Futures for Post-Pandemic Mathematics Teacher Education: responsiveness and responsibility in the Face of a Crisis

Bill Atweh · Berinderjeet Kaur · Gladys Nivera · Abadi Abadi · Sampan Thin wiang thong

Abstract
COVID-19 has caused unprecedented disruption to mathematics teacher education worldwide. This paper is anchored in our learnings from the experiences of teacher educators at four major universities from the Association of Southeast Asian Nations as they dealt with changes in their programs’ delivery triggered by the pandemic, and raises challenges that remain for the futures of post-pandemic mathematics teacher education. Here, we use the two ethical constructs of responsiveness and responsibility to guide actions in response to a crisis, in order to discuss a range of decisions the participants made to respond to the crisis. Behind their initial response to the emergent conditions, the participants were concerned about maintaining the continuity of their students’ education. Further, we identify remaining challenges for mathematics teacher educators to re-imagine their curriculum, teaching, assessment, and equitable access towards a more relevant, productive, and equitable mathematics teacher education. This study adds to the rapidly increasing literature on the effect of the pandemic on mathematics education in the following three ways: (1) here we take a comprehensive view of the disruptions instigated by the pandemic; (2) we pay special attention to issues of equity; and (3) we address concerns about possible and desirable post-pandemic futures.

Keywords Mathematics Teacher Education · COVID-19 · Futures of education · Equity · Responsiveness · Responsibility

Introduction.
Within three months between the initial identification of the new coronavirus in December 2019 and the time it was declared a pandemic by the World Health Organization in March 2020, COVID-19 has spread to over 100 countries and territories around the world (Ducharme, 2020). By May 2020, a survey of the International Association of Universities (IAU, Marinoni et al., 2020) showed that some of the universities had reopened after different periods of closure to face-to-face teaching, and approximately two-thirds of the surveyed universities had adopted flexible online teaching, with 98% of the universities indicating that their teaching was negatively affected.

Undoubtedly, the universities experienced COVID-19 as an unexpected and unprecedented crisis. In the context of this paper, we understand a crisis in two ways. A crisis is a major disruption of society’s normal practices and life. What was possible in the past becomes impossible, and society needs to develop different practices to achieve approximately the same outcomes. However, a crisis is also an opportunity to reflect on the assumptions behind the normal practices and to look forward to new systems and new outcomes that may become a fairer, safer, and more productive new normal.

Further, a crisis calls for a response by those affected. Undoubtedly, a response involves technical and managerial decisions to deal with the crisis. However, it also calls for decisions about what is appropriate and desirable - hence,
ethical - considerations. One ethical construct that is relevant here is responsiveness (Waldenfels, 2012), which is the quality of providing “appropriate and sympathetic” responses (Meriam Webster Dictionary). Concerns for student’s welfare framed the various educational stakeholders’ responsive responses to the pandemic.

For us here, the discourse of responsiveness faces a few limitations as a guide for dealing with responses to a crisis. First, as argued by Doyle & Ponder (1977), responsiveness can reflect a concern towards “immediate … reaction rather than … long-term goal accomplishment”; further, it can be “oriented toward the concrete and the procedural rather than the abstract and the general” (p. 5). In this sense, a responsive response to the immediate disruptions due to the pandemic could introduce quick fixes to the problem of institutional closures but keep everything in the curriculum the same, irrespective of the affordances of the alternative modes of education and the long-term differential effects on diverse student populations.

Second, as Biesta (2013) pointed out, responsiveness may include a stance of acceptance of the conditions for change and seeking ways to accommodate them in practice without being critical about their implications. Instead, he argued for a responsible response. For Biesta, a more responsible response would start with the foundational engagement with the purposes of education and schooling in the light of the changing demands of society. Hence, a responsible response is critical, more comprehensive, and more long-term than a responsive response.

In this paper we report on learnings from an empirically grounded theory study (Glaser & Strauss, 1967) of mathematics educators from four large teacher education programs in the Association of Southeast Asian Nations (ASEAN). It is based on narratives compiled by the authors themselves and interviews with various mathematics educators in those countries. Here, we address the following two research questions.

1. What responsive action was taken to deal with the major disruptions experienced by mathematics educators in Southeast Asian countries?
2. What persistent challenges demand further consideration toward a more responsible response to the pandemic?

1 Background

While attempting to understand the issues affecting mathematics teacher education during and after the pandemic from pedagogical and sociological perspectives, it becomes clear that mathematics teacher education is intrinsically affected by social conditions, government policies, and issues in general education. For this study we drew on literature from within and outside of mathematics education while framing implications for mathematics teacher education.

The sudden, rapid, and extensive spread of the pandemic and its drastic implications involving university closures demanded immediate responses from governments, institutions, and individual educators. The survey from IAU showed that many universities around the world were ill-prepared for managing the changes and challenges, due to limited infrastructure and the lack of policies and previous experiences in flexible education, particularly in medium- and low-income countries. However, most participating universities adopted measures by which their curriculum, pedagogy, and assessment were, using a term by Kidd & Murray (2020), “migrated online.”

The demands on workloads for educators (Kaden, 2020), in order to keep learning open for their students, should not be underestimated. Understandably, major reconsideration of the curriculum and pedagogies (Cahapay, 2020) was necessary and afforded by the new technologies might have been less urgent. However, the immediate and short-term solutions adopted may raise some undesirable possibilities. Arnove (2020) pointed out that the lack of focus on pedagogies that apply to online education may lead to, using a term by Freire, “falling back to the ‘banking’ model of education” (p. 44). The lack of time and opportunity to develop educators’ expertise in the affordances of the new technologies could amplify this danger.

Similarly, the transition from face-to-face to online education occurred when students (and educators) passed through extreme uncertainty and anxiety, if not trauma, induced by the pandemic. Darling-Hammond and Hyler (2020) pointed to the danger that a focus on migrating content competencies online may fail to provide for “the social-emotional needs of students” (p. 457) and their “abilities to learn how to learn” (p. 457), rather than providing a mere focus on the content and its delivery. Perhaps these concerns call for a comprehensive responsible response to the pandemic.

