Issues and Challenges of Bhutanese Mathematics Curriculum: A View from the Exploratory Study

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Abstract: Bhutanese mathematics curriculum witnessed several rounds of revision in its attempt to improve its quality of mathematics education. A growing body of research, however, reports that the Bhutanese mathematics curriculum is largely plagued by several issues and challenges. Therefore, this exploratory study was carried out to document the issues and challenges of the Bhutanese mathematics curriculum. Twelve (N=12) Bhutanese mathematics teachers took part in the study based on the inclusion criteria of purposive sampling design. The mathematics teachers took part in one-to-one interviews. The data collected through one-to-one interviews were analysed based on Braun and Clarke's approach (2006) to thematic analysis. Findings showed that the Bhutanese mathematics curriculum from fourth to 12th-grade is largely vast, fragmented and compartmentalised, developmentally not age-appropriate. Moreover, findings also inferred that the Bhutanese mathematics curriculum from fourth to 12th-grade is considerably laborious or taxing in nature; and prescriptive in design. The urgent need to address the issues and challenges of mathematics curriculum, especially from the point of being vast and voluminous, fragmented, developmentally inappropriate; or prescriptive in the design is also discussed.

Keywords: Bhutanese mathematics education, Bhutanese mathematics curriculum, Bhutanese mathematics teachers, exploratory study, thematic analysis

1. Introduction

Bhutanese mathematics education started with a curriculum borrowed from India (Rinchen, 2013). In the pre-1980s, Bhutanese schools not only used mathematics textbooks designed for Indian students but also taught by Indian teachers (Namgyel, 2011; Subba, 2006). However, by the turn of early 1986, Bhutan started to reform the school curricula when the *New Approach to Primary Education* (NAPE) was launched as the nation-wide educational approach. Since then, Bhutan has initiated to make the school curricula relevant to the students in the context of Bhutan. Thus, all school curricula at the primary level were tailor-made into the Bhutanese setting (Dukpa, 2000; Sherab, 2013). However, at the secondary level, the school curricula including mathematics still used Indian textbooks.

By the early 2000s, the mathematics curriculum from pre-primary (PP) to 12th-grade was revised (Dolma, 2016). In 2004, the Ministry of Education (MoE) in consultation with the Royal University of Bhutan (RUB) initiated the development of the PP to 12th-grade school mathematics curriculum framework. Hence, a new PP to 12th-grade mathematics curriculum framework was developed in 2005 based on a recommendation from the needs assessment carried out by MoE. The standards in the new mathematic curriculum framework were formulated based on the principles of the National Council Teachers of Mathematics (NCTM). Thus, the reform process, development, and implementation of the new mathematics curriculum as completed by the end of 2008 (Dolma, 2016; Tshewang et al., 2017).

The new mathematics curriculum is envisioned to facilitate an in-depth understanding of mathematical patterns, emphasise more on why mathematical patterns are true not simply they are true; or focus more on reasoning and contextualisation in the local setting (Dolma, 2016). At the core, the new mathematics curriculum intended to promote teaching in mathematics through constructivist approaches. This aspired to transform from a traditional chalk-board dominated teaching style to a learning environment that demands more group and pair work with an increased emphasis on communication between students and teachers (Tshewang, 2015).

However, in recent past years, a growing body of literature reports that the Bhutanese mathematics curriculum from PP to 12th-grade is largely affected by several issues and challenges. The consultation study carried out by MoE (2014) reports that the Bhutanese mathematics curriculum from PP to 12th-grade is not only difficult for students but also largely challenging for teachers. The nationwide survey conducted by Bhutan Council for School Examinations and Assessment (BCSEA) (2013) and Royal Education Council (REC) (2016, 2019) also opine that the Bhutanese mathematics curriculum is so taxing that both students and teachers find it difficult to transfer its curricular intention. More recently, the *Programme for International Students Assessment Development* (PISA-D) test conducted by BCSEA (2017, 2019) found out that the Bhutanese students'

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performance in mathematics was significantly below many Asian nations. The test reports suggested overhauling the Bhutanese mathematics curriculum to augment the quality of mathematics education.

1.1. Bhutanese Education System

Education in Bhutan started with the principles of elite monasticism. The monastic education dates back as early as eighth century when it was the only source of teaching and learning (Schuelka, 2012, 2013; Sherab, 2013). During those days, the monastic education was accessed by only a few selected individual (Sherab et al., 2016). However, by the turn of the early 1900s, under the leadership of first Druk Gyalpo Gongsa Ugyen Wangchuck, Bhutan established first school with modern secular education in Haa. From there on, the Royal Government of Bhutan (RGoB) established numerous schools across many parts of the country. This enabled modern secular education accessible to many Bhutanese children (Dorji & Scheulka, 2016).

