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Instances of dis/juncture: STEM education and young people's aspirations for development in the Malaysian *luar bandar*

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Abstract

This article foregrounds young people's aspirations from one secondary school in the Malaysian *luar bandar* (literally meaning 'outside of the city' in Bahasa Melayu) as they encounter science, technology, engineering and mathematics (STEM) education, a policy emphasis in service of national development. Together, a postcolonial perspective on development, subjectivity in science education and science's role in development provide the conceptual apparatus for an ethnographic, comparative case study involving interviews and observation of eight rural young people, complemented by the perspectives of their teachers. Through instances of 'dis/juncture' between rural young people and the developmental state, which entail concurrence with modernity, appropriation, and resistance to the 'STEM education for development' model, this article advances understanding of scientific literacy and aspirations, as well as the production of scientifically educated persons in the Global South, an understudied nexus of cultural production through education.

Keywords
Aspirations; Malaysia; national development; STEM; education policy

Introduction

> 'If it's too far to imagine, I don't have aspirations…' Chik remarks in response to my question about his aspirations for development. A few months into the school year, bolstered by his performance in the lower secondary assessments, he moves from his rural community to the state capital to attend a technical school, dreaming of becoming an air traffic controller. On a mural in his new school with images of skyscrapers, the airport, an overground metro and a professional in a hardhat, a tagline reads 'This is where national technocrats are born'.

This article takes Malaysia as a case wherein the postcolonial developmental state (Embong 2008) embodies a renewed version of the science for development model (Drori 1998) and translates it into an education policy known as the '60:40 policy' universally applied throughout the national education system (Zainudin, Halim, and Iksan 2015). Through such policy emphasis on science, technology, engineering and mathematics (STEM) in contemporary times—targeting 60 per cent enrolment in this area in upper secondary education—the state funnels young people in accordance with a logic of human capital for national economic development. In response, I pay ethnographic attention to the ways young people in one site of the *luar bandar* (rural, literally meaning 'outside of the city' in Bahasa Melayu, the national language) are ordered by the 60:40 policy, and the ways they subsequently navigate this policy while they express their aspirations for development from the periphery. The opening vignette demonstrates one anecdote of a rural young person (Chik) encountering development through education that emphasises STEM in Malaysia.

This article illuminates instances of 'dis/juncture' between aspirations for development expressed at the national scale by the postcolonial developmental state, and that of young people navigating formal education and lived experiences in a site constructed as *luar bandar*. Dis/juncture here is defined as hybrid instances of alignment between the aspirations of young people with the state's emphasis on STEM education (juncture), coupled with misalignment that compromise the fulfilment of national aspirations for development (disjuncture). Together, these dis/junctures dialogue with existing literature associated with scientific literacy, providing new empirical material at the intersection of the framing of scientific literacy as 'the acquisition of a commodity' and 'a tool for economic development' (Valladares 2021, 557). Specifically, I pay attention to how young people see the utility of studying STEM subjects at the upper secondary level to articulate their subjectivities as educated persons (Bazzul 2012; Levinson, Foley, and Holland 1996). As I show in this article, to be scientifically educated—

thus acquiring scientific literacy—can mean proclivity for modernity through technological adoption in everyday life, leveraging STEM's powerful status in school, or even, counter-intuitively, resisting and abandoning formal STEM education. I argue that such dis/junctures demonstrate the complex cultural production of scientifically educated persons that enact a claim to aspirational equality, without easily and wholly interpellated by the state ideology. This is despite, as I demonstrate here, the pervasive role of the developmental state in advancing what I term the 'STEM education for development' model.

Drawing attention to 'spatial imaginaries' of development operating at various scales, a postcolonial perspective (McEwan 2019) can shed light on the complex subjectivities, relationship and mutual construction of metropole (urban) and peripheral (rural) spaces in relation to policy and implementation. Doing so through the case of Malaysia provides insights on dis/junctures for other highly centralised contexts where education policy influenced by international discourses (such as STEM) is utilised by the state to advance specific ideologies of national development. In what follows, I begin by providing a review of the production of educated persons for national development as well as rural young people's aspirations. I then present the postcolonial perspective on development adopted in this study, followed by the exposition of the country context of Malaysia.

Subjectivity and (scientifically) educated persons for national development

Scholars have long theorised the state's role in shaping and constructing national identity, allegiance and subjectivity via schooling. Althusser (1971), for instance, through his notion of interpellation, point to schools as one of many ideological state apparatuses that serve to condition and recruit subjects in service of its aims. Meanwhile, Durkheim (1956) presents the moral dimension of the state building project within which teachers, via schooling, transmit the values necessary to sustain such a project. Therefore, schooling becomes the arena for the orchestration of national aspirations, culturally conditioning the notion of educated persons in the mould of the 'pedagogical state' (Pykett 2012). In *The Cultural Production of the Educated Person: Critical Ethnographies of Schooling and Local Practice* (Levinson, Foley and Holland 1996), various authors demonstrate the extent to which the state building project through education is successful, coupled with fine-grained attention to moments of resistance and appropriation from teachers and students. Such cases demonstrate the utility of cultural production, in the words of Levinson and Holland (1996, 14), as a lens for 'understanding how

human agency operates under powerful structural constraints', thus contesting, to various degrees, the overarching force of state agendas.

Since the publication of the above volume, the notion of cultural production of educated persons vis-à-vis state ideologies tied to development, progress and citizenship endures across various contemporary contexts. These include the discourse of 'Suzhi' in China (Kaland 2020) as well as the embodiment of meritocratic responsibilisation in Singapore as a neoliberal-developmental city state (Chiong and Dimmock 2020). Far from being confined within the boundaries of nation-states, research also highlighted how international development agendas play a role in shaping national ideologies translated through schooling. For instance, Cheney (2007) tracked the discursive construction of childhood and national development in relation to the notion of human rights and 'Education for All' in Uganda. What is less obvious, however, is a focus on the cultural production of the *scientifically* educated person for national development, which I seek to illuminate in this article. One point of departure is Drori's (1998) identified link between science, development and the advancement of human capital, tied to a model termed 'science for development'. This model suggests a belief that

> national economic growth depends on the scientific and technical capabilities of the labor force; such capabilities rely on the level of advancement of scientific and technical training; and finally, such advanced training rests on the foundations of science education in primary- and secondary schools (Drori 1998, 50-51)