Cahapay (2020) propounded that the consideration of the curriculum must include considerations of the goals of education, content, pedagogies, and evaluation. The abrupt crisis faced by universities worldwide may not have provided the optimal time for this authentic rethinking of education the way Cahapay aspired. This study adds to the rapidly increasing literature on the effect of the pandemic on mathematics education in three ways. First, we take a comprehensive view of the disruptions instigated by the pandemic. Two further concerns guided our research, namely, (1) the problem of equity and (2) concerns about possible and desirable post-pandemic futures.
Futures for Post-Pandemic Mathematics Teacher Education: responsiveness and responsibility in the Face of a…

1.1 Equity

In the international effort to move education online, concerns about inequality of access and participation in education were brought to the forefront of the educational discourse, on the same footing as concerns about maintaining the quality of education. The authors of a working paper for the Organization for Economic Co-operation and Development (OECD, Gouëdard et al., 2020) on the effect of the pandemic on education, argued that “the crisis is a stress test challenging the resilience and equity of our education systems” (p. 30). Government, institutions and individual educators faced a major challenge in implementing higher education in a distant mode due to students’ unequal access to facilities demanded by online teaching. The study by Aristovnik et al., (2020), involving 30,383 students from 62 countries, showed significant differences in students’ experiences in online study and access to technology. While approximately 75% of the students surveyed indicated that they possessed computers, many came from countries with advanced economies. Equally alarming, “almost half the respondents did not have a quiet place to study” (p. 19).

The blog of the International Monetary Fund, by García-Escribano (2020), held that “the digital divide is more like a chasm, both within and between countries” (par. 3) and highlighted the lack of access to fast, reliable, and affordable internet connectivity as a significant issue in unequal access to quality education. It is worth noting that this digital divide paralleled existing inequalities due to students’ geographic location and socioeconomic and cultural background. Hence, as Reimers & Schleicher (2020) argued, the pandemic did not cause inequalities in education; rather, it highlighted them and, arguably, exacerbated them.

1.2 New Futures?

It is worth noting the apparent ambivalence in our individual and collective imagination of post-pandemic futures. We simultaneously talk about the new normal, yet we hope the pandemic will be under control soon, and life will go back to normal. A simple google search of the phrase “COVID-19 has changed our lives forever” yields numerous headlines from leading media agencies, non-government organizations, and academic publications. Perhaps, it is easier to admit intellectually the possibility of the pandemic changing our lives forever than to hold its certainty deep in our psyche. Moreover, we note that the discourse of the new normal remains under-theorized and under-imagined.

The futures of mathematics teacher education may be minor modifications of the past normal—with possible flexibilities in blended learning. The discourse of blended learning gained a wider audience due to the pandemic (Borba, 2021). However, it is prudent to keep in mind that technology is not the answer to all problems in education (Teräs et al., 2020), and any apparent solution raises its own problems—not the least of them the problem of equity discussed above. Moreover, one effect of the pandemic in educational discourse was to re-kindle what may be considered radical proposals for the future of education, including deschooling society (Illich, 1971) and the Community Learning Centers (Arnowe, 1973, 2020). In any imagination of educational futures, teacher education is positioned to play a major role in designing, supporting, and implementing nonstandard and flexible forms of education. The future challenge for teacher education will be how to serve the needs of education in these uncertain futures. In particular, mathematics teacher education faces the challenge of taking the lead in re-imagining alternative possible futures, commencing with re-engaging with the question of the purposes of mathematics education (Biesta, 2009, 2013). The current study is an attempt to meet this challenge.

2 The current study

Sample ASEAN is a grouping of ten nations in the region providing avenues for economic, political, social, and security collaboration towards promoting the interests of its member states (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam). Mathematics educators from four countries, namely, Indonesia, Philippines, Singapore, and Thailand, agreed to participate in this project. It is worth mentioning that an educator from Myanmar withdrew from the project due to the political upheaval plaguing the country. The represented institutions are well recognized as large teacher education universities in their own countries and widely known for their innovation and research.

The study involved faculty members in mathematics teacher education programs from each university in a focus group discussion. The participants selected by the corresponding author varied in terms of years of experience in teaching, pedagogies employed to deal with disruptions, and whether they mainly taught mathematics content or mathematics education subjects. A total of fifteen (15) participants joined the different focus groups, with 10 teaching mathematics content courses, 11 teaching mathematics education, and a number teaching both. Concerning their experience in teaching, the majority of 10 had more than ten years of experience, and 4 participants had less than five years of experience.
Design The study is informed by grounded theory (Glazer & Strauss, 1967), designed to generate a substantive “deeper understanding” (p. 239) of a phenomenon not based on pre-established theories but through conceptual categories (p. 23) founded on the raw data using a constant comparison method (p. 102). From the perspective of grounded theory, the credibility of the research is established through “the detailed elements of the actual strategies used for collecting, coding, analyzing, and presenting data” (p. 224).

Procedures The first data source was the respective authors themselves in their roles in their respective universities. They summarized the national response of each of the four countries and institutions as a background to the study. Along with our knowledge of the literature and the foci adopted in this study, this background information shaped the opening questions that were used for the focus groups. Secondly, separate focus groups were conducted with the mathematics educators from each university. The first author facilitated all discussions to attain some uniformity between the various focus groups and was assisted by the researcher from each country. The focus group discussions were recorded, transcribed, and, when applicable, translated into English.

In line with grounded theory research, the arising discussions focused more on issues deemed central to that particular group rather than restricted to preselected questions based on established theories. The following opening themes were used to allow participants to discuss their lived experiences in managing the teaching amid the crisis and project the possible future of mathematics teacher education.

1. The main challenges that the pandemic posed in terms of curriculum, pedagogy, and assessment.
2. Factors that facilitated/inhibited the change.
3. The implication of the adoption of flexible education to quality and equity.
4. The participants’ projections for post-pandemic teacher education.

Data analysis In terms of data analysis, the research team analyzed the data, identified themes, and compiled their collective observations to produce this report. This method of data analysis is consistent with the grounded theory approach discussed by Glaser & Strauss (1967). The theoretical constructs of responsiveness and responsibility were not used in the data collection nor in the initial analysis. We utilize these constructs here to make sense of the analyzed data and in the writing of this paper.

The actual process involved two rounds of analysis. First, a careful analysis of each focus group discussion was carried out by one of the authors, each acting separately. The first author read all the transcripts. In this analysis stage, we came up with several codes identifying the more salient issues raised by the participants in that group. The following is an example of the identification of codes (Fig. 1):

In navigating the data, we employed a technique promoted by Curcio (1987) in discussing graph comprehension. First, we attempted to analyze our data by thoroughly reading the data and reporting on the issues raised by the participants during the focus groups. Second, we attempted reading between the data, identifying certain presumed assumptions behind the different teachers’ practices as seen by us, the researchers. Finally, for further understanding of the data, we attempted to read beyond the data to point out possible silences, as they appeared to us, the researchers, for the purpose of raising issues for a responsible response.
towards the question of the nature of the futures of a post-pandemic mathematics teacher education.

