE landscape has its unique characteristics (Baburajan, 2011), in that it has always been marked by a shortage of qualified academic staff to teach at all education levels. The expatriate staffing of academic and non-academic positions is facilitated by open barriers which leads to high levels of labour mobility, which in turn helps the country to compensate for this inadequacy (Baburajan, 2011). The staff composition of Higher Colleges of Technology (HCT) shows that Emiratis represent only 9.8% of employees in the HCT system, that prompted it to hire employees from other countries (Human Resources Newsletter, 2008-9; Gill, 2008; UAE education, 2008). Another important benefit that translates to HE interconnectivity and scientific advances has been marked by the establishment of several campuses of foreign universities (Baburajan, 2011). Globalization in UAE HE is undoubtedly viewed as a source of high income compared to the revenue-generating approach (Santiago et al., 2008). American, European and Australian institutions as well as the local American University of Sharjah are especially expensive, even considered the

highest in the region (Globalhighered, 2008). Higher education institutions (HEIs) are not only enrolling expatriates' children and employees, but they are also attracting international students from the Arab world offering the UAE Government a very lucrative revenue stream (Baburajan, 2011). Finally, to answer Boaventura de Sousa Santos, although the proponents of the globalization of HE claim that attention is paid to preserving and protecting states' cultural identities (Santiago et al., 2008), it does not always happen. The foreign universities present in the UAE offer curricula with little relevance to Emirati socio-cultural values (Baburajan, 2011). This does not help in promoting and preserving Emirati culture, imprint cultural Emirati identity and build Emirati individuals' sense of citizenship (Bubtana, 2007). Young Emiratis educated abroad are also reported to have poor loyalty to Arab family values and culture; these transformations has resulted in conflicts in Arab families and communities (Baburajan, 2011). Moreover, expatriate universities value individuality as opposed to the traditional collectivism, thereby questioning locally esteemed Arab principles and values (Barakat, 1993; Bubtana, 2007). Baburajan (2011) implies that the globalization of HE is fragmenting the unique cultural identity of Emirati society instead of preserving and promoting it, an argument that needs more in-depth investigation.

The research literature has shown that the UAE's higher education context is unique in terms of emphasising pre-tertiary education reform as the first step that impacts students and supports their journey into higher education. Therefore, the main research aim of the study is twofold: (i) to understand the impact of globalization on policymakers' perceptions of the pre-tertiary science curriculum as a by-product of the MOHESR policy reform; and (ii) to identify the impact of globalization on education policy documents and strategies while providing substantial information on the UAE's globalization-driven science curriculum. The current research project will try to answer the following research questions:

1)   What are the views of MoE curriculum stakeholders regarding the impact of globalization on both the UAE's education policy and the strategies adopted in its science curriculum reform?

2)   What are the implications of the reform of the science curriculum and practices for the higher education context?

Therefore, it is highly important to consider how the UAE SCS have negotiated its role within a country that is increasingly using a science curriculum reform to move away – at least at a discursive level – from an oil-driven economy to a knowledge-based economy, one that is steadfast in its commitment to achieve excellence after this shift, particularly in the context of an increasingly globalized world. The SCS designers might be the experts who can answer the current study's questions. In order to do this, I conducted semi-structured interviews with curriculum specialists in the UAE's MoE so they could identify how the rapid adoption of globalization has affected their curriculum design and if and how they have adapted their plans as a result. Beyond straightforward queries about their perceptions of the role of globalization in curriculum reform, I also asked more probing questions such as: "Are physical textbooks still enough?" and "Do we need to digitize the curriculum to conform to global trends?" Based on my analysis of their answers, I reflect on what would help improve the practices in our professional environments, improve future research, and inform policymakers on how to introduce globalization and where to embed it in the philosophy of education reform.

The current research follows a qualitative interpretivist paradigm where greater completeness in findings might be reached (Szyjka, 2012), particularly through the interviews responses collected from the SCS and ACS. It has been argued, as per Chilisa and Kawulich (2015), that some statements collected in the research study process by specialists might be influenced by their own historical, cultural, or subjective background and perceptions.

However, through this thesis, they reflect on the impact of neoliberal globalization on their academic science document that they have achieved courtesy of the science reforms.

1.4 Significance of the Study

This study is unique in its context. The relevant literature in the region has detailed the views of students and teachers in respect of curriculum reform (OECD, 2020; Ridge, 2012, 2017; Farah, 2012; Fatma, 2021; Forawi, 2013, 2020; Kassir, 2013), while others have developed analysis of education policy in the UAE (Samier, 2012, 2017; Maguire, 2012). However, the literature has not yet explored the views of the stakeholders who designed and tailored the science curriculum to in response to global neoliberal and education policies in the region and in the UAE. This study is unique in its context. As a researcher and a science curriculum specialist myself, I was involved in the MoE's science curriculum reform from 2015 until 2019 from K to Grade 12 and had a unique opportunity not offered to any other researcher in the past, namely to collect views from inside the MoE itself. This unique opportunity inspired me to try to reach greater awareness of how globalization impacted our own choices and decision making at the science curriculum level, from kindergarten to Grade 12, and how these choices have shaped higher education outcomes. My task at the MoE is to align the requirements of higher education in science and what we offer to the students at pre-tertiary levels. Does our science curriculum support students' readiness for higher education? Does our curriculum empower the scientific choices necessary for students' future careers at higher education levels? Does our science curriculum empower the students' scientific literacy and skills at a higher education level? These reflections and questions are behind this dissertation's choice of topic. However, it is also important to explore the views of the SCS and SAS regarding this reform project; it is only the curriculum specialists who can identify how globalization has impacted education policy and the current science curriculum choices made as a result of certain strategies.

As a practitioner researcher I agree with Hamilton and Appleby (2009) in that this research aims to improve indirectly science curriculum reform practices at the higher education level through encouraging critical reflection on the part of the SCS and SAS and to inform and challenge the UAE's current education and hopefully enable dialogue between practice and research in relation to science curriculum reform and work-integrated learning employability through a practitioner perspective.

As an insider researcher and a science curriculum specialist involved in science curriculum reform from 2012 and having been an outsider scholar, the complexity inherent in having different levels of status has been acknowledged by the literature, particularly as boundaries between the two positions are not all that clearly delineated (Merriam et al., 2001). As an insider, I am trying in this research to provide an objective point of view in my analysis (Asselin, 2003) as well as communicating an awareness of the substantive contribution that the SCS and SAS have made to the current curriculum document given how they have answered the UAE's global requirements and local policy needs. Although I doubt that there is total neutrality in all the statements that I have collected from my colleagues because of the relationship I have with them (Rose, 1985, p. 77). After leaving the MoE in 2019 and moving pursuing education consultancy and education projects locally and regionally, and given my positioning in the current research, I am an outsider who is collecting data from the SCS and SAS, and answering the current study's questions. This position has allowed me the distance to reflect even more deeply on my current role and using a different lens to reflect on the SCS and SAS responses (Dwyer & Buckel, 2009). In other words, as an insider researcher I gathered data with my eyes open and now that I am outside the organization I can say that I am not sure I know everything that is happening in the same institution as things have changed substantially from 2019 to 2022, particularly after COVID-19, the establishment of the Emirates Schools Establishment in 2021 and the three federal independent ministries of education in 2022. After

the COVID19, The Ministry of Education announced the ESE that will operate all schools and in 2022 the same Ministry has re organized its structure into adding to the ESE two other federal entities independent that oversees early years and quality assurance all three : ese, early years and quality assurance entity will report to the Royal Office of Abu Dhabi.

From the perspective of accessing the data and creating the opportunity that allowed for the data collection, I am an insider. In terms of the discussion and analysis of the data findings, I am more both insider and outsider as I am implicitly oriented to seek answers to questions that I myself had during the active work on the science curriculum reform. Bartunek and Lewis (1996, p. 61) call that a kind of "marginal lens" with which to examine the subject matter; experientially and although it requires maintaining tension and a distinction between the standpoints (Merriam et al., 2001). In particular – and as advised by Merriam et al. (2001) – reconstruing one's insider/outsider status in terms of one's positionality vis-a-vis the MoE and my colleagues' class, gender, culture, and other factors, offer me better tools for answering the dissertation's qualitative research questions. Furthermore – and in line with Adler and Adler (1987) – I have shared at a certain point the same deadlines and pressure from authority as my colleagues revealed in their responses, while questioning the real values and goals of the science reform and its rationale which make up this practitioner-framed research. As many researchers have discovered, fieldwork has no substitute where positionality, power, and reflections are personally encountered in sometimes unanticipated – and oftentimes subtle – ways (Merriam et al., 2001). For many UAE practitioners the very flexibility of the practices associated with this part of the science curriculum has proved attractive during the reform, but the assemblages we drew on in trying to make sense of the science reform from the SCS and SAS stakeholders' point of view through collecting their responses are unique. I do not claim to have developed an empirical quantitative analysis but instead have used a qualitative approach to open up this research topic for other practitioners and for myself. I still need to

assess and measure quantitatively the impact of the science curriculum reform itself on the students and teachers' cognition and skills and it is better to choose the experts who worked on and implemented the science curriculum document at pre-tertiary and higher education levels while measuring the students' performance not only through EmSAT and CEPA but also to come up with a tool designed to tailor the curriculum.

This study is unique as it is based in an era of change in both science education and the status and role of the science teacher in the UAE. The UAE's science curriculum reform has suggested an overhauling or "reconceptualization" of the teaching profession's identity as well as establishing new job description requirements for UAE teachers (Anggraini, Jumiarni, & Ekaputri, 2021). The curriculum reform required by higher education brought saw the emergence a new pre-tertiary perspective on instructional pedagogies in terms of design thinking, STEAM, online teaching, lesson design, as well as development and planning for science subjects. This was designed and worked on from early 2015, starting from building the science framework through to localization and learning outcomes implementation (Ridge et al., 2019). The new education concepts implemented in the science curriculum design during the reform follow current blended learning and technological advances in relation to science, in the content implementation technology in the form of digital resources, and the use of technology to access a global library of resources (Anggraini, Jumiarni, & Ekaputri, 2021). The new standpoint education involves the introduction of e-learning content aligned with the curriculum's scope and sequence as well as offering devices to both facilitate communication and for students to easily track their progress (Anggraini, Jumiarni, & Ekaputri, 2021). Hargreaves (2003) states that in relation to global needs, teachers are "failing to meet the challenge [of creating] new professional knowledge" (p. 15). Some UAE students – like most of the present generation – look differently at their teachers' profiles and consider them as poor role models (Cutri & Mena, 2020). UAE students comment that teachers must be more

competent in terms of adapting to a socio-cultural context that is different from their own and need to more open to learning about the second culture they teach within (Kaviani et al., 2021). Teachers who intend to implement the new curriculum reform should be trained on the latest global education changes and the unprecedented levels of teaching and learning innovation (Cutri & Mena, 2020). Teachers' preparedness is essential for success and yet a core challenge that faces any reform and impacts on the effectiveness of any curriculum implementation (Cutri & Mena, 2020). Science teachers in the new era must promote professional knowledge and economic growth in a globally competitive society, but also achieve the delicate balance of helping the younger generation to appreciate their cultural heritage while simultaneously preparing them for a world in which new skills are at a premium (Omar, 2021). Teachers in the UAE will better validate their professional knowledge regarding the surrounding culture while sharing their own experiences with objectivity and transparency (Kaviani et al., 2021). Teaching and learning are considered the penultimate positive pedagogy that articulates a well-designed curriculum (De Lissovoy, 2013). Pedagogy is essential to teaching and learning inside the classroom. In a broader sense, it also plays a crucial role in transmitting dominant ideologies and notions of national and cultural identity through the reproduction and maintenance of discourses and languages (Bernstein, 1999).

Finally, it is important to acknowledge our own theoretical positions and values in relation to this qualitative research and how we translate its uniqueness and rationale. I do not subscribe to a realist view of qualitative research whereby I will simply 'give voice' (see Fine, 2002) to the participants but I will try to discuss these findings based on earlier research and identify their extension to further science curriculum-based research, specifically in education and higher education science reform policy. As Fine (2002) argues, even giving voice to the participants "involves carving out unacknowledged pieces of literature and text evidence that scholars select, edit, and deploy to border their arguments" (p. 218).

CHAPTER TWO – LITERATURE REVIEW

2.1 Neoliberal Globalization and Its Impact on Education in the Middle East and the UAE

2.1.1 An Overview of Neoliberal Ideology

The following section will take us back to the three eras that globalization has gone through, using Friedman (2005) to identify which era of globalization we are experiencing at the moment. Thomas Friedman (2005), in his book entitled *The world is flat*, divides the history of globalization into separate phases and explains these based on "glib phrase-mongering" rather than on reasoned analysis (Hertz et al., 2005, p. 122). He argues that each era led to the next and lists them as follows: Globalization 1.0 (1491-1800) involved countries' initial globalization; Globalization 2.0 (1800-2000) relates to companies' globalization; and finally, Globalization 3.0 (2000-present) is characterised as "the globalization of individuals". In addition, Friedman is the first American journalist and author to use the term "golden straitjacket" as a phrase to describe the inevitable effect of globalization on policymaking and human progress (Haugerud, 2005; Lewellen, 2006; Baldwin, 2019), explaining that the global set of policies implemented worldwide is imposed by a neoliberal ideology that, supposedly, will let off local markets from government oversight in favour of private sector global institutions and international markets (Lewellen, 2006). Friedman further explains that our present century belongs to his Globalization 3.0 where, along with changes at economic and political levels, globalization imposes changes that touch on social, cultural, political, and economic aspects of our lives (Carter, 2008). I believe that the contemporary era is marked by globalism (Hošman & Baldwin, 2020), a phenomenon that creates a convergence of in-country powers while reflecting an "increasingly hegemonic homogenization" as observed by Carter

(2008, p.617). There is a need for us to answer whether we are in the era of Globalization 2.0 where companies are global and where individuals follow companies' needs (Baldwin, 2019).

Anthropologists have questioned the validity of Friedman's claim that globalization is an inevitable fate and that everyone who objects to the forces of globalization will be left behind (Hertz, 2005). Later in his articles Friedman invites the public to come and join the Lexus group of elites created by globalization and follow the neoliberal economic ideology that will make each elite society even richer (Hertz et al., 2005). Anthropologists have criticized Friedman's assertions and objected to his definition of the neoliberal movement as a tool for inequity while its primary goal is to remove social inequality and offer equal opportunities for all (Hertz et al., 2005). Globalization has created two complicated challenges for youth to face: firstly, the drive for prosperity and development is a dilemma for the young, who either do not have the economic means to take advantage of opportunities or who do not enjoy sufficient government support or resources; and, secondly, due to the need to preserve and protect traditions as well as sociocultural identity in the light of globalisation (Blomgren, 1997; Friedman, 2005). These two dynamics are globalization's double-edged sword, namely, the need to reconcile economic as well as socio-cultural factors, an issue that bedevils any reform in a developing country, especially in relation to education policies. Indeed, education policy reform affects curriculum frameworks as well as pedagogical practices and this includes – rather inevitably – scientific subjects. Al'Abri (2011) and Maguire (2002) agree with Friedman (2005) – perhaps some of the few academics who do – that globalization is "obviously" happening (pp. 262-263) as "inevitable forces and processes" leading to scientific and technological innovations (Friedman, 2005, pp.6-7; Al Abri, 2011, p.492; Maguire, 2002, p.263). At its most general, globalization implies a heightened form of time and space, where globalizing labour markets impact on the national and the local, where all is made possible and irresistible by the means of new technologies and new communication capacities introduced

into the marketplace (Maguire, 2002). Adding this to a deregulated labour market accelerates the movement of capital beyond national borders and regulatory systems (Carter, 2020; Maguire, 2002). Instead, Barnawi (2012) suggests that we are drifting towards a re-globalization that goes beyond the third wave of "Globalization 3.0" coined by Friedman (2005). Barnawi (2015) continues that, given the evolution of human logical reasoning, a global postmodern has emerged and a displacement towards global imperialism that determines individuals' choices. Friedman (2005) explains that in the era of Globalization 3.0, individuals choose their career path, select the information they are interested in from books or digital media resources, wear clothes they wish to, and decide which food they wish to be served as per their local culture and habits, or based on their geographical position and their socioeconomic status. Nevertheless, it is not just the country they belong to that acts as the factor that determines their choices and growth, but it is primarily the new cultural values acquired through globalization that causes a displacement of old social and cultural practices (Barnawi, 2012).

Moreover, market laws are now often ideologically dominant, including the demands, offers, and competitiveness that affects human interactions and education – whether formal or informal – which are not easily measurable in terms of quantifiable market values (De Lissovoy, 2013). As a consequence, social relationships based on the market, market competition and efficiency reshape a state's socio-cultural practices and behaviours, thereby leading to a profound disconnection from one's roots to answer the plethora of global market needs and demands that are considered the absolute dictator of individual choices (Bornawi, 2012). In particular, the tradition of understanding ideology in schooling – specifically at the pre-tertiary level – in terms of common sense production (De Lissovoy, 2013) and "mass collectives" (Khan et al., 2021, p. 20) overlooks ideological forces in different countries' contemporary education structures and the procedures of standardized assessment and scripted

curriculum design. This reflects the tendency for neoliberalising forces to expect education and public life to incorporate the former's main elements – such as graduates or outcomes – as either inputs or products (De Lissovoy, 2013). This infers that, from the neoliberal perspective, value in the field of education must be demonstrated through scores and numbers on the basis of quantitative and standardized measures.

2.1.2 Revisiting Higher Education Reform in the MENA Region and the UAE

Reiser and Davies coined the phrase 'globalization' in 1944 to refer to the integration of societies in a global context in light of the removal of geographical, legal, and political constraints (Scholte, 2000). In the contemporary era, the process of globalization has become attractive to politicians, policymakers, businesspeople, social workers, academics, and researchers (Merriem et al., 2001). The global education reform movement (GERM) emerged from the interests of supranational development agencies and has precipitated the ascendancy of high stakes accountability regimes in educational systems across diverse socio-political jurisdictions (Sahlberg, 2010; Clark, 2012). Consequently, the overarching impact of this movement's ideological underpinnings has undermined concerns about promoting a social democratic vision and a social justice discourse in education policy and practice, including more equitable educational outcomes to encourage learner diversity (Sahlberg, 2010; Hargreaves & Shirley, 2012). In education, the adoption of globalized policies is seen as espousing values and styles of social interactions imported through the recruitment foreign student and subsequent socialization (Dennis et al., 2011) into models and theories often reinforced by acclaimed accreditation bodies such as the OECD (Altbach & Knight, 2007), in other words reflecting an implementation of a "hidden curriculum" (Giroux & Purpel, 1983, p. 10).

Globalization is relevant to the higher education (HE) context, and the central focus of its process is on modern technology and the advanced sciences, where individuals' growth depends upon their level of specialized knowledge and skills (Baburajan, 2011). If we look back at how authors have viewed globalization (Dennis et al., 2011) they have largely related globalization to business growth and how the process of this business can have an international influence while operating on an international scale (Wu, 2014). If education is the chosen product of business and science is its medium, then return on investment is guaranteed, especially if barriers are opened to rapid expansion. Al'Abri (2016, p.55) explains that globalization, which moves beyond the mere free movement of people (Carter, 2020) is thought of as the accelerated and free movement of services, capital, ideas, and knowledge across national borders; he continues that globalization uses new technologies to facilitate this interconnectivity. Science and technology play a significant role in globalization as a tool and as a medium, which explains the rationale for choosing science curriculum reform as the focus of the current study. The need to move towards science, technology, and engineering on the part of Western HEIs has led to more mature practices in relation to fostering student learning, curricula, processes, and organizational strategies, all of which have been studied, benchmarked, and imported by many countries seeking to make rapid progress in their education reforms (Dennis et al., 2011). This underlines the need to explore the impact of globalization on the UAE curriculum not only at a HE level but also to examine its roots, namely, is it a science curriculum that is locally tailored or is it an imported ready-made document based on western higher education practices; if it is locally tailored, then there is a need to explore the stepping stones of the UAE science curriculum reform from its pre-tertiary basic education level. That implies that in order to understand the higher education science and technology reforms, we need to explore the science curriculum reform at its pre-tertiary levels

and understand the rationale behind the new tailored document and its implications for higher education in the UAE.

Nevertheless, all variants of globalization share some common denominators that drive and lead to what is now universally known as a global trend, including in relation to science, technology, and social media (Pohlmann et al., 2013). Another common denominator is cross-border flows, where the products flowing through borders differ between countries (Pohlmann et al., 2013). The nature of these products has evolved throughout three eras of human history and impacted us today, eventually reaching education as a tool for cultural change in different countries (Pohlmann et al., 2013). Pipia (2017) and Al'Abri (2016) have warned of the danger implied by the free movement of globalization, defining the latter as an unstoppable force that shows no signs of slowing down anytime soon, one that creates inequality in a given society while simultaneously reshaping its cultural patterns. Although education reform is a fundamental process that comes with glocalization, its implementation is not uniform in terms of providing educational curriculum and resources to impart the required knowledge and skills (Baburajan, 2011; Peterson, 2001). Goals, functions, and consequences of globalization for HE reform have varied from when globalization was set in motion in the early 20th century and throughout the 21st century (Baburajan, 2011; Peterson, 2001).

2.1.2.1 Globalization's Impact on Higher Education Reform in the UAE

HE has been defined by the United Nations Educational, Scientific and Cultural Organization (UNESCO, 1996) and the OECD (2002) as education imparted by colleges of technology, universities, and post-secondary institutions. More recent studies have pointed to the HE role in the Arabian Gulf states to transform the oil-dependent society to a knowledge-based economy by "increasing labour market nationalization, reducing youth unemployment, reducing the emigration of highly skilled labour, reducing currency outflows caused by

nationals studying overseas, and by contributing to the creation of more highly diversified, knowledge-based economies (Dennis et al., 2011). The UAE is committed to inculcating high level research and higher education and has assigned a department only concerned with HE and science research which is a concrete indication that the UAE's government is placing HE at the heart of the country's competitiveness. The UAE's National Qualifications Authority (NQA) and the Emirates Competitiveness Council (ECC) have hitherto acknowledged some challenges that needed to be addressed in HE in order to meet UAE2021's vision and mission (Ridge et al., 2017). The UAE's Commission for Academic Accreditation (CAA) in 2012 revealed that fifty percent of the country's HE students choose a degree in business or engineering.

Peterson (2001) states that the globalization of HE is the answer to all challenges, while Baburajan (2011) explains that globalization of HE is inevitable in the UAE for several reasons: Firstly, the nature of its economy, labour market, and demographic structure are powerful forces. The oil expansion in the mid-20th century transformed the UAE into an oil-based economy while the lifestyle of the Emirati people, previously based on fishing, the cultivation of dates, and nomadic animal husbandry, switched to rapid industrial and economic development, leading to an influx of global businesses and industries, i.e. EXPO2020 in 2021 as well as the more general opening up to the education global industry (Kamal, 2018; Globalhighered, 2008; Nydell, 2002). Secondly, the tiny population of the UAE, with its relatively poor levels of higher education, meant that the state was largely inadequate in terms of meeting the growing demands of a rapidly expanding industrial economy (Gill, 2008). The need to move towards globalization and global profiles is related to the global need of the job market: i.e., globally oriented firms and international institutes seek highly skilled professionals. Therefore, the HE graduates need to be ready for the global world job demands and to answer the UAE's competitive vision and mission as well as part of the country's

mandate (Gill, 2008). Therefore, the globalization of tertiary education (TE) is necessary in order to meet the needs of the UAE's expatriate workforce as their children do not have access to federal schools (Baburajan, 2011). Adding all these variables together reflects the need to establish private and foreign tertiary educational institutions (TEIs) to cater to the expatriate community's HE requirements while supporting the UAE's local economy (Globalhighered, 2008). This support, however, might not be the only reason behind HE reforms. Sixty percent of the UAE's academic scholarships are in the health sciences, engineering, and business, while there is a need to re-visit the science curriculum at the basic school level as students lack scientific methods and critical thinking skills (Sebihi, 2014); the belief is that curriculum reform will close the gap in higher education if it addresses the gap between soft and technical skills, and if professionals and academics are willing to address these challenges.

The main challenge facing HE in the UAE is the high level of boys dropping out while still in their primary schooling (Ridge, 2009). Table 2.1 showcases that in 2007 many Emirati boys did not reach the HE level because they dropped out of schooling either in Grades 10, 11, or 12. Major factors might be behind the rise of school dropout levels: it might be because of the quality of the education delivered or family and cultural practices that burden young Emirati men such as farming and agriculture. Other factors might include the curriculum's content and scope, its quality, effectiveness, and authenticity given UAE students' profiles and their social status (Ridge, 2009). The World Education Forum (WEF, 2018) report states, "Quality in HE and training is important for economies that wish to move up beyond simple production processes and products" (p. 33). This explains the need to oversee the impact of globalization on the curriculum reform from the basic school level upwards in order to explore the rationale behind the changes made and to determine if these changes actually answer the given society's needs. Based on the indicators used for the GCI, the disparity in male tertiary enrolment levels suggests a cause for concern. Inequality can be cited as another reason behind the pursuit of

HE curriculum reform in the UAE. The country's social reforms can be seen as a consequence of the exceptionally high mobility of capital, finance, trade, labour, industry, resources, its cultural values and identity, and the knowledge that affects a country's economy and its management (Maguire, 2002). The UAE's education distribution reflects a small population of Emirati and a majority of expatriates living between a medium to a high-level economic range yet receiving the same education opportunities. That might infer that education is offered for free and the quality of education is assured and directly proportional (Baburajan, 2011). I use the word "proportional" to infer that the foreign providers in the UAE offer HE at a very high cost, making higher education an expensive and marketable commodity that endangers highly esteemed Arab values. Essentially, the globalization of HE has been seen as challenging and undermining the unique cultural identity of Emirati society instead of preserving and promoting it (Baburajan, 2011).

Table 2.1. Dropout rates in the Emirate of Ras Al Khaimah, 2006-7 (source: WEF, 2018)

Reason	Grade 10		Grade 11 Science		Grade 11 Arts		Grade 12 Science		Grade 12 Arts		Total Number	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Absent	148	14	5	1	22	5	7	1	34	2	216	23
Work	25	0	1	0	8	0	0	0	10	1	44	1
Marriage	0	10	0	1	0	5	0	1	0	9	0	26
Sick	0	1	0	1	0	1	2	0	1	0	3	4
Total (% of students)	14.2	3.8	3.3	1.4	5.6	2.5	3.0	1.3	8.2	2.0	14.0	2.5

Source: UAE Ministry of Education, Ras Al Khaimah Zone, 2007

Note: Studies on school quality in the UAE found boys' schools to lack in warmth, creativity, and engagement, with teachers expecting little from students and giving back little in return (WEF,2018).

2.2 UAE Education Policies and Their Impact on Curriculum Reform

2.2.1 Curriculum History and 2030 Future Trends

It is essential to understand what the word 'curriculum' means in the first place as well as discussing Curriculum 2030 and its main trends and themes. Curriculum as a concept includes three components that start from the intended curriculum's strategic design, its implementation and, finally, what has been attained by students; all three components work together (Farah & Ridge, 2009). In its general sense, the curriculum includes all the principles that underline the education content, goals, philosophy, and how to approach such principles in the learning environment while implementing these learning outcomes (Kassir & Forawi, 2019). Curriculum reforms influence and improve the dimensions of science education practice when it comes to issues of content depth, range of perspectives, and expectations in relation to students and their perceptions of self (Beacco et al., 2016). Curricular issues have now become the main driver of each reform and have redefined standards at different levels of the educational system ranging from the national/regional (macro), school (meso), class, teaching

group or teacher (micro) levels respectively. These three levels need to interact with curriculum planning while the latter has to engage social groups as well as the values of a given society (Beacco et al., 2016). Therefore, comprehensive decisions when it comes to designing curriculum content and strategies ought to be made at the national level in order to develop a strategic macro vision while tailoring the national curriculum to global requirements. This helps to define the main purpose of learning outcomes and the main curriculum (Elmas et al., 2014; Wu et al., 2015). In 1972, the UAE's Ministry of Education (henceforth MoE) functioned as a central education authority to oversee and develop education policies for all schools (Ridge, Kippels, & Farah, 2017). From 1972 until the present, the MoE oversees education policy reform and empowerment and improves educational practices (Kassir & Forawi, 2019). The evaluation of the quality and efficiency of the curriculum is assigned to professionals in HE, SCS, and SAS in primary schooling to carefully monitor classroom practices (Kassir & Forawi, 2019). Further, students' expected outcomes and performance skills are assessed to highlight their learning and to determine what skills they have developed throughout their journey.

Formal education was introduced in the UAE in 1953 when the first Kuwaiti educational mission was established in the Sharjah emirates, considered now as the country's capital of literature and knowledge (Ridge & Farah, 2017). Following that, schools were opened across the UAE with the support of Kuwait, Bahrain, Egypt, Qatar, Saudi Arabia and other countries' funding. Typically, the same countries staffed these schools with same texts and curricula of their home countries (Suliman, 2000). Table 2.1 shows some of the broad curriculum changes that have taken place over the past seven decades in the UAE while identifying the exact timeline of curriculum changes dealt with in this thesis (2015-2021). Despite the establishment of the MoE in 1972 as an independent authority, pre-tertiary and schools in the UAE have continued to follow a large assortment of different curricula with

diversified standards, which are borrowed mostly from neighbouring countries (Suliman, 2000). It is only in 1979 that the MoE launched its National Curriculum Project to create a single Emirati curriculum, which only came into nationwide use in 1985 (Ridge, 2009; Suliman, 2000). Since 1985, the word "curriculum" in the UAE context refers to official textbooks, or what is called "the intended curriculum", rather than a framework or set of standards outlining skills or learning outcomes a student should acquire in a particular grade or subject (Ridge & Farah, 2017). This means that teachers have been dictated to regarding what they can teach and restricted in terms of moving away from the textbook in order to centralize the assessment paper (UAE Policy, 2016). In 2012, the UAE launched a curriculum that targeted students in Grades 6-12 with a strong focus on mathematics and science (Ridge et al., 2017). The initiative planned to have students take the Advanced Placement (AP) examinations (UAE Ministry of Education, College Board; Cox, 2017). One of the main education challenges facing the UAE's stakeholders relates to recruiting qualified, bilingual teachers and this has raised concerns on the part of parents and members of the Federal National Council (FNC) regarding how the shift to using English as a medium of instruction will lead to a decline in children's command of Arabic by imposing a foreign language and a foreign curriculum upon Emirati children (Habboush, 2009). In 2015, the initiative of empowering schools with English as a medium of instruction and adding science in English was discontinued, and schools returned to the MoE's national regular curriculum and a different reform perspective was initiated; this is where the current study has its focus and the MoE curriculum department took the lead in executing the future UAE science curriculum framework.