The model thus allows 'for the discursive regime of "development" to dominate any discussion of science, science education, and their social role' (Drori 1998, 51). The pervasiveness of this model across the global South as countries pursue national development is facilitated by its legitimisation through the role of international organisations such as UNESCO, the World Bank and OECD (Caillods, Gottelman-Duret, and Lewin 1996; Drori 1998; Schwachula et al. 2014; Smith 2009). Since the turn of the new millennium, discourse around development and science is reflected in the contemporary focus on STEM education. Far from an inert education trend, contemporary critiques of STEM education have traced its neoliberal, Eurocentric and human capital origins, linking its expansion to the global capitalist economy and modernity (Weinstein, Blades, and Gleason 2016; Wolfmeyer, Lupinacci, and Chesky 2017; Zouda 2018). Once more, the pervasiveness of STEM is reflected in its foregrounding as a topic of interest by the abovementioned international organisations (Hammond et al., 2020; OECD, 2018a; UNESCO, 2019). Emphasis on STEM is also captured in regional agendas across Asia and

Africa (SEAMEO STEM-ED Centre 2021; Tikly et al. 2018). Meanwhile, in a comparative study of STEM education spanning more than 20 countries, Marginson et al. (2013) argue that STEM education is intertwined with countries' economic policies, tied to notions of human capital and commercialisable innovation.

In this light, Drori's (1998) science for development model can be renewed into what I call the 'STEM education for development' model. Not only has the focus shifted from 'science' to 'STEM', such a contemporary model of national development is also underpinned by a neoliberal logic that (re)fashions individual literacies and subjectivities via competition and hierarchy, mainly to realise homogenising, capitalist economic advancement. How might the ascendance, translation, and interpellation of this model figure into the production of scientifically educated persons? In other words, our understanding of the aspirations articulated by young people in their encounter with STEM education and the formation of their subjectivity must reckon with what Bazzul (2012, 1011) refers to as 'the discourses found in all areas of education [that] shape what individuals adopt as a valid course of action or thought'. Doing so, as I attempt in this article, will shed light on the ways in which the neoliberal, late modern, globalised discourses around STEM education for development—translated into state ideology and education—serve to naturalise the urban, scientifically educated young person as *aspirational*, against which those in rural spaces are valued and (re)fashioned (Corbett and Forsey 2017).

Rural young people's aspirations for development

Here, I consider how rural young people's aspirations can provide a window into better understanding of the production of educated persons as they navigate schooling and their local environments. This follows Levinson and Holland's (1996, 14) premise that cultural production 'generates understandings and strategies which may in fact move well beyond the school, *transforming aspirations*, household relations, local knowledges and structures of power [emphasis added]'. Within the context of aspirations in this study, development is framed as young people's conceptions of constitutive elements to a meaningful life, which Sen (1999) describes as the kind that people have reasons and freedoms to value. These may include their own personal development, as well as those of their immediate family, community, and the nation. Rural young people's aspirations have been predominantly studied in relation to further education and careers, as well as the process of out-migration tied to such pursuits (Elias

et al. 2018; Oyarzún 2020). In relation to STEM education, Mills et al. (2021) highlight the importance of a place and project-based learning approach that can support young people's career aspirations in rural Australia. Elsewhere, rural and regional youth aspiration in India (Sugden and Punch 2016), Indonesia (Naafs 2018), Malaysia (Stivens 2012) and Laos (Sentíes Portilla 2017) are tied to consumption patterns that echo national and global inclinations, suggesting the far-reaching penetration of globalisation, amounting to the mobility of taste and sensibility. Still, material inequalities and discrimination can dampen aspirations to render them obscure, thus diminishing agency and foreclosing alternative imaginations of development, such as in the context of Peru (Crivello 2011) and Indonesia (Munro 2018). Collectively, the aspirations of rural young people for development provide a window into the production of subjectivities of educated persons, in relation to discourses of neoliberalism and globalisation. Such aspirations, while dynamic and signalling agency through education in and beyond schooling, may be circumscribed by material deprivation, political configurations and prevailing capitalist economic structures.

Postcolonial perspectives on development

A postcolonial perspective on development—with its attention to dimensions of subjectivity alongside material conditions—can shed light on the interplay of young people's aspirations and state ideologies. Power (2003, 126) refers to subjectivity as 'the range of subject positions or identities that an individual human being as agent or subject actually mobilises or embodies', suggesting that postcolonial theory illuminates 'the notion of agency, to deepen our understanding of subjectivity by looking at its multiple forms, influences and meanings and opening up the spaces where development's subjects are constructed'. Navigating the hegemonic discourses of development within postcolonial settings always involves a complex, at times contradictory negotiation among the actors involved (Kapoor 2008). In this article, I mobilise a postcolonial perspective on development, coupled with Bazzul's (2012) attention to subjectivity in science education in order to examine the ways that rural young people's aspirations—as a dimension their educated subjectivities—are characterised by a kind of hybridity, mimicry and ambivalence associated with the state's STEM for development agenda through education. Additionally, I pay attention to 'non-discursive', material concerns that affect young people's work of aspiring, taking the middle point in utilising postcolonial theory within comparative education (Crossley and Tikly 2004; Tikly 1999). This entails a combination of 'realist forms of analysis alongside the more deconstructive leanings of newer

forms as healthy as well as necessary source of tension' in order to better grasp postcolonial realities (Crossley and Tikly 2004, 149). Such a balance enables me to portray a complex, nuanced narrative of young people's aspirations, without resorting to purely romanticised or deficit accounts.

Context—The Malaysian developmental state, *luar bandar* and STEM education

Malaysia, a postcolonial country in Southeast Asia is geographically divided into Peninsular Malaysia on mainland Southeast Asia and East Malaysia on the island of Borneo. Across history, its constitutive geographies underwent colonisation by the Portuguese, Dutch, Japanese and British empires and entities (Department of Information Malaysia 2016; Tajuddin 2012). In the country, the majority classification *Bumiputera* (literally meaning 'sons of the soil') is used as an umbrella term to represent multiple ethnic groups including 'Malays, Aborigines of Peninsular Malaysia and indigenous tribes in East Malaysia' (Nagaraj et al. 2015, 153). In the wake of independence, the sweeping and commanding efforts of the Malaysian government to reorganise society primarily in the economic sense, especially from the 1970 onwards, marks it as a developmental state (Embong 2008). Such a state is characterised by Castells (1992, 56) as one that can 'promote and sustain development through the combination of steady high rates of economic growth and structural change in the productive system'.