Secondly, a follow-up meeting of the authors allowed for a thorough discussion of each author’s analysis and identification of the common themes and differences in experiences and views. In our discussion, eight themes used in Sects. 4 and 5 below arose as conceptual categories, in order to group the codes generated individually by the authors. Finally, these codes were grouped into two categories based on what the participants reported they had done in response to the pandemic and those that we, the authors, saw as remaining challenges for a more responsible response to the pandemic. The eight codes were subject to continuous confirmation for their credibility by discussions between the authors on successive paper drafts.

Before discussing the eight themes, we present the overall response to the pandemic of the four participating countries.

3 Four national responses to the pandemic

3.1 Indonesian response

At the outset of the pandemic, the Indonesian government implemented large-scale social distancing measures based on local quarantines in particular regions of the country with high infections, rather than total national lockdowns. These measures included the closure of the universities for face-to-face teaching and replacing it with online delivery.

Online teaching was not new to Indonesia. To manage quality disparity between the universities within the country, in 2015, the Ministry of Research, Technology, and Higher Education launched a national internet-based teaching and learning platform called SPADA (Sistem Pembelajaran Daring). The platform used a Learning Management System (LMS), which allowed universities to collaborate, develop, and share educational resources, both for educators and students. Likewise, just before the pandemic, the Ministry of Education and Culture launched the “Freedom of Learning, Independent Campus” policy which allowed students to take several courses in their study program from another university in the country or even overseas.

The university participating in this study had developed its own LMS to integrate into the nationally developed SPADA before the pandemic. However, only about 15% of faculty members utilized the LMS in practice as most educators preferred the traditional and familiar management of learning.

3.2 The Philippines response

Soon after the declaration of the pandemic, the Philippine government imposed various national quarantine measures, including the shutdown of basic education schools and all higher education institutions resulting in over 28 million Filipino learners having to study from home. The Commission on Higher Education (CHED) issued a series of COVID-19 advisories to exercise flexibility in the approved academic calendar, to move from on-campus learning to distance learning, to provide alternative activities for practicum/on-the-job training courses, and to require educators to work from home.

A local survey at the participating university showed that most students and teacher educators did not have a stable internet connection and laptops/desktops. Thus, the university adopted a mix of online and offline modalities for instruction. The online modality used both synchronous and asynchronous sessions, while the offline modality used printed modules.

To minimize the expense of internet data for students, the participating institution decided to limit each course’s synchronous session to one hour per week per subject. Educators had to modify the syllabus to include only the most essential learning outcomes, given the decrease in synchronous contact hours.

3.3 Singaporean response

On January 23, 2020, Singapore confirmed its first imported case of Covid-19. On March 23, as the daily cases from outside the country rose rapidly, Singapore closed its borders to incoming and transit passengers. On March 26, all bars, cinemas, and entertainment outlets were closed, and on April 7, the Circuit breaker, or lockdown, kicked in. All non-essential services were put on hold, and work from home became the new normal. Schools and universities adopted home-based lessons.

The lockdowns coincided with the last three weeks of instructional time, and the end-of-term examinations were directly affected. As hybrid modes of instruction such as blended learning and flipped learning were not new to faculty members and students, there was virtually no time lag in the transition from face-to-face to online lessons. Students who had difficulties with internet access and hardware for online lessons were allowed back on campus and provided designated spaces to work safely.

The curriculum and ‘class’ time remained the same as pre-pandemic. However, some modifications were made to the examinations, as not all face-to-face examinations could be easily done online. Assessment of learning is an ongoing process engaged in by every educator and student. Hence,
the weights of some assessment components were changed in order to have a more balanced set of criteria for the final grades.

3.4 Thailand’s response

On January 13, 2020, Thailand reported the first COVID-19 case outside China. By April 30, 2021, the country had reported 65,153 confirmed cases, with 203 deaths from the virus, prompting the Ministry of Higher Education, Science, Research and Innovation to consider unsafe any activity of teaching that might gather a huge number of students, and to recommend online meetings as an alternative. It also announced measures to avoid all face-to-face teaching activities, except for some required courses such as practicums which were subject to decisions by the university administrators. Examination and assessment methods were adapted to the new modes of online instruction. These measures covered all courses, including mathematics teacher education.

The university participating in this study allowed educators to decide the mode of instruction and means of assessment for their subjects. Modes of instruction included online teaching, blended instruction, or even an independent project-based or case study approach. The individual educators could decide on the final examination, assignment, report, or take-home examination.

4 Responsiveness to the Crisis

The pandemic caught all participating universities in this study unprepared for the sudden suspension of their normal functions. In this section we consider the participants’ specific challenges in adjusting to the new normal and what these implied for their decision-making. The data reported here rose from reading the data using the above analysis technique. This section addresses the first research question: What responsive action was taken to deal with the major disruptions experienced by the mathematics educators in Southeast Asian countries.

4.1 Technological Responsiveness

All participating universities adopted online teaching as the main mode of course delivery during the suspension of face-to-face classes. The university in the Philippines was an exception in offering students and educators a choice between studying online or using printed and pre-developed modules during the first semester of the disruption. However, online education became the only teaching mode in subsequent semesters.

Each of the participating universities had previously developed a university-wide learning management system and, in some cases, a policy toward distance learning. However, it is safe to say that, before the pandemic, online teaching remained a marginal concern of the universities, and the mathematics teachers rarely used such LMSs. Hence, technological decisions arose as a priority in the initial responses to the pandemic. Decisions about using a particular platform were made at the university and individual educator’s levels. In many cases, the participating teacher educators used a combination of platforms for different purposes. In particular, most educators adopted electronic meeting software (e.g., Zoom, Google Classroom, Microsoft Teams) to conduct synchronous classes with their students. These platforms were supported by messaging systems (e.g., Facebook Messenger, WhatsApp, or email) for announcements and instructions to students and, at times, for discussions and queries. In addition, a variety of platforms were also used to upload lecture notes, recordings, or readings for the students (such as Facebook, YouTube, or the locally adopted LMS). The teacher educators and the students needed training in using various platforms, virtual manipulatives, and online software such as Geogebra, Graphmatica, and Desmos.