The Bhutanese education system underwent series of structural changes (Miloni, 2012). Currently, the education structure consists seven years of primary education (Pre-primary [PP] to sixth-grade), followed by four years of lower and middle secondary (seventh to tenth-grade), and two years of higher secondary education (11th to 12th-grade). Children start school at the age of six when they enter PP (Sherab et al., 2016). Today, RGoB provides free basic education until the end of 10th-grade. After 10th-grade, students either continue general education in 11th and 12th grade, join vocational training institutes, or enter the job market (Namgyel & Rinchhen, 2016). Similarly, after completing 12th-grade, student who do not qualify for government scholarship programmes enter either the job market or pursue tertiary education on self-financing basis. The selection of students for government scholarship after completion of 12th-grade is strictly based on merit and availability of slots (Childs, et al., 2011; Miloni, 2012).

In Bhutanese educational setting, mathematics is studied as one of the academic subjects aside from Dzongkha, English, science, etc. Apart from Dzongkha and English, it is also one of the subjects offered right from PP to 12th-grade. From PP to 10th-grade, it is offered as a compulsory subject, while from 11th to 12th-grade, it is offered as one of the optional subjects (Sherab et al., 2016).

Conversely, most of the nationwide studies have mostly focused on reporting the issues and challenges of the Bhutanese science curriculum merely in terms of numerical inference, such as frequency or severity. As such, given the paucity of study that reports the narrative inferences, the views concerning the issues of the Bhutanese mathematics curriculum is still vague and shallow. Therefore, this exploratory study was carried out to ascertain the in-depth understanding of the issues and challenges of the Bhutanese mathematics curriculum. The study was carried out to answer the following questions:

1. What are the issues and challenges of the mathematics curriculum?

2. What intervention programmes may be derived from the findings of this study?

The findings from this study are expected to help readers understand the issues and challenges of the Bhutanese mathematics curriculum. Findings can inform Bhutanese policymakers, education officials, and curriculum developers regarding the issues and challenges; and the implication of the mathematics curriculum. As such, findings can help them make an informed decision in policy-related matters; and provide a basis to overhaul the quality of the mathematics curriculum. Moreover, the study is expected to recommend strategies to upscale the quality of the mathematics curriculum.

2. Method

2.1. Research Design

In this paper, we aimed to document issues and challenges of the Bhutanese mathematics curriculum. Crowe et al. (2011) posit that the exploratory is carried out when the study "lends itself well to capturing information on more explanatory … *what*… questions" (p. 4). The study documented the opinions of teachers by talking directly to them in the natural school setting. The study permitted teachers to speak either in English or *Dzongkha* to let them express their perceptions and opinions spontaneously (Fabregues & Fetters, 2019). The study used an interpretive approach to examine the issues and challenges of the Bhutanese mathematics curriculum in the form of meanings or themes using logic inductive reasoning (Crowe et al., 2011).

2.2. The Context

This qualitative inquiry was conducted towards the fall of 2019. The letter of approval for data collection was sought from the Chief District Education Officer (CDEO). Based on the approval letter, two lower secondary schools (LSS), a middle secondary school (MSS), and one higher secondary school (HSS) were selected as the study sites. The HSS situated in the semi-urban area contained both boarding and day schooling facilities, while the other three schools were day schools located within the premises of district town. The school principals of the selected schools were informed beforehand regarding the nature of the study. The information related to the

type of school, grade range of students, or the geographical locations of schools were collected from the principals of selected schools.

2.3. Participants

Nine male and three female mathematics teachers formed the informants of this study. Three were (*n*=3) specialised in teaching mathematics from PP to 6th-grade, four (*n*=4) from seventh to 10th-grade, five (*n*=5) from eighth to 12th-grade. Those specialised teaching mathematics from PP to 6th-grade had bachelor's degree of education (B. Ed) in primary as pre-service qualification, while those specialised teaching mathematics from seventh to 10th-grade had bachelor's degree of education (B. Ed) in secondary. Teachers specialised in teaching mathematics from eight to 12th-grade had a post-graduate diploma in education (PGDE) as a pre-service qualification. Meanwhile, six of them had availed a master's degree in education or mathematics discipline. The profile of the participants is outlined in Table 1.