In the context of subsequent economic growth, employment opportunities are mainly concentrated in growing urban city centres, or *bandar* in Bahasa Melayu. Its shadow, the *luar bandar* (literally meaning 'outside of the city') constitute areas across the country with low population density, including the countryside, small settlements, as well as agricultural estates and sites. The young people from one site of the *luar bandar*—whose voices are foregrounded in this article—are of the Malay ethnic group that make up the majority Bumiputera, present day descendants of the peasantry that have been the subject of previous anthropological works in Malaysia (see Ibrahim, 2010). Migration and urbanisation patterns associated with development are reflected in the temporal shift of residents in the *luar bandar*—from 73.1 per cent in 1970 declining to 23.3 per cent in 2020 (Ministry of Rural Development Malaysia 2021). By declaring the *bandar* as the standard, the developmental state thus positions and contributes to the *luar bandar*'s diminishment over time. This is plainly stated in the *Rural Development Policy*:

> *Bandar* is the centre of economic growth and main centre of administration, wherein many job opportunities and amenities are provided. This attracts many from the *luar bandar* to migrate to the *bandar* to search for better life opportunities such that it causes the population of the *luar bandar* to continue decreasing. (Ministry of Rural Development Malaysia 2019, 2-1)

The normative cultivation of educated persons in the *luar bandar* is also reflected in the Rural Development Policy. This policy calls for equipping young people in the *luar bandar* with education that leverages technology as part of the Fourth Industrial Revolution (4IR), as well as vocational education as a second chance for school dropouts (Ministry of Rural Development Malaysia 2019). Through the act of officially naming spaces outside of its normative aim using this term *luar bandar*, the developmental state reifies the symbolic and material differences that characterise *luar bandar* as being lesser and other than the *bandar*, whilst articulating the role of technoscientific education to refashion young people in these spaces.

In Malaysia, the science for development model is indigenised through an education policy known as the 60:40 policy. Crafted in 1967, this policy at the national level reflects a target of 60 per cent enrolment in the science and technology (S&T) pathway against 40 per cent in the arts pathway of upper secondary education in Malaysia (Zainudin, Halim, and Iksan 2015). Thus, the 60:40 policy reflects a development target that can be quantified and tracked, thereby linking science to the accumulation of human capital in service of economic development. This policy is therefore congruent with an aspect of the science for development model wherein 'the vision of national development is reduced to economic development, i.e. the type of national development that is easiest to quantify and easiest to monitor' (Drori 1998, 52). Subsequently, the term 'STEM' formally entered the education discourse in Malaysia as part of the *Malaysian Education Blueprint 2013-2025 (Preschool to Post-Secondary Education)* (Bunyamin 2015). The trickle of STEM into the curriculum is reflected in the new national secondary school curriculum, called *Kurikulum Standard Sekolah Menengah* (KSSM), which was gradually rolled out in 2017. Under the KSSM and depending on the availability of offerings at every school, students may choose from two main packages of elective subjects at the upper secondary level, which are the STEM package or the Arts and Humanities package (Ministry of Education Malaysia, 2019). Despite the changes in nomenclature, the 60:40 divide at the policy level is effectively maintained, refreshed as a manifestation of STEM education for development.

Methodology

This study, based on data collected for a larger project between October 2019 and August 2020, employs a comparative case study (CCS) design (Bartlett and Vavrus 2017). I attempted to address the following questions: How is the science for development model indigenised in Malaysia and translated into STEM education in one location of the *luar bandar*? What are young people's aspirations for development in response? Ethnographic engagement over 8-months took place in relation to one rural secondary school which I call Sekolah Luar Bandar (SLB) in the interior of eastern Peninsular Malaysia. At SLB, I learned from eight consenting young people (out of 11 who were eligible) who, at 16-years old, were tracked into the STEM package in the first year of the upper secondary level (in a class I call 4-STEM), complemented by the perspectives of nine teachers who were either part of the administrative team or taught relevant STEM subjects. By taking the STEM package in class 4-STEM, in addition to common core subjects, the young people enrolled in four elective subjects which are physics, chemistry, additional mathematics, and a choice between technical communication graphics or accounting principles.

This study utilised semi-structured interviews with teachers and the young people. Each interview ranged between 25 and 105 minutes in Bahasa Melayu. Interview excerpts included in this article are my own English translation from Bahasa Melayu and all teachers and students were assigned pseudonyms. In addition to the interviews, I also engaged in informal conversations and participant observation with teachers and the young people, coupled with the recording of extensive fieldnotes and reflexive memos. Data was analysed using reflexive thematic analysis (Braun and Clark 2021), where the construction of codes and subsequent themes were guided by elements of the science for development model (Drori 1998), coupled with inductive construction from the data. With due attention to the reflexive dimension of thematic analysis as elaborated by Braun and Clark (2021), I embraced my own subjectivity as a resource for analysis. Like the young people, I am a Malay Malaysian and speak Bahasa Melayu as my native language. In secondary school I encountered the 60:40 policy like the young people in this study, hence studying mostly similar elective subjects. Prior to this study, I have conducted research and engaged in projects in STEM education, becoming a member of a network of researchers and practitioners in Malaysia. SLB was suggested to me as a research site by an academic in the region who is part of this network. Meanwhile, attention to rurality

within this study finds its roots in my lived experience growing up with a mother who is from one site in the *luar bandar*, not unlike the environment surrounding SLB. Together, these elements of my subjectivity position me as a native researcher (Jacobs-Huey, 2002), and my personal attachment to the topic compelled me to adopt an ethics of care as part of the research process (Swartz, 2011). In the following sections, I first provide a description of the indigenisation of the science for development model in Malaysia through the STEM package at SLB, followed by accounts of dis/junctures between young people's aspirations for development in comparison to that of the developmental state.

Sekolah Luar Bandar (SLB): Tracking young people via STEM education

Sekolah Luar Bandar (SLB) is a school located in the interior of eastern Peninsular Malaysia, serving as a secondary school for the villages in its vicinity. The school is situated in one of the districts classified as 'interior' in Malaysia. Interior districts are defined as areas far from the city or coast, with very low population density and less access to the network of roads and transportations (Ministry of Rural Development Malaysia 2019).