All four participating universities provided some training on the programs needed for online teaching and learning to their educators and students to varying degrees. Educators were expected to learn other platforms and programs on their own using available resources on the internet or through peer planning. Within a relatively short time, all participating educators developed their online courses in preparation for the start of the new semester. However, all decisions by individual educators were tentative and temporary as universities and governments were making their policies about coping with the disruptions simultaneously as well. Lastly, with limited experience and training in alternative distance education pedagogies, and the time to implement them, the teacher educators focused on software that best suited their familiar pedagogies and practices.

4.2 Pedagogical responsiveness

The sudden shift to online learning led educators through a steep learning curve. They had to adjust to the new modality at the same time that they were learning about new technologies, resources, and appropriate pedagogies for their classes.

Decisions on pedagogies and resource materials varied among the different educators. Such variations depended primarily on their individual past teaching experiences, understandings, and teaching and learning values. In all cases, the educators utilized weekly synchronous meetings with the students. Many educators opted to pre-record
their lectures and post them to students before synchronous classes. A participant from the Philippines compared her practices before and during the interruption in the following way: “Before the pandemic, I did the lecture and let them do some advance reading, and after the lecture, I gave an assignment. So [now,] it is a kind of a reverse [process]”. However, in most cases, there was no expectation that the pre-recorded videos were sufficient to cover the entire content or that all students viewed the videos before the synchronous classes. Often, the educator repeated the key points in the pre-recorded lectures during the synchronous classes. One participant from Thailand noted that, from his experience, “Only the active students would read [the pre-posted material] before [class] and ask questions when I teach.“ Students may not read or listen to the pre-posted material for various reasons. One participant from the Philippines noted, “I have some working students who may not be able to do the reading and viewing beforehand.“ In other cases, the synchronous classes were recorded and posted to students after the lecture to make them accessible to students with limited internet connectivity or work commitments. However, some participants opted not to post classroom lectures online to encourage real-time participation in synchronous meetings.

Replacing normal face-to-face classes with synchronous meetings was seen by the participants as problematic. Several participants lamented losing face-to-face contact with students, thereby making education less personal, and losing the provision of immediate feedback about students’ difficulties. Synchronous meetings tended to be content and task-focused, and social learning and interaction tended to be limited. The participants claimed that students were more hesitant to participate in discussions or ask questions. Further, most students turned their video transmission off to cope with internet speed and cost. One participant from Singapore indicated that in online teaching, “There was some invasion of privacy, they were at home and sometimes in small spaces, with family members walking around. They did have some screen, but one could hear the voices of ‘others’. Sometimes they felt embarrassed”. In another part of the interview, he added, “and my privacy is invaded too”.

The time available for the synchronous classes was another challenge encountered by the participating educators, which varied from one institution to another. At least in the participating university in Singapore, a university policy provided the same number of hours for synchronous classes as the pre-pandemic regular class meetings of three hours a week. However, at least one teacher educator noted that “Because in class the time is quite different as [in face-to-face teaching] we use much time to walk around to talk to the students, move from one group to another. Online lessons usually finished in less [time]”. Indonesia set a minimum of one hour and a half of synchronous classes per subject. In Thailand, the length of time for synchronous meetings was left to the individual educator to decide. Some educators noted that it was hard to keep the students’ attention and engagement in meetings longer than one and a half hours. One participant from the Philippines shared: “A student government officer reported to the VP Academics that some teachers held very long synchronous sessions, and to some students, that is a little expensive”. The University responded by imposing a limit of one-hour synchronous session per week per course to lessen the internet expenses of students. Naturally, the available class time determines the number of activities and materials that can be covered. Thus, the curriculum had to be simplified, or more work had to be done outside the synchronous sessions.

The participating university in the Philippines adopted the policy of identifying the course’s essential outcomes and focusing only on these outcomes during the semester, thereby reducing the course scope. As a result, educators had to sacrifice the depth of the discussion by giving fewer examples and applications of the concept and limiting the tasks to easy ones. It was not clear how the different participants understood the meaning of essential learning. Did it mean basic knowledge of concepts and simple exercises? Did it suggest less focus on basic procedural skills and more on high-order thinking tasks? A comment from a participant seemed to suggest the former rather than the latter: “Now I have learned that the more straight-[forward] the material is, the better it is. Our toolkit has a lot more content that does not fit the new normal”.

Participating educators had to make a related pedagogical decision to balance whole-class teaching, small group activities, and individual learning by students. At least one educator from Singapore felt that conducting online small group activities was problematic due to the awkwardness of switching between Zoom rooms where the small discussions were working. However, another educator from the same university indicated a high level of satisfaction in spending time with small groups focusing on their progress and concerns uninterrupted by other students. Perhaps understandably, there was less opportunity to divide into small groups in the participating university in the Philippines due to limited time available for synchronous meetings. One participant said, “No more group activities now in the synchronous; [just] more lectures and practice exercises.”

4.3 Subject-specific responsiveness

Educators encountered two specific challenges in teaching mathematics teacher education subjects. First, some mathematics pedagogy and curriculum subjects depended heavily on manipulative materials. In the pre-pandemic face-to-face
teaching, students developed the manipulative materials and designed lessons using them. One teacher educator from Thailand said, “Students need experience in touching, feeling, and using the materials; teaching via Zoom, I only could show them.” Universities usually provide materials for use in face-to-face classes. The educator from Thailand added, “[Now], all we can do is talk.” One participant from the Philippines demonstrated concrete manipulative materials to her students online, but it was less effective and engaging. She resorted to using free online virtual manipulatives as substitutes for the actual concrete materials. However, she found that the students’ spontaneous interactions and collaborative explorations in groups were difficult to replicate online.

Second, some participants pointed out the particular challenges in practice teaching (known as practicum or field experience in other universities) due to school closures. Practice teaching is central to teacher preparation and is a prerequisite for registration as a teacher. The regular assessment in practice teaching includes actual teaching observations by the cooperating teachers in schools and the university educators. A Thai educator claimed that for the practicum courses during school closure, “We asked the students to analyze the curriculum, analyze the textbook at each level, construct a lesson plan, do micro-teaching with their friends, and then edit the lesson plan” as an alternative to actual practice teaching.