Table 2.2 UAE Curriculum Reform Timeline, 1953-2020 (Ridge & Farah, 2017)

Year(s)	Curriculum Development
1950-1970	• A variety of curricula brought from the original countries of schools, such as Bahrain, Egypt, Kuwait, Qatar, and Saudi Arabia (Ridge, 2014; Suliman, 2000)
1971-1990	• Largely based on the Egyptian model (Findlow, 2001) • Two track system: arts and science • Arabic was the language of instruction • In 1979, the National Curriculum Project started and a national curriculum was implemented nationwide by 1985 (Ridge, 2009)
1991-2000	• In the 1990s, the MOE partnered with UAE University to develop a new English language curriculum and extended it across all grade levels (prior to 1991, a foreign-produced English language curriculum was used) • In 1994, Model Schools were established (Shaheen, 2010) o These used English as the language of instruction in scientific subjects and mathematics and also emphasized the use of new technologies • By 1994-95, all secondary schools taught computer science (United Nations Educational, Scientific and Cultural Organization International Bureau of Education [UNESCO-IBE], 2011)

2001-2010	• In 2007, the *Madares Al Ghad* initiative was launched (see Box 1)
	  o English used as the medium of instruction for science and mathematics, plus additional hours of English (Layman, 2011)
	• In 2010 in Abu Dhabi², the New School Model was launched
	  o Bilingual instruction in Arabic and English
	  o Reduction in number of subjects, heavy emphasis on science, technology, engineering, and mathematics (STEM) (Pennington, 2016a)
	  o Emphasis on developing 21st century skills (Pennington, 2016a)
	  o Later renamed the Abu Dhabi School Model (ADSM) (Pennington, 2015)

2011-2020	• In 2012, the Mohammed Bin Rashid Smart Learning Program (MBRSLP) was established (Dubai Government Authority, 2012)
	  o Emphasis on technology
	  o Aim to provide all Grade 6–12 students with tablets and teachers and principals with laptops by 2019
	• *Madares Al Ghad* program discontinued in 2015 (Jonny, 2015)
	• In 2016, MOE introduced new subjects and created new streams (WAM, 2016)
	  o History, geography, economics, and social studies were combined
	  o New subjects introduced: Innovative Design, Health Sciences, Career Guidance, Life Skills, and Business Management
	  o A special 'elite' stream to nurture gifted students introduced³

It is important to identify the role of the UAE MoE Curriculum Department across the curriculum reform timeline. Unlike in most Organization for Economic Cooperation and Development (OECD) countries, the UAE had to wait until 2017 to have an overarching curriculum document that outlined its curriculum goals, standards, or content in its entirety. Overarching curriculum frameworks typically outline the content and performance levels desired for students in each grade and subject (Chapman et al., 2014; Schmidt et al., 2001). Their role evolved from reviewing and approving textbook manuscripts imported from other countries – a fundamental resource for teachers in the classroom – preparing and overseeing assessments and examinations (Ridge & Farah, 2017), to being involved in the curriculum's rewriting and editing its framework. The MoE curriculum department has led the project of partnership with foreign companies to design curriculum content, included the seven-year deal signed in 2016 between the MoE and McGraw-Hill Education to develop the mathematics and science curricula (Sahoo, 2016).

2.2.1 The History of the UAE's Science Curriculum and 2030 Future Trends

Science research studies based on the Arab region and the UAE more specifically have been conducted and offer enough information on the science curriculum reform from teachers and students' viewpoints; from these academic and science research authors I cite Ridge et al., (2017), Farah (2018), Hanadi (2021), Forawi (2019), Kassir (2019), AlTahani (2021), Kamal (2018), Barnawi (2005), Gobert (2019) and Shakera (2020), all of whom have managed to collect views on science teachers' perceptions and gave recommendations on teaching strategies. Other authors have shared their understanding of the impact of policy reforms on Arabic culture and Islam values in the UAE and the GCC, including Al-Abri (2018), Samier (2013), and Al Issa (2019). However, until now, no research has been executed to explore the MoE's curriculum stakeholders' views on the impact of neoliberal globalization on both education policies and strategies adopted in the UAE's science curriculum reforms at a pre-tertiary level and its implications to HE reform. The current study emphasises the impact on individual and on systems of education in the UAE.

Freeman (1984, cited in Macha, p.77) defines a stakeholder as an individual or group of individuals "*either impacted upon by the company or ability to impact on the achievement of its objectives*". The SCS and SAS team include science curriculum specialists and science assessment specialists working on the science curriculum reform, however not all team members are involved in education policy design and curriculum tasks; therefore, not all the team members have a holistic vision of the rationale behind the science curriculum reform. The SCS and the SAS are people who work hard in the MoE to achieve the UAE's national agenda goals and, for the first time in the history of the region's academic research, we are exploring the views of those professionals directly involved in the education national science document from an insider and outsider practitioner researcher perspective. The current study examines how MoE stakeholders have responded to the national UAE framework and managed to

modernize the science curriculum in line with global needs while answering HE policies and national requirements. It is important to mention that most of the education research concerning policies and education reform in the UAE is governed by high levels of MoE confidentiality and is released only through the Prime Minister's Office, which again distinguishes this study from others in the region.

Identifying the key features of the UAE's 2030 curriculum for students is a vital undertaking. Education systems worldwide need to be dynamic and flexible to adapt to the changing requirements of their learners, their social context, and the world around them (Qasimi et al., 2020). Governments worldwide have used the ideology of globalization to justify reforms that affect social, cultural, political, and economic aspects of human lives, ways of thinking, attitudes, and the behaviours of individuals (Maguire, 2002). By the 1970s, many countries started to remove regulations on capital flows to facilitate the globalization process which is guarded by proponents of self-regulation that come with free-market capitalism. Besides capital flows, globalization has offered the opportunity for nation-states' interaction with each other and to be able to express opinions at a global political and economic scale that has led to a surge of "global thinking" (Pipia, 2017). Sharing global ideas between nations involves new concepts and projects that include innovation and technology in education, most notably involving transportation and communication. Due to high levels of consumption and a lack of natural resources, some countries have substituted their petrol/oil consumption with alternative, more environmentally friendly energy sources (Held & McGrew, 2003). Respectively, oil-rich states have started to rethink their over-dependence on exporting petroleum and associated products (Nikolova, Rodionov, & Afanasyeva, 2017). The above global dynamics have affected national-level science, technology, and education policy in a profound way, most notably in the UAE. Education policy has undergone drastic shifts due to globalization; this has been accomplished through diffusion, borrowing, transfer, travel, and

policy convergence (Verger & Novelli, 2018). The UAE had translated worldwide dynamics and job market needs into an education policy that guarantees adequate progress toward a curriculum for 2030, where lessons are learned by looking back at recent large-scale science curriculum reforms from education systems around the world; reflecting a significant positive impact of globalization on education policy progress locally (Qasimi et al., 2020).

A different perspective had been proposed by Giddens (1990) and Sajid (2005), who argue that local and global globalization forces put pressure on nation-states' governmental agencies and limit their policymaking options. Rutkowski (2007) adds that globalization dictates what is written in a given country's policy documents. Three understudied policy design phenomena are observable in MENA region neoliberal reforms (Boagert, 2013). First is the profound shift from state-developmentalism to intrinsic authoritarian forms of neoliberal government; in simple terms, market requirements lead and direct policy reforms toward economic elites (Boagert, 2013). The second is that neoliberalism is the result of a crucial facet of local political agency is that it can shape the country's constitution and values, although this impact has led to the advent of neoliberalism in the MENA region, creating a unique set of principles differentiated from those that exist worldwide (Boagert, 2013). Boagert explains further that this region of the world is unique because the local power is an agent of globalization assembled within a new political configuration, namely, the monopoly of power by certain people, institutions or organizations. The third phenomenon has been explained by Harvey (2005, 2009) and, as mentioned earlier in this chapter, an overview of neoliberal ideology. Harvey (2005) explains that neoliberal globalization has a tendency to set uniform worldwide standards, including in locations as divergent as the UAE and the Ghana Education Service Agency (GES) in the Ghanaian Republic. The country's whole education system is changing its orientation towards more technical and vocational skills building, formulating national policies that work on skills development across the broad spectrum of pre-tertiary and

tertiary education, formal, informal, and alternative education, all in order to regulate and promote technical and vocational education and training and implement skills for transformation and innovation to achieve sustainable development, the latter being a critical area of education reform on the path to a knowledge-based economy (Adu-Agyem & Osei-Poku, 2012).

National and international policymakers regularly define "financial globalization" as a critical factor for education policy design in different settings and areas to cope with globalization's rapid potentiating growth and the benefits that affect every member of society (Baker, Hudson, & Woodward, 2005). However, globalization has weakened higher education with budget cuts and the search for alternative resources, incomes, the commodification of knowledge, the introduction of new accountability norms, and debates over the role of universities in future societies (Porter & Vidovich, 2000). The global financial crisis that touched HE affects not only academic staff but also students. On Tuesday 30 November 2021, at 18.30 GMT, *The Guardian* announced a University and College University (UCU) three-day strike in England because of pension cuts for academics (Byrne, 2021). The situation in other developing and underdeveloped countries is even more problematic. Countries like Hong Kong and Taiwan are pressured to alter their curriculum to meet national agenda indicators, introduce new governance structures, and compete for budgetary allocations (Mok, 2000; Mok & Lee, 2000). The IMF supports some underdeveloped countries' education sectors; others, like Pakistan, are encouraged to involve the private sector in financing higher education reform (Ahmed, 2003). The UAE, like all Arab Gulf countries, suffered harshly during the economic crisis of 2008 and had to act to reform its policies and ensure expansion and adequate resourcing (Kamal, 2021; Carpentier, 2018). In the context of globalization, Bourdieu argues that, in an economic crisis, new education policies need to be put in place that stretch beyond the nation and consider the emergent global policy field in education while reducing autonomy

(Bourdieu, 1983; Lingard et al., 2005). In the context of the UAE, despite being a rich country, the country's leadership put in place a predictive plan to move gradually from being an oil-based state to a knowledge-based state relying on education policy reform translated into new documents and curricula (Gray, 2016). To achieve this primary purpose and guarantee effective HE policy implementation, the UAE has as of 2019 approved a budget of 60.3 billion Arab Emirates Dirhams to support community development, education growth, and healthcare services (WAM, 2018).

Education policies in the MENA region have not received substantial attention regarding education as a vital tool for promoting neoliberal ideology in the postcolonial era (Brock-Utne, 2000; Thiong'o, 1986), and it has not been closely analysed to identify which elements of competition are implemented in the education realm's public and private sectors (Kesley, 2003). The term "migration" is a commonly used phrase in the Gulf region these days. The concept of migration in our present era, a consequence of open barriers and globalization, has changed from temporary to permanent migration and residency in the Gulf states, contradicting a study conducted by UNESCO (2006) that associates permanent migration with European countries and temporary migration with the Gulf states (Nassar & Heba, 2004). The term migration also includes education policies, curriculum documents, and teaching and learning practices (Verger & Novelli, 2018). Existing educational research does not explicitly or comprehensively factor globalization processes into an analytical framework or explain how and why national policies are globally constructed and are increasingly added to a country's national agenda (Verger & Novelli, 2018). What remains clear is that – since educational changes tend to be more intensely focused on local and regional levels rather than on global ones – in order to understand the global aspects of education policy, the complex relationships between globalization ideas and practices along with their dissemination and re-contextualization in national, regional, and local settings still need to be studied (Verger &

Novelli, 2018). In response to this radical and transformative phenomenon, the UAE has steered a new wave of forming policies in institutional agencies, i.e., education, health, science, and technology (Maguire, 2002; Lin, 2018). The impact of globalization on education policy is permanent in that it oversees the effectiveness and quality of teaching and learning worldwide as well as in the context of the UAE (Hanadi, 2021). The UAE has written in its national policy ambitions the requirement for solid cooperation and partnerships between educational, corporate, and government institutions to fulfil national indices (Hanadi, 2021). From the UAE's strategic goals, we discuss the need to fulfil the indicators detailed in international competitiveness reports, and the steadfast desire for the UAE to be featured in the top fifteen OECD countries ranked according to a large scale of measurements in science, mathematics and literacy. It is no coincidence that some UAE Vision 2021 policy requirements are listed in the free trade GATS document, such as English as a core language, entrepreneurship skills, and aligning education with job market needs (Robertson, 2017). Robertson reflects that the need to follow prominent policymakers is another dimension of cultural colonization imposed implicitly on low-income countries wishing to usher in a newly modernized world. In essence, countries that adamantly follow the World Trade Organization (WTO), International Finance Cooperation (IFC), and General Agreement on Trade in Services (GATS) need to have elements of competition woven into their governmental education policy and implemented in both the public and private education sectors (Kesley, 2003). Porter and Vidovich (2000) present a practical analysis of the impact of globalization on higher education policy design and implementation in Australia and the United Kingdom, similar to the UAE Vision 2021.

The UAE has added indicators of neoliberal globalization in into its 2021 vision policies (UAE2021), attempted to organise foreign accreditation for universities and schools, and moved the country's international rankings indicators (Samier, 2020). The UAE's

Centennial 2071 vision requires that the state is number one in the world in education, along with underlining the country's mission to cooperate with the five common goals for globalized education policies (Green et al., 2007): first, high-quality mass education; second, a planned expansion of academic, technical, and vocational education through designated education tracks and linking them to high level market expertise; third, the development of communication skills through establishing international partnerships with the United Nations (UN) and creating ambassadors from its Emirati youth; fourth, the equitable positive expansion of education that positively influences all other affiliated institutions in the region; and finally, investing in the potential of both the official and hidden curriculum of all educational institutions while preserving the UAE's national unity and culture and social cohesion (Green et al., 2007, p. xv). Therefore, knowledgeable and receptive science teachers are the crucial agent in the UAE's policy changes and science curriculum reforms. Teachers have an essential role in designing the pedagogies based on the new policies and they are often considered potential change agents (Lundqvist, 2021; Ryder, 2018; Fullan, 1993; Heijden, Geldens, & Popeijus, 2018). Fullan (2010) argues that reform executions and processes must make sense for those it concerns on an internal and external level.

In addition, Fullan (2010) proposes an essential argument for this section, namely, the importance of aligning the purpose of any reform with what is empowering and functional for the main actors participating in the reform executive process. Changing practices is complex and highly demanding and needs to be related to the potential professional development of the change agents (Ryder, 2018). Furthermore, the examination of neoliberal globalization using the cultural method shows that Emirati society has experienced a collision when balancing commercialism and traditionalism, an impasse that moved neither towards a diverse dilution of societal values and norms nor strictly holding on to the status quo of local traditions (Al-Khazraji, 2009). Consequently, it is expected that the UAE will continue this trend of seeking

the benefits of a progressive, modern, and innovative financial mechanisms and substructure while resolutely preserving a very intense focus on the Emirati cultural heritage, its Islamic religious foundation, and collaborative relationships. This combination of equally ambitious goals has made the UAE one of the most fascinating social, economic, and political success stories in modern history (Al-Khazraji, 2009).

2.3 The UAE Science Curriculum Reform and Changes to Pedagogical Practice

2.3.1 The History of the UAE's Science Curriculum

The science curriculum designed by the UAE's MoE curriculum and assessment specialists is what is a called an "intended science curriculum" from a list of three types of curricula detailed in the research texts (Farah & Ridge, 2009). The intended science curriculum is dictated by the MoE curriculum department to the UAE's public schools called Emirati Schools, and to the private schools that follow the MoE curriculum, initially a US curriculum. In the UAE context, the curriculum equates to textbooks, while teachers follow the textbook to ensure their students' success and do not try to use any other resources while facing school principals, parents, and the wider society (Johansson, 2005). Finally, there is the third type, the expected curriculum, which can be measured by assessing what students have learned from the intended and implemented curriculum (Farah & Ridge, 2009). Although the science curriculum reform – as is the case in all curriculum reforms – should create a natural synergy, whereby changes in science textbooks (the intended curriculum) lead to changes in science teaching styles (the implemented curriculum) and scientific examination methods (the attained curriculum). However, the expected synergy between these three types did happen and some challenges arose from the intentions of the MoE's proposed science curriculum and what has been implemented in schools as a science curriculum document. Therefore, the current

exploratory study will share the views of the SCS and SAS regarding the impact of globalization on the science curriculum reform at its basic levels, including the speed of the reform, its indirect impact on HE, and how education policies as well as global pedagogies have impacted this change. Research has shown that examination is the tool that measures the effectiveness of any curriculum, notably its science variant (Ekins, 2012), and in the UAE the scenario is not different. Therefore, the UAE government has retained a heavy focus on testing science textbook content up to the present moment, whereby – and even if they do not wish to do it – students essentially need to memorize some amount of content and are required to acquire science-related skills (Shaker & Saleh, 2021). This type of process handed down by elite stakeholders discourages science teachers in the long term from embracing new student-centred approaches to science teaching as they have a heavy content load to cover (Hanadi, 2021). Table 2.2 shows the UAE's current intended, implemented, and attained curriculum structures drawn from Ridge and Farah (2017), which offers a glimpse into the science curriculum reform's philosophy.

Table 2.4 UAE curriculum types (Ridge & Farah, 2017)

Type of Curriculum	Description

Intended	• *Ministry of Education Strategy 2010 – 2020*
	• Guiding documents and resources
	  o Common national examinations
	  o Subject syllabi
	  o School textbooks
	  o Student and teacher workbooks (laying out standards, activities, strategies, expected outcomes and tools for teaching and assessment)

Implemented	• How teachers teach
	• What teachers teach
	  o How content is presented
	  o Materials or pedagogical approaches used

Attained	• What students have learned, as measured by:
	  o Three MOE examinations a year[5]
	  o End of term student reports, which have weighted numerical subject grades based on teacher assessments and MOE examinations
	  o Common Educational Proficiency Assessment (CEPA) for Grade 12 students only[6]
	  o National Assessment Program (NAP) in Grades 3, 5, 7 and 9 to assess for Arabic, English, mathematics, and science (UAE MOE, 2015; UAE MOE, 2017)[7]
	  o International assessments: Trends in International and Mathematics and Science Study (TIMSS), Programme for International Student Assessment (PISA), and Progress in International Reading Literacy Study (PIRLS)

Knowing that, in 2016, the MoE curriculum department signed a seven-year contract with McGraw-Hill Education to produce a science education textbook that includes engineering education – an element new to the UAE science curriculum – aligned with the new NGSS curriculum standards that can support UAE students to compete in the Trends for International Mathematics and Science Skills (TIMSS) (Sahoo, 2016). Whatever the curriculum type, domains and strands, its learning outcomes will focus on the knowledge built through the curriculum document but as educators we are invited to build constructively on this knowledge so it can be a tool for reflection and lead to changed mind sets and more independence in learning, while not functioning as a tool for rote learning (Ryder et al., 2021; Kassir et al., 2019; Shaker et al., 2021). Changes in education systems do not happen in a vacuum, while economic, social, cultural, and policy variables all impact pre-planned reforms (Hairon et al., 2018) and are not experienced in an identical manner in different countries. Table 2.5 explains the future reform curriculum trends in different countries and their focus, including the UAE. Curriculum trends are key and interrelated and of equal importance for any curriculum reform, including the science subject of our exploratory study.

Table 2.5 Future Curriculum Trends (OECD, 2019)

Future Curriculum Trends	Explanation
Interest-driven and personalized learning	Emphasizes students' choices and voice in their learning experiences (Copper, 2017)
Lifelong Learning	Lifelong learning skills, personalized that supports transition between jobs and to adjust to changes (OECD, 2018c).
Digital delivery	Open educational resources that enable access to teaching and learning experiences and offers accessibility and equitability to learners (Koenig, 2020).
Infusion of innovative pedagogies	Facilitate experiential learning and computational thinking learning experiences through student-centred approaches and innovative pedagogies (World Economic Forum, 2020; Istance et al., 2019)
Integration of skills in the curriculum	Establish connections between content knowledge and the skills building to meet needs and demands of evolving industries (e.g., Bates, 2019; Partnership for 21st Century Skills, 2009; Chase, 2020).

Note: the above curriculum trends include the internationally required skills in science and technology over the timeline of the curriculum reform. This lead us to the conclusion that the OECD (2019) future trends in any curriculum has to follow scientific ways of knowing in any curriculum reform

Any type of discussion around the nature of curricula and its philosophical direction needs to focus on the knowledge, skills, attitudes, and values needed for the 2030 student's profile (OECD, 2019c). Curriculum 2030 includes four types of knowledge that need to be included in the reform (OECD, 2019a), notably in the science curricula: disciplinary knowledge, interdisciplinary knowledge, procedural knowledge, and epistemic knowledge as per Figure 2.1.

Figure 2.1. Curriculum knowledge (source: OECD, 2019a)
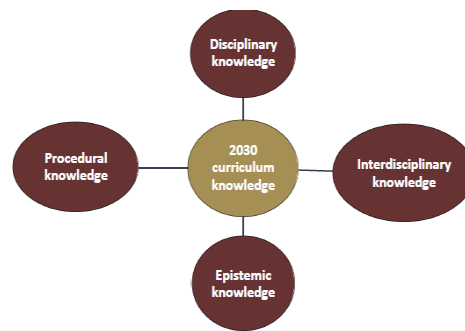
The new science curriculum in the UAE needs to be designed to include the disciplinary knowledge advised by the OECD (2019a) to facilitate students' understanding of the world. The HE students' volume of cognitive skills that are built by 2030 is not particular; however, likely, choices of subject-specific content such as science and technology of disciplinary knowledge are impacted by the values and needs of the current local society (OECD, 2019a) and in this case the UAE. STEM education that translates Science, Technology, Engineering, and Mathematics or STEAM, STEM+ art, gives momentum to interdisciplinary knowledge, grouping interdisciplinary themes into key subjects (Al Qasimi et al., 2020). Furthermore, engaging students in real-world learning experiences (Davies, 2019) build their epistemic knowledge and extends their disciplinary knowledge. Finally, any organization's most strategically significant asset is the Know-how identified by the procedural knowledge (Haradhan, 2016) essential to be embedded in any curriculum design and relevant to solve complex problems (OECD, 2019a) for all job types. Overall, most of the reforms explored through academics are keen to keep an eye on the challenges which lie ahead for the global learners, such as technology-based jobs and their requirements, twenty-first-century skills, and holistic multidisciplinary scenarios in their curricula, while keeping the assessments formative and continuous with less emphasis on the summative (OECD, 2019c).

2.3.2 Science Curriculum 2030 Reform Future Trends

To forecast the needed skills in 2030, the McKinsey Group (Bughin et al., 2018) reports high demand for higher cognitive skills, including critical thinking, creative decision-making, and complex information processing (Al Qasimi et al., 2020). Similarly, the OECD (2019), owner of the large-scale science and mathematics measurements tools, forecasts a set of skills needed for the future that include cognitive skills and self-regulation as well along with metacognition and critical thinking, and creative thinking as mandatory for the future workforce (OECD, 2019b). Both predictions, the OECD (2019b) and the McKinsey Group (Bughin et al., 2018), show that soft skills such as social and emotional intelligence skills and self-efficacy, empathy, and teamwork are essential along with hard skills (Prince, 2020). Well, being and practical skills are also crucial for the growth of any society (OECD, 2018d).

The reform of the science curriculum moves away from a knowledge-based pedagogy that fosters knowledge retention to a student-centred one that builds on the skills deemed essential for the 2030 jobs market (see Figure 2.2). Kropotkin advocates that rote-learning need to be coupled with independent inquiry and discovery-based problem solving instead of didactic learning. From the constructivist perspective, the science inquiry-teaching approach emphasizes that the knowledge a student achieves is a part of his/her active thinking, organization of information, and integration and knowledge replacement. Thereby, students are actively engaged in the science learning process, both behavioural and mental, so that the learning can take place (Cakir, 2008; Mayer, 2004). The scientific inquiry is one of the highly recommended pedagogies that interrelates to four factors such as teachers' beliefs, and their explicit and implicit social knowledge and practices (Bryan, 2000) which can support the resistance of curriculum implementation—using science inquiry-based strategies for science teaching and learning dated back to the nineteenth century with Kropotkin (1885, p. 944). Therefore, as a constructivist and a teaching approach, the focus of the science inquiry

permeates much of education, particularly in science education. Kassir and Forawi (2019), in a study on the effectiveness of scientific inquiry as a pedagogical instruction for the Next Generation Science Standards (NGSS) based curriculum, have generated results that show that if science teachers are well-versed in their own content knowledge and beliefs, then these same teachers can negotiate a new science document based on scientific inquiry as the core pedagogical tool. In addition, scientific inquiry increases students' engagement and thus their assessment grades. This promising result of mixed-methods research conducted on UAE public school students tested the efficiency of the science curriculum reform in public schools at a basic schooling level using the science curriculum using English as a medium of instruction offers an *ébauche* regarding decreasing the number of boys dropping out at an early age from the UAE's public schools (Kassir et al., 2019). When students are more engaged with the content, they keep up their attendance and they manage to achieve better grades. The results of the Kassir (2019) study offers us an insight into both the quality of the new UAE science curriculum document as well as its implementation at the pre-tertiary level while offering a glimpse regarding higher education instruction.

Figure 2.2. Teaching and learning models enhancing 2030 curricula competencies and a student-centred approach
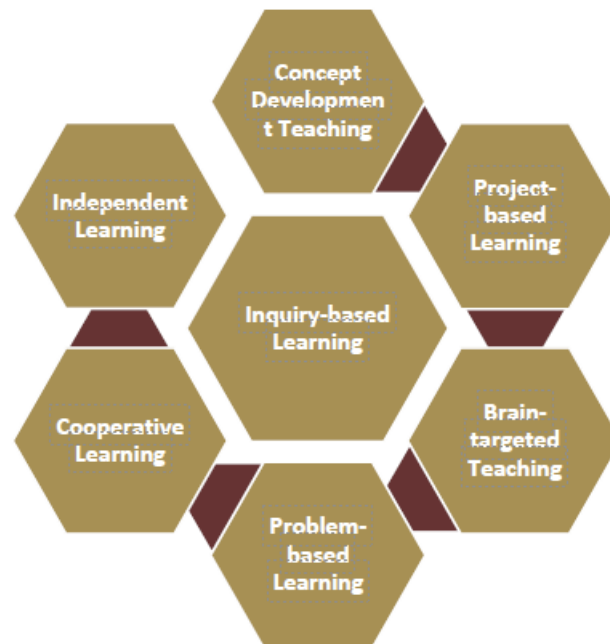
Note: This policy brief highlights the importance of implementing innovative interactive models of teaching and learning. These models offer opportunities for learners to become active participants and become responsible about their learning in order to acquire the knowledge, skills, and competences to compete on global context (Ridge et al., 2017)

In 2013, the US-drafted international standards of science benchmark, the Next Generation Science Standards (NGSS), were released and the UAE embraced the US curriculum in their schools (Achieve Inc., 2014) because, according to research and the NGSS overview, if UAE students followed these standards in science, they would be capable of learning science and improving their comprehension of scientific sophisticated language functions (e.g., providing explanations, arguing from evidence, and developing models). The NGSS represents the latest intended science curriculum reform released by the USA as a reformed science curriculum (National Research Council, 2012). The curriculum reform adds new areas of science and technology, namely engineering and environmental sciences that were missing from their counterparts worldwide (El Gamal et al., 2018; Forawi, 2020). The overall UAE science curriculum is structured based on the NGSS outlook on the content levels needed

for students in subjects and evaluations per the UAE's MoE science curriculum department (MoE, 2019; Al Basha, 2018). The new science education introduced the science NGSS modernized curriculum which focuses on twenty-first-century skills, including problem-solving, critical thinking, and an inter-disciplinary approach to science correlating real-life practice with classroom science experience to replace the old practices of the previous memorization approach (Al Basha, 2018). Students in the new science practice learn the topic with more rigour and in-depth knowledge, making connections between the content by applying knowledge and aptitude beyond the classroom structure (Al Basha, 2018).

The UAE science curriculum reform offers new streams to its old education system such as the vocational and applied technology modules, in addition to elective subjects for low-performing students (Ridge et al., 2017). The vocational and applied streams include business studies and economics topics and empowers digital content areas, which had been neglected previously. In addition to the newly created modules and streams, content has been introduced from early years to higher education with a core vocational and applied stream concept focussed on Information and Computer Technology (ICT). The ICT curriculum framework design introduced at the basic level of schooling is in some ways an extension of the artificial intelligence university project inaugurated in the UAE in 2020 (Samy et al., 2019). Moreover, the government has organized continuous training opportunities and events to introduce digital supplies to all academic and non-academic staff and has gone beyond that to create the Mohammad bin Rashid Smart Government Program (Samy et al., 2019). Moreover, the science reform suggests the 5Es model of scientific methods and inquiry as a pedagogy to follow (Kassir & Forawi, 2019). The modern OECD curriculum keeps pace constantly with global economic, technological, scientific, and social growth (Shakera & Salehb, 2021). Ryder (2015) and Banner (2013) have underlined the significance of science curriculum reform in schools as an unavoidable consequence of permanent change and development in a given country's policy

making while reform is also driven by education governance, scientific inventions, social changes, and technological advances. These key factors are especially crucial for the UAE's science curriculum reform since scientific findings are now prompting acute awareness of the global natural world around us (Koti, 2016).

2.4 Conclusion

The efficiency of a curriculum is measured through its implementation, which is considered the main challenge. The significant obstacle in curriculum implementation is teachers' perceptions, values, and beliefs (Heidenreich & Spieth, 2013; Walkington, 2005). The implementation of each curriculum document is measured through the identifiable impact it has on teachers' work and students' experience in the classroom (Alghamdi & Al-Salouli, 2013; Shakera & Salehb, 2021). The resistance to change that we usually see in teachers, students and parents is due to salient challenges derived from the new curriculum's philosophy and implementation which is either because it is not well embraced by the local community or given that the curriculum challenges local teachers' thoughts, beliefs, and ideologies (Heidenreich & Spieth, 2013). Teachers' beliefs may also be based on their self-image and identity as well as the extent to which they feel part of the education system they serve and if their own values and beliefs are compatible with this system (Eick & Reed, 2002). In addition, science teachers face problems that usually come along with any curriculum reform implementation, such as lesson preparation, insufficient subject knowledge regarding ways to communicate science principles in new teaching methods, all of which affects their ability to form a new cohesive teaching style in a new reform scenario (Elmas et al., 2014). Understanding teachers' beliefs and value structures is vital to improving their professional development and growth (Heidenreich & Spieth, 2013). Throughout the implementation of the NGSS science curriculum in all United Arab Emirates schools, science teachers received

training to unpack and implement the new science curriculum reform; the same scenario has been repeated in Saudi Arabia, Kuwait, and Jordan (Shakera & Salehb, 2021; Simpson et al., 2017). However, the same science teacher who is implementing the newly modernized science curriculum is also the textbook-driven teacher who used to rely on "word by word dictated knowledge" and who assesses students based on Bloom's low order thinking taxonomy and who used to rely on recalling information rather than applying Bloom's or Web's higher order thinking skills (Cyber et al., 2021). Shaker and Saleh (2021) agree with Lundqvist, Lidar and Ryder (2021) in relation to science teachers retaining their traditional perceptions of science teaching during curriculum shifts despite innovative curriculum reform (Heidenreich & Spieth, 2013). Teachers' resistance to curriculum reform is usually assessed through the resources and tools used in the classroom instruction, including lesson planning and inadequate subject knowledge mastery as well as a lack of new pedagogies (Tondeur et al., 2013; Hill et al., 2005) alongside poor quality textbooks (King, 2010). The last of these factors is not the case in the UAE teachers' scenario, namely, not enough training and professional development support (Gibbs & Coffey, 2004).

Even if science teachers in the UAE welcome the new science curriculum and realize its advantages, they still have to face other constraints, such as time limitation versus content overload, students' level of English language literacy and enthusiasm, and teachers' pedagogical content knowledge (Shakera & Salehb, 2021). Therefore, when obstacles to curriculum reform are experienced, some science teachers in the UAE prefer to retain the rote-learning approach (Shakera & Salehb, 2021; Allchin et al., 2014; Elmas et al., 2014). For these reasons, some science teachers – even in the UAE – might not move their scientific classes toward the full implementation of the NGSS three-dimensional approach, which includes: 1) understanding the scientific concept; 2) using this concept to solve problems that are usually encountered in their daily life; and 3) understanding how to connect science concepts to the

real world (Willard, 2020; Duvan; & Cavera, 2015). Thus, teachers' opinions and perceptions of new science curriculum content must be considered when designing professional development that will ensure the successful implementation of the NGSS, thereby impacting on students' learning (Shakera & Salehb, 2021).