> On the second day of the school year in January 2020 at SLB, I accompanied one of the STEM subject teachers, Cikgu[1] Halim to meet the 11 students assigned to class 4-STEM, their first year of upper secondary education. Cikgu Halim asks who among them had the intention to leave the class and opt for other classes offering the Arts and Humanities subjects. Five students raised their hands. Later, as we wrap up the discussion, a student stops by to inform us that Cikgu Fahmi (the school principal of SLB) has requested to see the students who expressed their intent to leave class 4-STEM.

The above vignette, recorded early during my fieldwork at SLB, demonstrates the ordering of the young people in one site of the *luar bandar* by the developmental state's implementation of the 60:40 policy. The basis of such assignment into class 4-STEM (thus enrolment in the STEM package of elective subjects) is academic performance during the assessment at the end of the previous year to mark the conclusion of lower secondary education. Over the course of my fieldwork in SLB from January to August 2020, the viability of class 4-STEM as a manifestation of STEM education for development at the local scale appeared tenuous—the cracks showing early on as reflected in the above vignette. The smaller number of 11 students

[1] Cikgu means 'Teacher' in Bahasa Melayu, and is often used as a prefix and marker of respect when addressing school teachers in Malaysia.

in class 4-STEM compared to the other non-STEM classes (ranging from 17 to 24 students) reflected academic eligibility in the most lenient sense. In other words, the number of students in class 4-STEM would have been much smaller if the administration adhered to the default criteria specified by the Ministry of Education. Cikgu Jun, the deputy principal in charge of academic matters, shared with me the reality:

> If we follow the criteria that are given, it's Maths and Science. At least grade B, I can't remember, I think grade B. That is the first choice. But if we look at our students, they do not meet these criteria…we might or might not have students that received at least grade B for these two subjects. Because [of that] we also take those with at least passing grade in order to fulfil the quota.

The quota mentioned by Cikgu Jun points to the school's role in upholding the national 60:40 policy at the local level. Here, the school administration must ensure that there are sufficient students in class 4-STEM so that it remains operational, and therefore in existence. Due to the centralised and hierarchical education system in Malaysia, schools all over the country must implement policies that were developed far away in the metropole. In the words of Bray (2007, 181), within heavily centralised systems, 'staff in the periphery are responsible for tightening implementation of policies determined by the central government'. Teachers, as central government employees in Malaysia, must therefore ensure their respective schools contribute to realising the 60 per cent target of STEM enrolment. The extent of the state's interpellation of the 60:40 policy in relation to young people's cultivation of their educated subjectivities in the *luar bandar* is presented as dis/junctures in the next section.

Dis/junctures in the aspirations of the state and young people

The term dis/juncture proposed here refers to hybrid instances of alignment between development-related aspirations of the young people with the developmental state's emphasis on STEM education (juncture), together with misalignment that may compromise the fulfilment of national aspirations for development (disjuncture). I demonstrate the complex cultural production of young people at SLB as scientifically educated persons through their aspirations, which reflect postcolonial subjectivities as they navigate state ideology rooted in the prioritisation of STEM education in pursuit of national development.

Broad junctures: Maju and aspirations so "we won't be too excluded from others"

Young people at SLB point to the word *maju* in Bahasa Melayu when articulating their aspirations for development. Through the application of technology, the development of infrastructure and conveniences can occur, enabling them to lead more convenient and meaningful lives. In discussing what they view as the meaning of development, the young people are quick to equate it with modernity and maju:

> Development is like, the kind of development that is modern and maju (Mila)
>
> National development is like…maybe for me it is like an economy that is maju, a country that is maju, that really has a difference from then to now. (Petir)

Maju refers to prosperity, flourishing and denotes a move forward. In Bahasa Melayu, the term 'developed country' equates to *negara maju*, suggesting a temporal direction where a country forges ahead. Although there are instances when maju is referred to in the larger scale (such as vis-à-vis the national economy), for the young people in this study, maju and modern mainly means the opportunity for more infrastructure development, right there in their village. This is exemplified by my exchange below with Wan when asked about aspirations for development in her village:

Wan	:	To be more maju
Aizuddin	:	It is not maju now?
Wan	:	Not maju
Aizuddin	:	You mean maju in what way?
Wan	:	Like a lot of amenities, like a bus for instance
Aizuddin	:	That is not here now? Meaning now if people want to move about do they have to take the motorcycle?
Wan	:	Not really, usually we use an informal van service

Such conveniences are facilitated by the adoption of technology that enables maju, taking us 'from then to now', to borrow Petir's phrasing above. Subsequently, Petir clarifies that the temporal difference from then to now can be reflected in the adoption of technology tied to ride-hailing apps such as 'Grab' and 'redBus' on the smartphone, which are much more convenient for traveling to the state capital compared to the long wait for taxis in the past. The importance of adopting technology to signal modernity is also shared in Ceney's view below,

who pointed out other parts of Malaysia that seem further ahead than where they currently dwell:

> For example, KL (referring to Kuala Lumpur, the largest city in Malaysia) has a lot of technology…In [the state of] Johor we can also see schools are using thumbprint [technology] now. Here we don't have that. For example, if we do development here we won't be too excluded from others right?

Technology is therefore seen as instrumental for a sense of inclusion in the wider project of development. In my encounters with the young people in this study, they demonstrated a keen interest in technology, even when they are faced with challenges especially related to unstable internet connection and purchase of internet data plans. Young people use their access to the internet to reach out into the global realm. For instance, H4lfiey shares that he plays mobile games with 'the whole of Asia'. Another example of interest in technology is also presented by Petir, who shares with me a photo from a training facility he visited with his father. The training facility utilised an Integrated Building Systems (IBS) technology, and he imagined that IBS could be used to build a 'gaming room'. Collectively, young people's interest in technology point to their desires to benefit from it, to participate in the project of maju so that, in the words of Ceney, 'we won't be too excluded from others'. As evidenced above, young people in the *luar bandar* indeed express aspirations for development reflected by the preamble of Malaysia's National Principles: 'Build a progressive society that uses modern science and technology'. In order to progress forward and become maju, the young people reflect aspirations tied to the adoption of technology that will improve infrastructure, mobility, and connect them with the world beyond their locality. Indeed, young people's favourable attitudes towards modernisation in the *luar bandar* reflect one of the socialisation effects of science education specified by Drori (1998). Furthermore, socialisation can also be understood in relation to Bazzul's (2012) claim of the role that science education has in constituting people's subjectivities amidst other competing discourses that influence possible choices and possibilities, captured here through young people's articulation of their aspirations for maju.