### 4.4 Assessment Responsiveness

Perhaps not surprisingly, the assessment practices in the various courses provided a considerable challenge for the participants because, arguably, they did not lend themselves to direct online migration. Here, we identify various ways the participants made decisions on their assessment practices.

To start, we note that educators predominantly use written exams in assessing their students’ performance in the vast majority of subjects. Since conducting face-to-face examinations was impossible in most countries, many participants converted these examinations to an online form and required students to undertake them at a distance. Of course, such measures could not provide the necessary supervision of students to assure the authenticity of the results. In certain cases, students could come to campus (e.g., the participating university in Thailand) only to undertake the examinations face-to-face. A Singaporean participant imposed strict time limits on examinations, thus reducing the time to consult outside resources to locate the answers. An Indonesian participant reported giving [students] open problems requiring different possible solutions to the problems. Similarly, a Thai participant gave online examinations, “but [used] more difficult questions, for example [questions that require deep] and [and] critical thinking to reduce direct copy and paste of solutions.” Another participant required students to hand-write their assignments to reduce the internet’s simple copy and paste solutions. Still others were concerned about marking. As one Filipino participant said, “My challenge is in evaluating [their submissions]. I need to download, print and check [them].”

Educators from four countries shared the need to increase weekly assessments and exercises and decrease summative examinations. With the exception of a very few cases of mathematics education subjects, educators all but abandoned the typically written and synchronous examinations in favor of performance tasks and projects such as the following: the analysis of curriculum and textbooks; creation of a hypothetical learning trajectory for students; and the development of teaching materials (e.g., participating universities in Singapore, Philippines, and Thailand). It is worth to note, however, that more mathematics content subjects retained the practice of written examinations, albeit with a reduced loading to the final results. Some educators indicated that they are still working through and experimenting with an alternative assessment that is more suitable for online teaching.

### 4.5 Equity Responsiveness

As discussed above, the pandemic-imposed disruptions to normal face-to-face classes brought the use of technology to the forefront of teaching and learning. It also raised a significant challenge to equity of opportunity to participate in education. Students’ access to technology and connectivity within each country varied based on their geographical locations and socioeconomic backgrounds. Some of these challenges were less significant in Singapore due to its size and socioeconomic level of development than in the other participating countries. While most university students have access to smartphones at the very least, it is not easy to imagine meeting all the university requirements merely by using one phone. In particular, rural students in Indonesia, the Philippines, and Thailand experienced limited, unstable, and slow internet connectivity.

All four universities had specific programs and policies to deal with such a variation in student access to technological devices and connectivity. For example, the Singapore government gave each student a computer and free internet connectivity. Thailand supplied students with free connectivity to the internet, and students could borrow computers weekly from the university. Indonesia supplied free internet connectivity for all students. With the absence of a national push to make connectivity easier for all students, the participating university in the Philippines campaigned for electronic devices, laptops, or internet connection donations for
most needy students. The participants in all focus groups were unsure if these provisions addressed their students’ needs, but they were certain that many students struggled with connectivity issues and access to online learning. Thus, they made efforts to design their courses to minimize student disadvantages.

### 4.6 Concluding remarks on responsiveness

The participants identified a range of decisions they made in the face of the disruptions due to the pandemic. These choices included technical and managerial decisions regarding technologies to be used and a slight modification of the curriculum, teaching methods, and assessment to fit in the new teaching mode. They were guided by government policy in making these decisions but not restrained by it. They were willing to devote a significant amount of time to master the new environments and, in some cases, simultaneously to implement them. Also, they and their educational managers in each specific country manifested a level of awareness of the students’ various needs. They took action towards reducing some negative effects on students. Hence, such decisions included their best intentions towards continuing education for most of their students. However, one can rightly argue that certain concerns, such as equity problems caused by online teaching and learning, go beyond the capacity of the individual teacher educator or even the university. Instead, they impose new demands on telecommunication networks to serve rural communities and families that have lower means for equipment. It is beyond the scope of this paper to evaluate the level of success of these decisions. Undoubtedly, the teachers learned from their initial experiences and are open to learning from them to improve the new practices as the pandemic persists. Due to the sudden and drastic changes triggered by the pandemic, immediate and perhaps short-term solutions had to be implemented. However, now we discuss the remaining challenges for teacher education in post-pandemic futures that illustrate a more responsible response to the pandemic.

### 5 Responsibility in the Face of the Crisis

In this section, we discuss learning with respect to the second research question: What persistent challenges demand further consideration toward responsible response to the pandemic. This research question arose from the last two techniques used to analyze the data discussed above, namely, reading between the data and reading beyond the data, which allowed us to do two things. First, we reflected on the participants’ decisions as reported in the focus groups towards identifying certain assumptions behind their varied responses as they appeared to us, the researchers. Second, we projected certain challenges that need reflection and action for mathematics teacher education. We do not understand these projections as predictions of what might happen, nor as normative of what should happen. Rather, the intention here is to raise these issues to contribute toward a post-pandemic discourse about the futures of mathematics teacher education. Since the identified themes at both levels of analysis are similar, we discuss them simultaneously in this section.

#### 5.1 The challenge of the Curriculum

All participants faced a primary challenge in the sudden and comprehensive shift to online teaching, namely, ensuring curriculum integrity. In some cases, the prescribed curriculum content, or outcomes, had to be limited to the most essential to reduce the students’ workload. In other cases, educators provided fewer opportunities for advanced exercises and discussions, thereby reducing the lesson’s depth and rigor. Nevertheless, many participants felt that the curriculum content remained more or less the same.

Here we note two possible assumptions that the educators seem to subscribe to behind their decisions. First, the pandemic was experienced as a temporary disruption, albeit very drastic, that had to be survived until education went back to normal. Second, there may have been the assumption that the previously planned curriculum was based on rational and careful planning that might not be sensitive to characteristics and fluctuations in the current conditions. Despite the variations in the teacher education courses, noted above, there are similarities in the content of their courses, in terms of theory and teaching methods, as the ICMI 15 study has shown (Tatto et al., 2010). These assumptions are consistent with the relevant absence of the pandemic directly affecting the content of the different courses. In particular, there is no evidence that the issues related to distant and online education, their supporting theories, and effective pedagogies were discussed in the mathematics education subjects. Nor was there evidence that the mathematics content subjects included topics such as modeling the spread of the virus and necessary social distance as examples to promote critical mathematical thinking (Sezer & Namukasa, 2021).