Finally, the current chapter has discussed some of the literature on the impact of neoliberal globalization on UAE education policy, which in turn has led to the science curriculum reforms. Furthermore, the current study offers stakeholders a voice with which to reflect on the science reform document and for other researchers to assess the expected curriculum outcomes of the NGSS at pre-tertiary levels, particularly those that impact HE (Al Basha, 2018). Once the expected science curriculum outcomes are assessed at a HE level, academic researchers can determine whether the gap between pre-tertiary and tertiary education has been bridged. Therefore, the viewpoints of science stakeholders during the reform are vital to developing a better version of the science curriculum reform (Beacco et al., 2016; Al Basha, 2018). It can be argued that the globalization of HE has been instrumental in raising the quality and level of education in the UAE in general while the HE curriculum science reform has helped to diffuse advances in education and technology in the country's tertiary education system, thereby helping to create a globally competent Emirati workforce (Baburajan, 2011). Furthermore, it has also enabled unrestrained student and human resources capacity and mobility. However, the science curriculum reform at both pre-tertiary and HE levels has several adverse effects: it is evident that globalization of HE has led to an inflated number of academic universities and institutions in the country, making the UAE's HE landscape an overcrowded marketplace threatened a decline in quality, however the UAE's education policy reacted immediately to that (Baburajan, 2011). The foreign providers seem to have ignored their responsibility to preserve Emirati culture and enrich it as well as to adhere to the collective mind set obliged by the new curriculum reform (Baburajan, 2011; Kamal,

2018). It is imperative that all academic providers of education in the UAE be more proactive

and socially responsible by paying serious attention to preserving Emirati culture.

CHAPTER THREE – METHODOLOGY

3.1. Introduction

The present study explores the impact of neoliberal globalization on the UAE's education policy and how this impacts the pre-tertiary level science curriculum reform from the perspective of its SCS and SAS designers. The study research questions have not previously been studied in-depth, and little academic research exists on this specific topic, namely, stakeholders' views of science reforms in the UAE. The SCS and SAS are staffed by the designers behind the scenes who have led the paradigm shift. For this reason, the current study has an exploratory research design and uses semi-structured interviewing as a data collection tool, a qualitative method which is frequently used in education studies (Divan, Ludwig, Matthews, Motley, & Tomlienovic-Berube, 2017). The focus here is on exploring the views of SAS and SCS staff working on pre-tertiary levels because of their direct connection with the science curriculum reform aimed at Emirati students at the higher education level. The views and perceptions of SCS and SAS staff are explored and interpreted, generating possible insightful explanations regarding how neoliberal globalization could have impacted their lives, their organizations' work, and the UAE's science curriculum framework design. The current research derives recommendations in relation to higher education graduate readiness for the job market based on their level of preparedness achieved at basic levels.

The context of this exploratory research is unique; I am both an insider and an outsider researcher. The impact of insider epistemology is considered determinant by qualitative researchers who are insiders and by those who are outsiders (Dwyer & Buckle, 2009). In this specific context, there is no neutrality, yet there is a lesser or greater awareness of one's biases as advised by Asselin (2003). Regarding the impact of insider epistemology, Dwyer and Buckle (2009) and Rose (1985) have affirmed that within the position of the insider and outsider researcher, there is a greater consciousness of situational identities and relative power. My

positionality in this study is complex; I am, firstly, a science curriculum specialist who is member of the committee for the science curriculum at pre-tertiary levels from early years to senior levels and a STEM evaluator and trainer who has worked on the interdisciplinary approach to science; secondly, an evaluator of the implementation of the new science curriculum in schools; thirdly, a TIMSS and PISA trainer and coder who liaises between higher education needs and what is instructed at a basic level; fourthly, and finally, a project management coordinator who oversees science curriculum department projects and their alignment with national UAE policy. As an outsider, firstly I am a practitioner researcher and currently running my own educational consultancy after I resigned from the MoE in 2020. As an insider and outsider researcher, I need to be sensitive to my formal position even if I was looking to maintain my credibility, so as not to appear to be coercing participation as part of this research. I am aware that I entered this study with my own perceptions and with a need to answer some questions I have noted during the process of the science reform. Throughout the process, I have gone through deep transformative learning myself. Questions that appeared to be genuine and needed answers such as, "Why are we doing this task and based on which factors?" "Is UAE Vision 2021's mission the only impetus behind the science curriculum reform?," "Is UAE Centennial 2071 behind the gap that we have identified between basic schooling and the preparatory year?," "Do the changes we are drafting and implementing in the science curriculum reform really support the HE student's profile?," "Will these transformations help the Emirati student to bridge the preparatory year gap? Throughout the daily discussions in the science department, it seemed to people that, in some instances, the changes and edits we are executing are not compatible with what is perceived as the "best" in Arab and UAE culture – the staff's nationalities are heterogeneous – compared what we used to do in the last decade in education. Keeping these questions in mind and putting them alongside the daily reflections I heard, made me consider going into even more depth and to

identify the impact of globalization on what is being undertaken at a higher stakeholder level. Again, this is unique research as the UAE's MoE observes high level security measures with regards to sharing data and allowing any kind of research studies to be performed on the internal context; with this in mind, the current study marks a turning point in research on science reform and future research in the area.

The methodology sections that follow outline the research paradigm and the main ontological assumptions, and the epistemological route followed. The chapter explains the participants' recruitment and sampling, data collection instrumentation and analysis process, and conclusions reached concerning the ethical issues raised and the measures taken to overcome them.

3.2 Research Methodology

The methodological approach used here is inspired in part by the work undertaken by Bryson (2004) on strategic management philosophy where he emphasizes that any disciplined attempt to create fundamental decisions and behaviours that shape and guide what a society or an institution is, what it does, and why it does it, needs to "explore stakeholders' views of that institution' (p.175). Bryson advises that the first step is choosing the stakeholders; in this study they are those MoE stakeholders involved directly in the science reform process at a pre-tertiary level, and they also possess the exact information needed to respond to this study's questions. Bryson (2004) explains that data from stakeholders in companies undertaking reforms or any other kind of organizational change is essential. The process employed here involved the recruitment of participants and conducting interviews for the purpose of data collection. Participants' recruitment for this current study was undertaken internally and indirectly through an advertisement placed at the Curriculum and Assessment Department's entrance to the

MoE's old building, currently the Emirates School Establishment, otherwise known as the ESE building.

3. 2.1 Exploratory Research Design

As mentioned in Chapter 2, up to this moment, no research has explored the MoE's science curriculum stakeholders' views on the impact of neoliberal globalization on both education policies and strategies adopted in science curriculum reform in the UAE, which means that the study falls under the category of exploratory research design and its unique concept. To define an exploratory design, it is important to understand the phrase "exploring"; it can have different meanings depending on its context. It can be an exploration conducted by inventors developing a product or an idea being pursued via a systematic diagnostic *a la recherche* of something new (Stebbins, 2001). Neuman (2014) asserts that exploratory research explores new areas of study, based on the intention to open doors for further investigation. Kaye and Harris (2017) stress that the commitment to research as a core component of success facilitates values such as trust, openness, and goodwill (Brannick & Coghlan, 2007; Freire, 1970, cited in Caine et al., 2007; McNiff, 2017). Therefore, the current exploratory research – despite the relatively small population size it is based on – will open new routes for evaluation and assessment of higher education related to the science curriculum framework as the Emirati youth who have been instructed through the new science document (Yousaf, 2021). The Emirati students graduating from basic schooling going into higher education reflect the impact of globalization on education policies and the science curriculum framework document, in addition to what has been modified to ensure longer-lasting results, and improved practice through examinations that study the underpinning of different statements or problems in the science framework document (Yousaf, 2021; Denscombe, 2003; Hair Jr., Babin, Money, & Samouel, 2003). To this end, exploratory research is our choice of research because it studies

the owners' views of the change of framework from their perspectives. Therefore, the current exploratory design falls under the interpretivist paradigm and adopts the qualitative methodology that produces holistic understandings of rich, contextual, and generally non-numeric and unstructured data (Mason, 2002). What follows will justify the choice of both the current methodology's design and paradigm.

As a researcher I am trying to answer the question whether neoliberal ideology is behind the science curriculum learning outcomes' editorial decision-making and changes, which I am trying to achieve through the use of an exploratory approach (Stebbins, 2001) and if this has impacted on the way UAE HE policy is empowering students with necessary skills. This exploratory research explores a new education phenomenon in a specific Gulf context about which "enough is not known" (Boru, 2018, p. 3). While there is a longstanding literature on the views of teachers and students on science curricula and their modernization, the current study draws on the views of stakeholders who worked on the science reform document. Exploratory research, at its core, is defined as an attempt to develop original findings by working one's way through a research topic (Swedberg, 2020).

3.2.1.2 Limitations

The current research tries to illuminate neoliberal globalization's impact on policies and education science curriculum reform and the Emirati student profile in the new era. One limitation of the current study relate to the sample size and type (i.e. whether it relates to students, teachers, etc.). The sensitivity of the topic researched here meant that respondents during the interviews were often reluctant to speak about some of the details of the science curriculum reform changes and the real impact of their curriculum design on the higher education sector. This resulted in a need to go back to the UAE education policies' texts to validate the participants' answers. Two out of the five interviewees from local education

authorities mentioned that they could not comment or asked to go off-the-record regarding certain questions that were raised during their interviews. The research is limited as it gives the designer's viewpoint without examining that of the end-user's. Furthermore, the current study is qualitative, which is advisable for this type of research and, as mentioned earlier in this chapter's introduction, a qualitative study has its own credibility and will gain more depth when a quantitative analysis supports its conclusions, recommendations and generalizations, thereby acquiring more credibility through the use of a triangulation or mixed methods approach.

3.2.2. The Exploratory Interpretivist Paradigm

A research paradigm is defined by Denzin and Lincoln (2011, p. 22) as" a net" that includes epistemological, ontological, and methodological premises which brings together the different research components. The interpretative framework determines the researcher's actions and procedures, including the research question(s), the data collection tools, the analysis, and the participants' recruitment.

Leitch, Hill and Harrison (2010) explain that interpretivism is based on a life-world ontology that argues that all observation is theory- and value-laden. They continue by arguing that investigation of the social world is not based on the pursuit of an objective truth detached from its context. Epistemologically speaking, the interpretivist paradigm is based on the belief that humans socially construct our knowledge of reality as main actors (Burrell & Morgan, 1979). Indeed, the paradigm is marked by a need to understand the surrounding world from a subjective point of view as it is and develops an explanation within the frame of reference of the research participant rather than the researcher as an observer of the action (Ponelis, 2015). Furthermore, the interpretivist paradigm is concerned at an axiological level with relevance rather than with rigour (Ponelis, 2015) and is fundamental to understanding the stakeholders' viewpoints, thinking, and interpretation of the world and their reality (Creswell, 2002; Easterby

et al., 2011; Biggam, 2018). The paradigm also tries to understand the phenomenon from the participants' perspectives and not the researcher's, namely their truth as shaped by their experiences and social context (Cohen, 2007; Dewi, 2021), in this case the impact of globalization on education policies and science curriculum reform. This is also an answer to my position as an insider. The SCS and SAS experiences are shaped by the UAE context and the MoE staff interpret the reform process by making sense of the impact of globalization on both education policies and strategies; whatever actions they have taken to change or edit the science curriculum document are a result of their own interpretation of both UAE Vision 2021 and UAE Centennial 2071. Their responses are further shaped by their work environment and backgrounds: SCS and SAS staff are drawn from fifteen different nationalities, making their interpretation of the same phenomenon heterogeneous and enriching the data collection. The SCS and SAS explained their assumptions regarding the impact of globalization on their work and the science curriculum while reflecting on what they used to do in their own country whether different or the same.

In terms of its epistemology, interpretive research believes the research findings should help to understand individuals' interpretations of the social phenomena which they interact with (Dewi, 2021), which inn this case means the MoE where they work and the UAE's national agenda that they need to fulfil. This research study contrasts with the positivist paradigm that assumes that reality is independent of the context and reaches objective assumptions using standardized tools (Dewi, 2021; Creswell, 2009; Saunders, 2009; Neuman, 2011). However, this thesis seeks diversified insights gathered from the participants to understand a situated version of the "truth" by studying the research participants in their local context (Alharahsheh et al., 2020). The qualitative methods used here to collect the participants' views and responses are better suited to this specific research context paradigm. The choice of this paradigm is significant for me as it supports sharing the participants'

responses and understanding the individuals' experiences and how they interpret the world around them (Kivunja, 2017, p. 33), regardless of the fact of my being their colleague or not.

As Ismail and Zainuddin (2013) summarise, the interpretive paradigm is an inductive approach that avoids assumptions by relaying an explanation offered by the participant yet allows room for bias and the extreme advancement of one's own identity (Yanow, 2006). The value of the understanding that emerges from an interpretive study is determined by the degree to which it works and fits with the participants' perspectives, while in the positivist research paradigm, the value of the latter is judged by the degree to which results can be generalized and this is how it is judged as reliable and valid (Glaser & Strauss, 1967). The current study topic is still novel; at this point, it is not recommended to generalize the findings but to stick to exploring the views and offering recommendations. Choosing the interpretivist paradigm aligns with the current exploratory design's objective as it does not focus on generating generalizations. Even the findings generated by the exploratory research within the interpretive paradigm differ from those in the positivist paradigm (Lincoln & Guba, 1985). For these reasons, the interpretivist paradigm is a good choice for the current study, where the main objective is to acknowledge SCS and SAS perspectives on the impact (or not) of globalization on the current changes made in the curriculum reform.

Finally, the interpretivist paradigm makes it a challenging yet gratifying process of seeking responses through the use of curiosity-driven qualitative methods based on open-ended questions (Lincoln & Guba, 1985). The best methodology to explore participants' viewpoints is to use a qualitative process to collect data, and this is what the next section will present. Further, positioning a research study within a paradigmatic structural framework is a worthwhile task that leads academic researchers to "reflect upon their perspective's wider epistemological and philosophical implications" (Perren & Ram, 2004, p. 95).

3.2.3 Qualitative Exploratory Research

The research design is the sum of the procedures used for collecting information, analysing data, interpreting the data reported in research studies, while the research type is defined by its purpose, process, and outcomes (Creswell & Plano Clark, 2007). The current study explores stakeholders' views on the impact of globalization and education policies and strategies concerning the science curriculum document. The current research design collects the views of the SCS and SAS through interviews that cover three areas: first, the views of the MoE stakeholders regarding the impact of globalization on their daily lives; second, their perceptions on how neoliberal globalization impacted both education policy and strategies adopted in the science curriculum design; and third, their views on Emirati student profiles in line with globalization and how all of this has indirectly impacted HE policy design.

Interviewing as a data collection tool is a widely acknowledged aspect of a qualitative methodology (Creswell & Plano Clark, 2007). In semi-structured interviewing, a qualitative research procedure is used to decipher realities based on the participants' responses as in Khan et al. (2021) who explain that realities depend on the participants' attributes and how they react to their environment; hence, working in the UAE's MoE for more than five years is an essential key factor that will reflect a more precise perception of the science reform, on that which makes it a key factor for the selection of the participant. Burns and Groove (2001, p. 374) define qualitative exploratory research as gaining new insights into various contexts in order to reasonably reflect a given reality or realities. The descriptive nature of an exploratory design is used to achieve a greater understanding of a given context (Yousaf et al., 2021). Meyer (2001) has defined exploratory research as providing a detailed description of the participants' experiences. In this interpretivist qualitative exploratory research, we seek the truth by exploring the views of the MoE stakeholders as our focus group, seeking to identify reality by analysing their perceptions. Perceptions of reality can interpreted and constructed via questions

that can identify the existing knowledge on a specific context, albeit with some degree of relativism (Alharahsheh et al., 2020; Bryson, 2003). Data collection and analysis in an exploratory research design depend on the purpose and central question of the research, an implicit critique of positivism, by adopting a perspective that considers that humans can give further depth to the meanings of the phenomena they experience (Alharahsheh et al., 2020; Straus & Corbin, 1990).

Some qualitative researchers are comfortable using dependability, credibility, confirmability, and transferability to share findings of an experimental study using qualitative research's trustworthiness (Bloomberg & Volpe, 2008). Credibility refers to how efficiently the researcher's portrayal of the participants matches the participants' perceptions (Bloomberg & Volpe, 2008). Dependability rests on the data collection and analysis (Lincoln & Guba, 1985) and is demonstrated by explaining that the research systematically studies what it claims to study (Miles & Huberman, 1994). Finally, transferability is concerned with how the study has made it possible for the reader to apply the findings in the situations investigated in similar situations (Bloomberg & Volpe, 2008; Lincoln & Guba, 1985). It is essential to systematically detail all evidence for the reader in order to confirm whether the research findings are data-driven rather than based on the researcher's bias and subjectivity. Finally, transferability is about how the study has made it possible for the reader to apply the findings in the situations investigated to other, similar situations (Bloomberg & Volpe, 2008; Lincoln & Guba, 1985). When planning, conducting and documenting research, attention to trustworthiness criteria – such as to what extent the views of the stakeholders reflect the real context of the science reform – is vital to convincing readers and examiners that the research is high quality (Oates, 2006). In the current study, data is collected using in-depth semi-structured interviews as it serves the purpose.

3.3 Research Purpose

The main aim of this exploratory research is to investigate MoE stakeholders' views on the impact of neoliberal globalization on education policies and strategies adopted in the science curriculum reform undertaken by the Ministry since 2015. The MoE's policymakers and curriculum developers are the people who undertook the reform of the science curriculum and made the edits and changes to the framework document, covering science, technology, biology, chemistry and physics. The data analysis of the information collected through these semi-structured interviews informs and thus improves the macro- sociological processes affecting the micro-sociological practices behind the policy process, based on the knowledge of experts who had experience of the science curriculum reform. Khan et al. (2021) explain that, in exploratory research, participants share their views with the researcher while themselves trying to make meaning and render practical and meaningful experiences to the reader, in this case regarding curriculum reform design and implementation.

Therefore, the research's methodology follows the interpretivist paradigm in which no account is taken, nor judgment passed, on what the participants – specialists in science education – perceive regarding the science curriculum documents, policies, or Emirati students' profiles. The two interrelated levels of the study juxtapose (i) the macro-sociological characteristics of neoliberal globalization in the UAE and its impact on the education system, (ii) the UAE's institutional-level education policy reform as reflected by official documents UAE Vision 2021 and UAE Centennial 2071, both adopting the science curriculum reform, and (iii) the semi-structured interview responses that intersect the professional and personal views of the SCS and SAS specialists at the MoE.

Qualitative research engages in interviews and conversations with the research's participants in a natural setting (Creswell, 2009). The defining feature of the question we seek to answer in this research focuses on 'how' (Myers, 2009) globalization has impacted the

education policies and science curriculum reform and, for this reason, the design is appropriate for a descriptive, exploratory study (Mouton, 2001). Emerging technologies researchers usually use an exploratory research design and applied focus (Barnes, Buckland, & Brancheau, 1992). The exploratory study can describe a global process or processes, group or individual behaviour in its total setting, and, finally, the sequence of events in which individuals' behaviours occur (Stake, 2005). In this study, the exploratory design will describe how globalization has impacted the education policy and science curriculum reform through the curriculum and assessment specialists' responses who have worked in the UAE's MoE setting and how this reform occurred. The following section justifies the choice of the interpretivist research paradigm.

3.3 Research Question(s)

Since education reforms are complex phenomena that involve politics, economics, society, culture, and religion and affect individuals on interpersonal to intrapersonal levels (Mullen et al., 2013), the current research project aims to respond to the following research questions:

1) *What are the views of MoE curriculum stakeholders regarding the impact of neoliberal globalization on both education policies and strategies adopted in science curriculum reform in the United Arab Emirates?*

2) *What are the implications of these science curriculum reforms for higher education?*

3.4 Participants

3.4.1 Sample Choice

The choice of participant in the current study comes under the logic of purposeful sampling, as participants' choices provide rich information about the phenomenon being examined. Indeed, participants' involvement in the research helps to develop 'in-depth understanding rather than empirical" generalizations (Patton, 2015, p. 264). Patton (1990) argues that the logic and power of purposeful sampling lies in selecting information-rich cases to strengthen the depth of the study, from which we can learn a great deal about issues that are important for the research. Purposeful sampling is about practical considerations and the underlying theories used in the study to guide the sampling strategy, thereby helping to produce the best explanations for the phenomenon under study (Emmel, 2013). The dynamic group in the current research has an average value of five years of experience in the MoE. The required minimum experience of five years for SCS and SAS staff is for the following reasons: If the curriculum specialist has an experience of, say, five years, that means that he worked on the science curriculum and was an active agent of the change. It also implies that the given SCS and SAS staff member, even if he is not directly involved in the education policy, is well-versed in its implementation and understands the causality behind the edits to the science curriculum. He has in mind the main goals to achieve in the reform of the essential science education curriculum document was to empower the higher education science curriculum; consequently, the responses will be significant.

Khan et al. (2020) have emphasised past actions and constructed experiences for participants within the interpretivist paradigm of an exploratory research design as constituting "meaningful experiences for them rather than passive experiences" (p. 57). There is a need to know the outline of the participants' backgrounds and experiences to understand their beliefs and perceptions concerning the reform séjour in the UAE. Furthermore, their cultural

backgrounds and experience in other education systems can impact their understanding of the UAE's government policy and how they translate that into a meaningful sequence in the science curriculum design. After choosing the participants, the sample size of the current research needs to support the credibility and significance of the responses.

3.4.2 Participants' Backgrounds

The current study's participants reflect the heterogeneous structure of the team working at the MoE and offer an insight into the wider working context in most organizations in the UAE. Employees are from different backgrounds, primarily expatriates with a minority of Emirati nationals, yet unified by the UAE's national agenda (Kamal, 2018). Table 3.1 lists the seventeen SCS and SAS staff members involved in the science curriculum reform. The SCSs work mainly on the science curriculum framework design and implementation policy. They design UAE science textbooks based on science curriculum research from around the world, aligning the learning outcomes of the MoE science curriculum with education systems both locally and internationally. SCSs define the scope as well as the sequence of the science instruction per grade and cycle levels, determine the outlines of the lesson plans, and choose the supporting resources that can empower science instruction in the classroom, such as videos, links, and other documents, while determine the learning outcomes required for assessment in the academic year's mid-term and end-of-term. The SCS staff must be members of the assessment committees to oversee the learning outcomes' achievements.

On the other hand, SAS staff are the specialists who work on the assessment policy, and this includes formative and summative assessments, sorting disciplines per groups and categories, deciding on international assessment tools and measures, analysis of students' achievements, and identifying the science curriculum's content knowledge scope and sequence compatibility with the student's ages and abilities. Furthermore, SASs build the assessment

calendar based on the learning outcomes assigned by the SCS team. All SASs were involved in the science curriculum reform at its early stages before moving to the Assessment Department.

Alharahsheh et al. (2020) imply that an individual's personal circumstances at the time of their recruitment versus the time spent working on a given document are two intertwined factors that influence the reform document. Depending on when they joined the MoE, not all the SCS and SAS staff oversaw the entire science curriculum framework process of change in terms of policy, design, assessment, follow up, and implementation, but all were tasked to at least to work on two-three grade levels, cycles, practical science laboratory, or science resource issues. Looking at this more deeply, Table 3.1 shows that, unless they are born in the UAE, the number of years that SCS and SAS staff spent living in the UAE is largely equal to their time spent working at the MoE, with a majority of them being made up of Jordanian and Egyptian nationals. The other nationalities include people from South Africa, India, Pakistan, North America, and Australia.

Table 3.1 The Nationality and Years of Experience of SCS and SAS staff in both the MoE and UAE

Science Curriculum Specialist (SCS)/Science Assessment Specialist (SAS)	Nationality	Séjour in the MoE (years)	Séjour in the UAE (years)
SCS 1	Jordan	more than 20	20
SCS 2	South Africa	5 to 10	5
SCS 3	South Africa	5 to 10	6
SCS 4	Egypt	more than 20	Born in UAE
SCS 5	Lebanon	5 to 10	13
SCS 6	Pakistan	5 to 10	5
SCS 7	Egypt	21	21
SCS 8	North American	5 to 10	5
SCS 9	Jordan	15 to 20	18
SCS 10	Emirates	more than 20	National
SAS 11	South African	5 to 10	5
SAS 12	Jordan	more than 20	18
SAS 13	Indian	10 to 15	Born in UAE
SAS 14	Jordan	more than 20	24
SAS 15	Egypt	more than 20	26
SAS 16	Australia	5 to 10	6
SAS 17	Emirates	more than 20	National

3.4.3 Sample Size

The SCS and SAS staff are a confined group of thirty-six experts working mainly on the science curriculum document and the scientific assessment of the curriculum, and together they shaped the science curriculum design and assessment. However, not all of them are eligible for interview as they will have to go through a more elaborate self-selection process during the recruitment phase. Holloway (1997) argues that, "in the interpretivism paradigm, the number of participants is relatively small" (p. 540). Alharahsheh et al. (2020) suggest that the inductive nature of the interpretivist paradigm requires a small-sized sample, while Lyell (1998) explains that all qualitative research sampling focuses on relatively small samples. Crabtree and Miller (1992) advocate that in qualitative interpretive research, a small sample size of six to eight subjects for homogeneity in samples is efficient for credible results.

On the other hand, Yin (2009) highly recommends that apprentice researchers – such as me – commence "with a simple and straightforward case study sample" (p. 162). The final number of SCS and SAS staff who willingly want to be involved in the study and answer the criteria is 17 individuals, constituting around fifty percent of the eligible population. Maxwell (1996) defines purposive or judgmental sampling as a strategy where we deliberately identify a particular setting or person because we cannot obtain the information needed by other means, which Boru (2018) calls purposeful sampling. The SCS and SAS are considered a focus group with deliberate sampling following specific criteria. After the recruitment of the participants comes the data collection.

3.5 Data Collection Process

The current research study collects the views of the MoE SCS and SAS staff qualitatively using semi-structured interviews undertaken 2019-2020. The needed informational inputs are gathered using interviews (Bryson, 2004). To this end, exploratory

research requires a qualitative approach to phenomena for the purpose of data collection (Denscombe, 2003; Hair Jr., Babin, Money, & Samouel, 2003). There are numerous classifications of data collection techniques in qualitative research. Cresswell (2017, p. 254) asserts that qualitative research data collection procedures involve four strategies: 'qualitative audio-visual material; archival or qualitative documents, qualitative observation; and qualitative interviews". In qualitative exploratory research, semi-structured interviewing in a familiar environment can help and support data collection, as Yin (1994) has advised. Lune and Berg (2017) list other types of data collection in qualitative research, including focus groups, interviews, and participatory settings. The current research question focuses on collecting the views of MoE stakeholders regarding the impact of globalization on both education policy and strategies adopted in the UAE's science curriculum reforms. Tables 3.2 and 3.3 respectively list the vision targets and mission indicators of both UAE Vision and UAE Centennial 2071 education policies.

Table 3.2 UAE Vision 2021's mission indicators related to education (MoE, 2019)

Competitive Knowledge Economy			
Global Indicators	**Literacy Level**	**Emirati Student Profile**	**Schools' Quality of Outcomes**
UAE ranked among the top 15 highest performing OECD countries in TIMSS for science and mathematics	Students' graduating from senior high schools do not need to join the foundation year programme	Ensure that 90% of students possess high literacy skills in Arabic as per national tests	100% of all public schools possess highly effective school leadership
UAE ranked among the top 20 highest performing OECD countries in PISA Arabic and science	Emirati students' high school graduation rate not less than 90%	Encouraged the student to choose science, technology, and innovation	Ensure that 100% of schools possess high quality teachers

Establish a culture of innovation in an institutional working environment	Ensure that 95% of Emirati students attend pre-primary education	Ready to meet future labour market demands	Strengthen the capacity for scientific research and innovation in accordance with quality, efficiency and transparency standards

Note: Table 3.2 lists the UAE2021 major indicators with regards to education at basic schooling and higher education levels as well as general literacy and numeracy.

Finally, the current study is not looking for a correlation between dependent and independent variables, nor does it seek to find causality characteristics in the positivist paradigm (Creswell, 2009). This study explores the views of the science curriculum and assessment specialists' teams and examines their curriculum choices through semi-structured interviews as part of an interpretivist paradigm. In the latter, Lincoln, Lynham and Guba (2011) clarify that what represents reality from the interpretivist perspective is what has been socially constructed. Kivunja (2017) continues that the significant work of the interpretivist paradigm is devoted to understanding "individuals' experiences" and how they interpret the world around them (p. 33).

Table 3.3 UAE Centennial 2071's indicators for education (MoE, 2021)

Diversified knowledge-based economy		
Global presence	**Emirati student profile**	**High Quality Indicators**
Modernized education that supports diversified economy	Independent, owning his future with Leadership skills, and equipped with the Knowledge and the professionalism' skills needed	Among the best global universities
Education that teaches advanced science and technology teaching	Possesses entrepreneurship and innovation skills	Future-oriented Schools
Education focused on space, engineering, innovation, and medical and health sciences	In a continuous learning process while collaborating with other developed countries	International research institutions in high schools supporting UAE publications in Arabic and English

	Possess high moral values and positive attitudes	Considered as Entrepreneurship and innovation hubs
	Inventors and scientists, supporting in their contributions the development of science and technology	
	Open to other cultures from other countries and experiments	

Note: Tables 3.2 and 3.3 are reduced to education indicators in general and their higher education counterparts, specifically and especially related to the science disciplines.

3.5.1 Recruitment

Three key factors are the driving force in determining SCS and SAS participant recruitment: first, they need to wish to be involved in the research willingly; secondly, they ought to have worked in the science curriculum reform for five years which means between 2015- and at least if not from 2012; and the third key determining factor is that their five years of experience needs to be at MoE headquarters so they understand the policy drive of the edits and changes made to the framework. If the SCS and SAS staff have been working on the national document reform for the last five years, they can immediately offer a perspective on the impact of globalization on the new national science document. Hence, when they are involved in the science curriculum edits, they can depict changes meant to meet the targets set by UAE Vision 2021 and UAE Centennial 2071 and articulate the specialists' views, with potentially significant contributions to the validity of the study's findings. The recruitment of the SCS and SAS staff was done internally and indirectly through an advertisement placed at the entrance of the SCS and SAS department in the UAE MOE's old building. The advertisement included the following text:

Globalization is changing how we perceive science and how we use it. Your opinion matters! Are you a Science Curriculum/Assessment Specialist and a stakeholder who has been

involved in the Science Education Reform? Have you been working at the Ministry of Education's Curriculum or Assessment Department for a minimum of three to five years?

If you wish to be involved in the research study, send us an email on …

The advertisement targets the SCS and SAS staff working at the MoE who are directly involved in curriculum design and its implementation, with a minimum experience of three to five years. The advertisement mentioned my own personal email address and my own phone number as a point of contact.

As mentioned earlier, I have a dual role in this study, namely, as a colleague to the SCS and SAS staff working on policymaking and project management in addition to being a researcher. MacLean and Poole (2010) explain that a dual-role researcher poses internal challenges to the research process due to the ethical standards that have to be observed. These challenges are principles that include informed consent, confidentiality, and other considerations generated by potential conflicts of interest during the research process. This study's participant recruitment is done without personal intervention, so the SCS or the SAS staff will approach the research study through the advertisement and follow the process. According to Gibson et al. (2014), an organization's hierarchy implies the power to influence each situation; in the current research study, recruitment procedures might be affected if interviewees know my identity and they might volunteer for friendship purposes. Friendship and having additional tasks in the MoE while working in more than one department are considered a potential point of pressure for the participants recruited. Sometimes power risks the non-recruitment of participants (MacLean & Poole, 2010). So, once the participants send an email to my account that is different from my professional one, or text me a message wishing to participate in the study, I inform them that I am the researcher and send them the Participant Information Sheet (PIS). During the first communication, I release them from any obligation to participate in the study after knowing who I am and reassure them that this would not affect

our collegial relations. If they wish to proceed (as many did), they will have to send back the signed consent form and the PIS as an attachment via SMS or email after one week. The signed consent form includes their approval of being audio-recorded during the interview lasting sixty minutes. The PIS and consent form both include clauses about the possibility to withdraw the information given during the interview up to six weeks after the interview before anonymization, and they could also request that part or all of their responses be destroyed, and no further use is to be made of them.

The data collection tool used in the research is semi-structured interviewing, and participants are free to suggest a safe venue outside of the MoE's old building to keep their identity undisclosed. Alvesson (2003) notes the impact of the social and physical setting in which the interview takes place, e.g. the interviewer's background, experience, gender, age, and nationality, the impact of the language used during the interview, terminology with which the interviewee might be unfamiliar with, and the place where the interview is conducted.