In translating the above junctures into acceptance and participation in the 60:40 policy, one of the young people, Ceney, articulates how remaining in class 4-STEM will contribute to the project of national development:

> The role [is] to raise the country, like to make it a modern country, so we need to learn technology. For example, now class 4-STEM only has six students. Many go to the lower class (referring to non-STEM classes). So we need to change: higher class (referring to 4-STEM) more [students] than lower class…Class 4-STEM offers more employment opportunities and [we] learn about technology, so we can create technology to raise the name of the country.

The way that Ceney describes the utility of enrolling in class 4-STEM above represents an effective interpellation and juncture with the state's STEM education for development model, noting that he is in favour of having more students in class 4-STEM (thus contributing to the 60 per cent in the 60:40 policy). However, other young people in this study do not connect their aspirations for development tied to maju and technological adoption with their tracking into class 4-STEM in the manner that Ceney has. Next, I frame their articulations regarding the utility of class 4-STEM towards the realisation of their aspirations as particular forms of disjunctures.

Particular disjunctures: The value and fate of class 4-STEM

Even when the young people do not articulate the necessity of being ordered by the 60:40 policy as a means of realising broad aspirations described in the previous section, some of them do acknowledge the value of being tracked in class 4-STEM to fulfil their own career aspirations for self-development. Taking on a mode of appropriation, Mila and Damia highlighted the indirect benefit of being in class 4-STEM although they do not aspire to STEM-related careers (hence thwarting the 60:40 policy goal). I asked Damia why it was important for her to remain in class 4-STEM when her aspiration to become an English teacher does not require her to do so:

Damia : Important because...it will make it easier for us to enter university.
Aizuddin : How does it make it easier?
Damia : Because most universities take students who choose the maths…and science (i.e. the STEM package in secondary school)

This notion of broader opportunities in higher education for students pursuing the STEM package is repeatedly highlighted by teachers at SLB. The following vignette depicts my conversation with the school principal (Cikgu Fahmi), following his chat with the students I

had previously described in the meeting with Cikgu Halim on the second day of the school year:

> I sit down outside of the prayer hall with Cikgu Fahmi and ask about his meeting with the five students from class 4-STEM that intend to switch to a different class. He says it seems that no one will be switching after their conversation. He had given them time to think and if they were still keen on switching classes, then they would need to come with their parent/guardian to see him. He tells them that of course when they are in the STEM class, they will lose the chance to win the 'best student award' because it is much harder to attain better grades with the STEM subjects compared to the arts and humanities. They might even fail subjects like additional mathematics and physics. But in his opinion the certificate for STEM subjects is still much more valuable than the arts and humanities. He gives the example that those in STEM can still opt to be a journalist, but students in the arts and humanities cannot become a medical doctor.

The notion of broader opportunities reflected by Damia and Cikgu Fahmi here point to how 'science education enjoys high levels of legitimacy and receives high status, relative to other topics' (Drori 1998, 56). Additionally, the way teachers and students in SLB use the term 'turun kelas' (Bahasa Melayu for 'going down' to a class deemed of lower prestige) when switching from class 4-STEM to classes offering the arts and humanities packages also points to the higher status accorded to STEM—recall one of the young people's (Ceney) description of 'higher class' and 'lower class' in the previous section. Together, these discourses reflect the value conferred to STEM education and qualification that signal a kind of scientific literacy (Valladares 2021), rendering it a commodity for individuals in the market with power beyond its subject matter (to study English, or become a journalist). Here, the STEM education for development model reflects its neoliberal bent associated with individual competition and hierarchy, resulting in winners and losers that depend on the embrace or rejection of STEM as part of one's subjective formation (Bazzul 2012; Zouda 2018).

Despite the high status and legitimacy of STEM at SLB, the population of class 4-STEM slowly dwindled from the initial 11 students in January 2020. Even when young people demonstrate aspirations for development that may cohere with a manifestation of the STEM education for development model, it does not necessarily translate into *individual* choices to remain tracked in class 4-STEM. Herein lies the dis/juncture. For example, Petir and Ana switched to an arts and humanities class, both not aspiring to STEM-related careers. Petir reflects on the ambivalence of being initially tracked in class 4-STEM:

> I know it's about learning science, things like that, but the science is more in-depth, chemistry and additional mathematics right?…But actually, before I found out my [lower secondary education] results and got placed in this class, I already thought I want to join the commerce [class]…I am interested in commerce.

Due to the various movements of students (including academic migration out of SLB like Chik presented in the Introduction), only four of the young people in this study remained in class 4-STEM by the end of my fieldwork in August 2020. In this study, young people's choices associated with (de)populating class 4-STEM in SLB reflect the multifaceted dis/junctures between their aspirations for development (including self-development) and that of the Malaysian developmental state's manifestation of what I call the STEM education for development model.

Discussion and concluding thoughts

In this article, I have placed the aspirations for development at the national level—reflected in the indigenisation of STEM education for development in Malaysian education—in dialogue with that of young people in one local site of the *luar bandar*. The aspirations of young people in this study reflect the desire for amenities that will enable them to lead lives with fewer encumbrances right where they are, through access to better internet connectivity and reliable public transportation, for instance. Their aspirations tied to the notion of maju and technology align with a larger scale study of rural livelihoods among youth in Malaysia, which reveal unsatisfactory infrastructure and facilities in their localities (Yassin et al. 2018). At first glance, such aspirations can be seen as young people in the peripheral *luar bandar* cultivating subjectivities by mimicking the lifestyle of their urban counterparts (Pavón-Benítez et al. 2021; Sentíes Portilla 2017). Nevertheless, beyond mere mimicry, such aspirations point to the obvious discrepancies in access to resources between the metropole and peripheral sites in Malaysia (Ministry of Rural Development Malaysia 2019). Therefore, yearnings from the peripheral *luar bandar* for a semblance of the metropolitan is not so much a postcolonial cultural mimicry. Instead, in the words of anthropologist James Ferguson (2006, 32):

> The aspiration to modernity has been an aspiration to rise in the world in economic and political terms; to improve one's way of life, one's standing, one's place-in-the-world. Modernity has thus been a way of talking about global inequality and about material needs and how they might be met.