It is possible to argue that the pandemic illustrated and intensified the age of uncertainty that economic and social theorists have discussed since the 1970s. There is a rising need in our collective thinking about the post-pandemic curriculum in teacher education to reflect critically on the content and processes appropriate for the age of uncertainty and crisis. Such deliberations should begin with rethinking the aims of mathematics education and the relevant theories and practices that may achieve these aims (Borba,
2021; Hammond & Hyler, 2020). For example, Kwon et al., (2021) gave examples of how the pandemic provided opportunities for focusing on data representation arising from media discussions of the pandemic, in order to increase the responsibility of mathematics education towards promoting the understanding of the real world. In a thought-provoking paper in the Special Issue of Educational Studies in Mathematics, Krause et al., (2021) argued that the post-pandemic mathematics education curriculum should aim at preparing students for becoming more active citizens, including the following:

(1) developing a positive mindset toward mathematics to engage with and reflect on real-world problems,
(2) improving interdisciplinary connections to the sciences to understand better how science professional practices and insights are similar or different from everyday practices, and (3) considering interpersonal and collective matters beyond the individual. (p. 1)

5.2 The challenge of the Teachers’ role

In responding to the pandemic, the teaching processes, pedagogies, and practices familiar to mathematics teacher educators were adapted to the new environment. The educators’ lectures remain the central source of knowledge to be developed by the students. Synchronous or recorded lectures replaced face-to-face lectures. While variations existed, teachers’ lectures remained the main means of developing the content with the students. As one Thai participant said, “Before the pandemic, we lectured on-site; now we meet the students … using technology … there is no difference”. In most cases, group discussions and group work were reduced due to time constraints set by university regulations, thus increasing the role of the teacher as the main source of knowledge. Perhaps these attempts to mix the new modes of teaching with the old assumptions and practices have led to what Engelbrecht et al., (2020) called “panic-gogy” (p. 836).

Once again, the huge challenges of re-designing teaching to suit the new environment during major interruptions, and the educators’ limited knowledge and experience in online education, may explain the apparent consolidation of the teacher’s role as the main source of knowledge for students. Hence, the concern expressed by Arnoke (2020) of education taking a step backward toward a teacher-centered “banking model” of education, at least in the short term during the crisis, seemed to be actualized in many participating classes. Similar observations were reported by Aldon et al., (2021). Although flexible education is often discussed as a means to achieve student-centered education, careful planning and experimentation in a new environment are necessary. Some participants were aware of the need to experiment with alternative pedagogies such as project work, problem-based education, and alternative assessment forms such as e-portfolios. Concepts such as student-centered learning, lifelong learning, and self-directed learning are not new concepts in the literature. The continuing challenge for the future of mathematics teacher education is re-examining its practices in the new environments in terms of mainstreaming these alternative pedagogies and assisting students towards becoming true self-directed learners.

The pandemic as an opportunity should lead to a reconsideration of the teacher’s role in learning mathematics, based on learning theories, which according to Borda (2021), needs to expand to include technology as a factor. In this context, Sullivan et al., (2020) put the case for two alternative conceptions of mathematics learning. The authors argued that the transmission models of teaching and learning might be easier to migrate online; however, models of learning where “students solve mathematics tasks for themselves when they have opportunities to explain and justify their reasoning and connect different aspects of mathematics” (p. 551) are possibly more difficult. This issue remains a major challenge for post-pandemic teacher education in mathematics education.

5.3 The challenge of Assessment

We discussed above how the participants faced particular difficulties in migrating their regular assessment practices online. While the communication platforms can approximate normal classroom interactions between teachers and students—albeit with considerable limitations—they fail when migrating the accustomed assessment online, even more so because examinations remain the main assessment tool. This reliance on examination for assessment is widespread. Attempting to introduce formative assessment in Hong Kong, Berry (2011) noted that “Hong Kong is traditionally an examination-oriented culture, a legacy of its Confucian heritage” (p. 199). However, the dominance of testing in education is a phenomenon that is wider than just in Confucian-based countries and is increasing worldwide, leading philosophers of education such as Biesta (2009) to coin the term age of measurement to describe contemporary times in education. As noted above, the main problem that troubled the participants was their inability to judge the integrity of students’ work without direct supervision. The participants made various efforts to minimize this risk.

The distinctions between assessment of learning, assessment for learning, and assessment as learning have become very common in educational discourse and have found their way into many educational policies. However, the
conjunction in the above sentence is not always sufficiently problematized. While these types of assessments may play a role in meeting the needs of various stakeholders in education, they are not of the same status for the students or teachers. For example, there is much more at stake in getting a good result on a national examination than there is in a teacher’s evaluation of a classroom project that a student does, even though the latter has more educative value than the former. Hence, a teacher trying to balance the limited classroom time may be more likely to influence the former rather than the latter. Perhaps the disruptions caused by the pandemic may motivate teachers to consider using the latter in their classes, as did some of the participants in this project. One Thai participant said, “I am thinking of using the project-based learning like I will put them in small groups; then, at the end of the semester, they will be asked to present the whole project to the class.” A similar pattern of increased use of alternative assessment during COVID-19 was found in the study by Fitzmaurice & Ni Fhloinn (2021).

Arguably, discussions about these alternative assessment forms have been around in mathematics education literature for decades now. Evidence from this study shows that the disruptions introduced by the pandemic have encouraged some educators to implement alternative assessment for the first time. However, the challenge for responsiveness of mathematics teacher education must go beyond this, perhaps pragmatic response. Several writers have raised questions that responsive mathematics teacher education must consider. In his comprehensive literature review, Anderson (2018) of the Modified Bloom Taxonomy fame, discussed five questions about assessment, as follows: (1) Why do we grade students? (2) What do grades mean? (3) How reliable are students’ grades? (4) How valid are students’ grades? (5) What are the consequences of grading students? Similarly, a challenging question posed by Biesta (2009) remains open for discussion. Do we value what we can measure easily, i.e., knowledge and direct applications, or do we measure what we value, i.e., higher-order thinking, creativity, and students’ evaluation skills? Relevant is the challenge raised by Hargreaves as early as 1980: Is our model of teacher education based on the perspective “so deeply imbued with and obsessed by what I shall call the cult of individualism that the social functions of education have become trivialized (p. 187)?”