The COVID-19 pandemic has stopped participants from being interviewed either at a coffee shop or at a hotel lobby in downtown Dubai outside the old MoE building and their working hours. Since the pandemic outbreak coincided with part of this data collection, online communication platforms were also a practical option, thereby minimizing the risk of contracting the virus. All seventeen interviews lasted at least sixty minutes and were conducted in Arabic for Arab native speakers and English for other nationalities who use English as their communication medium. After the interview was conducted, the given audio-recorded interview was transcribed and anonymized; a pseudonym was then given to each research participant. However, interviewing does not automatically guarantee the collection of rich data and the production of meaningful insights (Schulze & Avital, 2011). Therefore, because we might need to come back to the interview transcripts, these were stored electronically in a .docx format and safeguarded against unauthorized access in an encrypted password-protected

external drive and on my personal computer. The audio recordings and hard copies of the transcripts are held in a personal cabinet secured under lock and key and will be erased five years after the thesis research is carried out.

3.5.2 Instrumentation

3.5.2.1 1 The Semi-Structured Interview

Interviews are valuable tools for collecting data in qualitative research (Potter, 1996). The personal interview method allows the researcher to interact with his participants and achieve a greater understanding of their nonverbal reactions during the assigned discussion time, which is sixty minutes or more (Potter & Hepburn, 2012). This research study seeks to understand the views of science stakeholders on the impact of globalization on curriculum reform; therefore, it explores and analyses the views of the science curriculum and assessment specialists' teams defined earlier, which work on aligning primary education with higher education needs and their curriculum choices through the use of semi-structured interviews (Creswell, 2009, p. 251). Qualitative interviews are useful because they permit participants to provide opinions and explanations on the topic under study (Tracy, 2013). Interviews permit researchers to explore other complex phenomena that may be hidden (Pauwels & Mannay, 2019). Semi-structured interviews – the approach used in this study – are more flexible and this is necessary when participants are stakeholders **a**nd peers, thereby removing pressure on them in terms of any expectation that they have to answer in specific ways (Pauwels & Mannay, 2019).

The focus of the semi-structured interview questions is: 1) to understand how curriculum specialists define the impact of globalization in their lives; 2) determine how the impact of globalization is manifested in the MoE's science curriculum reform for K-12 primary schools; and 3) how this reform will answer higher education demands for future graduates

capable of joining a high-skilled labour force. Core interview questions relate to personal and professional backgrounds and are asked in both languages, namely Arabic and English (see Table 3.4). The main focus is on exploring the impact of globalization on scientific domains the staff worked in, determining what they identified as affected mainly by globalization, and changes they experienced in the way education processes took place and shaped the UAE's future higher education and labour force development. The interview questions enquire about the level of edits relating to learning outcomes in the science curriculum document to answer the global HE needs of Emirati graduates.

Furthermore, we need to understand what is required in new science domains regarding what will be added to the current science curriculum in order to respond to the demands of globalization. The interview questions explored if the informants created new science content and added it as a supplement to the current resources to answer the job market demands. Did they suggest new approaches to teaching and learning science in the curriculum for STEM areas of study, and how did they translate the textbooks' supposedly globalized aspects in order to keep them legible and user-friendly. The interview questions also asked how they saw the balance – on macro, meso, and micro levels – between the perceived requirements of globalization and the preservation of UAE students' local socio-cultural identity, education system, and labour markets. Was, in this sense, the curriculum reform a successful move? Did the edits to the science curriculum document fulfil what is required on behalf of UAE HE graduates?

The semi-structured interviews enable research participants to express themselves freely "while favouring their viewpoint and knowledge" (Chilisa, & Kawulich 2012, p. 3). The amount of information collected through interviewing is abundant yet still falls under a qualitative design, in this case an exploratory one (Boru, 2018). Values and facts collected cannot be separated while sharing one's own views, and the insight of real-world experiences

drawn from an individual's context and experiences allows for the collection of multiple perspectives based on a given individual's background and earlier experiences (Elliott & Lukes, 2008). That implies that the data collection is derived from the participants' contexts (Denzin & Lincoln, 2011), and the SCS and SAS staff views are constructed contextually from the knowledge they receive and built during their work in the UAE's MoE. Their responses are based on their interpretations of the national agenda indicators and how they translate these into specific tasks to perform in their role. Kivunja (2017) explains that, during interviewing, participants share "multiple" realities of their situations (p. 33).

Denzin and Lincoln (2005) observe that semi-structured interviews allow the researcher to comprehend the situation's complexity without imposing any prior classification. To this end, the purpose of interviewing for data collection is to gain a deeper understanding of the science curriculum and assessment specialists' constructed knowledge through dialogue. In this context, the semi-structured interviews allow all participants to cover the same ground while seeking further clarity and detail from different individuals at different times via probing and follow-up questions. The interaction between a given interviewee and the researcher is based on pre-existing trust and friendship rapport because I am part of the MoE's curriculum stakeholders. For this reason, the interviews went smoothly, and the participants were relaxed and did not express any anxiety about being judged (Stanley, 1990).

Table 3.4 Semi-structured interview questions

Domain	Interview questions	أسئلة المقابلة
PERSONAL	1. As a curriculum specialist for science how do you define globalization and how do you think globalization impacts your own work practices and employment and work in the education sector, and the job market?	1- كاختصاصي مناهج وتأليف أو تقييم لمادة العلوم أو الرياضيات، كيف تعرف العولمة وتأثيرها في حياتك، وتأثيرها على سمات عملك الحالي. وهل هي تؤثر على التوظيف، العمل وفرص التوظيف في قطاع التربية والتعليم؟
	2. Which of the scientific domains you think they are the most affected by globalization, and what are the main topics? What steps have been taken to communicate the rationale and goals of globalization to all stakeholders?	2- أي من المجالات العلمية في اعتقادك الأكثر تأثُراً بالعولمة ، وما المواضيع الرئيسة؟ ما الخطوات التي اتخذتها لإيصال الأسس التنفيذية وأهداف العولمة لجميع أصحاب المصالح؟
INSTITUTIONAL	3. Did you create new science domains/ standards/strands in your curriculum to response globalization needs?	3-هل قمتم بتعديل أو انشاء مجالات / أو معايير / علمية جديدة في الإطار العام لوثيقة العلوم لتلبية احتياجات العولمة؟
	4. Did you create/ edited/added new science learning outcomes in your curriculum to answer globalization needs?	4-هل قمتم بتعديل أو انشاء نواتج تعليمية علمية جديدة في الإطار العام لوثيقة العلوم لتلبية احتياجات العولمة؟
	5. Did you create/edit/remove new science content/knowledge/skills to answer the job market need? What approach is taken to the integration of the 21st century skills into the globalized curriculum? Did you define pacing charts/guidelines and the new skills needed to be developed?	5-هل قمتم بتعديل المحتوى المعرفي والمهارات العلمية المطلوبة للإجابة على احتياجات سوق العمل؟ إذا كانت اجابتكم نعم، ما هو النهج المتبع في دمج مهارات القرن الحادي والعشرين في الإطار العام لوثيقة العلوم؟ هل قمتم بتحديد المخطط الزمني / والاستراتيجيات والمهارات الجديدة اللازمة لتطويرها؟
	6. How did you translate globalization traits in the UAE textbooks? Are these readable, user-friendly resources and in which discipline did you mostly reflected these globalization traits? Are physical textbooks enough in nowadays?	6-كيف قمت بترجمة سمات العولمة في الكتب المدرسية في دولة الامارات العربية المتحدة؟ هل هذه الكتب سهلة القراءة وسهلة الاستخدام؟ في أي مجال في مادتك قمتم بعكس سمات العولمة هذه؟ هل الكتاب المطبوع كافي للطالب؟
	7. Did you suggest new approaches for teaching and learning practices science in your science curriculum? i.e. curriculum as a form (what is required to change; how the new composition of classrooms is reflected; are there new methods of teaching etc.). If so, how is this manifest? If not, are there strategies in place to improve it?	7-هل اقترحتم ضمن الإطار العام لمادتكم أساليب جديدة في تدريس العلوم أو الرياضيات؟ إذا لم يكن الأمر كذلك، هل هناك استراتيجيات قائمة لإضافة ذلك؟
	8. How globalization affected STEM in the curriculum design? Is there a need to move towards a STEM approach?	8-كيف أثرت العولمة على تطوير تصميم STEM في إطار المناهج التعليمية ؟

MACRO-SOCIOLOGICAL	9. How you balanced between globalization needs and the social cultural identity for Emirati schools' students in the science content?	9-كيف توازن بين احتياجات العولمة والهوية الوطنية والثقافية طلاب المدرسة الاماراتية وفي المحتوى العلمي؟
	10. Can this curriculum reform produce the intended UAE student profile required by UAE national agenda? When can we see that? Will UAE students coming out of the globalized curriculum will find jobs after graduation?	10- هل يمكن أن ينتج عن تطوير المناهج الدراسية سمات الطالب الإماراتي المطلوب في الأجندة الوطنية لدولة الإمارات العربية المتحدة؟ متى يمكننا رؤية هذا التحول؟ هل طلبة المدرسة الإماراتية المتخرجين سيجدون وظائف شاغرة لهم؟

3.6 Data Process Analysis

3.6.1 Data Analysis in Qualitative Research

Mouton and Marais (1991) describe the process of data analysis as based on deconstructing a phenomenon into its core parts to better understand the topic. It is recognized that guidance is needed on the practical aspects of how to conduct qualitative analysis (Clarke & Braun, 2013). Nowell, Norris, White and Moules (2017) explain that qualitative research analysis needs to have a rigorous focus and a thematic analysis approach to derive implications in terms of the credibility of the research process while the tools used need to be well defined. Qualitative research emphasizes the importance of the context in analysing data (Denzin & Lincoln, 2005). The data in the current research is gathered through semi-structured interviews. Furthermore, the data analysis of the current research is conducted similar to any phenomenological analysis approach and follows the thematic analysis process. A phenomenological study gathers information from individuals who have experienced or lived in a situation using interviews, observations, or journals (Pauwels & Mannay, 2019) and this is the kind of material the current study will collect through the SCS and SAS staff responses using the semi-structured interviews. The phenomenological approach is used to describe how

human beings experience a particular phenomenon and make meaning (Pauwels & Mannay, 2019). In this study the participants' perceptions, perspectives, understandings, and feelings experienced during the science curriculum reform is explored as outlined in Creswell and Creswell (2018). Knowledge is acquired through experience in the phenomenological process (Pauwels & Mannay, 2019), and in this research the curriculum specialists describe their experiences in the UAE context. In this specific context, the interview responses reflect a data set that explores the perspectives of science curriculum and assessment specialists on the science reform phenomena they experienced and how globalization has impacted the policy and their work that makes up the current science document.

Hutchby and Wooffitt (1998), Smith and Osborn (2003), Braun and Clarke (2006), Clarke and Braun (2013) and Boyatzis (1998) writing on qualitative analysis advise to use thematic analysis in interpretative phenomenological research. In this research context, post-data collection, thematic analysis is used in the process of identifying patterns or themes based on the collected responses of the interviewees. Braun and Clarke (Braun & Clarke 2006; Clarke & Braun, 2013) explain that thematic analysis is that it is a method rather than a methodology. This means that, unlike many qualitative methodologies, it is not tied to a particular epistemological or theoretical perspective. This makes it a very flexible method, a considerable advantage given the diversity of work in learning and teaching, in contrast to the semantic theme level defined by Braun and Clarke (2006) where data remains within surface meanings. In addition, Boyatzis (1998) elaborates that thematic analysis can go beyond simple data collection and grouping to interpretation and analysis. The current research explores questions that have not been posed or answered before by the SCS and SAS staff and also explores the underlying ideas, assumptions, and conceptualizations that are theorized as shaping the semantic content of the data and might give an idea of how the dynamics of science reform with the education policy worked.

3.6.2 The Semi-structured Interviews' Data Analysis Steps

Analysing qualitative data entails reading many transcripts, looking for similarities or differences, and subsequently finding themes and developing categories (Wong, 2008). Figure 3.1 shows the flowchart that outlines the data analysis of the current research inspired by Wong (2008) while Figure 3.2 illustrates data analysis model's components. Interviews require transcription, and transcription requires listening to participants' voices repeatedly, which can support early analysis and transform the interviews into usable data (Tracy, 2013). Arbid, Samir, & Tairab (2020) add that there are many approaches to qualitative data analysis, and all are subject to discussion and interpretation depending on the research question(s). As per Wong's (2008) process, for the data analysis I will try to make sense of the large amount of data in the interviews responses by reducing the volume of raw information and identifying significant patterns, finally giving meaning to the data and subsequently constructing a logical chain of evidence. It is vital to reduce the data without losing any meaningful information as an essential step in document analysis (Ahmed, 2010; Miles, Huberman, & Saldaña, 2020).

The current research has followed the very simple approach adopted by Braun and Clarke (2006), namely a six-step framework for conducting thematic analysis. The study has followed the same steps, first becoming familiar with the data, second generating initial codes, and third identifying themes compatible with the patterns. The next three steps are reviewing the theses, defining them, and writing them up. The interviews will facilitate the SCS and SAS staff to provide their opinions on the complex phenomenon of science curriculum reform, while the specialists' responses will reveal some areas that may be hidden.

Figure 3.1. Qualitative data analysis flowchart

Miles and Huberman (1994) explain that qualitative data analysis activity is followed by three main processes: data reduction, data display, and drawing and verifying conclusions.
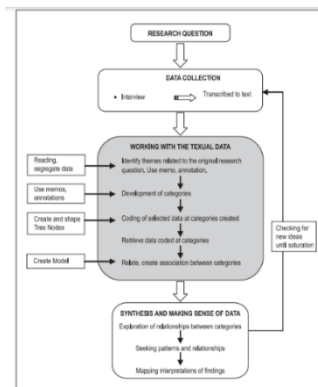
Figure 3.2 Components of Data Analysis: Interactive Model (source: Miles & Huberman, 1994, p. 12)
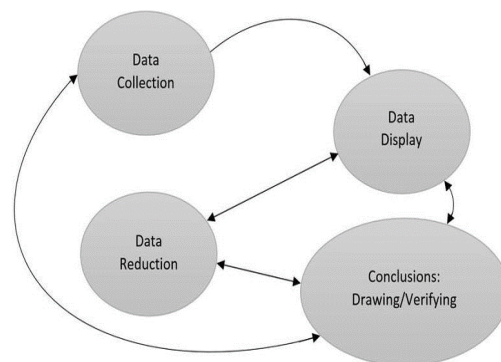
3.6.3 NVivo in the Current Research Study

The technique used in the transcripts analysis of the interviews responses to reduce the data is to code the transcripts, an approach that can be manual or using computer software such as NVivo, then the data is analysed to generate themes and categories and engender interpretation and reflection (Carley, 1993; Alharahsheh et al., 2020; Giorgia, 2018). Traditionally, these phases were done manually, using coloured pens to categorize data and subsequently cutting and sorting the data (Wong, 2008). Coding is an approach to systematically organizing and making sense of the data (Tracy, 2013), while codes are the basic

elements of labelling and organizing the dataset, essential to linking the data and synthesizing it into categories (**Sage, 2019**). In simple terms, codes are tags for allocating defined themes or topics from the data compiled in a study (Wong, 2008). Nvivo or other qualitative research software does not do the analysis but only gathers the data in codes or themes (Wong, 2008); Figure 3.3 provides an overview of the Nvivo software's main steps in categorizing the transcribed semi-structured interviews in this thesis. When coded, the transcribed are categorized into nodes and sub-nodes (categories and subcategories); core areas of convergence and divergence can be established in terms of how science curriculum specialists perceive a particular concept by checking the number of node occurrences. The Nvivo12 has replaced the 'Node' with 'Codes' and 'Codes' with 'Cases'.

Figure 3.3 Procedure Followed in Applying NVivo Software (source: Hilal, & Alabri, 2013)
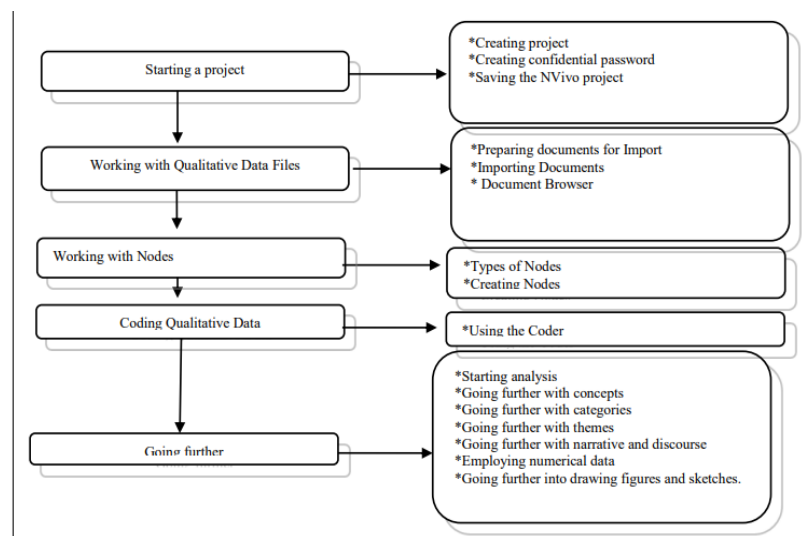
Note: Documents in NVivo can be created inside the NVivo project or imported from MS Word or WordPad in a rich text (.rtf) format into the project. rk for conducting this kind of analysis, starts with (1) familiarizing oneself with the data collected through semi-structured interviews and audio-recorded interviews, the data display, and the reduction of information using transcriptions, and (2) all transcribed interviews are coded, and

themes search is executed; The choice of themes is based on categorization and grouping evidence of similarities between responses in line with the research question. Themes that emerge at a later stage are defined and written up. All thematic transcripts are later imported into the NVivo software as a plain text file (.txt) and then coded and thematically categorized so relationships can be easily explored. It is important to note that participants' names and contact information were not recorded during the transcription, rather they were assigned anonymous identifiers for the purpose of coding and analysis.

The categories that shape the current research are globalization, the science curriculum, and policy reform. Attributes of the categories are necessary because of the UAE's unique social structure, so participants are categorized by gender, nationality, ethnicity, and demographics (see Table 3.1). With the high level of expatriates' recruitment to support higher education scientific advancement and technology reform in the GCC and UAE (specifically in terms of expertise transfer and best practices), the case node regroups participants by age, gender, nationality, and location (Alexandre et al., 2020). Table 3.5 explains how the interview responses were grouped in themes/categories and subthemes/subcategories and fed into the Nvivo software for digital categorization. The grouping of the data is intended to answer the research questions based on the participants' perceptions. The data analysis following the results will explain how participants constructed ideas and how they attached meaning to their conceptual constructs.

Table 3.5 Data Categories Based on Stakeholders' Responses

Analysis of the Interviewees' Responses		
Theme/ Case Nodes (Main Categories)	**Sub Nodes (Subcategories)**	**Codes (References in transcripts)**
Nationality	Expatriates Skills	Hard work
		National versus expatriates
		Experience
		Authority
	Emirati Skills	Authority
		Lack of Expertise
		Lack of long-term commitment
Globalization as defined	Historical	From 1970
	Advancement	Technology & Science
	Moves throughout time/space continuum	Inevitable
Globalization History as perceived	Impact on Science Advancement	Science curriculum
	Science inventions	Western Inventions
	Science content	Science Curriculum
	Science innovations	Western Inventions
	Impact on life	Colonization in clothes
		Colonization in food and goods
		Barriers open market
	Impact on work	New Career demands
Globalization impact and education policies reform as viewed	Sustainability in the learning	Less printing
		Job Market Skills readiness
		Independent learners
		Equal Opportunities
		Sustainable development goals i.e., Energy resources
		Education after the COVID-19
	Curriculum Design	Learning outcomes reform and edits Indicators' reform and edits
		Scope and Sequence redone Textbook content edits
		Include 21st Skills in science content textbooks
	Teaching and learning new Strategies	Emiratization
		Global competitiveness
		High world ranking
	StrEaM based in science and Math and technology	Employability
		Science skills
		Smart learning system
		Robotics

Theme/ Case Nodes (Main Categories)	**Sub Nodes (Subcategories)**	**Codes (References in transcripts)**
		Transfer of ... through open markets
	Domains	Level of change
		Number of domains created
	Strands	Level of change
		Number of strands created
	Standards	Level of change
		Number of standards created
	Learning outcomes	Level of change
		Number of learning outcomes created
Globalization Impact on curriculum Design needed changes as viewed	Assessment reform Summative & Formative	Digitalized
		Skills based
		Centralized
		Different per tracks
		Divide types of assessment per groups
		Experimental lab test assessment
		New sections were added based on 21st century skills
		Constructed by teachers and curriculum specialists
		Assessment for learning
		Standard based assessment
		Based on learning outcomes and indicators adaption
		Digitalized
		Project based
		Tailored by the teacher
Globalization impact on curriculum implementation as perceived	Teaching and learning strategy Technological tools	New curriculum philosophy
		Learner centered
		Independent learner
		Professional development
		Learning Management System (LMS)
		Digital textbooks
		Interactive textbooks
		Online assessment
		Smart boards
		Smart platforms
	Assessment Summative Formative	Digitalized
		Skills based
		Centralized
		Different per tracks
		Divide types of assessment per groups
		Experimental lab test assessment
		New sections were added based on 21st century skills
		Constructed by teachers and curriculum specialists
		Assessment for learning
		Standard based assessment
		Based on learning outcomes and indicators adaption
		Digitalized
		Project based
		Tailored by the teacher
		Continuous
		Learner centered
		Skills based
		Learning outcomes based
		An assessment for learning
		International Assessment

The second level of NVivo coding allows us to group the themes coded at the primary level and identify their occurrence in different transcripts (Dalkin, Forster, Hodgson, Lhussier, & Carr., 2021), while establishing connections between the different categories and subcategories. For example, in Table 3.5, the theme "nationality" is connected with the sub-themes "Expatriate skills" and "Emirati skills". Both skills are interconnected with the codes "level of work, authority, and experience". This connection takes us back to the current study and the participants' demographics, where the recruitment of the participants shows that only two science experts were Emirati nationals. In contrast, most of the others are either Arab nationals or Asian, with a minority of Europeans. Furthermore, new theme nodes appeared during this categorization, such as well-being, the impact of the COVID-19, science online

learning, digital technology, science digital resources, culture, and heritage; simultaneously, some new topics emerged related to science, technology, engineering, computer sciences, sustainability, 21st century skills, and the global economy.

Finally, the crucial point here is to maintain attention to confidentiality and ethical considerations during the methodological process, the data and the information collection, and the discovery of in-depth knowledge.

3.7 Ethical Considerations

Qualitative research presents ethical challenges unique to the study of human beings, while traditional science allows the researcher to assume a standpoint away from the object of study or phenomenon in question (Eid & Kahn, 2008). Ethics in research are of utmost importance and can pose a significant challenge in conducting research (Creswell, 2009) while ethical challenges need to be foreseen where at all possible (Bryman & Bell, 2011). Qualitative research also requires a mutual standpoint from researcher to participant, and – in the case of this study – from human being to human being (Eid & Kahn, 2008). Gajjar (2013) points out that ethical standards' alignment with an institution's goals is essential because it can help validate study objectives such as inventiveness, trustworthiness, and anomaly avoidance. The current research explores my insider/outsider (employee/researcher) status and allows me to address some of the challenges of subjectivity and shifting positionality (Kanuha, 2000; Bhattacharya, 2007; Kerstetter, 2012; Razon & Ross, 2012; Blix, 2014). In sum, the ethical considerations guidelines of the University of Liverpool have been maintained and the study's ethical standards are aligned with the Arab Gulf context, namely, respect for autonomy, maintaining privacy, confidentiality, and ensuring justice (Silverman, 2017).

The current study's research methodology is exploratory and qualitative, using interviews as the primary data collection tool. The research ensures autonomy by giving the

participant the choice of volunteering to be part of the research (Ketefian, 2015), and they can choose the place where the interview will take place, typically a location outside the MoE's old building suitable for him to conduct the interview. The preferred venue is far from the MoE, at least 30 minutes' drive away, awhile the site could also be a local café (the café should not be in the same building as the MoE).

Regarding privacy and anonymity, in the Arab and Gulf world, we "stress the embeddedness of the individual within his society and define a person through relations to others" (Christakis & Levine 1995, in Silverman, 2017, p. 23). That means that an Arab participant might spread the news himself and disclose his own identity by sharing his volunteering as reflecting his achievements and initiatives in the field, with other work colleagues and family; the participant would thereby violate his privacy in this research and will be easily spotted undertaking the interview. For this reason, the PIS and the consent form signed by the interviewee include the following additional statement:

As a participant, I will not reveal my own identity as a research participant and will not gossip about the subject in public. Any violation of my own identity by myself is considered my responsibility, not the student-researcher's responsibility. In that case, the data collected from my interview will not be valid.

The PIS stresses explicitly that any inquiries should be referred to specific bodies, providing a clear description of who can be contacted for questions and inquiries about the research. Data collected from the participants need to be stored well while safeguarding confidentiality, especially if the data is to be kept for five years. Drafting and finalising the appropriate consent form will solve the challenges of re-using the data. The data is kept safe in a closet that only I know of and encrypted with a password that only I know.

Privacy in this research is monitored from the beginning, starting from the enrolment setting of the participants through to the interview process. Confidentiality is breached when

privacy is violated (Silverman, 2017). As stated by Silverman (2017) earlier, the social relationship between the Arab and Gulf peoples has a high frequency, and news spreads quickly. Therefore, the participant will have to declare that he will keep his own participation confidential from others within the same department as the confidentiality of all data collected is the responsibility of both the participant and the student researcher. Furthermore, in any future quotations, all participants' statements will be amended where necessary to mask their identities, while the main text will avoid using their daily leitmotivs in its use of quotation.

Most of the curriculum specialists who have more than five years of experience in the Ministry of Education are considered people with low to middle income, which puts them in a vulnerable situation, and they are considered at risk of losing their jobs, their titles, and their income (Silverman, 2017). The particular interview location used is one of the main challenges that might violate the privacy and confidentiality of the data collection procedure, thereby increasing participants' vulnerability. For this reason, and as stated earlier, the participant will be given autonomy in choosing the interview location. If the chosen location is not suitable for the interview, we will advise a calm place in which to conduct it. The UAE has a large selection of exquisite cafes labelled as meeting and interview venues for business and corporate purposes.

HEIs such as the University of Liverpool emphasize protecting the research participants' psychological and emotional safety and dignity (Creswell et al., 2021). Several ethical considerations are reflected upon to ensure that the study was conducted appropriately (Babbie & Mouton, 2001). Given that the focus of the current research is to identify the impact of globalization on both stakeholders' perceptions and national policies, it is crucial to consider the cultural and privacy context in which the research takes place. The issue of any psychological harm during the interview procedure is addressed in the following aspects: First, the fact that I am an insider/outsider researcher might pressure the interviewee as I oversee

most of the projects' coordination related to science and I am close to everybody while in relation to others, I am a family friend. Rarely do I fall into unnecessary conflicts in the professional field; that might create some power over and pressure on the participants. Silverman (2017) explains that emotions such as shame on the part of the participant might manifest themselves relating to the disclosure of sensitive or embarrassing personal information; adverse emotions might be caused by responding to questions related to students' test results. This challenge has been pre-solved in the PIS and the consent form, where I mention that taking part in the current research does not place any obligation on the participant, even taking into consideration a friendship relationship. The second potential challenge relates to the interview duration and its impact on a participant's level of tolerance which might make him feel vulnerable. For that reason, the PIS offer a flexible choice of interview length, between 30-60 minutes, in case given participants cannot commit to the full duration. Finally, the interview questions and process does not involve any questions related to the Arab region's security which could be considered a crucial issue and hence a concern for a participant during the interview.

CHAPTER 4. FINDINGS

4.1 Introduction

This chapter shares the findings concerning the research question by elaborating the views of science curriculum specialists (SCS) and science assessment specialists (SAS) regarding the impact of globalization on the science curriculum reform and classroom practices in the UAE, with a specific focus on Emirati public schools. The findings will be divided into three main thematic areas derived from the interviews domains: (1) globalization's impact on education policies, including the main aspects of neoliberalism that affect education policy

documents and policymaking; (2) the globalization impact on the reform process and strategies adopted in the science curriculum reform in UAE at institutional areas; and (3) the globalization impact on the micro-sociological which is around the Emirati student profile required in the UAE to support the new neoliberal globalization strategy adopted during the reform process.

The results reflected common traits in the SCS and SAS responses regarding globalization's impact on education policy and science strategies in the curriculum reform document as the people who worked on the science curriculum document owners of the intellectual mind. As explained in the methodology, themes and categories were chosen as per the research questions as shown in Table 3.5. Based on these categories/themes, the data is analysed to answer the research question.