Thus, when young people in this study describe an aspiration to become maju, to move forward through a proclivity for technology and the embodiment of modernity from the periphery, it can also be interpreted as a material claim to 'aspirational equality' (Ferguson 2006), notwithstanding the circumscribing backdrop of neoliberalism and capitalism. Put simply, why shouldn't young people in the *luar bandar* aspire to standards of development taken for granted in many parts of the *bandar* (city), if such aspirations serve as critiques of exclusion and inequality? In fact, such aspirations for development from the *luar bandar* suggest a desire from the postcolonial periphery to transcend class boundaries. Perhaps the goal is to partake in what Fischer (2017, 56) calls 'middle-class projects in modern Malaysia' occurring predominantly among the urban Malay, involving 'mental and social negotiations between the luxury/excess of elites and the economic necessity of the lower classes'.

Subsequently, the prestige associated with another variant of the word 'class'—rendered here by the ethnographic focus on class 4-STEM—is captured in the phrase 'turun kelas' (Bahasa Melayu for 'going down to a non-STEM class'). This turn of phrase reflects the broader emphasis on STEM in the 60:40 policy, pointing to the notion of 'powerful knowledge' that is universalised, specialised and institutionalised by those in positions of power (Young and Muller 2013). Further to the point on neoliberal subjectivity elucidated in the previous section, a postcolonial reading suggests how 'the link between science and technology is emphasised and equated with notions of progress and development' (Burke and Wallace 2020, 574). Indeed, the manifestation of STEM education for development in Malaysia evident in this study gestures to this postcolonial link, as well as bestowing a powerful status to STEM that in turn influences discourses in school and subsequently young people's choices. Nevertheless, the power associated with remaining in class 4-STEM is a contingent one. Only by achieving the right grades will the promises of the STEM package open more doors for the young people. As described by Cikgu Jun earlier, young people are placed in class 4-STEM by the school administration at SLB despite not meeting the minimum academic criteria. They face an uphill battle foreshadowed by Cikgu Fahmi, the school principal: the possibility of failure and difficulty to attain better grades than their peers in the arts and humanities package. The situation created here by the developmental state's implementation of the 60:40 policy in the peripheral *luar bandar* is reminiscent of Vavrus' (2021) observation in the Tanzanian context. She argues that aspirations embedded in the promises of education can be thwarted by the ideology of policy at the national level, producing what Berlant (2011, 2) calls 'cruel optimism', wherein 'the object/scene that ignites a sense of possibility actually makes it

impossible to attain the expansive transformation for which a people risks striving'. This means that the aspirations tethered to the power and promise of class 4-STEM—the paths it is purported to open for individuals competing in the neoliberal market—can be foiled when young people tracked into the class are not academically prepared in the first place. Therefore, the prospects of realising their aspirations are circumscribed by broader forces orchestrated in the metropole in the name of national development, sometimes in counter-intuitive ways.

The cultural production of scientifically educated persons in the *luar bandar* here demonstrate dis/junctures—broad junctures of integration into modernity through technology, coupled with particular disjunctures regarding the effects of education policy on young people's choices for their future. On the one hand, a desire for maju through the adoption of technology point to young people's day-to-day experiences beyond formalised state education apparatuses such as the 60:40 policy. Aspirations for development are forged by observing deficits (public transportation, technology use) and through everyday socialisation (mobile games, visits to training facility). A desire for inclusion in the project of modernity and national development through technology can result in buy-in to the logic of the 60:40 policy, which suggests effective interpellation. This is evidenced by Ceney's articulation of the importance of populating class 4-STEM to engage in the kind of learning that will raise the name of the country. In between, the effect of this policy on young people's potential futures means that the power of being in class 4-STEM (and the STEM package in general) can be appropriated and harnessed even if they do not aspire to STEM-related careers. While such appropriation points to the strength of neoliberal discourses underpinning STEM and associated subjective formation among students (Bazzul 2012; Zouda 2018), might it also hint at a mode of scientific literacy forged under conditions of exclusion and inequality? This is a literacy associated with the recognition of the power of STEM and the ways in which it can be harnessed beyond its subject domain, a component missing the various visions of scientific literary mapped by Valladares (2021). Still, some young people that do not aspire to STEM-related careers enact their agency to leave class 4-STEM, thus resisting the accounting of the 60 per cent target of the policy. To various degrees, young people therefore navigate their tracking into class 4-STEM and their subjective formations to suit what they believe will pave the way for fulfilling their aspirations, despite or in service of national development targets. As I have demonstrated, young people's aspirations and production of scientifically educated subjectivities are not interpellated in a totalising or deterministic way by the STEM education for development model translated through the 60:40 policy in Malaysia. Outside and within the realm of the

60:40 policy and STEM, young people carve out the space to enact subjectivities as complex dis/junctures with the state. They are at once agents, appropriators, and resisters of the developmental state's national development agenda via STEM education. Such empirical insights also extend existing work in science/STEM education associated with aspirations—which erstwhile have focused largely on the career domain (see Kaur, McLoughlin, and Grimes 2022)—by framing aspirations within the discourse of (national) development.

Through a comparison of aspirations for development discursively constructed by the Malaysian developmental state and among young people living in one site of the peripheral *luar bandar*, I advance Levinson and Holland's (1996) argument on cultural production of educated persons by focusing on the development of scientific subjectivities in relation to STEM education. Attention to cultural production refutes the totalising interpellation of state ideology in development, elucidating instances of concurrence, appropriation and imagination through rural young people's aspirations as they engage in STEM education. The subjectivities demonstrated by the young people in this study invite education policymakers in the metropole to consider the variegated and granular forms of negotiations and aspirations that the intended beneficiaries in the peripheries enact. Tapping into young people's aspirations will enable a deeper understanding of why policy goals—numerical or otherwise—seem to be unmet, suggesting the possibility that their neoliberal logic and effects require interrogation, in order to enable better coherence between the aspirations of all parties to realise the benefits of national development.

References

Althusser, L. 1971. "Ideology and Ideological State Apparatuses." In *Lenin and Philosophy and Other Essays*, edited by L. Althusser, 142-147. New York: Monthly Review Press.

Bartlett, L., and F. Vavrus. 2017. *Rethinking Case Study Research: A Comparative Approach*. New York: Routledge.

Bazzul, J. 2012. "Neoliberal ideology, global capitalism, and science education: engaging the question of subjectivity" *Cultural Studies of Science Education* 7: 1001–1020. doi: 10.1007/s11422-012-9413-3

Berlant, L. 2011. *Cruel Optimism*. Durham and London: Duke University Press.