5.4 The challenge of equity

Earlier we argued that inequality concerning internet access had highlighted existing inequalities of opportunities, and that the management of inequalities in technology access reaches beyond the capacity of the individual educators and institutions. The ASEAN 37 Summit (ASEAN, 2020) acknowledged that “educational and social inequalities have been exacerbated, including learners’ limited access to infrastructure, devices, and resources; lack of teaching materials tailored to disadvantaged students; and the relevance of curriculum and programs to the changing demands of emerging industries and the future shape of the workforce post-COVID-19” (p. 25). The report posits a five-strategy comprehensive recovery plan, including “Broad Strategy 4: Accelerating Inclusive Digital Transformation”.

Teacher education in post-pandemic uncertain futures faces two challenges concerning equity in teacher education. First, there is a continual need to investigate access and student experiences within teacher education related to possible inequitable participation by all population segments. The discussion paper of the ICMI Study 15 on the professional development of teachers asserts “that no effort to improve students’ opportunities to learn mathematics can succeed without parallel attention to their teachers’ opportunities for learning” (Ball & Even, 2004, p.117). However, as Tato et al., (2010) noted, the important role that preservice teaching education programs have in developing quality education is not matched by a focus of research on them, resulting in a limited knowledge of the relative effectiveness of the different structures, their content, and pedagogies. Here we may add that such research should include equity issues experienced within teacher education. Secondly, teacher education must look into how equity issues are integrated as a standard component in their curriculum, in order to assist future teachers in managing equity in their practices. Cochran-Smith et al., (2016) identified four areas where equity can become central in teacher education programs, as follows: teacher education should continue to define the nature of practice for equity, conceptualize the ever-changing nature of equity in education, develop courses sensitive to the local manifestation of inequality, and develop research on inequality and effective ways to manage it (p. 68).

5.5 Concluding remarks about a responsible response

Calls for reforms in mathematics teacher education are not new. Much of the literature quoted above about desirable curriculum development, pedagogy, and assessment in teacher education predates the pandemic. Without undermining the past developments during the last few decades, the drastic interruptions instigated by the pandemic form a unique opportunity for re-imagining the basic assumptions, forms, and practices of mathematics teacher education. There is ample evidence that the responsiveness of mathematics teacher educators to the pandemic illustrates their willingness to implement some practices that, even
though they were quite well established prior to the pandemic, were not utilized, perhaps due to implicit assumptions and the power of tradition. Decisions on how far these developments would go are more of a possibility now after the initial responsiveness to the urgency for action at the pandemic’s start. The remaining challenge is for mathematics teacher educators to re-imagine their course and teaching towards a more critical, relevant, comprehensive, and responsible response to the challenge of the pandemic.

6 Concluding remarks

As of this writing, a year and a half into the pandemic and eight months after the first vaccine roll-out, the future remains filled with uncertainty. Many universities worldwide will have resumed face-to-face teaching when this paper is published. However, occasional disruptions might still occur. It remains to be seen whether the world’s economic and political systems match the formidable scientific achievements activated to control the coronavirus. More uncertain are life forms in economic, social, and political regimes that might arise. Will the new normal be a mere back to normal? Or will we build back better, as the slogans used by the United Nations and World Bank prompt us to imagine?

The same alternative futures are possibilities in mathematics teacher education. The pandemic confronted education, including mathematics teacher education, with massive disruptions. These disruptions may be used as a magnifying lens to provide insights into our programs and practices, standard curriculum, pedagogies and assessment, and the exclusion of a large segment of our student teachers. More importantly, the disruptions may give rise to opportunities for imagining thinking about the purposes of mathematics education, its teaching and learning, and the preparation of teachers. These responses to the challenges of the pandemic are more difficult yet necessary. They may be seen as the crisis yet to come.

In this paper, we used the term futures in the plural to indicate that the future is not pre-determined—and yet, possibly will not be deliberately engineered. It highlights the agency of the different stakeholders in shaping the possible future that will eventuate. Just as the pandemic affected all education systems worldwide, building the future has to be a collaborative and participatory imagination by all people interested in building back a better, more relevant, productive, and equitable mathematics teacher education.

References

Aldon, G., Cusi, A., Schacht, F., & Swidan, O. (2021). Teaching mathematics in a context of lockdown: A study focused on teachers’ praxeologies. Educational Science, 11(6), 733–744. https://doi.org/10.3390/eduscience11020058
Anderson, L. W. (2018). A critique of grading: Policies, practices, and technical matters. Education Policy Analysis Archives, 26, 49. https://doi.org/10.14507/epaa.26.3814
Aristovnik, A., Keržič, D., Ravšelj, D., Toneževi, N., & Umek, L. (2020). Impacts of the COVID-19 pandemic on the life of higher education students: A global perspective. Sustainability, 12, 8438. https://doi.org/10.3390/su12208438
Arnove, R. (2020). Imagining what education can be postCOVID19. Prospects, 49(1–2), 43–46. https://doi.org/10.1007/s11125-020-09474-1
Arnove, R. F. (1973). Community learning centers. Assignment Children, 22, 94–103
Association of Southeast Asian Nations (2010). ASEAN Comprehensive Recovery Framework. https://asean.org/asean-comprehensive-recovery-framework-implementation-plan/ (Accessed May 30, 2021)
Ball, D., & Even, R. (2004). The fifteenth ICMI study: The professional education and development of teachers of mathematics. ZDM – Mathematics Education, 36(4), 117–123
Berry, R. (2011). Assessment trends in Hong Kong: Seeking to establish formative assessment in an examination culture. Assessment in Education: Principles Policy & Practice, 18(2), 199–211. https://doi.org/10.1080/0969594X.2010.527701
Biesta, G. (2009). Good education in an age of measurement: On the need to reconnect with the question of purpose in education. Educational Assessment, Evaluation, and Accountability (formerly: Journal of Personnel Evaluation in Education), 21, 33–46. https://doi.org/10.1080/10995771119220028
Biesta, G. (2013). Responsive or responsible? Democratic education for the global networked society. Policy Futures in Education, 11(5), 733–744. https://doi.org/10.2304/pfie.2013.11.5.733
Borba, M. (2021). The future of mathematics education since COVID-19: Humans-with-media or humans-with-non-living-things. Educational Studies in Mathematics, 108, 385–400. https://doi.org/10.1007/s10649-021-10443-2
Cochran-Smith, M., Ell, F., Grudnoff, L., Haigh, M., Hill, M., & Ludlow, L. (2016). Initial teacher education: What does it take to put equity at the center? Teaching and Teacher Education, 57, 7–78. https://doi.org/10.1016/j.tate.2016.03.006
Cahapay, M. (2020). Rethinking education in the new normal postCOVID-19 era: A curriculum studies perspective. AQUADEMIA, 4(2), ep20018
Curcio, F. (1987). Comprehension of mathematical relationships expressed in graphs. Journal for Research in Mathematics Education, 18(5), 382–393
Darling-Hammond, L., & Hyler, M. (2020). Preparing educators for the time of COVID... and beyond. European Journal of Teacher Education, 43(4), 457–465. https://doi.org/10.1080/02619768.2020.1816961
Doyle, W., & Ponder, G. (1977). The practicality ethic and teacher education systems worldwide, building the future has to be a collaborative and participatory imagination by all people interested in building back a better, more relevant, productive, and equitable mathematics teacher education.