Table 4.1 Sample of the Thematic Groupings Based on Interview Transcripts

Analysis of the Interviewees' Responses		
Theme/ Case Nodes (Main Categories)	**Sub Nodes (Subcategories)**	**Codes (References in transcripts)**
Nationality	Expatriates Skills	Hard work
		National versus expatriates
		Experience
		Authority
	Emirati Skills	Authority
		Lack of Expertise
		Lack of long-term commitment
Globalization as defined	Historical	From 1970
	Advancement	Technology & Science
	Moves throughout time/space continuum	Inevitable
Globalization History as perceived	Impact on Science Advancement	Science curriculum
	Science inventions	Western Inventions
	Science content	Science Curriculum
	Science innovations	Western Inventions
	Impact on life	Colonization in clothes
		Colonization in food and goods
		Barriers open market
	Impact on work	New Career demands
Globalization impact and education policies reform as viewed	Sustainability in the learning	Less printing
		Job Market Skills readiness
		Independent learners
		Equal Opportunities
		Sustainable development goals i.e., Energy resources
		Education after the COVID-19
	Curriculum Design	Learning outcomes reform and edits
		Indicators' reform and edits
		Scope and Sequence redone
		Textbook content edits
		Include 21st Skills in science content textbooks
	Teaching and learning new Strategies	Emiratization
		Global competitiveness
		High world ranking
	StrEaM based in science and Math and technology	Employability
		Science skills
		Smart learning system
		Robotics

Theme/ Case Nodes (Main Categories)	**Sub Nodes (Subcategories)**	**Codes (References in transcripts)**
Globalization Impact on curriculum Design needed changes as viewed	Domains	Level of change
		Number of domains created
	Strands	Level of change
		Number of strands created
	Standards	Level of change
		Number of standards created
	Learning outcomes	Level of change
		Number of learning outcomes created
	Assessment reform Summative & Formative	Digitalized
		Skills based
		Centralized
		Different per tracks
		Divide types of assessment per groups
		Experimental lab test assessment
		New sections were added based on 21st century skills
		Constructed by teachers and curriculum specialists
		Assessment for learning
		Standard based assessment
		Based on learning outcomes and indicators adaption
		Digitalized
		Project based
		Tailored by the teacher

Globalization impact on curriculum implementation as perceived	Teaching and learning strategy Technological tools	New curriculum philosophy
		Learner centered
		Independent learner
		Professional development
		Learning Management System (LMS)
		Digital textbooks
		Interactive textbooks
		Online assessment
		Smart boards
		Smart platforms
	Assessment Summative Formative	Digitalized
		Skills based
		Centralized
		Different per tracks
		Divide types of assessment per groups
		Experimental lab test assessment
		New sections were added based on 21st century skills
		Constructed by teachers and curriculum specialists
		Assessment for learning
		Standard based assessment
		Based on learning outcomes and indicators adaption
		Digitalized
		Project based
		Tailored by the teacher
		Continuous
		Learner centered
		Skills based
		Learning outcomes based
		An assessment for learning
		International Assessment

The thematic analysis of the transcripts of the science specialists' responses identify high levels of similarities regarding the main research topics, i.e. science skills, literacy, the impact of globalization, learning outcomes, and technological advances. Figure 4.1 shows the SCS and SAS responses to key terms when asked about globalization's impact on the curriculum reform's education policy and science strategies. The analysis of the transcripts show whether the SCS and SAS responses to key terms such as literacy, skills, graduate, job readiness, technological advances were interrelated and compatible with the global need for science skills advised by the WEF (2018) report and the OECD (2019a). The nodes in Figure 4.2 are based on policy, technology, science skills, and learning outcomes and standards in the science framework and their relationship to the education policy. Figure 4.2 shows a web figure of closed interconnected relationships between the nodes, meaning that the SCS and SAS confirm the impact of the education policy on both the science reform and the learning outcomes edits, while there is also a relationship between science skills and the expected science reforms (Godchaux-Berezhnova & Moonesar, 2021). Figure 4.2 illustrates that 21st century skills are one of the main components of the science curriculum document, which takes us back to the OECD (2019a) requirements expected of HE graduates mentioned in the literature review as well as the technological advances brought about by globalization and its

impact on the learning outcomes' changes and on UAE culture and identity (AlAbri, 2016). Although most of the science specialists are non-native English language speakers, their views recommended adding English language literacy in science as a vital necessity for HE graduates in terms of their readiness for the job market. Regarding English language ability, Soederberg et al. (2005) emphasize that it is the language of the global market and technological advances, a perspective we will later see reflected in the science specialists' responses. In summary, Figure *4.1 shows that there is a close connection between globalization and education policy reform in the UAE. In particular, there is a relationship between the education policy reform and the science framework changes and edits applied to science learning outcomes. Furthermore, Figure 4.2 recalls Baburajan (2011), in that both identify that globalization has had an impact on HE in the UAE.*

Figure 4.1 *Examples of specialists' views on globalization's impact on education policy and the strategies adopted in science curriculum reform*

Note. Main themes shared between science specialists on the impact of globalization on education policy and strategies adopted in the science curriculum are around economy, skills, STEM and technological advancement in addition to the views on the impact of globalization on the culture and identity
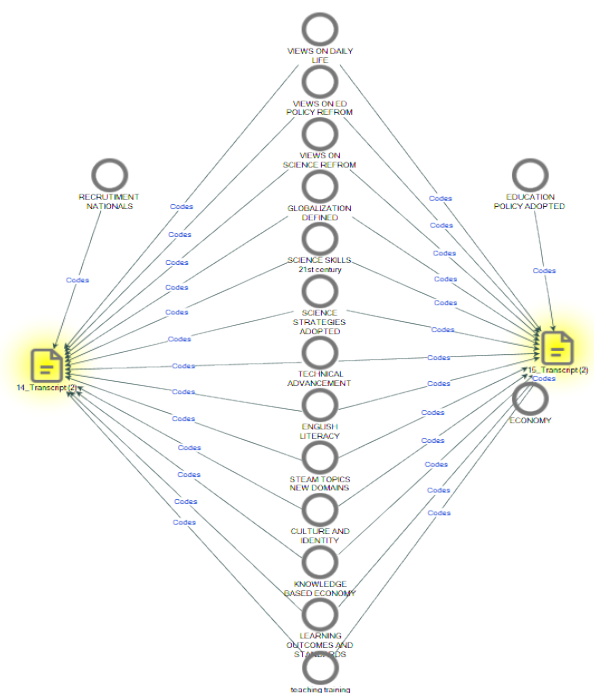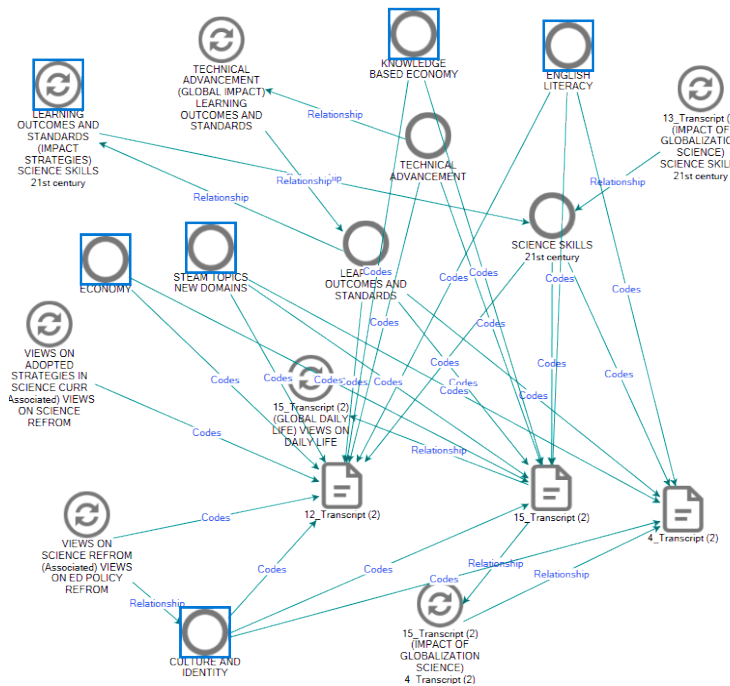
Figure 4.2 *Examples of Specialists Shared views on globalization impact education policy and strategies adopted in science curriculum reform*.

Further findings emerged from the categorization of the data collected, findings that will allow deeper reflection in future research regarding the economic effect of globalization and how to maintain the sustainability of a country that is moving from an oil-based to a knowledge-based economy as well the impact of globalization on the health and mental wellbeing of students experiencing science curriculum reforms in a foreign language. To sum up, Section 4.2 will share the findings that directly answer the research question based on the science specialists' responses that have been categorized and grouped into themes using Nvivo. The three main themes for data analysis are as follows:

Theme 1: Globalization's impact on education policies reform, including the following subthemes related to HE students and graduates: job market skills readiness; equal opportunities; global competitiveness; high world ranking; and employability skills.

Theme 2: Globalization's impact on science curriculum design, including all the edits and changes performed on the science framework document with the following

subthemes: domains; strands; standards; learning outcomes; 21st century skills textbooks; international benchmarks for teachers; international assessment students; and assessment tools and pedagogical strategies for teaching and learning. In the subthemes and related to Theme 2, there is also the issues of technological advances that involves the global skills required for HE graduate students.

Theme 3: The UAE's social and cultural character after neoliberal globalization requires reflection on the particular Emirati student profile required to support the UAE's new neoliberal globalization strategy adopted during the reform process.

Before starting with the three themes, it is important to determine the views of the science specialists regarding the impact of globalization on their daily lives. The reason for this is that such views are socially constructed and will impact the science specialists' responses, depending on where they stand in relation to globalization and their beliefs will impact their responses; this falls within the interpretivist paradigm (Alharahsheh et al., 2020).

4.2. Globalization's Impact on SCS and SAS Personnel

Responses of the SCS and SAS show that globalization ideology affects their local daily life and has also affected the local Emirati education context. SAS11 who is South Africa national living and working in the UAE uses the phrase "invisible hands" of globalization, found in Huang (2012, p. 39). For Flew and Iosifidis (2020), globalization inflates social media usage as a tool to transfer ideologies and concepts by the medium of electronics and televisions and has left a significant effect on everyone's daily life and social relationship with family; in consequence it affects people's their daily social practices. SCS4 views that globalization affects how they dress and which vocabulary terms they use during their daily lives. SCS7, an Egyptian national who lives and works in the UAE for the last twenty years confirm that some daily practices in the UAE are different now compared to a decade earlier and yet he adds that

globalization is positive in the sense that it opens opportunities for business and growth long waited for. SCS7 infers that the daily information needed is more accessible because of the high level of tools and resources available nowadays, such as calling others, using the car instead of walking, and globalization with its technological advancement reduced energy consumption in the Ministry of Education work (Specialist 7). SAS17 works in business and on a computer science along the education implies that globalization is a source of technology, and technology is the nerve of life (Specialist 17). SCS6, Pakistan national, infers that globalization has brought new life trends in food, fashion, that he cannot find in his country; some terminologies used in his everyday language has changed his native dialect especially the ones related to technology (see Figure 4.3). Figure 4.3 shows that globalization has chiefly affected their own lifestyle, what they watch on social media, and how they spend their time with families, more than impacting political or economic affairs (Specialists 15 & 4). SAS15 communes the high impact of globalization through the social media tools and how these tools predict our behaviours and choices through artificial intelligence machinery embedded within and in TV shows, seeking to control our minds:

Globalization has a big impact starting from food and water supplies and communication and media, and I say to my kids there is no TV anymore shortly, per example my kids we sit all day on Netflix and me, and we have shahid.net; we observe only Netflix, and we have more than one account, … rarely we see the TV unless to follow some special events, each one of us has his different tablet and account, we have several accounts, and we see together publicly, and on our laptops, if we do not agree to see one thing at once we see different things... (Interview, March 2020)

SAS12 shares the same concern and complements that some western television programs brought by globalization are eye-opening on Western practices that are not

compatible with the Islamic ideals that Arab families living in the Gulf were raised on (Specialist 12).

Figure 4.3 Views of SAS15 and SCS4 on the Relationship between Globalization and Their Daily Life Practices

Note. The SAS15 and SCS4 both see that globalization has chiefly affected their own lifestyle, what they watch on social media, and how they spend their time with families, more than impacting political or economic affairs (Specialists 15 & 4).
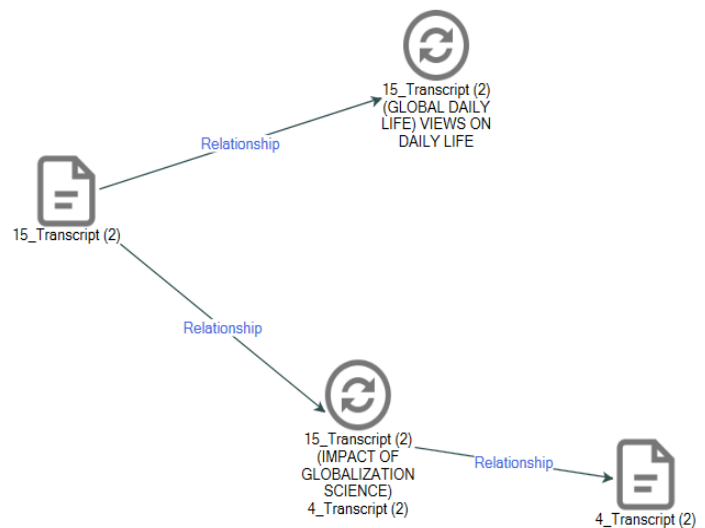
With regards to human capital mobility, the current findings coincide with Kabir (2016) and (Baburajan, 2011) that the UAE possess the highest benefit of the higher education in the mobility of expertise and staffing which has caused human brain- drain from the country of origin. SAS15, elaborates that the mobility of the human resources from their home country is a resultant of globalization, remarking that, "I am a fine example of that mobility". Maguire (2002) adds that mobility of human resources causes a knowledge transfer and this what made the UAE receive a positive outcome to build its current knowledge-based economy. SAS16, who oversees the assessment for science, the UAE offers a concrete example of an heterogeneous working team in a globalized country such as the UAE. The common areas that join them are the science document they work on, and policy they need to follow:

"*I work with, a group of people from across the globe. you know, we are globally linked, such as the global village, all the world is becoming a small, tiny place now, every area of our life is impacted and influenced by decisions are affected by other places from all around the world.*" (Interview, March 2020)

Furthermore, on human capital movement brought by globalization, the study shows that it is a reciprocal effect that touches the Emirati nationals living in the UAE as well. SAS14, who possesses a senior role in the science committee and an Emirati national adds that in the work context, meeting different people from different countries who are bringing along with them their personalities and their practices empowers us and raises the level of positive competitiveness. In addition, SAS14 explains that for this reason they are always seeking global recognitions and global positions. In addition to that, they are more acquainted working with different nationality' context and they can recognize people's origins, dialects and food types and predict their behaviours.

Finally, on knowledge transfer and its impact on curriculum reform and technological skills, SAS12 who oversees the strategic goals implementation in the MoE, explains that globalization has made the availability of information for science and the transfer of knowledge much more accessible for the curriculum designers and stakeholders' decision-making with regards to students' future. Globalization open access to information and skills building supports them to have a strategic view on how they should work on the science curriculum to have it a global document. SAS11, who leads the applied science committee and tracks' learning outcomes' alignment, appoints that globalization provides open channels for science worldwide and keeps them updated with the latest changes in scientific technology required for the local UAE science curriculum (Specialist 11).

Figure 4.4 shows that for the SCS and SAS, globalization is closely related to technological advancement, affecting learning outcomes science skills and that the *cultural identity, and the learning outcomes in the science curriculum. The* sociocultural perspective and that includes the cultural identity is important in professional agencies and goes down to the specific context of being a teacher in an education higher education setting and how they respond to education policy reform *(Ryder et al., 2018).*

4.3 Theme 1: Views on Education Policy Adopted in the Science Curriculum

The UAE has created a new science curriculum that answers the new country policy, and to which the science experts positioned themselves firmly in favour of the UAE2021 vision and the UAE2071 centennial and voiced their endorsement. SCS5 and SAS10 are both members of the strategic planning committee at the MoE level and oversee the alignment of the curriculum learning outcomes with the UAE2021 vision and the UAE2071 centennial. SCS5 explains that: "*The UAE science curriculum needs to be futuristic as required by the policy agenda...our education policy is the country's policy requirements*" (Interview, February 2020).

In their responses, science specialists use phrases such as "we need", "it is important", "it is a must". Their answers show the strong lines of authority behind their decision-making. Ryder et al. (2018) write that education policy reforms are the agenda setting and the "framing discourses" on what gets noticed in the science curriculum reform, and the education policy indicators are underpinned by a hidden curriculum holding hidden values (Ryder et al., 2018). The responses of the science specialists are aligned with earlier findings of Zemmouri et al. (2020) that explain the shift in policy design and science curriculum changes. SAS16, an Emirati national, also emphasises the importance of globalization: "*... as Emirati, we realize that globalization is creating new ideas, values, identities, practices, and movements…but we reduce the time of completion of our kids when they travel abroad… They develop new skills to match the job market…*" (Interview, February 2020).

One of the UAE Vision 2021 national agenda indicators is top ranked in TIMSS and PISA results (UAE Government, 2018). The SAS16 emphasizes that TIMSS and STEM topics are found in the new science modernized curriculum (Specialist, 16). On the other hand, SAS17 explains that the MoE science curriculum document includes strands, standards are fixed taken

from the NGSS framework, while learning outcomes and indicators are in constant edits as per the requirements of UAE Vision 2021 to reach the top 15 countries in the world in TIMSS and PISA. SCS3 explains that the modernized science curriculum includes global attitudes and twenty-first-century skills with traits of a global citizen and affirms that TIMSS and STEM topics are included in the UAE science curriculum framework. However, not all SCS see these changes as beneficial and needed on national levels. SCS7 is not in favour of the OECD ideology and the edits made in the science curriculum' scope and sequence to serve the TIMSS and PISA requirements: "*...I do not agree on the fact that we need to re-sequence a country national curriculum to follow the requirements of a standardized test given from the OECD*" (Interview, February 2020).

The responses give an insight on the content of the new science advanced curriculum that includes technology and computer sciences as per UAE Vision 2021 and UAE Centennial 2071, the government's education policy requirement, another assurance of earlier studies in Ryder et al. (2018), Ryder (2015), Banner et al. (2012), and Colebatch (2009). On the other hand, SAS11 adds that UAE's national agenda orients the primary source of the science curriculum framework and learning outcomes align with the local, national agenda indicators. As curriculum department stakeholders, they worked to ensure that the twenty-first-century skills were in the science framework and gave real examples from industries needed in the UAE market (Specialist,11). SCS17 from his end assures that they are executing the directives that they receive from MoE elite stakeholders to whom they report (i.e., Associate Undersecretary and the Minister of Education); any edit conducted on the learning outcomes such adding domains or topics, or changing in the scope and sequence is a requirement of UAE Vision 2021's national policy. These science curriculum reform editorial requirements need to be finalized in accordance with a competitive timeline while maintaining high quality deliverables. When questioned about the science curriculum framework's domains and

standards, SAS17 responded, "… *we work with speed and efficiency for our leaders who expect from us always the best*" (Interview, February 2020).

SAS15 and SAS16 (see Figure 4.5) share the same view as SAS17, while going further by highlighting the need to identify science globalization patterns in the science curriculum to make it equivalent to what is required by international policies:

"…. *we have a mandate dictated by the policy of the MoE, this mandate is to drive the curriculum to be a cutting edge and globally acceptable … to make sure that our students are going to be able to continue their school studies and compete with their peers in high ranked universities schools...*" (Specialist 16, Interview, February 2020)

Figure 4.5 Views of SAS15, SAS16 and SAS17 regarding the impact of education policy on different areas of the science curriculum reform
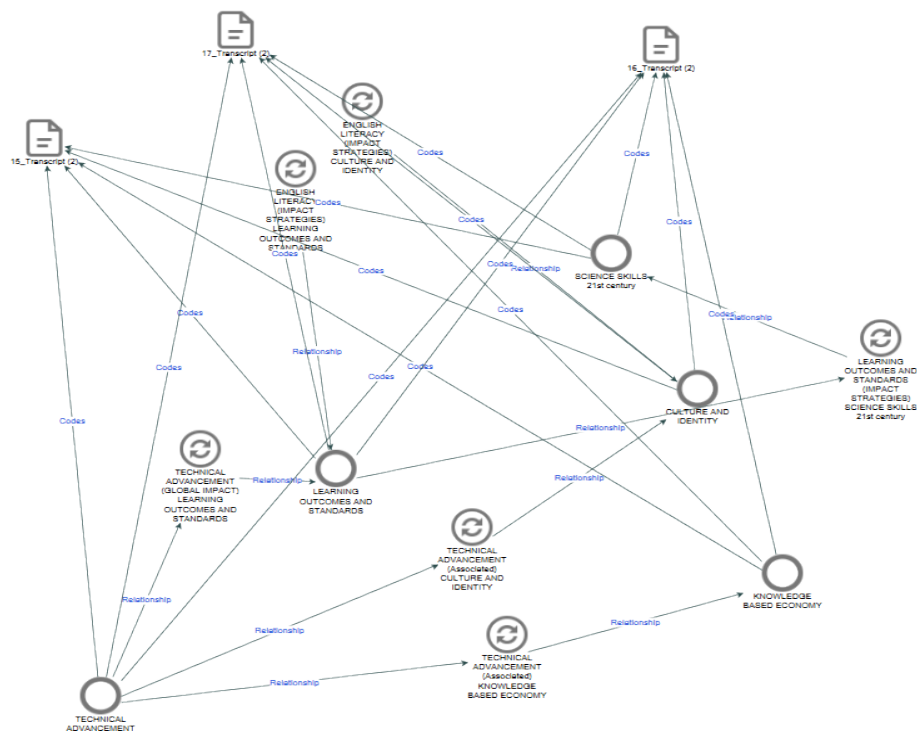
The current study goes beyond the education content of science and finds similarities with Helmy et al. (2021) that the UAE, like most MENA and Gulf countries, is moving slowly

towards more private and public partnerships in education sector – as part of the new neoliberal ideology – to ensure more Critical Success Factors' (CSF) success and to guarantee better project management' successful implementation in education projects. The current thesis findings coincide as well with Alteneiji et al. (2019) who emphasize that the rapid momentum of the UAE growth has pushed the country towards engaging the private sectors in education infrastructure to reduce the governmental budget pressure after the reduction of the oil economy. Some responses retained from the SCS and SAS show that specialists are in favour of public-private collaboration in the education sector. The current study finds, as in Helmy et al. (2019), that there is a minimal independent evaluation being conducted on the current education projects and that more careful assessments are needed to ensure that governments maintain their effectiveness on the long-term run (SCS5, SAS17). In addition, SCS5 explains that education reform is inevitably a plan that saves the UAE's country whose GDP has fallen in the last decade by moving from an oil-based economy to a knowledge-based economy. SCS10 continues that the MoE needs to achieve significant steps in establishing more partnerships with the private sector from one hand the approach communicates the rationale and goals of the country's plan for globalization to all stakeholders, notably in education and on the other enhances profit and guarantees budget sustainability. On the other hand, SCS10 complements that the private sector has the obligation to respond and support the public sector's challenges as part of the local community' responsibilities and SCS10 offers some ideas on how to proceed:

"*...extend the community platform to share the common challenges of the education and include the civil society and the private sector along with the local institutions and endorse the role of the federal and non-federal institutions in planning, funding, and executing dogmas of human resources empowerment to support the progress of the government performance at*

the same time in management, ordering, inspection, audit, and accountability" (Interview, February 2020)

4.3.1 Sub-Theme 1: Views of SCS and SAS on Globalization's Impact on a Knowledge- based Economy

The words "knowledge" and "knowledge-based" were seldom used in the science specialists' interview responses. The SCS and SAS expressed the view that there is a close relationship between the UAE Vision 2021 and UAE Centennial 2071 mandates and how the science curriculum has been tailored to the ideology of the knowledge-based economy (see Figure 4.7). Findings derived from the specialists' responses echo earlier conclusions reached by Forwai (2021), Hanadi (2021), Ridge (2019), and Kamal (2021), namely that the science curriculum in the UAE is moving from a knowledge-based to a skills-based curriculum that extrapolates knowledge. As SAS11 explains, "*Using technology in the science curriculum content design and application extrapolates knowledge for students' learning*" (Interview, February 2020).

SAS11 continues that, the way he perceives it and based on his earlier experience in his home country, there are three primary keys to science reform, namely, skills-based learning as well as global trends in science and technology respectively. The SAS and SCS confirm what has been stated in Lahann and Reagan (2018), that neoliberal education reform focuses on international-level auditing and strict accountability to improve education, while the UAE is moving towards more measures and metrics while focusing on investment in the field of education. SAS10 explains that investing in the current science curriculum reform is essential in order to support Emirati students to become more flexible and adaptive in terms of learning compared to their international peers, also in terms of ensuring the sustainability of their knowledge. The current study builds on Sandel (2012), who argues that the wider society is

being marketised to serve a knowledge-based economy; current human resources teachers and curriculum workers are trained to meet new global demands (Lahann & Reagan, 2018; Sandel, 2012; Kamal, 2021). SCS7 explains that all the changes made to the science curriculum fall into the world competitiveness report (WEF Report 2021) that shows the UAE's level of knowledge transfer and GPI (Specialist 7). SAS13 expands on SCS7's view and elaborates on the process: "*We have increased the input and reduced the output, and all resources were managed to keep increasing the GPI of this knowledge-based resources*" (Interview, February 2020). In addition, SAS17, confirm that work is focused on increasing building a knowledge-based economy.

STEM is an economy-based strategy. The SAS and SCS reflect on it in terms of it as a budget auditing mechanism: instead of having four sessions of teaching and learning of four different disciplines with four different teachers, STEM can support an integrated approach and develop students' twenty-first-century skills in order to foster future entrepreneurs (Specialist 13).

Figure 4.6 SCS and SAS views of changes made to the science curriculum to achieve a knowledge-based economy
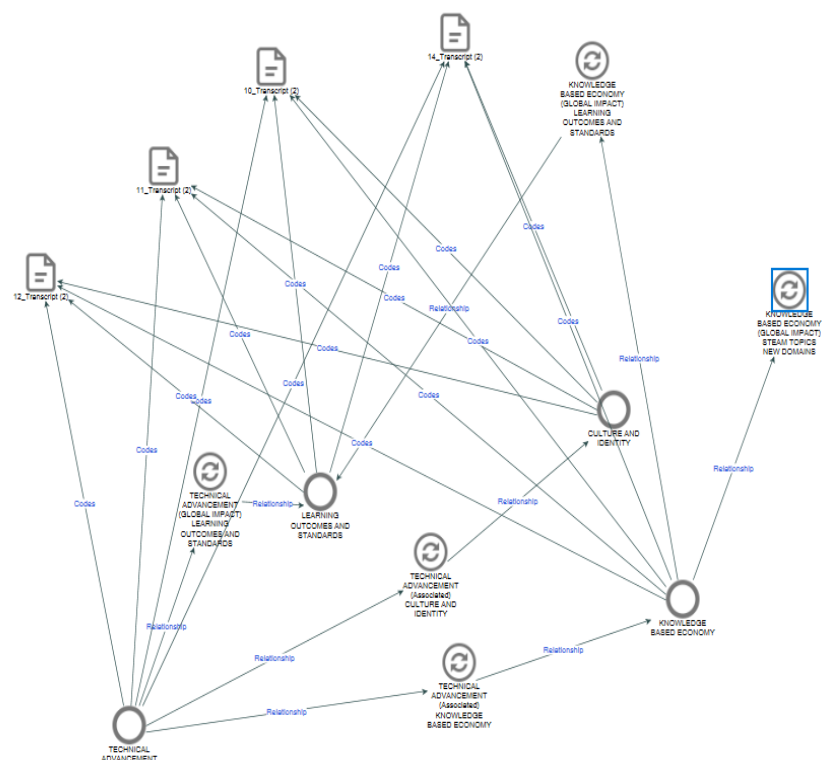
Figure 4.6 shows that there is a relationship between the knowledge-based economy and the curriculum edits that are executed in the science curriculum. However, if we go further, it is evident that SAS10 and SAS11 believe that edits based on the learning outcomes are closely connected.

4.3.2 Sub-Theme 1: Education as an Education Product

The curriculum is a complex conceptual document that defines bodies of knowledge within a given pedagogy determined by the politics of knowledge (Shay et al., 2016). The curriculum is the tool that either promotes post-colonial cultures' ideologies and values to be developed in youths' minds or it promotes a form of "decolonization" (Gyamera, 2018, p. 5). SCS10 advises that, in the context of the twenty-first-century skills, bilingual literacy in Arabic and English develops UAE students' capacity for new ways of understanding science and mathematics. Adopting a neoliberal economic strategy dominates UAE thinking; globalization is necessary while making the economy sustainable is a specific mandate (Kanna, 2010). The perspectives of the science specialists regarding the wider conception of education during the reform show that education and textbook production is an income generator for the UAE in terms of both its local and regional market (Specialist 7): *"The number of science textbooks printed and distributed to all Emirati schools are expenses yet also a source of income"* (Interview, February 2020).

Sandel (2012) describes education as moving towards a "commercialization effect" (p. 120) whereby education is a good to be sold and not a tool for the common good. In the same context, in 2021 Saudi Arabia sought to purchase from the UAE MoE social studies textbooks and its "Smart Learning Program" which won an award at the World Summit on the Information Society (WSIS) in March 2022 (Telegram 31 May 2022, 17.08pm, MOEUAEOFFICAL). Our present education market requires knowledge and knowing to be reduced to the logic of the market and defer to broader anxieties about global economic

competitiveness and positions in world rankings (Nixon, 2013, cited in Gyamera, 2018, p.102). SAS17 shares the daily challenges parents face as a result of the UAE's expensive school fees, particularly for non-Emirati; this implies that low-income parents might not be able to purchase the MoE's highly priced printed science textbooks, therefore the digital version will be their only option. Further, integrating STEM in the science curriculums nurtures the country's knowledge economy (Kamal, 2021): *"Education has a big influence on students' pattern in UAE; as science curriculum specialists, we had to change the learning outcomes sequence and standards to bridge the gap between the college and the universities and support the Emirati student to finish quickly and gets certified ..."* (Specialist 14, Interview, March 2020).

SCS10 suggests some education tools that the MoE needs to invest in to attain a knowledge-based economy and move towards digital education and modern communications media in the new state policies. SAS17 brings up the World Economic Forum report again and refers to the Applied Stream curriculum and practices as one of the answers to its requirements; and explains that the MoE is promoting skills development and technical expertise to make sure all global documents are answered, including the UAE Centennial 2071, in order to inculcate professionalism in science and technology, sentiments also echoed by Specialist 6. SAS12 adds more about the Applied Stream's academies and lists the main domains of focus, namely, agriculture, business, tourism, aviation, and electrical engineering. To conclude, SCS6 gives his opinion regarding the reason behind having the MoE develop the Applied Stream curriculum: *"...not all students will be future doctors or science engineers..."* (Interview, February 2020).

Sheikh Zayed Bin Sultan Al Nahyan, the UAE's first ruler, envisioned education as an essential element of economic modernization: "*the greatest use that can be made of wealth is to invest it in creating generations of educated and trained human capital...and the*

prosperity and success of the people are measured by the standard of their higher education"
(cited in Kamal, 2021, p. 2).

Furthermore, the science curriculum specialists responded to the education policy changes set out in UAE Vision 2021 moving towards UAE Centennial 2071, in relation to which the science experts positioned themselves firmly in favour of these two mandates, voicing their endorsements and mirroring the modernized vision of education: *"The curriculum needs to be futuristic in the UAE as required by the policy agenda..."* (SCS6, sentiments echoed almost verbatim by SAS12 and SAS17).

4.4 Theme 2: SCS and SAS Views on the Science Curriculum Reform Process

In relation to the 2012 science curriculum framework document, based on the SCS and SAS responses, twenty percent of the text had been changed through the editing process, edits that reflected alterations to the science learning outcomes as an average per cycle. SCS7 explains that the overall edits to the science curriculum framework were inclusive of the learning outcomes, which they measured at approx. sixty percent changes to the framework document as a whole. SCS7 explains that the UAE is also trying to respond to global reports while meeting the overall objectives of the OECD's testing requirements. Other responses collected by SCS9, SCS6 and SAS12 give us other information regarding the percentage changes that touched the science framework, underlining that the current science document is ninety per cent different from the one used in 2012. An MoE cycle is made up of every four academic years, i.e., Grades 1-4 is Cycle 1, Grades 5-8 is Cycle 2, and Grades 9-12 is senior high school or Cycle 3. The findings reflect Ridge et al. (2019), who suggest that learning outcomes edits need to match the OECD requirements in terms of the Trends in International Mathematics and Science Study (TIMSS) large scale measurement assessment tools as well as the Program for International Student Assessment (PISA) (Specialist 7). SCS5 explains the

process: first, a research review and study of the international science textbooks series' compatibility with the current science curriculum document is conducted, then second, the choice of an acceptable publication is sent via an official report to higher management. In this report the SCS and SAS present the results of their evaluation of the scientific content and its alignment with HE policy demands and OECD requirements, namely, TIMSS, PISA and UAE Vision 2021 and compatibility with the UAE's science curriculum framework. The textbooks chosen by both science curriculum specialists and higher-level leadership are the McGraw-Hill series and the textbooks are in English. SCS7 explains the rationale behind the new science curriculum document recommending the McGraw-Hill science textbooks: in addition to meeting the NGSS science framework, the textbooks follow Atkin and Karplus's (1987) 5Es model, namely Engage, Explore, Explain, Elaborate, and Evaluate. The main goal of choosing this science series is to strengthen schools' quality of learning outcomes coupled with a new framework that improves the quality of academic research with a focus on developing curricula geared toward employment and business corporate (SCS7) (Kamal, 2021).

SAS17 highlights the challenges they faced during the process:

"*... in some instances, we had to edit our science learning outcomes in one grade level. In other instances, we made edits on our science learning outcomes in different grade levels available in the science curriculum framework document to match the sequence of the science textbooks imported or match our local science curriculum to TIMSS and PISA requirements.*" (Interview, February 2020)

Indeed, these results chime with Tabari (2014), who explains that the choice of reformed science textbook is an instrument developed to achieve UAE Vision 2021's policy and as such is a mandate that the country needs to follow, rather than reflecting context-specific practices (Tabari, 2014).

SCS3 reflects on the science reform and explains that the policy has shaped the choice of domains, strands, standards, learning outcomes, and indicators. Moreover, SAS13 works on the STEM training for teachers and thinks that it is about time to enhance both the UAE's level of education provision and Emirati student ability in order to foster world-class researchers, engineers, scientists, entrepreneurs, writers, technicians, and various other roles as per market requirements. Additionally, the present curriculum reform provides practical opportunities for learners to practice leadership skills through negotiation and discussion as well as helping them to develop responsibility and strong self-esteem through the STEM topics that have been added to the original context of the curriculum. Finally, regarding the profile of Emirati students, the current study concludes that keeping the Emirati student aligned with his local cultural identity is going to a difficult task to fulfil, particularly when considering the need to keep up with the rate and speed of transformations required by the country.