Braun, V., and V. Clarke. 2021. "Conceptual and Design Thinking for Thematic Analysis." *Qualitative Psychology*, 9(1): 3–26. doi: 10.1037/qup0000196

Bray, M. 2007. "Control of Education: Issues and Tensions in Centralization and Decentralization." In *Comparative Education: The Dialectic of the Global and the*

Local, edited by R. F. Arnove and C. A. Torres, 3rd ed, 175–96. Rowman & Littlefield Publishers.

Bunyamin, M. A. H. 2015. "Pendidikan STEM Bersepadu: Perspektif Global, Perkembangan Semasa Di Malaysia, Dan Langkah Ke Hadapan." *Buletin Persatuan Pendidikan Sains Dan Matematik Johor* 25 (1): 1–6.

Burke, C. A., and J. Wallace. 2020. "Re-Examining Postcolonial Science Education Within a Power-Knowledge Framework: A Caribbean Case Study." *Science & Education* 29 (3): 571–88. doi:10.1007/s11191-020-00116-8.

Caillods, F., G. Gottelmann-Duret, and K. Lewin. 1996. *Science Education and Development: Planning and Policy Issues at Secondary Level*. Paris: UNESCO and Elsevier Science.

Castells, M. 1992. "Four Asian Tigers with a Dragon Head: A Comparative Analysis of the State, Economy, and Society in the Asian Pacific Rim." In *States and Development in the Asian Pacific Rim*, edited by R. P. Appelbaum and J. Henderson, 33–70. Newbury Park: SAGE Publications.

Cheney, K. E. 2007. *Pillars of the Nation: Child Citizens and Ugandan National Development*. Chicago and London: The University of Chicago Press.

Chiong, C., and C. Dimmock. 2020. "Building Trust: How Low-Income Parents Navigate Neoliberalism in Singapore's Education System." *Comparative Education* 56 (3): 394–408. doi:10.1080/03050068.2020.1724487.

Corbett, M., and M. Forsey. 2017. "Rural Youth Out-Migration and Education: Challenges to Aspirations Discourse in Mobile Modernity." *Discourse: Studies in the Cultural Politics of Education* 38 (3): 429–44. doi:10.1080/01596306.2017.1308456.

Crivello, G. 2011. "'Becoming Somebody': Youth Transitions through Education and Migration in Peru." *Journal of Youth Studies* 14 (4): 395–411. doi:10.1080/13676261.2010.538043.

Crossley, M., and L. Tikly. 2004. "Postcolonial Perspectives and Comparative and International Research in Education: A Critical Introduction." *Comparative Education* 40 (2): 147–56. doi:10.1080/0305006042000231329.

Department of Information Malaysia. 2016. "Summary of Malaysia's History." 2016. https://www.malaysia.gov.my/portal/content/30120.

Drori, G. S. 1998. "A Critical Appraisal of Science Education for Economic Development." In *Socio-Cultural Perspectives on Science Education: An International Dialogue*, edited by W. W. Cobern, 49–74. Dordrecht, Netherlands: Kluwer Academic Publishers.

Durkheim, E. 1956. *Education and Sociology*. New York: Free Press.

Elias, M., N. Mudege, D. E. Lopez, D. Najjar, V. Kandiwa, J. Luis, J. Yila, et al. 2018. "Gendered Aspirations and Occupations among Rural Youth, in Agriculture and beyond: A Cross-Regional Perspective." *Journal of Gender, Agriculture and Food Security* 3 (1): 82–107. doi: 10.1139/er-2017-0058.

Embong, A. R. 2008. "Developmentalist state in Malaysia: Its origins, nature, and contemporary transformation." In *Globalization and National Autonomy: The Experience of Malaysia,* edited by J. M. Nelson, J. Meerman, and A. R. Embong, 27–58. Singapore: ISEAS Publishing.

Ferguson, J. 2006. *Global Shadows: Africa in the Neoliberal World Order*. Durham and London: Duke University Press. doi:10.1215/9780822387640.

Fischer, J. 2017. "Middle-class projects in modern Malaysia." *Asian Anthropology* 16 (1): 54–69. doi: 10.1080/1683478X.2016.1270030

Hammond, A., E. Matulevich, K. Beegle, and S. K. Kumaraswamy. 2020. "The Equality Equation: Advancing the Participation of Women and Girls in STEM." Washington DC: World Bank

Ibrahim, Z. 2010. "The Anthropology of the Malay Peasantry: Critical Reflections on Colonial and Indigenous Scholarship." *Asian Journal of Social Science* 38 (1): 5–36. doi: 10.1163/156848410X12604385959362.

Jacobs-Huey, L. 2002. "The Natives Are Gazing and Talking Back: Reviewing the Problematics of Positionality, Voice, and Accountability among "Native" Anthropologists." *American Anthropologist* 104 (3): 791–804. doi: 10.1525/aa.2002.104.3.791

Kaland, O. J. 2020. "The Cultural Production of the 'Quality Citizen': Internalisation, Appropriation and Re-Configuration of Suzhi Discourse among Migrant Youths in Shanghai, China." *Globalisation, Societies and Education* 18 (3): 303–16. doi: 10.1080/14767724.2019.1700352.

Kapoor, I. 2008. *The Postcolonial Politics of Development*. Abingdon: Routledge.

Kaur, T., E. McLoughlin, and P. Grimes 2022. "Mathematics and science across the transition from primary to secondary school: a systematic literature review." *International Journal of STEM Education* 9 (13). doi: 10.1186/s40594-022-00328-0

Levinson, B. A. and D. C. Holland 1996. "The Cultural Production of the Educated Person: An Introduction." In *The Cultural Production of the Educated Person,* edited by B. A. Levinson, D. E. Foley and D. C. Holland, 1-54. Albany: State University of New York Press.

Levinson, B. A., D. E. Foley and D. C. Holland, eds. 1996. *The Cultural Production of the Educated Person.* Albany: State University of New York Press.

Marginson, S., R. Tytler, B. Freeman, and K. Roberts. 2013. "STEM: Country Comparisons, International Comparisons of Science, Technology Engineering and Mathematics (STEM) Education." Melbourne: Australian Council of Learned Academies.