References

Aldon, G., Cusi, A., Schacht, F., & Swidan, O. (2021). Teaching mathematics in a context of lockdown: A study focused on teachers’ praxeologies. Educational Science, 11, 38. https://doi.org/10.3390/eduscience11020058
Anderson, L. W. (2018). A critique of grading: Policies, practices, and technical matters. Education Policy Analysis Archives, 26, 49. https://doi.org/10.14507/epaa.26.3814
Aristovnik, A., Keržič, D., Ravšelj, D., Toneževi, N., & Umek, L. (2020). Impacts of the COVID-19 pandemic on the life of higher education students: A global perspective. Sustainability, 12, 8438. https://doi.org/10.3390/su12208438
Arnove, R. (2020). Imagining what education can be postCOVID19. Prospects, 49(1–2), 43–46. https://doi.org/10.1007/s11125-020-09474-1
Arnove, R. F. (1973). Community learning centers. Assignment Children, 22, 94–103
Association of Southeast Asian Nations (2010). ASEAN Comprehensive Recovery Framework. https://asean.org/asean-comprehensive-recovery-framework-implementation-plan/ (Accessed May 30, 2021)
Ball, D., & Even, R. (2004). The fifteenth ICMI study: The professional education and development of teachers of mathematics. ZDM – Mathematics Education, 36(4), 117–123
Berry, R. (2011). Assessment trends in Hong Kong: Seeking to establish formative assessment in an examination culture. Assessment in Education: Principles Policy & Practice, 18(2), 199–211. https://doi.org/10.1080/0969594X.2010.527701
Biesta, G. (2009). Good education in an age of measurement: On the need to reconnect with the question of purpose in education. Educational Assessment, Evaluation, and Accountability (formerly: Journal of Personnel Evaluation in Education), 21, 33–46. https://doi.org/10.1080/10995771119220028
Biesta, G. (2013). Responsive or responsible? Democratic education for the global networked society. Policy Futures in Education, 11(5), 733–744. https://doi.org/10.2304/pfie.2013.11.5.733
Borba, M. (2021). The future of mathematics education since COVID-19: Humans-with-media or humans-with-non-living-things. Educational Studies in Mathematics, 108, 385–400. https://doi.org/10.1007/s10649-021-10443-2
Cochran-Smith, M., Ell, F., Grudnoff, L., Haigh, M., Hill, M., & Ludlow, L. (2016). Initial teacher education: What does it take to put equity at the center? Teaching and Teacher Education, 57, 7–78. https://doi.org/10.1016/j.tate.2016.03.006
Cahapay, M. (2020). Rethinking education in the new normal postCOVID-19 era: A curriculum studies perspective. AQUADEMIA, 4(2), ep20018
Curcio, F. (1987). Comprehension of mathematical relationships expressed in graphs. Journal for Research in Mathematics Education, 18(5), 382–393
Darling-Hammond, L., & Hyler, M. (2020). Preparing educators for the time of COVID... and beyond. European Journal of Teacher Education, 43(4), 457–465. https://doi.org/10.1080/02619768.2020.1816961
Doyle, W., & Ponder, G. (1977). The practicality ethic and teacher decision-making. Interchange, 8, 1 – 12. https://doi.org/10.1007/BF01189290
Ducharme, J. (2020). World Health Organization declares COVID-19 a ‘pandemic.’ Here’s what that means. Time Magazine. https://time.com/5791661/who-coronavirus-pandemic-declaration/(Accessed May 10, 2021)
Engelbrecht, J., Linares, S., & Borba, M. (2020). Transformation of the mathematics classroom with the internet. ZDM
Futures for Post-Pandemic Mathematics Teacher Education: responsiveness and responsibility in the Face of a…

Marinoni, G., Land, H., & Jensenm, T. (2020). The impact of COVID-19 on higher education around the world. IAU Global Survey Report. Paris: International Association of Universities.

Reimers, F., & Schleicher, A. (2020). A framework to guide an education response to the COVID-19 pandemic of 2020. https://global.dse.harvard.edu/files/geii/files/framework_guide_v2.pdf

Sullivan, P., Bobis, J., Downton, A., Feng, M., Hughes, S., Livy, S., & McCormick (2020). Threats and opportunities in remote learning of mathematics: Implication for the return to the classroom. Mathematics Education Research Journal, 32, 551–559. https://doi.org/10.1007/s13394-020-00339-6

Sezer, H. B., & Namukasa, I. K. (2021). Real-world problems through computational thinking tools and concepts: The case of coronavirus disease (COVID-19). Journal of Research in Innovative Teaching & Learning, 14(1), 46–64. https://doi.org/10.1108/JRIT-12-2020-0085

Tatto, M., Lerman, S., & Novotna, J. (2010). The organization of the mathematics preparation and development of teachers: A report from the ICMI Study 15. Journal of Mathematics Teacher Education, 13, 313–324

Tatto, M., Peck, R., Schwille, J., Bankov, K., Senk, S., Rodriguez, M. … Rowley, G. (2012). Policy, practice, and readiness to teach primary and secondary mathematics in 17 countries. The Netherlands: International Association for the Evaluation of Educational Achievement

Teräs, M., Suoranta, J., Teräs, H., & Curcher, M. (2020). Post-Covid-19 education and education technology ‘solutionism’: A seller’s market. Postdigital Science and Education, 2, 863–878

Waldenfels, B. (2012). Responsive ethics. In D. Zahavi (Ed.), Oxford handbook of contemporary phenomenology (pp. 423–441). Oxford University Press

Publisher’s Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.