SCS2 is taking care of the Applied Stream along with the science curriculum reform and remarks, "*... we are performing this job to build the necessary workers and where the cultural and social needs should not be a hindrance in education...*" (Interview, February 2020), while SCS10 shares their own learning journey over the course of the science curriculum reform: "*At first, when we were building the national science framework in 2012, we did not have in mind the skills and all the current political and economic and socio-cultural events we are experiencing right now and what was the main request of our leaders...*" (Interview, February 2020).

Finally, the SCS and SAS confirm, from their perspectives, that they adhere to the education policy of UAE Vision 2021 in relation to the science curriculum framework document. SCS7 believes that they follow the pace of the global changes, reflect the needed updates in the science textbooks, and constantly introduce new features needed in science

schools. These findings mirror a statement done by the UAE's Minister of Education, Hussein Ibrahim Al Hammadi, in his tweet on 1 June 2016:

"The UAE imported the western international textbooks aligned with the American Next Generation Standards as a tool for the new neoliberal globalized education ideology"

[Al Hammadi, H., telegram, June 1, 2016]

4.4.1 Sub-Theme 2: SCS and SAS Views on the Impact of Globalization on STEM and Skills in the Modern Science Curriculum

The study findings have revealed the substantial impact of neoliberal globalization on the science curriculum reform; SCS7 believes that the specialists follow the pace of global changes, thereby reflecting the updates required in science textbooks as well as introducing new features in science schools starting from the digital resources, to the new pedagogical approach based on STEM to the flipped classrooms and hybrid context. Furthermore, most edits have been made mainly to learning outcomes and indicators while keeping the domains and strands identical to those in the NGSS. Specialist 2 explains that STEM is "*[T]he adopted strategy in science and math to build the entrepreneurship mind set among the students*" (Interview, February 2020).

Moreover, an important issue to consider is these changes' rationale and purpose. The main goal of these edits is to prepare graduates for the global job market by building skills to support the country's move from an oil-based economy to a knowledge-based one, which in turn is directly linked to the neoliberal preoccupation with skills development. When questioned about learning outcomes and skills-building, SAS12 and SAS13 and other science experts stated that twenty-first-century skills will support future citizens in the industries the UAE needs to develop.

The specialists' responses demonstrate that the UAE is moving far beyond basic science and mathematics knowledge towards literacy in these areas, which is an essential basis

for research in the region, thereby empowering high school students' profiles and skills, especially as outlined in the UAE's Policy Brief (Godchaux-Berezhnova & Moonesar, 2021). SAS14 favours technology use in learning and digital practices and implies that the MoE practices based on scientific advances and a technology-based learning environment enable students to adapt better to the future while helping their levels of be resilience. SCS9 adds that "…*new science domains are of real importance during the education reform for all Emirati students to prepare them for the future*" (Interview, February 2020).

The SCS3 and SCS4 stakeholders perceive STEM to be a core structure of the modern science curriculum pedagogy; STEM is an integrated approach or what we call an interdisciplinary pedagogy of the new science reform framework based on the NGSS and its mapping of twenty-first-century skills. In addition, it is a crucial component of the new science curriculum document (Specialist 15) while new innovative domains – such as STEM topics – are aligned with SDG topics such as green, nuclear, and food chemistry respectively have been newly added to the original version of both science textbooks and learning outcomes (Specialist 3). Figure 4.7 illustrates that the SCS and SAS perceive that the main nodes which are science skills, knowledge-based economy and technological advances, need to be embedded in the science curriculum's learning outcomes and are closely interrelated with STEM topics and pedagogies. STEM is a science teaching pedagogy in which students can build lifelong learning skills while dealing with personalised content extracted from their own space in such a way that it supports their transition between jobs and allows them to adjust to changes (OECD, 2018c). This is the new teaching strategy's perspective on developing innovation and creativity in the Emirati students' profile while preparing them to join the new knowledge-based job market (Specialist 3).

Figure 4.7 Views of the SCS and SAS on STEM topics in the modern science curriculum

Note. Figure 4.7 shows some views of the SCS and SAS codes that are focused on the skills building.
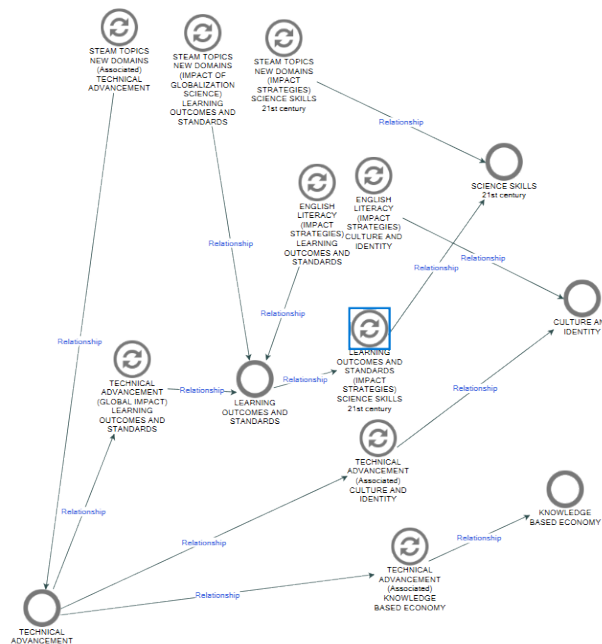
Specialist 2 explains that STEM is: "*[T]he adopted strategy in science and math to build the entrepreneurship mindset among the students...*" (Interview, February 2020). Figure 4.7 shows that the SCS and SAS perceive STEM as closely connected with building twenty-first-century skills and empowered by technological advances, beliefs which have and informed the learning outcomes edits. The figure also indicates that most of the responses were repetitive in relation to science skills, technological advancement, and STEM during the coding of the transcripts. When questioned about learning outcomes and skills-building, SAS12 and SAS13 replied that the new science reform include practices that enhance twenty-first-century skills in the Emirati students and support them to become better future citizens in the industries needed in the UAE marketplace (Specialists 12 & 13). STEM is the most used pedagogy in the NGSS science curriculum in the MoE while Asghar et al. (2013) infer that STEM reflects the output and input of globalization in many countries. Furthermore, SAS14 explains that STEM is "*... the strategy of integrating more than one discipline is a locally trending approach that*

secures innovation". He continues that " *globalization has introduced innovation in sciences and technology that need to be reflected in the science curriculum*" (Interview, February 2020).

For the science curriculum specialists of the current research, globalization is about the availability and abundance of STEM and technology is part of these practices (Martinez & Bozzi, 2017). SAS11 explains that, "...*globalization affects the education domains and strands and has pushed us to add technology, science, and engineering…to build the new generation of entrepreneurs, engineers, and doctors required by UAE society*" (Interview, February 2020).

The new modernized curriculum emphasizes students' choices and voices in their learning experiences (Copper, 2017). SAS14's response cites the choice of the technology used in learning and digital practices when building students' future skills, implying that the MoE's practices are based on scientific advances and a technology-based learning environment to enable students to adapt better to the future and be resilient at higher education level, a mentioned previously. SCS 9 adds that "…*new science domains are of real importance during the education reform for all Emirati students to prepare them for the future*" (Interview, February 2020). SAS16 emphasizes that STEM practices will build an Emirati generation capable of and "*effective decision-making process*" (Interview, February 2020).

Based on their responses, SCS and SAS are involved in advising the instructional hours required for science. SCS2 continues that STEM is not only a theory but a strategy based on economic considerations. Figure 4.7 illustrates the positive sentiments specialists expressed regarding adopting STEM as one of the main strategies in science alongside the science inquiry. In addition, Kassir and Forwari (2019) have emphasized the main role of the science inquiry in the implementation of the UAE science curriculum, namely, to increase students' motivation. Further, and as mentioned in Chapter 2, STEM facilitates experiential learning and computational thinking through student-centred approaches and innovative pedagogies (World Economic Forum, 2020; Istance et al., 2019), hence the SCS advised UAE science teachers to

implement an integrated STEM approach based on skills to support the implementation of modern science (Specialist, 2). In addition to STEM topics, reviewing SDG goals, and aligning with the scope and sequencing of TIMSS and PISA, the UAE's modern science curriculum included twenty-first-century skills to ensure a knowledge-based economic approach: SAS15 emphasizes that, "*...science textbooks include topics related to the knowledge-based economy and innovation skills development, and these topics consider the physical health and wellbeing of students and individuals…*" (Interview, February 2020).

The Canadian SCS8 elaborates that enhanced skills practices start gradually in the science curriculum, beginning with the ability to cope with changing environmental conditions. SCS6 explains that the UAE's national agenda has defined the science framework's primary outlines, including twenty-first-century skills as a specific mandate. The Egyptian SCS7 elaborates further that this twenty-first-century skills-based pedagogy is dictated by the MoE's policy, and this includes the early years. Regarding SCS7's statement, Ryder (2015) explains that science curriculum is often a focus of externally driven higher education reform in many countries, while Ryder et al. (2018) argue that higher education is expected to answer continually shifting education policy reforms that are imposed upon the sector, which is rarely a reflection of curriculum designers' intended outcomes. Ryder (2015) continues, agreeing with the SCS7 that, being externally driven, the science curriculum reform does not make science teachers proactive in terms of adopting a particular curriculum reform initiative. In addition to this, the responses of the specialists coincide with Banner et al.'s (2012) argument that "implementation" of curriculum design policy– not least in relation to a science curriculum – is often seen as reflecting a certain kind of mechanistic, centrally-determined complex process, especially in the field of education. SAS16 explains that the science curriculum moved from a formal document to a new modern skills-based document where twenty-first century skills are enhanced and the process is conducted entirely centrally and without the support of teachers

who traditionally are the main players in the reform: "*It is a twenty-first-century skills document, these skills were not very obviously embedded within our curriculum eight years before now, but these days, twenty-first century skills are becoming defined so well, defined so accurate...*" (Interview, February 2020).

The responses of the SCS and SAS emphasized that twenty-first century skills were embedded and empowered throughout the science curriculum reform process. These skills – such as critical thinking, creativity, and problem solving – reflect a deeper understanding and interpretation of scientific knowledge, whereby learners are requested to build their own awareness through peer work and project-based learning (Hwang, Tu, & Wang, 2018).

SCS1 and SAS17 explained the process of embedding them in the learning outcomes in almost exactly the same manner, with the former remarking,

"*... we have made the required changes by the UAE education policy and the global needs in the learning outcomes... globalization has pushed us towards adding more learning outcomes focused on science technology engineering and mathematics ... with more emphasis on higher cognitive levels at the Bloom Taxonomy so we ... revisited our science textbooks objectives.*" (Interview, February 2020)

SAS16 maintains that science textbooks supporting digital resources target literacy and digital numeracy for students due to the latest PISA and PIRLS reports. Textbooks in the UAE have previously been considered as embodying the science curriculum itself (Ridge et al., 2019), therefore moving away from a solo textbook to a science framework is necessary in order to support the higher education graduate while building the skills they require in the future. SCS8 concludes that "*...our science curriculum is global now and includes twenty-first century skills, as well as aspects of the sustainable development goals required for our future graduates*" (Interview, February 2020).

SCS2 favours a policy that builds literacy and numeracy in a bilingual context to improve students' cognition. He advises that the choice of supporting tools such as resources and extra- curriculum activities can support the achievement of this goal. SCS6 explains the importance of having bilingual content in science curriculum textbooks:

"*...while the science curriculum and science resources were only in the Arabic language six years ago, the MoE new policy mandate is to equip students with the transnational twenty-first century skills in the English language as well to assure the mastery of the bilingual literacy in science and technology and engineering.*" (Interview, February 2020)

Regarding bilingual literacy, SCS10 remarks that the new reform brought about by neoliberal globalization has required of students creative design and digital skills such as science simulation, robotics, and gaming. In the context of twenty-first century skills, bilingual literacy in Arabic and English inculcates in UAE students new ways of understanding science and mathematics (Specialist 10). Moreover, SCS10 remarks that science resources need to highlight research, technology and finance by focusing on the development of appropriate skills. SCS2 and SCS8 emphasised the MoE's lack of research in science and technology, while SCS2 explains the reason why: "*I can say that we have defined well- enough the mandates of skills needed for globalization and that includes research skills and the scientific ways of knowing, but we need time to see the fruit of this work in our youth*" (Interview, February 2020).

To conclude, SAS 12 explains that the curriculum department undersecretary directs the specialists to include all the science topics that are global in nature and internationally needed for their students, including adding SDG goals such as green energy, solar power, and wind energy to the science textbooks. Stromquist and Morkman (2014) argue that the growing impact of technology on education, the emergence of new policy variables, and the increasing fragmentation of higher education have become powerful agendas indicators influencing all levels of education, including higher education. Adding to that the neglect of human rights

among other issues, and the demise of centrally planned socialist economies, the market is expected to reach its highest volume and quality in terms of production, while competitiveness is a fundamental aspect of the globalized market (Stromquist & Morkman, 2014). In turn, SDGs are another integrated feature of globalization and high-level technology and are considered significant indicators in the 2019 IEF index (Wyman, 2019). SAS8 explains that all science textbooks and curriculum framework indicators include energy conservation topics that raise awareness regarding SDG7 and the climate change phenomenon. At the MoE, the SCS and SAS aligned the SDG indicators with the current official national science curriculum document, and these indicators have been expanded to other disciplines, including the Arabic language and social studies (Wyman, 2019). SAS13 clarifies that the UAE's science textbooks also include SDG-related content and global education pedagogies. The science textbooks consider the global aspect by including diversified examples from different social, religious, cultural, culinary, and geographical contexts.

SCS7 remarks that as a federal governmental entity, the MoE's science textbooks are based on clear strategies dictated by UAE Vision 2021 and UAE Centennial 2071's education policy outlook and mission. SCS8 clarifies his colleague SCS7's response regarding the MoE's directives and assigned pedagogies on the science available skills in the curriculum, explaining that science skills evolve gradually from the ability to interconnect to the ability to cope with changing environmental circumstances using problem-solving, critical thinking and innovation. These higher order thinking skills are in line with Bloom's taxonomy skills pyramid (SCS8). SCS3 adds that the UAE's reformed science curriculum uses the STEM approach as a medium pedagogical tool to teach the twenty-first-century skills needed within the context of the need to develop sustainable cities.

The OECD's (2010) "21st Century Skills and Competencies" framework for New Millennium Learners in OECD countries lists three significant dimensions: (1) communication;

(2) information, and (3) ethics and social impact with three skill sets: (1) learning and innovation; (2) information, media, and technological, and (3) life and career skills respectively. A 2018 OECD report enumerates the skills now required of young learners, which include decision-making, problem-solving, creative, and critical thinking, communication and interpersonal skills, self-awareness, empathy, coping with emotions, and stress. SCS9 acknowledges that creativity and innovation skills are present in the science curriculum framework and the science textbooks, which support the readiness of graduates to enter the job market. SCS9 and SCS7 dived into the science textbook's structure, with SCS9 repeating SCS7's words almost verbatim: *"Our science textbooks include skills-based resources such as the activity lab manual and other experiments..."* **(**SCS7 Interview, February 2020). In addition, SAS12 explains that *"sustainable development goals are required by the government..."* (Interview, February 2020).

Finally, it is important to stress that research shows that UAE considers neoliberal policies as fundamental to maintaining the country's political and economic security in the Middle East (Bogaert, 2011). The UAE has added the SDG indicators to the science curriculum framework. Considered the new era of work and business, the SDGs cater to green technology and other industrial businesses and are considered future opportunities. The SCS and SAS at the MoE aligned the SDG indicators with the official national science curriculum document, and these indicators have also been expanded to other disciplines in the UAE, including the Arabic language and social studies (Wyman, 2019).

4.5 Theme 3. SCS and SAS Views on Globalization's Micro-sociological Level Impact

4.5.1 Sub-Theme 3: Globalization's impact on Emirati students' profiles

Students' projects and practices, when pursued in an unfamiliar cultural setting, show challenges in terms of their implementation (Kahn & Misiaszek, 2019). Science textbooks have to respect Islamic culture and are reviewed accordingly (Specialist 5). SCS2 adds to that that the science textbooks, although are required to be in English, they still have to respect Arabic culture in their images and wording while also emphasizing twenty-first century skills in science instruction. The role of the SCS and SAS is defined by Ridge and Farah (2017) in terms of their main tasks and job description, which SAS16 confirms in his responses: "*...go through a deep level of adaptation, compatibilization, and adaptation, without upsetting the global content and its specification, we balance the local culture to meet the global needs...*" (Interview, February 2020).

Emirati students have a significant challenge to complete their studies and graduate using their lingua franca. Science specialists favour the English language in science and technological subjects, so shifting the science curriculum to English as a medium of instruction will assist higher education graduates to feel more comfortable in their studies and bridge the gap between senior high school and their first preparatory year of college. Moreover, Samier (2012), Ridge et al. (2017), De Lissovoy (2013) and Altbach and Knight (2007) have written about the education policies reform in the UAE and how has impacted higher education and graduate profiles as well as the need -- as the focus of the current study- to look back at the curriculum that has shaped recent students and their skills, the latter being the focus of the current research.

Globalizing the curriculum involves incorporating international and intercultural dimensions into both the content of the education curriculum of a given country as well as its

teaching and learning pedagogy (the second is not elaborated on in this research), after which resources are aligned with the curriculum (Leask, 2009). The MoE adopted western curriculum philosophy and textbooks (Kamal, 2021) with some cultural adaptations and added English as a medium for science instruction (elaborated on in Chapter 5) (Ridge, 2015). The power of curriculum reform and its implications for students' profiles and beliefs cannot be underestimated and its influence reaches beyond simple cultural adaptation and censoring of textbooks (De Lissovoy, 2013); it is the hidden curriculum that is beyond the remit of science curriculum reform that we need to consider in terms of its effect (Burke et al., 2021). Indeed, education reform is a long-term process that involves the entire national education apparatus, and its success depends on teachers and students as the essential components of this change (De Lissovoy, 2013). The level of cognitive and behavioural involvement and the beliefs of these two sets of stakeholders can influence the effectiveness of the reform's implementation (Hargreaves, 2004; De Lissovoy, 2013). The knowledge-based economy in the UAE requires specific Emirati student profiles from the science reform such as the mastery of science content as well as scientific expertise (Baig et al., 2019). Before asking students to use 21st century skills such as critical thinking and problem solving in their open-ended responses, it is important to check their understanding of scientific language (Gobert, 2019).

SCS5 argued that all adaptations made to the science curriculum document were based on cultural sensitivity while SAS17 explained that Emirati youth are motivated when surrounded by peers from different cultures, namely they are more challenged to complete their studies and graduate and – when they have knowledge of the English language – they feel more comfortable. SAS17 gives an example of their early life:

"My father sent us to live with families in Great Britain to learn the language and get our studies. The British family takes care of our daily food and needs, and for this reason, we

are emotionally attached to the British culture and country now; I do not have to send my kid abroad for the language and the study..." (Interview, February 2020)

The UAE Vision 2021 (UAE Government, 2018) defines the student's profile as an Emirati global, competitive student who masters twenty-first-century skills and is proud of his local identity and practises Islam as his religion, while UAE2071 Centennial lists new indicators for the indicative Emirati student's profile: He needs to be talented and skilled with a high level of digital literacy, entrepreneurship skills, and tolerant of others (UAE Government, 2022). The new policy emphasizes open-mindedness and the adaptability of future graduates ready to embrace the changes determined by globalization. Thus, it remains an open-ended question to what extent the ideal student envisaged in UAE Centennial 2071 – alongside a modernized science curriculum reform – can preserve local practices and traditions while also marking a move towards a more transnational and cosmopolitan identity based on a transnational highly-skilled elite who possess transferable skills that transcend local contexts and boundaries (Kanna, 2010). When asked to define what marked the specifically Emirati features of the reform, the SCS and SAS insist that traditional culture and Emirati identity are kept in mind throughout the reform process but hardly ever specified what this means exactly, even when prompted. SAS14 adds that all the edits made to the science framework are new to the specialists and to UAE science teachers. The science teachers are considered novices in terms of dealing with standards-based teaching coupled with a Western philosophy of education. For instance, SAS17, an Emirati national, attempted to explain what they meant by Emirati features meant: *"... as an Emirati living in the UAE I encounter and live and face all of these divergent aspects and specific attitudes and customs that are different from those we have been raised with... even within the same country, we have different personalities, and this can affect me personally"* (Interview, February 2020). SAS16, an Emirati national, also emphasised the importance of globalization: *"... as Emirati, we realize that globalization is*

creating new ideas, values, identities, practices, and movements…but we reduce the time of completion of our kids when they travel abroad… They develop new skills to match the job market…" (Interview, February 2020).

Both SAS16 and SAS17, Emirati nationals, agreed that globalization did not affect their youth as travelling and encountering Western culture has been a regular practice since 1970. SCS6 defends the adaptation made to the science curriculum document: *"…all changes made on the science curriculum design focus on keeping the Emirati profile and this is advised by UAE Vision 2021 and are followed with level-based indicators …taking into account the social and cultural aspects of the local Emirati practices"* (Interview, February 2020).

Neoliberal globalization has affected UAE policy-making and marks a transformational shift at a critical time and, as remarked by Barnaw (2015), it is the country's institutions that are being shaped by a foreign language ideology that comes with this change. Kanna (2010) adds that the Western influence that comes with neoliberal globalization has a sustained structural effect on the given local society. All of that being said, accentuating what Baldwin (2019) has termed "open telemigration" (p.10) helps to explain the impact of open barriers, the importing of new languages, and new cultural practices. Some female Emirati students have reported that the Western curriculum did not affirm their Islamic and Arab identity, however, despite this they retained their strong sense of belonging (Tabari, 2014). On the other hand, Whiteoak et al. (2006) predict that UAE youth will face challenges in terms of preserving their local social norms while maintaining Islamic ideals in the context of globalization. However, Abray et al. (2021) do not confirm this prediction, instead arguing that the UAE's leadership has done much to preserve national identity and Emirati values based on their interviews of Emirati students at Zayed University where students showed that they retained their UAE beliefs and values. SAS16 explains that the specialists' task in the curriculum department is to *"…go through a deep level of adaptation and compatibilization*

without upsetting the global content and its specification; we balance the local culture to meet the global needs" (Interview, February 2020).

Nevertheless, to what extent can the stakeholders navigate the changes that will inevitably influence Arab behaviours, notably Islamic values (Samier, 2019). On 3 February 2021, the MoE announced the translation of the "Al Sanaa" curriculum as a way to introduce Emirati values and practices to the Western world, where the core Emirati Gulf Arabic dialect, practices and traditions were translated into the English language (MoE, 3 February 2021, Telegram). The initiative is a sign of modernized thinking on the part of UAE stakeholders, an example of the practice of tolerance, yet some authors in local newspapers have viewed that translating the UAE programme for hospitality and Bedouin social behaviours and phrases as leaving behind the roots of Emirati culture to impress the West (Halwa, 2020). In this vein, SAS15 remarks that what Western culture has brought to science content in terms of vocabulary words and the standard dialects used by Emirati youth in their daily lives is different from what their parents taught them.

Barnawi (2017) perceives globalization as a new form of colonization that penetrates and homogenizes non-European cultures, languages, and values in the Arab world without accomplishing and sustaining the expected socio-economic development. It might be out of context to add this example in this section, but on Wednesday, 8 December 2021, the UAE Prime Minister's Office announced the shift of the weekends to Saturday and Sunday while Friday – a Muslim day off – is from now on a working day in the UAE until mid-day while all Salat prayers have been set to a specific timing, namely 1:00 in the afternoon. That means a shorter week and more daily working hours effective from 1 January 2022. Khamis (2021, 8 December) explains that "*The new schedule aims to book trading opportunities between Western countries and the UAE and improve the Emiratis and residents' lifestyle"*.

SAS17 believes that all the edits are influenced by each specific science specialist's personality and his perception of heritage. The UAE has implemented Western education framed by Western ideology as refracted through a Gulf Arabic Islamic society's patterns and practices (Abdelsalam, 2021). There is a substantial responsibility behind the reorganization of the country's curriculum and its instructional pedagogy; this task concerns reconceptualizing the whole ideology of education and its accountability (De Lissovoy, 2013). Building and reorganizing a curriculum content tool will preside over the shared understanding of teaching and learning in UAE schools for the next century.

4.6 Conclusion

Said (1970) explains that the administration of education reform in a country that has not yet fully established a modern education system result in the direct transplantation of an imported curricular model, teaching staff, and textbooks from the "West" without any localization. Small touch adaptations of textbooks, papers and science curriculum frameworks cannot maintain the culture, heritage, and identity of a country like the UAE. The *problematique* of the impact of neoliberal globalization is more profound than the issue of staffing and even more profound than the curriculum itself as it affects the curriculum implementation's pedagogy at multiple levels and on different registers. In addition, it is the education accountability behind that ideology that makes the implementation of the science curriculum, like any other curriculum, a substantial and onerous task (De Lissovoy, 2013).

CHAPTER 5. DISCUSSION

5.1 Introduction

This exploratory research study explores the views of MoE curriculum stakeholders on the impact of globalization on education policy and strategies and how both education policies and strategies have influenced the UAE's science curriculum reform. It is hypothesized here that globalization impacts the daily functioning of the SCS and SAS and has shaped the changes brought about by the science curriculum document that follows the UAE's education policy. This chapter draws on Chapter 4's thematic analysis and previous research studies to provide a deep understanding of the impact of neoliberal globalization on education policy and strategies as well as its influence on science curriculum reform. The discussion details the relationships between these themes and how they connect holistically to support the UAE's educational policy while answering its global needs. In addition, the chapter discusses the points raised by the organigram in Figure 5.1 which illustrate the main findings.

Figure 5.1. Discussion Themes Based on the Findings
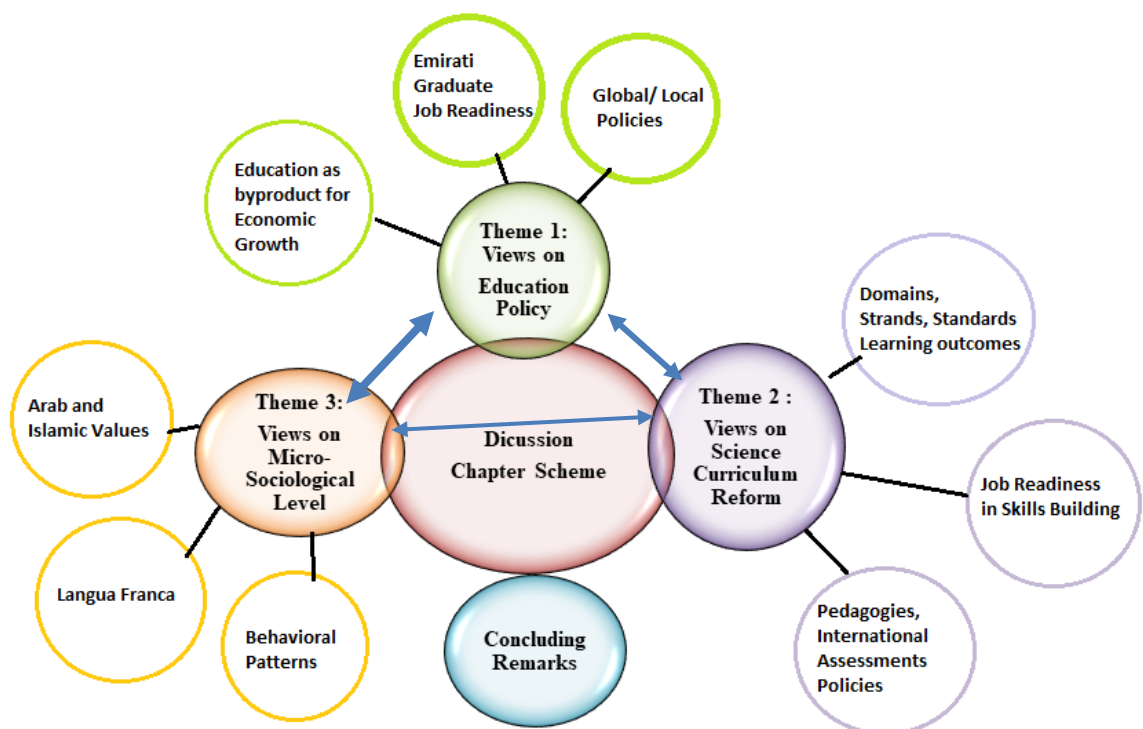
5.2 Discussion of the Findings

5.2.1 Theme 1. Views on Education Policy Adopted in Science Curriculum

While all participants' responses were in favour of both UAE Vision 2021 and UAE Centennial 2071's mission, the results of the study highlight three areas of focus: (1) globalization is inevitable and fast and affects the local context in terms of life, patterns, behaviours; (2) there are high level demands on the part of senior stakeholders in terms of achieving national indicators at a fast pace while acquiring the profile needed by global HE graduates; and (3) education as a marketable by-product can affect the quality of the outcomes.
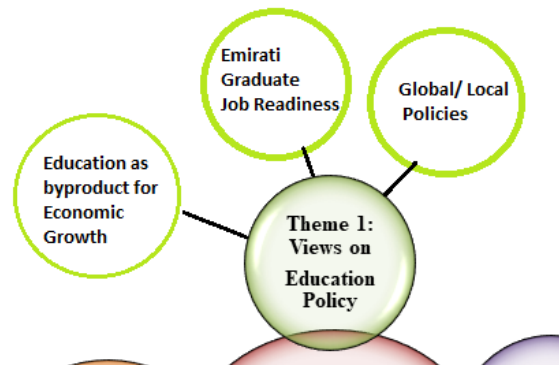
Regarding the first point, the MoE's strategic planning committee oversees the alignment of the curriculum learning outcomes with the mandates of UAE Vision 2021 and UAE Centennial 2071. Nevertheless, as SCS5 explains, there is a mandate behind every action they perform, namely the use of phrases associated with authority and its demands are always present in their responses: *"The UAE science curriculum needs to be futuristic; the science curriculum as required by the policy agenda; the need to follow the education policy as the country policy requirements"*.

Regarding the second point, the consistent challenge is getting the balance right by ensuring that governments focus on only a limited number of specific policy goals whereby the implementation of these goals in higher education is a clear-cut objective (OECD, 2019). First, the hierarchisation of education science programmes and the tracking systems recall the "Washington Consensus" elaborated on in Soederberg et al. (2005). We have the precise response of SAS12 who cites the example of the Applied Stream's academies established in

the UAE as a mandated goal of the education reform, which includes agriculture, business, tourism, aviation, and electrical engineering. Another policy mandate – orienting higher education choices towards technological advances required by both the Washington Consensus and SCS6 – gives an emotional reason for establishing the Applied Stream in the UAE's curriculum: *"...not all students will be future doctors or science engineers…" (Interview February 2020).*

SCS6's answer shows that the SCS and SAS are making the science curriculum reform changes bearing in mind UAE Vision 2021 and UAE Centennial 2071's mission with the aim of impacting students' future science choices and qualification. This is not what Homer and Ryder (2015) view as science curriculum reform; the authors believe that a science qualification is a cognitive construction that emphasises pre-tertiary level literacy. Literacy and numeracy might be a goal that the SCS and SAS are trying to achieve in the Middle Eastern context through the science curriculum reform in the UAE, however at this moment the current study cannot assume its success.

Furthermore, the pressure on Arab identity includes the impact on traditional cultural practices (Tabari, 2014). This pressure is translated first in the education policy that includes Muslim as a requirement of the Emirati profile, as shown in the literature and enacted in the science reform curriculum and later textbooks. SCS5 explains that all adaptations made to the curriculum document of science and science textbooks were made based on cultural sensitivity that respects Islam. SAS17 sees that all edits are viewed depending on the individual's personality and perception of heritage.