Mills, R., L. Scholes, G. Stahl, S. McDonald, B. Comber, and J.L. Brownlee 2021. "How do rural Australian students' ethnogeographies related to people and place influence their STEM career aspirations?" *International Journal of Science Education* 43 (14): 2333–2350. doi: 10.1080/09500693.2021.1961326

Ministry of Education Malaysia. 2019. "Pelaksanaan Kurikulum Standard Sekolah Menengah (Menengah Atas) Dan Pelaksanaan Pakej Mata Pelajaran Mulai Tahun 2020."

Ministry of Rural Development Malaysia. 2019. *Dasar Pembangunan Luar Bandar.* https://www.rurallink.gov.my/dasar-pembangunan-luar-bandar-dplb/

Ministry of Rural Development Malaysia. 2021. *Data Asas KPLB 2020* https://www.rurallink.gov.my/wp-content/uploads/2021/07/Data-Asas-KPLB-2020_edited-13082021.pdf

Munro, Jenny. 2018. *Dreams Made Small: The Education of Papuan Highlanders in Indonesia*. New York: Berghahn.

Naafs, S. 2018. "Youth Aspirations and Employment in Provincial Indonesia: A View from the Lower Middle Classes." *Children's Geographies* 16 (1): 53–65. doi: 10.1080/14733285.2017.1350634.

Nagaraj, S., N. Tey, C. Ng, K. Lee, and J. Pala. 2015. "Counting Ethnicity in Malaysia: The Complexity of Measuring Diversity." In *Social Statistics and Ethnic Diversity: Cross-National Perspectives in Classifications and Identity Politics*, edited by P. Simon, V. Piché, and A. A. Gagnon, 209–28. Springer. doi: 10.1007/978-3-319-20095-8_11.

OECD. 2018. "A Brave New World: Technology and Education.". In *Trends Shaping Education Spotlights* (Issue 15). http://www.oecd.org/education/ceri/Spotlight-15-A-Brave-New-WorldTechnology-and-Education.pdf

Oyarzún, J. 2020. "Uncertain Futures in Forgotten Places: A Study on Education Policies and Students' Subjectivities in Rural Contexts in Chile." *Compare: A Journal of Comparative and International Education* 50 (7): 1047–63. doi: 10.1080/03057925.2020.1758923.

Pavón-Benítez, L., N. Romo-Avilés, and P. Sánchez-González. 2021. "Smile, Photo! Alcohol Consumption and Technology Use by Young People in a Spanish Rural Area." *Journal of Rural Studies* 85: 13–21. doi: 10.1016/j.jrurstud.2021.05.005.

Power, Marcus. 2003. *Rethinking Development Geographies*. London: Routledge.

Pykett, J. 2012. *Governing Through Pedagogy: Re-educating Citizens.* London: Routledge.

Schwachula, A., V. S. Maximiliano, and A. Hornidge. 2014. "Science, Technology and Innovation in the Context of Development: An Overview of Concepts and Corresponding Policies Recommended by International Organisations." 132. ZEF Working Paper Series. Bonn.

Sen, A. 1999. *Development as Freedom*. Oxford: Oxford University Press.

Sentíes Portilla, G. 2017. "Land Concessions and Rural Youth in Southern Laos." *Journal of Peasant Studies* 44 (6): 1257–76. doi: 10.1080/03066150.2017.1396450.

Smith, J. 2009. *Science and Technology for Development*. London and New York: Zed Books.

Stivens, M. 2012. "The Youth, Modernity and Morality in Malaysia." In *Questioning Modernity in Indonesia and Malaysia,* edited by W. Mee and J. S. Kahn, 169–200. Singapore & Tokyo: NUS Press Singapore and Kyoto University Press.

Sugden, F., and S. Punch. 2016. "Changing Aspirations, Education, and Migration: Young People's Declining Agroecological Knowledge in Rural Asia." In *Geographies of Global Issues: Change and Threat*, edited by N. Klocker and N. Ansell, 483–500. Singapore: Springer. doi: 10.1007/978-981-4585-95-8_35-1.

Swartz, S. (2011). ""Going deep" and "giving back": Strategies for exceeding ethical expectations when researching amongst vulnerable youth." *Qualitative Research* 11 (1): 47–68. doi: 10.1177/1468794110385885

Tajuddin, A. 2012. *Malaysia in the World Economy (1824-2011): Capitalism, Ethnic Divisions, and "Managed" Democracy*. Lanham, MD: Lexington Books.

Tikly, L. 1999. "Postcolonialism and Comparative Education." *International Review of Education* 45 (5/6): 603–21.

Tikly, L., M. Joubert, A. M. Barrett, D. Bainton, L. Cameron, and H. Doyle. 2018. "Supporting Secondary School STEM Education for Sustainable Development in Africa." 5. *Bristol Working Papers in Education Series*. Bristol Working Papers in Education Series. Bristol.

Valladares, L. 2021. "Scientific Literacy and Social Transformation: Critical Perspectives About Science Participation and Emancipation." *Science & Education* 30: 557–587

Vavrus, F. 2021. *Schooling As Uncertainty: An Ethnographic Memoir in Comparative Education*. London: Bloomsbury Academic.

Weinstein, M., D. Blades, and S.C. Gleason. 2016. "Questioning Power: Deframing the STEM Discourse." *Canadian Journal of Science, Mathematics and Technology Education* 16 (2): 201–212. doi: 10.1080/14926156.2016.1166294

Wolfmeyer, M., J. Lupinacci, and N. Chesky. 2017. "Three Ontologies of STEM Education? An Apolitical Curricular Trend, Eurocentric Economic Policy, and Discursive Episteme." *Critical Education* 8 (15): 68–78.

Yassin, S., H. Azril, M. Shaffril, and A. Hamzah. 2018. "Rural Youth Sustainable Livelihood in Malaysia." *Pertanika Journal of Social Sciences & Humanities* 26: 1–18.

Young, M., and J. Muller. 2013. "On the Powers of Powerful Knowledge." *Review of Education* 1 (3): 229–50. doi: 10.1002/rev3.3017.

Zainudin, S., L. Halim, and Z. Iksan. 2015. "How 60:40 Policy Affect The Development Of Science Curriculum in Malaysia." *Proceeding: 7th International Seminar on Regional Education, November 5-7, 2015* 3: 1396–1405.

Zouda, M. 2018. "Issues of power and control in STEM education: a reading through the postmodern condition." *Cultural Studies of Science Education* 13: 1109–1128. doi: 10.1007/s11422-017-9820-6