The third point concerns the impact of neoliberal ideology on the economy and the education sector, either from a policy or teaching and learning point of view, including the mobility of human practices and beliefs including the way people perceive education in the region. These findings chime with those of Abdesslem (2020), Al'Abri (2016, 2011) and

Helmey et al. (2020). The science specialists believe that education is a tool for economic growth by implementing, first, the agenda indices of competitiveness, second, the comprehensive global measurement tools, and third, the new pedagogies that support the entrepreneurship thinking to reach the knowledge-based economy. SAS17 confirms that its curriculum design task is focused on building a knowledge-based economy. STEM is an economy-based strategy. SAS13 reflects on STEM as a budget auditing capacity that can decrease the recruitment of teachers while implementing an integrated approach to develop the twenty-first-century skills needed to build future entrepreneurs. SCS3 continues that the modernized science curriculum includes global attitudes and twenty-first-century skills with the traits of a global citizen and affirms that TIMSS and STEM topics are included in the UAE's science curriculum framework. To continue the global impact of open barriers, Kahn and Misiaszek (2019) argue that the dominant perspectives on internationalized higher education view education mobility as straightforward. Higher education teachers might explore difficulties in shaping the local policy and values in addition to their pedagogical tasks.

5.2.1.1 Correlation Between Theme 1 and Other Themes

5.2.1.1.1 Science Curriculum reform

The arguments made in the current chapter support the OECD's (2019) observation that there is a mix of government influence and institutional freedom in the UAE. In addition, the arguments also reflect how SCS and SAS have translated the UAE Vision 2021 and UAE Centennial 2071's national mission in relation to science learning outcomes, educational objectives, and reforms have been translated into quality of outcomes in the science curriculum's implementation. In the findings, science experts positioned themselves firmly in favour of UAE Vision 2021 and UAE Centennial 2071, voicing their endorsement while and mirroring the modernized vision of education: *"The curriculum needs to be futuristic in the*

UAE as required by the policy agenda..." (SCS7, sentiments repeated almost verbatim by SAS12).

5.2.1.1 A new form of neo-colonization in the Arab world

Burawoy (2000) explains how grounding globalization in the local context of a given country removes the local culture from its imperialistic roots, replacing it with a modernity that necessitates modalities of displacement such as the education curriculum reform mentioned above. Indeed, older and more traditional economies are turning to information technology while established cultural identities are being scattered and diminished in favour of new ones, political *ancien régimes* are being replaced by more liberal laws (NDTB, 2020). On a socio-cultural level, "globalization leads, in the first place, to changes in the structures of developing societies, and changes in the system of social and cultural values of its people" affecting family, socialization, and every other aspect of a sovereign society through the imposition of "global values" (Al-Issa, 2005). This also produces substantial cultural dilemmas for those societies at the receiving end of foreign powers that are promoting a neoliberal agenda abroad. There is a danger that Emirati culture, values, and Islamic faith, are diminished out due to open barriers. Therefore, their protection and – in Bourdieusian terms – "reproduction" (Bourdieu & Passeron, 2000) will be placed increasingly at the centre of the argument. All other factors of globalization that might affect the culture of a country such as media influence, sublimated messaging, hidden curriculum, are regarded by certain sectors within the UAE in terms of whether they are a source of support or a threat, particularly in terms of securing, preserving and protecting the UAE's values. In educational terms, the question is, do curriculum, teaching style, and organizational culture further the strategic and national purpose of a modern Muslim Arab state? In addition, do the linkages established through globalized networks accelerate the UAE's apparent colonisation by

betraying its local values through rampant Westernization? As a whole, neoliberal globalization and its critiques present a Pandora's box of meanings depending on the perspective of the discipline and school of thought.
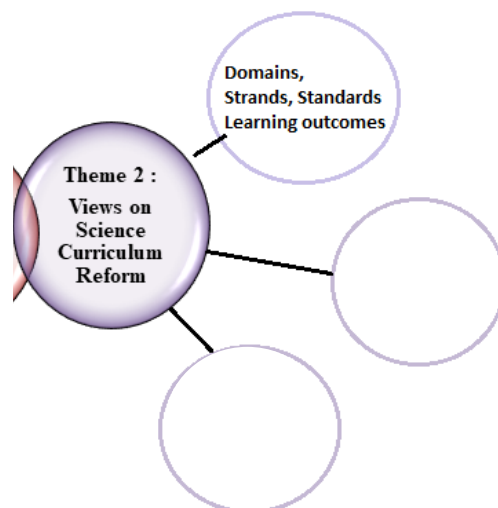
The current study agrees with Abdesslem (2020) in terms of his assertion that the Middle East region is facing a new form of neo-colonization that has the potential to obliterate the Arab language. The ideology that imposes English as a tool for communication threatens the long-term existence of Arabic as an ancestral language in favour of speaking English as a decided job interview asset or given that it is the medium of instruction for science and technology research. Globalization, in the UAE in particular, is driven by an economic ideology that proliferates its morality and social impact (Litonjua, 2008). The specialists' responses were in favour of the use of the English language in science while their point of view was based on what had been instructed and advised by the national policy. Early bilingualism has been associated with certain aspects of brain function abilities, working memory, inhibitory control, attention, and improved language skills (Sandhofer & Uchikoshi, 2013), which might explain the challenge students have in terms of both late bilingualism in an Arab context as well as the challenges experience by non-native English language speakers in the realm of science.

5.2.2 Theme 2: Views of the SCS and SAS on the Science Curriculum Reform Process

Regarding the science curriculum reform status of domains, strands, standards, and learning outcomes, the UAE is not the only country with nearly 50% of science subject knowledge edited, reformed, and re-classified over a short timeline (Gobert, 2019). The 2016 WEF report suggested that by 2021 most countries in the region would have higher education content and curriculum reform in place and would have to include the technological advances needed to keep up with job market requirements (WEF, 2016). The responses of the SCS and

SAS are timid in relation to the struggles they face in the bilingual implementation of Arabic and English in the sciences, which may also be because of their role limitations. Ridge and Farah (2017) explain that the role of the SCS and SAS includes, and is limited to, reviewing and approving textbook manuscripts as well as the preparation and oversight of assessments and examinations, while other OECD countries assign their equivalents to SCS and SAS more policy design-level tasks. Despite this, they still follow the UAE Vision 2021's policy recommendations to promote English as the sole language of science instruction in grade school while simultaneously using Arabic in science at other education levels and streams and using the same textbook in Arabic and English. In sum, the SCS and SAS in the UAE's MoE are dealing with a translated McGraw-Hill science textbook based on Western philosophy which is yet to be adapted to the local Emirati context. Therefore, the main task of the science specialists is not to design, construct, or even innovate but to check the accuracy of the Arabic scientific translation. Any additional updates or changes need to be within the twenty percent gradual adaptation required by terms and conditions of the contract signed between both parties, namely, the MoE and the science publisher. That means that the first and second year of implementing the science curriculum and its textbook is challenging until the science specialists can fully and freely perform their primary role as science experts. Therefore, there is a need to reflect on the science teachers' challenges during the science reform implementation.

Earlier findings in Al'Abri (2016) and Ayber et al. (2021) show that current Emirati students are more confident and more skilled compared to their peers' schools' graduate a decade ago. This confidence and skills' mastery is due to the continuous care and support that

the UAE is providing for education, especially in terms of literacy in the bilingual scientific

context. The statement concludes that if the curriculum design is right and the pedagogy is well

implemented in the right context the reform oversees

a success. The traditional Arabic science curriculum

and pedagogical practices were replaced by Western

science content and American pedagogical practices

based on STEM, an entirely imported system that was

prescribed with a complete teaching and learning

philosophy that enjoyed the strong support of the

UAE's leaders (Abdelrsalam, 2021). SAS16

emphasizes that STEM practices will build an Emirati generation capable of "*effective*

decision-making process". As Kamal (2018) has observed, Emirati HE students are now more

confident in relation to travelling to access tertiary education in western universities outside of

the UAE or their local affiliates.
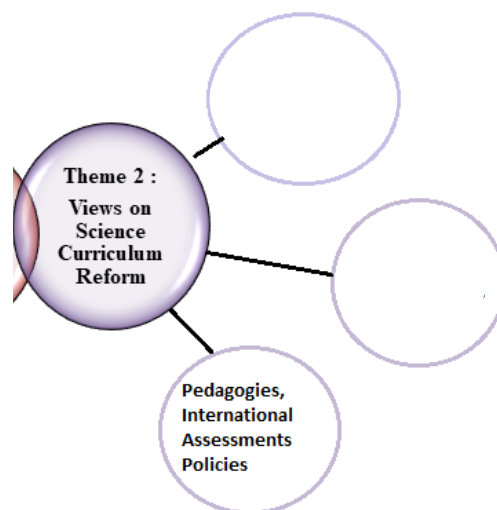
It is a challenging task for UAE teachers to deal with a bilingual environment that

requires STEM integration and they are also required to develop twenty-first-century skills in

a classroom with an information communication technology (ICT) setting. Teachers who move

from a culture to another shift values and pedagogy (Kahn & Misiaszek, 2019). SCS7 explains

that science teachers are Arab nationals and bilingual; moving from a science instruction in

Arabic language as a medium to a science instruction in English is quite a challenge as the full

concept is shifting beyond the language syntax and into scientific terminologies, including the

relevant reading, writing, and expression skills and inculcating that in the students.

Implementing bilingual literacy in science requires a science teacher and support from a teacher

specialising in English as a second language who will work closely with other disciplines to

ensure cognition building (van der Walt & Steyn, 2014), especially at the HE level. The MoE

recruited science experts with a bilingual background to support the starting point of implementation and thereby reduce resistance (Tabari, 2014).

The current thesis has examined the implications of HE education reform in the UAE in relation to education and science curriculum reform and its impact on the promotion of employability. The SCS and SAS have mentioned more than once in their responses the necessity of aligning the science curriculum with employability, the latter defined as students' capacity to contribute to maintaining the future shape of future collectives (Kahn & Lundgren, 2021). Some questions come to mind such as to what extent the science curriculum reform can be considered as work-integrated learning that plays a crucial role in HE while being at the heart of students' employability. Another question is, does the education policy reform support the students playing a central role within their future workplace collectives as advised in Kahn and Lundgren (2021). Does the new science curriculum include content and values that take into account the shift between the curriculum's theoretical instruction and the students future workplaces or organizational contexts? If that is the case, what are the indicators of this and why did the SCS and SAS not mention anything about it; did they use a holistic strategic plan to oversee how the science curriculum reform will answer job market needs? The SCS and SAS responses did not mention any quantitative tool or forms for use as a basis on which to build the required indicators to meet the requirements of UAE Vision 2021 and UAE Centennial 2071. Furthermore, what if HE graduates wish to continue within applied organizations, how does the science reform offer job readiness? Work-based learning is what the UAE's science curriculum is trying to offer but it is still not matured in terms of understanding or application. In addition, work-based learning is expected to offer students a philosophy of learning that involves skills as the main core of teaching and learning while science concepts are embedded within the collective remit of the curriculum. As advised by Khan (2021), students will not struggle in adapting between two different collective mindsets. Work-integrated learning in the

UAE reflects when the science curriculum is designed to advance applied technology and vocational education, including the skills and technical knowledge required as well as familiarity with common organizational practices. What is expected from the science curriculum is that it does beyond both samples of learning and moves into a critical process of reflections and cognition as outlined in Kahn and Lundgren (2021); and cultivating their students' own conclusions and awareness of knowledge while translating this into new practices that can empower them in the job market while helping them to develop new ideas.
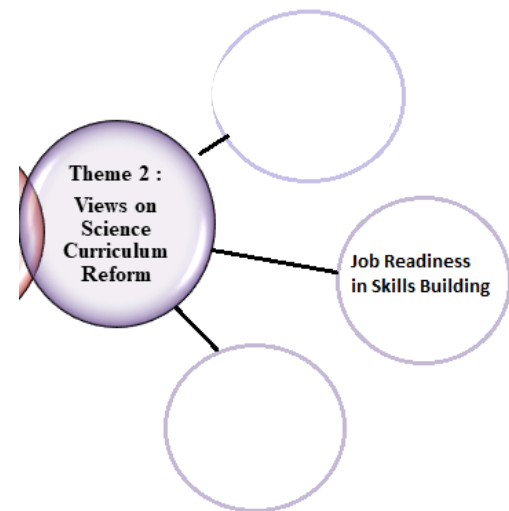
5.2.2.1 Correlation Between Theme 2 and Other Themes

During the UAE's evolution, rapid changes require reconciliation between western neoliberal ideologies and local socio-cultural and religious values as well as the doctrines of Islam – the country's core religion as emphasised in UAE Vision 2021 (Malek, 2021). Given the increasing effect of globalization and the intertwining of technology and robotics, it is important to problematize the Emirati nationalism that maintains a vision of the UAE as a self-contained country (Bogaert, 2013).

Tabari (2014) explains that the UAE's education policy and curriculum reform were coupled with divergent teachers' emotional reactions regarding the reform that they perceived questioned their capability and professional identity. Hargreaves (2003) examines attitudes towards the science reform using English as a medium of instruction by comparing teachers' views globally when dealing with external educational change, finding that sixty percent of science teachers perceived negatively the external, legislated, government-imposed change,

thereby resisting the change and two percent only viewed the science curriculum change as a positive. SAS17 explains that some UAE teachers work hard to integrate the STEM approach horizontally and vertically based on necessary reforms but they still need support in order for the pedagogy to mature in relation to the science reforms. Teachers are the other key actors in the newly developed and implemented curriculum, and the way they perceive the new science curriculum framework and science textbooks are a significant consideration (Priestley et al., 2012; Priestley, 2016). Some teachers might willingly implement the new science curriculum reform (Porter et al., 2015), others will not. In addition, some science teachers were unwilling to change their pedagogical strategies in accordance with the new reforms (Penuel et al., 2007) as they assumed, based on their impressions, beliefs, and ideologies, that the reform was not compatible with their own identities and beliefs (Shakera & Salehb, 2021). Therefore, they will retain their traditional views of science content and teaching (Heidenreich & Spieth, 2013).

5.2.3 Theme 3: SCS and SAS Views on Globalization's Micro-sociological Level Impact

The science specialists explained that all adaptations made to the science curriculum document were based on cultural sensitivity and that Emirati youth are motivated when surrounded by peers from different cultures.

The science curriculum reform as a by-product of globalization's impact and a policy reform reflects an evolution in Emirati students' mindsets towards using literacy in English as a tool for communication in their daily lives beyond their science curriculum textbooks' content. It is a challenge to guarantee the effectiveness of the scientific outcome and to assure literacy if a teacher's pedagogical knowledge and beliefs are not
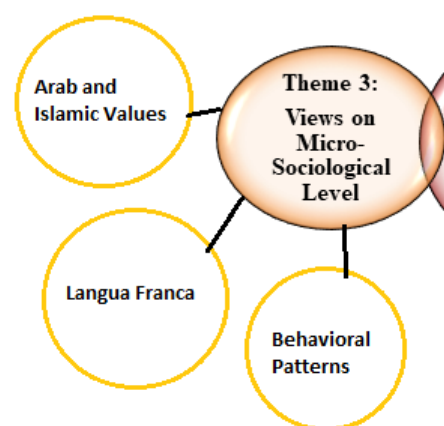
compatible with global and local needs (Ryder et al., 2018). Throughout the move to a modernized UAE science curriculum document, teachers from different nationalities and ethnicities were recruited to teach a globalized curriculum in UAE schools. However, little is known about their past experiences as migrant professional teachers, and very few studies have examined their professional identities (MacLeod, 2013). There is a definite new identity that the UAE education reform is building as part of effects of a hidden curriculum. SAS16, an Emirati national, also emphasises the importance of globalization: *"As Emirati, we realize that globalization is creating new ideas, values, identities, practices, and movements…but we reduce the time of completion of our kids when they travel abroad… They develop new skills to match the job market…"* (Interview, February 2020).

Braithwaite et al. (2018) write that, in order for improvement to be realized, the context must be re-etched or re-inscribed such that its culture, characteristics and politics are metamorphosed. Science specialists admit that youth willingly shift their social patterns, behaviours, and dialects. Current Emirati graduate students and their beliefs are different from their peers a decade ago; this phenomenon extends beyond Emirati nationals to touch all Arab youth living in the UAE. SAS17 gives an example of the influence of their earlier lives:

"My father sent us to live with families in Great Britain to learn the language and get our studies. The British family takes care of our daily food and needs and, for this reason, we are emotionally attached to the British culture and country now; I do not have to send my kid abroad for the language and the study..." (Interview, February 2020)

The high interest in absorbing a new culture and new patterns of behaviour is an interesting topic for future research.

5.3 Concluding Remarks

In neoliberal globalization, higher education on a global scale has taken on a new meaning (McLeod, 2013). Universities worldwide have responded to this business requirement by internationalizing their curricula and – in many cases – using English as the lingua franca for modernized curricula, all in order to create knowledge economies to engage with wider global ones (McLeod, 2013). It was argued earlier that UAE science education reform outcomes are linked directly with the country's national agenda and economic progress, in common with the mathematics education and language skills that prevail worldwide. The political pressure coming from having open barriers – especially in Arab regions such as the UAE – impacts the decision-making of stakeholders beyond the education content and its capacity to ensure specific science education outcomes aligned with the competitiveness index. Ryder et al. (2018) argue that politics has an impact in the elevated inclusion and status of science in education in addition to which in many countries powerful accountability measures such as tests and assessment tools use science and mathematics as means to score certain global rankings. In the UAE, the impact of neoliberalism on education policy has led the incorporation of high-stakes metrics and measurements at national and international levels to evaluate student attainment in primary school and higher education. These factors are placing students in situations of consistent anxiety and are considered negative hidden factors in the science curriculum reform. Several studies have examined the impact of such accountability measures on the responses of science students and teachers to external curriculum reform and how policymakers advocate such measures which need to be considered when it comes to the reform's sustainability and its influence on the detail of teachers' classroom activity (Benson, 1989; Donnelly et al., 1996; Hughes, 2000; Kim et al., 2013; Olson, 1981; Wallace, 2012; Zembylas, 2004). Echoing Kim et al. (2013), Donnelly et al. (1996), and Zembylas (2004) regarding education reforms and political pressure, the SCS and SAS advocate the approach

they used to change and re-design the science curriculum as one of the UAE policy mandates to answer global needs and the TIMSS, PISA, and PIRLS. While there is a pressure to "teach to the test" instead of achieving designated outcomes, teachers' instructions are aligned with the textbook more than with learning outcomes. That means that even if the science curriculum is a new document it is not still a positive lever that necessarily leads to the science reform in the classroom. Bourdieu (1999) has explained neoliberalism in political terms, defining it as dominant economic thinking that reduces policy design from being based on values and specific projects to mathematical modelling exempt from a given country's social context and moral values. Finally, the UAE needs to rethink equal opportunities policies and to promote genuine inclusivity. Younger nationals are – in relative terms – exhibiting a higher level of individualism (Tabari, 2014).

Cultural identity worldwide has been shifting to satisfy political powers, which includes changes to linguistics in every single context and country. The UAE is a dynamic context, one where the Arabic language is considered as pure linguistic embodiment of the country, however it is now being coupled with another one or two languages. This has resulted in a linguistic hybridity with less mastery of a more traditional Arabic, in other words, moving away from the purity of a single language to the hybridity of a changing linguistic context (Zemmouri et al., 2020). On the other hand, Emirati students live and socialize in a conservative Islamic context in addition to learning foreign languages that involves negotiating and constructing new identities and cultures. Abyr et al. (2021) have found that Emirati students in higher education resist aspects of the target culture and maintain their own identity and practices despite the new values imported, while agreeing with Diallo (2014) that Emirati students can filter and adopt new values when necessary. Neoliberal globalization has changed the way curriculum specialists write educational documents and present scientific and

academic content, thus the content, visuals, and topics of scientific material has become an area where all cultures meet (Zemmouri et al., 2020).

The current thesis recalls Abdesslem's (2020) discussions and conclusive remarks. Even if the SCS and SAS are convinced of the need to shift to a modern curriculum and English as a lingua franca and "must-own currency" (p. 87), they need to consider that achieving scientific advances and technological progress needs to go hand-in-hand with their own social and religious beliefs as well as cultural identity.

CHAPTER 6. CONCLUSION

By exploring science specialists' reflections on their views on globalization's impact on national education policy reforms and science curriculum reform, the study identifies several features of their response that deserve broader attention by researchers and policymakers.

6.1 Theme 1: Views on Education Policy Adopted in the Science Curriculum

The current study concludes that neoliberal globalization has impacted the UAE's education policy and science curriculum document. As is the case for education policies worldwide, the UAE's education and science policies relating to curriculum reform follow a well dictated national agenda (Ridge, 2019; Samier, 2013). Similar to what Ryder et al. (2018) and Banner et al. (2012) have observed, such policies shape powerfully the work of science stakeholders. Samier (2013) adds that it also influences teachers and students' experiences and beliefs in the UAE. There are frequent calls to explore the effectiveness of the outcomes of education reform on HE to shape the development of future education policy and its socio-cultural impact and sustainability. The UAE's new education policy, UAE Centennial 2071, might better support education policy 2030 and guarantee the sustainability of the reform given the globalization of the local curriculum. The education policy reform implementation and its expected outcomes need to make sense for all stakeholders (Ryder et al., 2018). In every aspect, the education policy reform document needs to involve all stakeholders concerned in implementation to guarantee its long-term impact (Ryder et al., 2018; Banner et al., 2012; Ryder, 2015). Involving all concerned parties in the entire process of planning for policy coherence, designing policy elements, and the provision of policy mediators enables effective meaning-making in policy enactment and local flexibility across diverse primary

schools and HE settings (Ryder et al., 2018; Banner et al., 2012; Ryder, 2015), especially in a heterogeneous context.

The complex context of the UAE as an Arab country with a monarchical governance and policy network creates continuities and contradictions. Research studies by Lee and Krajcik (2012); Luttenberg, Veen and Imants (2013), and Fensham (2009) have identified a link between policy and practice in science education and the role of research to follow its effectiveness and sustainability. Furthermore, the constancy of change, the significant impact of science reform on practice, and the mismatch between reform intention and the implemented curriculum in senior high school and higher education, the design and enactment of science curriculum reform is a crucial education policy issue. Therefore, to provide policy mediators with the right tools we need to enable practical meaning-making in policy enactment across diverse educational contexts, departments, and settings (Ryder et al., 2018). Finally, significant resources need to be invested worldwide in education and science curriculum policy development to shape science teachers' work and students' experiences.

6.2 Theme 2: Views of SCS and SAS on the Science Curriculum Reform Process

There is a gap between science education policy and science education reform (Campbell-Phillips, 2020). The current research has found – similar to other research on science reform worldwide – that any science reform's goals include the empowerment of scientific literacy (Roberts & Bybee, 2014) and the increasing humanization of HE science curriculum reform (Donnelly & Ryder, 2011). The current study has highlighted Campbell-Phillips (2020), while other studies such as Sufian (2019), Kassir (2019) , Ryder (2015) and Donnelly-Hermosillo et al. (2020) suggest that it is also vital to align the global science curriculum to a given country's local vision and mission – in this case the UAE – with all the

indicators clearly stated to stakeholders in order to design an acceptable and credible document that satisfies students' needs.

The current study has shown that the science curriculum reform is highly influenced by external assessment policy regimes imposed by the OECD and global competitiveness, and has shifted the scope and sequence of the science curriculum and even the choice of topics. Studies have emphasized the powerful influence of external assessment regime features in many studies (Ekins, 2016; Kim et al., 2013; Zembylas, 2004). However, these studies have not stressed students' interpretations of the science curriculum reform; Ekins (2016) examines students' interpretations of science curriculum reform. In turn, what counts as appropriate science curriculum content can condition teachers' responses to curriculum reform and impact its enactment. Moreover, a similar scenario to the UAE context is dealt with in Wallace and Priestley's (2011) analysis using assessment for learning as a tool based on an external reform agent and adapted in particular ways to the local context, one where TIMSS and PISA items are locally tailored and sent to the OCED committee as samples from the region while introducing the STEM pedagogy. Moreover, a similar scenario to the UAE context is dealt with in Wallace and Priestley's (2011) analysis using assessment for learning as a tool based on an external reform agent and adapted in particular ways to the local context, one where TIMSS and PISA items are locally tailored and sent to the OCED committee as samples from the region while introducing the STEM pedagogy. For example, Kim et al. (2013) have analysed a distinctive feature of the Singapore reform where assessment for learning empowered the shift towards a more inquiry-oriented pedagogy in the classroom. In its modernized way, the UAE science curriculum is externally inspired based on the NGSS science curriculum and contextualized in distinctive ways within local classroom cultures as outlined in Squire et al. (2003).

The current research has observed that the new UAE reformed curriculum for science education programs includes scientific knowledge and practical laboratory applications, learning theory and teaching strategies as recommended by Campbell-Phillips (2020). However, it is always beneficial to review what has been built and given that the UAE science curriculum's scope, sequence, and depth of knowledge implemented in the classroom (all part of the first reform), targeted the externalized assessment that answered the OECD's (2019a) recommendations, it is useful to revisit the amount of content delivered in order to support teachers during implementation. However, it is always beneficial to review what has been built, particularly given the UAE's science curriculum's scope, sequence, and depth of knowledge implemented in the classroom, all of which were part of the first reform. Moreover, in order to re-evaluate the externalized assessment impact that answered the OECD's (2019a) recommendations, it is useful to revisit the volume of content as well as the pedagogy and process used and the students' results. Bybee (2013) has conducted a similar study, while McInerney (1995), Ryder et al. (2018) and Hanadi (2021) have focused on the challenges that face teachers when they implement the new science curriculum. The current study has determined that the original document of the UAE's science curriculum has been edited based mainly on both the state's policy requirements and global trends as influenced by neoliberal ideology. This is reflected in learning outcomes level edits and the new scientific tracks generated.

The findings confirm Ridge's (2017) assertion that, when science is taught by native speaking English science teachers, this reflects a response to globalization and neoliberal ideology. Neoliberal ideology sets up an accountability regime for education, one that tightens teaching pedagogy for a given curriculum to an increasingly dense, complex set of standards, objectives, and continuous assessments to be fulfilled rigorously, which are themselves – as per the UAE model – tied to an accelerated performance national state indexes while they also

need to be translated at a classroom level (De Lissovoy, 2013). This pre-determined and pre-scripted curriculum will require a hefty pedagogical reorganization employing instruction and choice (De Lissovoy, 2013). Due to this, the reorganization necessitates a move towards test-based accountability initiatives – such as the large scale of measurements dictated by the OECD – thereby reorienting the whole concept of teaching and learning toward a statistical data-driven approach that aims to produce assessment outcomes (Webb, 2005). Lipman (2006) emphasizes the increased anxiety on the part of students and teachers and the shift of schooling away from a community based on social interaction to a network of assigned actions and an omnipresent culture of shadowing (namely a supportive context) from which students feel trapped with no escape. Adding pressure on education strategies and implementation has been the real meaning of the globalizing phenomenon of education reform in different countries for some time, and this appears to have set defined parameters for what education means in the modern era (Levin, 1998). Teachers working within the science curriculum reform in the UAE are well-trained to implement rigorous standards (Shakera & Salehab, 2021). UAE science teachers have been using external (i.e. Western) science content for the last eight years, even though it is different from their own, and this specific task suggests an effective method of implementation at the grade level (Shakera & Salehab, 2021). From an educator and a curriculum specialist perspective, it is proposed here that one way to respond to the challenges discussed above is to develop a comprehensive conceptual framework for naming, organizing, and evaluating/critiquing the broad range of pedagogical tools, many of which have been a direct result of the introduction of neoliberal norms and governance models (Shakera & Salehab, 2021).

The next era requires careful decisions on the part of the MoE, including the careful structuring and careful choice of education committees that include Emirati professionals' expertise in education policies and their operation if the UAE wishes to maintain its social

and cultural ideology for future generations. In the coming era, MoE curriculum specialists need to be innovative think tanks and not only executive bodies. There is a need for its education curriculum specialists to possess high expertise in the unique context of Emirati schools' culture and patterns; education in the UAE will require solid expertise in aligning the unique identity and roots of Gulf Cooperation Council (GCC) education practice values with the socio-economic changes that have taken place given country's new political agenda. This is not about keeping the country's economic metrics high on account of its own people's equity, awareness, and well-being (Bourdieu, 1999). There is an urgency to slow down the pace and revisit the science curriculum outcomes that students have reached after seven years of the first reform, evaluate the gaps, suggest remediations if needed, and re-strategize education as a realm shaped by the need to inculcate well-being. UAE teachers' resistance is based on their salient assumptions, beliefs, and ideologies (Ridge & Kippels, 2017).

On the other hand, the current study found that there are cultural challenges associated with the UAE's curriculum reform and the translation of the science framework into textbooks and lesson plans, which have been administered in an atmosphere of inadequate subject content, pedagogical knowledge, and the science teachers' uneven mastery of uneven mastery of the new science curriculum's philosophy, similar recalling the findings of Shakera et al. (2021). Alharahsheh et al. (2020) affirm that a curriculum reform undoubtedly affects classroom practices, especially in science. In the interpretivist paradigm, the reality that we perceive is seen by the participants and shared through their responses (Bogdan & Biklen, 1998). More extensive work is needed to evaluate the impact of this reform on higher education students while measuring the achievement of the predicted and designed outcomes as understood by the stakeholders.

To conclude this section, little has been developed on the role of education systems and higher education in relation to compromising or protecting cultural or social security within

what is described as the "dialectics of Westernization – a trend toward cultural homogenization and reactions against it" (p. 138). The UAE has tried to build a new model of neoliberalism through its education policy reform and modernized science curriculum reflecting an "Emirati Gulf consensus" with its multicultural perspectives and rights (Al Nahyan, 2005, p. 91). The UAE has set using the Arabic language and following the Islamic religion a mandate for all Arab and Muslim students to enter higher education at local universities, thereby empowering the Arabic language. Whatever the model of neoliberalism used in each country, from my perspective, it should follow the culture, religious, and social institutions of the local context (Kymlicka, 2001). If education is the product of the neoliberal ideology, students are HE instruments and, for that reason, an accurate evaluation and assessment of the outcomes of any reforms are necessary to evaluate the quality of the curriculum design. Wong (2021), in his study on alienation in higher education under neoliberal globalization, finds that students did not acquire the mandated skills; on the contrary, in a highly competitive free trade environment, that might be businessmen with no social or cultural values. The following section shares the conclusions reached regarding the impact of globalization and education policies and science reforms on a micro-sociological level.

6.3 Theme 3: Globalization's Micro-sociological Level Impact on the views of the SCS and SAS

The views offered by the specialists show that the new curriculum reform has opened up new employment choices for Emirati men and women who are now increasingly financially independent, which has made them rethink marriage as either a personal choice or as something imposed by their family and parents (Salem, 2013). This change might sound

obvious in European and Western families, but in the UAE, the shift is considered quick and remarkable.

To what extent can the science curriculum specialist translate the Emirati cultural vision and mission be moulded into action plans and pragmatic, tangible results? Behind public pronouncements, the MoE has introduced a moral education programme to support the complete curriculum planning and reform, but it is not enough. A unique report by the Islamic investment bank GFH (2012) states that by 2014 the UAE's tertiary teaching staff would be almost exclusively foreign-born professionals, making up 98 percent of foreign instructors in private academic institutions and 92 percent of foreign instructors in public institutions. The science curriculum and assessment specialists' nationalities in this thesis research included India, South Africa, Canada, Jordan, Egypt, Lebanon, the United States of America, and Pakistan, while only two out of the seventeen are Emirate nationals. Inevitably, recruiting teachers from diverse backgrounds brings worldwide expertise and new psychological and sociological beliefs to UAE students worldwide.

6.4 Concluding Remarks and the Implications Into Practice

The current study concludes that education is a necessary component for the UAE's development in terms of responding to globalization and achieving economic growth and socio-economic development. This study's results recall those reached by Green et al. (2010) relating to Oman. The findings of this research are framed by the determination of the UAE to be a positive driver for economic growth while ensure globalization's efficient impact on education by fostering knowledge, expertise, and mastery of the science curriculum content and philosophy. Al'Abri (2011) writes that the prosperous countries that implement globalization are those that have achieved an efficient engagement between economy and education, thereby creating opportunities for their citizens through education.

The study finds a direct association between globalization's impact, development, and education in the UAE. First, there is the issue of globalization as an economic policy that encourages trade that directly affects the UAE's education policy reform. Second, there is education as a by-product of economic growth while investment has led to the setting up of many HE franchises in the UAE, that in turn require foreign language literacy. The third cultural and social transformation impacts the daily lives of young Emirati nationals or the Arab youth living with their parents in the UAE. In sum, the Emirati mindset extends to behaviours and practices including those of other Arab youth living in the UAE. From this critical perspective, neoliberal globalization has reflects aed neo-colonization on the part of western culture through education in general and the science curriculum in particular, including cultural dimensions and new pedagogies (Gyamera, 2018). The impact of globalized neoliberal ideology on the UAE's social structures stresses on the need to maintain Emirati security, along with preserving the positions of the powerful and the powerless so the UAE nationals can preserve inequality between current non-privileged expatriates, privileged expatriates with western origins, and local Emirati nationals (Rhys, 2010, in Winckler, 2010). We conclude that the enactment of external curriculum reforms in school science teaching has significant implications for policymakers, teachers, and students (Ridge et al., 2018).

The issue that might arise is maintaining equality in this current system while the UAE is creating "a cycle of rich getting richer and poor getting poorer" (Kristof, 2019, p. 172). Is neoliberalism a choice or a necessity for the UAE's sustainability in the region? At this moment, neoliberalism is still criticized extensively for the ways it is steeped in economic imperatives that silence complex inequalities and unequal relationships conducted by forcebetween first and third level countries (e.g., Rose, 1999; Bauman, 2005). Thus, one can argue that one aspect of this change has been that neoliberalisation has 'matured' over time in the UAE, becoming a more complex system of recruitment of foreign nationals in different

public and private sectors of the economy who have shared their expertise with the local context (Castree, 2006). This complex recruitment has extended to all UAE business sectors, including the MoE.

Since the present study is based exclusively on a qualitative approach, it is also recommended to add quantitative items such as surveys and questionnaires that might facilitate more rigorous and generalizable results. A mixed-methods research approach is a good choice for the future where we might combine a quantitative study and a qualitative one with a bigger population sample (Creswell, 2017). The population selected for the current study are MoE stakeholders situated in Dubai and the Northern Emirates, making the study appear that it was tailored exclusively for Dubai and the Northern Emirates. It is suggested to include more education institutions entities from different UAE locations with stakeholders who could have been involved in curriculum reform. Therefore, the study can also involve other samples populations such as teachers, students, and parents who have perceptions regarding science curriculum reform and the transition phase between the use of Arabic and then English as a medium of instruction for science. The results will be more reliable and generalizable once research has been ducted in a variety of contexts (Creswell, 2012).

When it comes to the interview questions, it might be of interest to add some new domains related to the e-learning ecosystem and the applicability of the current science curriculum framework document to such a new research practitioner context, and thereby highlighting the views of the science curriculum and assessment specialists with regards to their current framework and to exploring the possibility to have a curriculum tailored for the e-learning ecosystem. Furthermore, interview questions might include a matrix of assessments that can empower students and develop their independent learning. Interview questions need to include to what extent the current science curriculum framework answers the inclusivity policy and can cater to the unique needs of students in cyber learning contexts.

These listed points will make the research more robust. The current study recommends repeating the same work within a broader context that includes the SCS and SAS in private sector institutions involved in the science curriculum reform in writing, standards alignment, and science standards implementation in their educational context. This kind of research, once extended, will give us, (1) a broader sense of the efficiency of the reform when it comes to applicability and localization within the local context, (2) new views coming from the end-user that might be either those of a student, teacher, or parent, and (3) compatibility between what students are constructing cognitively during their school journey and what they are expected to acquire once they arrive at the college level.

Let us consider that the UAE wishes to achieve social harmony and a knowledge-based economy while continuing its current scientific progress. If this is the case, then the country must fulfil the requirements listed in Navarro (2017, p. 58), namely, first to tame neoliberalism, second to rethink the sustainability and stability of education policies, and third to offer security to all members of local indigenous communities who have been part of the UAE's infrastructure modelling. In conclusion, this represents a total organizational management change. The question that might come up during this discussion is the following: did the leadership conduct an organizational diagnosis of the MoE and school readiness to process the science curriculum reform change to recognize the education challenges in science, thereby determining the root causes and choosing effective interventions irrespective of whether the process of change is planned or evolving? Alternatively, the change of the science curriculum document might have followed the same Herbartian philosophy where knowledge is dictated, centralized, and organized, while people at the bottom need to follow what has been instructed by those at the top ped to the bottom (Khan, 2021). The current paper shows that the way science specialists perceive curriculum design, notably in science, has changed from 2006 until now as educators and curriculum specialists are advised to link

their curriculum document to the new advanced modern philosophy of teaching and learning, and to align it with the country's social and political trends as part of the wider organizational change (Plamer et al., 2022).

Finally, the recognition and appropriate use of UAE education policy processes can provide an effective balance between external accountability and local autonomy of the modernized science curriculum, one that supports rather than constrains teacher professionalism. The UAE must define its education philosophy. The analysis of the current findings noted a high frequency of common words and terms related to a specific neoliberal philosophy of education and social management, such as a high focus on job market readiness, human capital management, resource management, education for all and, equal opportunities, while UAE Vision 2021 and UAE Centennial 2071 are leading education towards a democratic, equal opportunity and high tolerance outcomes. There is undoubtedly a big step towards more religious tolerance while we do not find the religion of Islam in the UAE Centennial 2071 nor in most of the science textbooks compared to what came before the reform. The UAE Centennial 2071 looks at individuals with tolerance and open-mindedness; the UAE MoE SCS and SAS cater to the aspirations of the global scientific student at all academic levels and not only to UAE nationals. With the new UAE Centennial 2071 policy, the UAE considers that residents are people with high potential that can be offered privileges for their loyalty to the country and can practice their freedom projecting the UAE as an international-facing neoliberal state in the driving seat (Soederberg et al., 2005). The UAE has followed an accelerated implementation of neoliberal globalization using education as a powerful medium and in conditions that showed us that neoliberal ideology itself is not only the hegemony of policy making, economy and education in this GCC country but an ideology that evolved alongside in the UAE's "monarchy model" (Barnawi, 2015, p. 235) to aand its modernisinged approach.

The UAE's heavy dependence on foreign labour is not advisable in terms of its sustainable development. The World Bank (2008) reports that education reforms are vital for MENA countries, including the UAE, in order to build and develop a skilled youth workforce in a sustainable environment for which HE globalization is an important strategy (Baburajan, 2011). On the other hand, the enactment of education policy reforms differs significantly from that intended by reform designers, and these initial changes are often not sustained over time (Ryder et al., 2018). The UAE government adopted and embraced the globalization of HE by opening up the opportunity for private universities both local and foreign to establish their branches in the country (UAE Education, 2008), having in total seventy-nine universities accredited by the Ministry of HE until this present moment (CAA, 2021). Although, many Emiratis still go abroad for their university education, the UAE university becomes, after the fully fledged reform, an important source of tertiary education for both Emiratis and Arab students in the region (Kamal, 2018). Further, the UAE government developed several plans and initiatives to fulfil this objective and secure graduates suitable to the new globalized labour market, and it has come to the conclusion that any reform of the UAE education system needs to start from its most basic level to support and empower HE reforms, especially in the science and technology fields (MoE, 2020).

Finally, to translate this into practice, the current research shows that education has changed its definition from being a mode of instruction and enlightenment to a tool for business growth and policy making for countries who wish to achieve a place among advanced and economically elite states. This dissertation's strong recommendations are to start by sharing its findings through publications as it returns to the roots of the science curriculum reform at pre-tertiary levels to understand better how the HE science reform can be empowered. The second recommendation is to extend the research focus to navigate beyond the premise of the MoE and to explore the stakeholders' views who assumed a

supporting role in the science curriculum reform while not marginalising them. Given the multicity of aims ascribed to school science education, a key question is the extent to which increasing the emphasis of one curriculum aim might result in a curriculum that is less effective at achieving other aims. Two of these aims have a strong presence within curriculum policy pronouncements: scientific literacy for all students, and preparing a minority of students for further science study; this brings us to an additional practical step after this study, namely the need to measure the effectiveness of the science curriculum reform in building the literacy, numeracy and twenty first century skills that are the main targets of the reform itself.

Chapter 7. References

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Appendices

UNIVERSITY OF LIVERPOOL

LIVERPOOL ONLINE RESEARCH ETHICS COMMITTEE

APPLICATION FOR APPROVAL OF A PROJECT INVOLVING HUMAN PARTICIPANTS, HUMAN DATA, OR HUMAN MATERIAL

Online Master's student applications with the specified attachments, should be posted to the Dissertation Advisor's classroom for initial review and then secondary review. Doctoral student applications should be submitted by the supervisor to the programme VPREC.

If a student application subsequently has to be referred on to the Liverpool Online Research Ethics Committee for a full committee review, the **DA/Supervisor must email the full application as a single, zipped file to <u>liverpoolethics@liverpool-online.com</u>**.

Faculty research applications should be sent with all documents in a single zipped file to this email address.

<mark>RESEARCH MUST NOT BEGIN UNTIL ETHICAL APPROVAL HAS BEEN OBTAINED</mark>

This form must be completed by following appropriate guidance documents:
http://www.success.liverpool-online.com/ethics
For faculty research, please refer to:
https://laureateemea.sharepoint.com/sites/loei/AQ/faculty.research/SitePages/Research%20Ethics%20for%20University%20of%20Liverpool%20Online.aspx

Please complete every section, using N/A if appropriate.
Incomplete forms will be returned to the applicant.

Declaration of the:

   Principal Investigator   **OR**   **DA/Supervisor and Student Investigator**   **X**

- The information in this form is accurate to the best of my knowledge and belief, and I take full responsibility for it.

- I have read and understand the University's Policy on Research Ethics: https://www.liverpool.ac.uk/intranet/media/intranet/research-support-office/ethics/University,Research,Ethics,policy.pdf

- I undertake to abide by the ethical principles underlying the Declaration of Helsinki and the University's good practice guidelines on the proper conduct of research, together with the codes of practice laid down by any relevant professional or learned society.

- If the research is approved, I undertake to adhere to the study plan, the terms of the full application of which the Research Ethics Committee has given a favourable opinion, and any conditions set out by the REC in giving its favourable opinion.

- I undertake to seek an ethical opinion from the Research Ethics Committee before implementing substantial amendments to the study plan or to the terms of the full application of which the Research Ethics Committee has given a favourable opinion.

- I understand that I am responsible for monitoring the research at all times.

- If there are any serious adverse events, I understand that I am responsible for immediately stopping the research and alerting the Research Ethics Committee within 24 hours of the occurrence, via liverpoolethics@liverpool-online.com

- I am aware of my responsibility to be up to date and comply with the requirements of the law and relevant guidelines relating to security and confidentiality of personal data.

- I understand that research records/data may be subject to inspection for audit purposes if required in future.

- I understand that personal data about me as a researcher in this application will be held by the University and that this will be managed according to the principles established in the General Data Protection Regulations.

- I understand that the information contained in this application, any supporting documentation and all correspondence with the Research Ethics Committee relating to the application, will be subject to the provisions of the Freedom of Information Acts. The information may be disclosed in response to requests made under the Acts except where statutory exemptions apply.

- I understand that all conditions apply to any co-applicants and researchers involved in the study, and that it is my responsibility to ensure that they abide by them.

- **For Supervisors**: I understand my responsibilities as supervisor, and will ensure, to the best of my abilities, that the student investigator abides by the University's Policy on Research Ethics at all times: https://www.liverpool.ac.uk/intranet/media/intranet/research-support-office/ethics/University,Research,Ethics,policy.pdf

- **For the Student Investigator**: I understand my responsibilities to work within a set of safety, ethical and other guidelines as agreed in advance with my supervisor and understand that I must comply with the University's regulations and any other applicable code of ethics at all times.
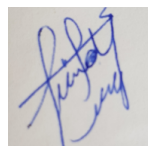
Signature of Principal Investigator   or DA/Supervisor   : ....
Date: (dd/mm/yyyy)
Print Name:

Signature of Student Investigator: . **Date:** (**16/01/2020**)
Print Name: Hind abou Nasr Kassir

SECTION A - IDENTIFYING INFORMATION

A1)   Title of the research (PLEASE INCLUDE A SHORT LAY TITLE IN BRACKETS).

> The Impact of Globalisation on the United Arab Emirates Education Policies and the Science Curriculum reform, a Policy makers and curriculum specialists' ' Perceptions towards globalization.

A2)   Principal Investigator   OR   DA/Supervisor X

Title:	Dr.	Staff number:	
Forename/Initials:	Mariya	Surname:	Ivancheva
Post:	Dr.	Department:	Centre for Higher Education Studies, School of Histories, Languages and Cultures

Telephone:	+359885326131	E-mail:	M.Ivancheva@liverpool.ac.uk

A3) **Co-applicants (including student investigators)**

Title and Name	Post / Current programme (if student investigator)	Department/ School/Institu tion if not UoL	Phone	Email
Mrs. Hind Abou Nasr Kassir	Doctoral Education	Assessment and Curriculum Sector, Ministry of Education (MoE) in the United Arab Emirates (UAE)	+971505075788	hind.abounasr@online.liverp ool.ac.uk Hind.kassir@gmail.com

SECTION B - PROJECT DETAILS

B1) **Proposed study dates and duration** (<mark>RESEARCH **MUST NOT BEGIN** UNTIL ETHICAL APPROVAL HAS BEEN OBTAINED</mark>)
Please complete as appropriate:
EITHER

a) **Starting as soon as ethical approval has been obtained**   X

Approximate end date:	31/01/2021

B2) **Give a full lay summary of the purpose, design and methodology of the planned research.**

Purpose
The current study aims to evaluate the impact of globalization on education policies and the science curriculum reform through the analysis of the policy makers and curriculum specialists' ' views on the changes caused by the globalization. As a curriculum specialist in the Ministry of Education (MoE) of the United Arab Emirates (UAE) myself, I would like to study the impact of the education policies' changes due to globalization on our science curriculum work. **Design and Methodology**

The study will use qualitative exploratory research design, within an interpretivist paradigm (Creswell, 2008).

The current exploratory research will provide a multifaceted insight of policy makers and curriculum specialists' personal reflective experiences of the impact of globalization on education policies and the science curriculum reform in the MoE. For this reason, participants are limited to a sample of n= 12 science curriculum and/or assessment specialists directly involved in building thinking and reflecting on the curriculum design in the MoE of the UAE with a minimum experience of three to five years, so they are have lived through the education policies as well. Any other participants that do not answer these criterions will not be involved in data collection.

After ethical approvals from both Ministry of Education and Liverpool's ethical committee, participants will take part in a semi-structured interview of 30 to 60 minutes composed of ten questions related to their views of globalization impact on education policies and science curriculum reform. The Participant Information Sheet (PIS) about taking part in the study via a semi-structured interview schedule is designed as per all ethical components of the UOL ethical policy, which includes the terms of privacy of participants and their anonymity; details are explicitly listed in the PIS document and the informed consent form (both attached).

Based on the interviews, the analysis is going to be based on rich descriptions and analysis of the interview findings and triangulated with the education policies documents of the ministry of education in the UAE (Meriam 2009; Johnson and Christensen 2008). This approach aims at contextualizing and historicizing the narratives of policy-makers and curriculum specialists, giving more texture to the understanding of choices made and directions taken in globalizing education policies and the science curriculum in UAE.

Summary of the Methodology Design

Table 1

Question	Approach	Instruments	Material analysed	Data Analysis
1- What are the main aspects of globalization that affect education documents and strategies adopted in the science curriculum reform in UAE?	Qualitative	Document Analysis	The Science curriculum Framework of Learning outcomes and skills	Thematic Analysis
2- What are the views of curriculum policy makers and curriculum specialists' on the impact of globalization on the science curriculum reform and classroom practice in the UAE, with focus on the Emirati Schools system? 3- What are the social and cultural aspects needed in the UAE to maintain the sustainability of the science reform adopted for globalization? 4- What student profile is required in the UAE to support the new globalization strategy that was adopted during the reform process?	Qualitative	Semi-structured interviews	The Minister of Education The AUS curriculum and assessment department 12 curriculum specialists	Interpretive qualitative analysis using the MAXQDA software (Frequency measurement via quantitative tools might be applied if needed)

B3) **List any research assistants, sub-contractors or other staff not named above who will be involved in the research and detail their involvement (note that the use of research assistances in recruitment and/or data collection is not permitted in student research projects)**

> None
> Interviews are done in Arabic for the Arabic native speakers among the participants and in English for non-Arabic native speakers. The interview' transcript is going to be available in both languages and I will be the one to do the translation as I master both languages. For the Arabic I am native, and I have an IELTS of 7 in English

B4) **List below all research sites, and their Lead Investigators, to be included in this study.**

Research Site	Individual Responsible	Position and contact details

Neutral place chosen by the student investigator for the semi-instructed interview	Student Investigator is the only investigator carrying out the research	

B5)   **Are the results of the study to be disseminated in the public domain?**

YES **X**

If not, why not?

The Ministry of Education in the United Arab Emirates will allow data to be shared or disseminated if it does not involve vulnerable students or teachers. The current study does not include any of the MoE students or teachers but curriculum and assessment specialists. Furthermore, the Ministry of Education will allow the dissemination of the research study to the public when it ensures that the ethical advisor at the Ministry grants all ethical authorisations.

B6)   **Give details of the funding of the research, including funding organisation(s), amount applied for or secured, duration, and UOL reference**

Funding Body	Amount	Duration	UoL Reference

B7)   **Give details of any interests, commercial or otherwise, you or your co-applicants have in the funding body.**

This is a self-sponsored research.

SECTION C - EXPEDITED REVIEW

C1)

	Yes or No?
a) Will the study involve recruitment of participants outside the UK? For studies involving overseas sites, please ensure you have researched any local approvals that might be required. Wherever possible this should include local research ethics approval. In the absence of a research ethics approval body, other relevant local approvals should be obtained, e.g. authorisation from a site, letter from a local organisation or group etc.	NO
b) Does the study involve participants who are particularly vulnerable or unable to give informed consent? (e.g. children, people with learning or communication disabilities, people in custody, people engaged in illegal activities such as drug-taking, your own students in an educational capacity) (Note: this does not include secondary data authorised for release by the data collector for research purposes.)	NO
c) Will the study require obtaining consent from a "research participant advocate" (for definition see guidance notes) in lieu of participants who are unable to give informed consent? (e.g. for research involving children or, people with learning or communication disabilities)	NO

d) Will it be necessary for participants, whose consent to participate in the study will be required, to take part without their knowledge at the time? (e.g. covert observation using photography or video recording)	NO
e) Does the study involve deliberately misleading the participants?	NO
f) Will the study require discussion of sensitive topics that may cause distress or embarrassment to the participant or potential risk of disclosure to the researcher of criminal activity, dangerous behaviours, or child protection issues? (e.g. sexual activity, criminal activity)	NO
g) Are drugs, placebos or other substances (e.g. food substances, vitamins) to be administered to the study participants or will the study involve invasive, intrusive or potentially harmful procedures of any kind?	NO
h) Will samples (e.g. blood, DNA, tissue) be obtained from participants?	NO
i) Is pain or more than mild discomfort likely to result from the study?	NO
j) Could the study induce psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life?	NO
k) Will the study involve prolonged or repetitive testing?	NO
l) Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?	NO

C2)

	Yes or No?
a) Will the study seek written, informed consent?	YES
b) Will participants be informed that their participation is voluntary?	YES
c) Will participants be informed that they are free to withdraw at any time?	YES
d) Will participants be informed of aspects relevant to their continued participation in the study?	YES
e) Will participants' data remain confidential?	YES

If you have answered 'no' to all items in SECTION C1 and 'yes' to all questions in SECTION C2 the application will be processed through expedited review.

If you have answered "Yes" to one or more questions in Section C1, or "No" to one or more questions in Section C2, but wish to apply for expedited review, please make the case below.

C3)   **Case for Expedited Review –** *To be used if asking for expedited review despite answering YES to questions in C1 or NO to answers in C2.*

SECTION D - PARTICIPANT DETAILS

D1) **How many participants will be recruited?**

> 12

D2) **How was the number of participants decided upon?**

> **12**
>
> The total number of curriculum and/or assessment specialists for science working on the curriculum design and its implementation is a total number of n=24 .
>
> The curriculum and/or assessment specialists not involved in the research are new joiners and are excluded from the sample for research. Therefore, the sample size might feel small yet it is a large proportion compared to the actual number. The study has chosen all curriculum and/or assessment specialists that have been recruited and involved in the reform of the science curriculum at the Ministry of Education with experience between three to five years. The sample is composed of decision makers and policy makers and curriculum and/or assessment specialists' involved in policies in regards to curriculum design, building and implementation.

D3)

a) **Describe how potential participants in the study will be identified, approached and recruited.**

> The target group of the study is limited to the science curriculum and/or assessment specialists - directly involved in thinking and reflecting on the curriculum design in the MoE of the UAE. The recruitment of participants is done through an advertisement placed on the entrance of the Curriculum and Assessment Department at the Ministry of Education. On the advertisement, there is a request of taking part of the research study. If participants would like to take part of the study, they are advised to call by my office or approach me on my email address and a phone number. After that they will be receiving the PIS through their non-professional email and they will have a one week time to reply, later on the interview will be in a neutral place outside of the MoE office and the interview is done.

b) **Inclusion criteria:**

Participants need to be working in the Ministry of Education of the United Arab Emirates and to have been deeply involved in the United Arab Emirates science curriculum framework' design, updates and implementation.

Participants need to be with a minimum experience of three to five years within the reform and aware of the education policies changes of the Ministry of Education.

The choice of this timeline of specific years has its rationale: I need participants that have lived the change of both education policies and science curriculum reform and can spot the difference in implementation stages in science in UAE schools and the impact of globalization.

Any participant that does not answer the above criteria will not be involved in data collection in addition to teachers and students. In order to avoid the exclusion stigma, the adverstisment will do the automatic exclusion of the non-concerned participants: all that are not specialised in science and the curriculum and/or assessment specialists, not at leadership positions and with less than 3 years of experience. Finally, participants who fit the criteria but do not want to volunteer to take part of the research study are naturally excluded as well.

c) **Exclusion criteria:**

d) **Are any specific groups to be excluded from this study? If so please list them and explain why:**

Teachers and students are involved in the implementation of the reform, yet are excluded from the study for the following reasons:

Vulnerable participants

Students are vulnerable participants and they are underage, cannot make autonomous decisions about participating and risks that being part of the study can entail. Even if the study can open horizons of deeper understanding of the impact of the globalization on students' engagement and learning in the classroom, yet my focus is decision makers and not the end user.

Teachers are not the focus as well in this research study as they are vulnerable vis-à-vis the power of the Ministry and myself as supervising the reform. While their viewpoint is invaluable, given this power differential, they might be under fear to participate or might wish to give answers that would please me but will not be useful for the study.

Ethical and clearance documents

When it comes to teachers and students, getting the ethical documents and the clearance from the Ministry of Education is very difficult. In some cases, getting the clearance and the consent might be impossible to have.

e) **Give details for cases and controls separately if appropriate:**

Not applicable

f) Give details of any advertisements:

"Globalization is changing how we perceive science and how we use it "
Your opinion matters!
Are you a Science Curriculum / Assessment Specialist and a stakeholder taking part in the education reform?
Have you been working in the Ministry of Education Curriculum/ Assessment Department
*for **a minimum of 3 to 5 years** ?"*
If you are interested to take part in the study that will assess the impact of globalization on the science curriculum reform, please approach me through email: hind.abounasr@online.liverpool.ac.uk or call/txt me at my phone number: +971505075788

D4)

   a) **State the numbers of participants from any of the following vulnerable groups and justify their inclusion**

Children under 16 years of age:	Not Applicable
Adults with learning disabilities:	Not Applicable
Adults with dementia:	Not Applicable
Prisoners:	Not Applicable
Young Offenders:	Not Applicable
Adults who are unable to consent for themselves:	Not Applicable
Those who could be considered to have a particularly dependent relationship with the investigator, e.g. those in care homes, students of the PI or Co-applicants:	Not Applicable
Other vulnerable groups (please list):	Not Applicable

   b) **State the numbers of non-vulnerable volunteer participants:**

Non-vulnerable Volunteers	**12**

D5)

   a) **Describe the arrangements for gaining informed consent from the research participants.**

Once the participant approaches me through phone or email volunteering for the interview, I will be sending them the PIS. The specialist will be given one week to come back to me confirming their participation in person via phone or email. Once they agree, we will schedule meeting in a café outside the office building and outside working hours. I will give them two copies of the consent form to sign – one stays for them, one for me. The interview will then take place at the designated café.

   b) **If participants are to be recruited from any of the potentially vulnerable groups listed above, give details of extra steps taken to assure their protection, including arrangements to obtain consent from a legal, political or**

other appropriate representative in addition to the consent of the participant
(e.g. HM Prison Service for research with young offenders, Head Teachers for research with children etc.).

Not applicable

c)   **If participants might not adequately understand verbal explanations or written information given in English, describe the arrangements for those participants (e.g. translation, use of interpreters etc.)**

Participants at the Ministry of Education in UAE are Arabic native speakers with a mastery of reading the English language and can talk the basic English that allows them to read the PIS and sign the informed consent form in English. Still, interviews will be conducted in Arabic for the Arabic native participants and in English for English native speakers, in order to give participants the easiness to express their thoughts honestly. I will be the one conducting the interview as I master both languages with Arabic as my native language and the English with an IELTs of 7.

d)   **Where informed consent is not to be obtained (including the deception of participants) please explain why.**

I will not carry out interviews in case I do not obtain consent by the participants.

D6)   What is the potential for benefit to research participants, if any?

Participants will take part in a research study that investigates policy makers' and curriculum specialists' perceptions on the impact of globalization on the education policies and the science curriculum reform in UAE. The research study will offer participants space for in-depth reflection and self-reflection on academic narratives underpinning the UAE educational professional practice and in the science reform such as policy makers and curriculum specialists'. I hope that the research's findings will contribute to new ways of thinking on the role of globalization in science curriculum design and policy-making in the UAE and will open up new horizons of thoughts on the link between globalization, UAE education and the UAE knowledge-based economy.

D7)   State any fees, reimbursements for time and inconvenience, or other forms of compensation that individual research participants may receive. Include direct payments, reimbursement of expenses or any other benefits of taking part in the research?

If the interview is done outside the Ministry of Education building in a quite place that might be a cafe, therefore, I might buy coffee and light snacks to the interviewees as a kind gesture as I am taking their free time.

SECTION E - RISKS AND THEIR MANAGEMENT

E1) **Describe in detail the potential physical or psychological adverse effects, risks or hazards (minimal, moderate, high or severe) of involvement in the research for research participants.**

Not applicable

E2) **Explain how the potential benefits of the research outweigh any risks to the participants.**

Despite the sensitive topic we are trying to explore; the curriculum and assessment specialists taking part of the current study, results will give better understanding of how narratives and perceptions of globalization are shaping the education policies and the science curriculum in the UAE, and how the views of policy makers, and curriculum specialists might underpin current implementation and future planning of curricular content. This will help the UAE' specialists in Ministry of Education to gain better understanding of our own work and a way to reflect on it to make relevant suggestions for future edits/reform.

E3) **Describe in detail the potential adverse effects, risks or hazards (minimal, moderate, high or severe) of involvement in the research for the researchers.**

There is minimal risk that the Ministry of Education does not allow any dissemination of the results of the thesis among its workers and beyond its borders.
However, until now, the Ministry of Education ethics committee has been supportive to a high extent. It gave me the interview approval.

E4) **Will individual or group interviews/questionnaires discuss any topics or issues that might be sensitive, embarrassing or upsetting, or is it possible that criminal or other disclosures requiring action could take place during the study (e.g. during interviews/group discussions, or use of screening tests for drugs)?**

NO ☒

If Yes, give details of procedures in place to deal with these issues.

E5) **Describe the measures in place in the event of any unexpected outcomes or adverse events to participants arising from their involvement in the project**

The only concerns that I believe are important and might be unexpected:
1-The participant wishes to withdraw some or all of his statements. This has been clear in all documents that it is acceptable if we are within 6 weeks of the interview.
2- The specialist wishes to destroy his /own data results. This has been clear in all documents that it may only be withdrawn 6 weeks after interview and prior to anonymization.
3- Participants agree on taking part of the interview but refuse to be audio-recorded and/ or do not want to sign the consent form. This will exclude them from the sample.

E6) **Explain how the conduct of the project will be monitored to ensure that it conforms with the study plan and relevant University policies and guidance.**

> All audio recordings will be erased immediately after being transformed into electronic transcripts. Transcripts will be stored safely in a password-protected folder in the personal computer of the student Investigator. The Informed Consent Forms will be sent to the supervisor and stored in a locked cupboard.

SECTION F - DATA ACCESS AND STORAGE

F1) **Where the research involves any of the following activities at any stage (including identification of potential research participants), state what measures have been put in place to ensure confidentiality of personal data (e.g. encryption or other anonymisation procedures will be used)**

Electronic transfer of data by magnetic or optical media, e-mail or computer networks	NO
Sharing of data with other organisations	Yes, Ministry of Education ethics head of committee willl review the final report/ dissertation before getting published in order to grant the approval.
Export of personal data outside of or into the European Union	Not applicable – Data will be collected outside the EU; and the UK might be outside the EU by time of data collection due to Brexit.
Use of personal addresses, postcodes, faxes, e-mails or telephone numbers	NO – all interviews will be carefully anonymised
Publication of direct quotations from respondents	Yes – The identity of interviewees will remain anonymous in the thesis analysis as well, and I will deidentify them further when writing up the analysis of their statements and make sure that their privacy is maintained even if their statements are used for reserach purpose during the 5 years of storing process required by the Liverpool policy.
Publication of data that might allow identification of individuals	Not applicable
Use of audio/visual recording devices	Use of audiorecording for the purpose of the interviews. Interviews will be transcriped and anonymised and audiorecordings will be erased completely afterward being transformed into anonymous transcripts.
Storage of personal data on any of the following:	

Manual files	The signed consent form will be scanned and stored by me in a password protected external hard-drive. The hard copies will be sent per post to my supervisor in Liverpool and stored in a locked drawer at the university only she and I have access to.
Home or other personal computers	My personal computer and an external drive and both locked with a password to secure the data collected. This will be done in line of UoL policies and monitored by my supervisor.
University computers	Not applicable
Private company computers	My personal computer and an external drive and both locked with a password to secure the data collected. It will be done in line of UoL policies and monitored by my supervisor.
Laptop computers	I will not be using my company device but my personal computer and an external drive and both locked with a password to secure the data collected and hidden in a cabinet that I only know its location. This will be done in line of UoL policies and monitored by my supervisor.

F2)   Who will have control of and act as the primary custodian for the data generated by the study?

Myself only.

F3)   Who will have access to the data generated by the study?

Myself only.

F4)   For how long will data from the study be stored?

At least 5 years after the thesis research is carried out

F5)   Will you be transferring personal data into or outside the EU?
    NO   ☐

    If YES, please explain the consent arrangements to cover the transfer

F6)   Will you be collecting special category data (racial or ethnic origin, political opinion, union membership, religious or philosophical beliefs, genetic data, data concerning health, data concerning a person's sex life, sexual orientation, criminal convictions)?

   NO   ☐

   If YES, please complete and submit as part of your application your data protection risk assessment (see template provided by the Information Commissioner's Office: https://ico.org.uk/for-organisations/guide-to-the-general-data-protection-regulation-gdpr/accountability-and-governance/data-protection-impact-assessments/)

SECTION G – PEER REVIEW

G1)

   a)   Has the project undergone peer review?

   YES   ☐

   b)   If yes, by whom was this carried out? (please enclose evidence if available)

My Main supervisor My Second Supervisor

SECTION G - CHECKLIST OF ENCLOSURES

Study Plan / Protocol	*NO*
Recruitment advertisement	*NO*
Participant information sheet	*NO*
Participant Consent form	*NO*
Research Participant Advocate Consent form	*NO*
Evidence of external approvals	*YES*
Questionnaires on sensitive topics	*NO*
Interview schedule	*YES*
Debriefing material	*YES*
Data protection risk assessment	*YES*
Other (please specify)	*NO*
Ethics response form and application form	*YES*