Table 1
The Profile of Teachers who formed the Case of the Study

Teacher (T)	*Gender*	*Qualification*	*School*
T1	Male	B. Ed	LSS
T2	Male	B. Ed	LSS
T3	Female	Master's degree	LSS
T4	Male	B.Ed	MSS
T5	Male	Master's degree	MSS
T6	Male	Master's degree	MSS
T7	Male	B.Ed	LSS
T8	Female	B.ED	LSS
T9	Female	PGDE	HSS
T10	Male	Master's degree	HSS
T11	Male	Master's degree	MSS
T12	Male	Master's degree	LSS

According to Patton (2002), participants are drawn into the study largely based on certain "pre-predetermined criteria of importance" (p. 238). Similarly, teacher participants of this study were also purportedly drawn into the study based on the five selection criteria. First, all the teachers teaching mathematics in four selected Bhutanese public schools were assumed as the "information-rich cases" (Suri, 2011, p. 66) or "will illuminate the questions understudy" (Patton, 2002, p. 273). Second, from the first list, teachers teaching for more than five years were drawn in as the potential participants. Third, teachers who appeared especially knowledgeable about or experienced in teaching fourth to 12th-grade mathematics were given the first preference. Further, teachers with the ability to communicate experiences and opinions expressively were given preference. Lastly, teachers who expressed their willingness and availability to participate in the study formed the informant of the study.

2.4. Data Collection

The data of this study was collected through one-on-one interviews carried out with 12 Bhutanese mathematics teachers. The interviews were carried out, either in the staffroom or school library in the natural setting after the school hours. Informed consent was sought from the participants after informing the rationale of the study; and how their responses will remain confidential. The interviews were carried using a semi-structured interview protocol that contained three open-ended questions. The interview protocol was adapted from the interview protocol developed by Kvale & Brinkmann (2009). The interviews were audio-taped for transcription and analysis.

2.5. Data Analysis

The data from the semi-structured interviews were analysed based on Braun and Clarke's (2006) approach to thematic analysis. The audio-taped interviews were transcribed into transcripts. Two researchers read the transcripts individually to immerse in the data. After the reading, two researchers shared the essence of data and formulated initial plans about the codes. Each researcher then set on coding four interview transcripts separately. The researchers carried out line by line manual coding making note of the sentences, phrases, or words that appeared salient or summative. Then two researchers compared and analysed the codes and changed them wherever appropriate before coding other transcripts. Researchers coded the transcripts by hand manually using a pen and highlighter. The researchers generated a list of codes without pre-determined coding frames. The codes were then compared and collated into themes.

The validity and credibility of findings were ensured through member checking. Therefore, both data and interpretation were handed over to a few teacher participants to check the information and the narrative accounts.

3. Findings

The findings from one-to-one semi-structured interviews are reported in the following themes of

3.1. Theme 1- Bulky and Voluminous

Participants opined that the mathematics curriculum from PP to third-grade is neither bulky nor taxing. They acknowledged that teaching mathematics curriculum for these grades is often completed either before time. However, they appeared frustrated with mathematics from fourth to 12th-grade. On this score, they expressed that the mathematics curriculum from fourth to 12th-grade is bulky and taxing with an exhaustive list of mathematical problems. Participants also remarked that teachers forcefully adopt tactics, such as accelerating the pace of teaching, theory-driven lecture method, or conduct extra-classes merely to complete the syllabus. Moreover, participants also stated that teachers focus more on certain portions and leave out some concepts deliberately. Concurrently, participants felt the need to shed off some concepts from the mathematics curriculum offered to arts and commerce students. They admitted that concepts, such as trigonometry and calculus, do not hold any practical values or relevance to arts and commerce students. Participants claimed that:

T2. "Class PP to three mathematics is ok… but I see a big jump from class four onwards. Class four to 12 mathematics is vast. It is really difficult to complete the syllabus on time. Many rushes to conduct extra classes even on Sundays forget after the school … many simply teach in a quick pace, or do lecture method … we land up giving more focus to certain topics and leave others … again you know, there is no point of teaching trigonometric functions and calculus to arts and commerce students. There is no relevance or application".

3.2. Theme 2- Piecemeal or Fragmented

Significantly, it emerged that there is not much of an issue concerning the conceptual progression from PP to the eighth-grade mathematics curriculum. However, participants felt that the ninth to 12th-grade mathematics curriculum lacks progression where concepts, such as calculus, trigonometric functions, logarithms, etc., are outlined in 11 and 12th-grade without basics from lower grades. In this light, many teachers felt that the standard and the concepts offered in 10th-grade do not prepare students proportionately to handle the concepts offered in the 11th and 12th-grade mathematic curriculum. Therefore, many of them expressed the need to introduce certain basics of calculus, logarithms, and trigonometric functions in the ninth and 10th-grade mathematics curriculum as well. Given below is an excerpt from one of the participants:

T7 "Class nine to 12 mathematics is not aligned properly. There is a big jump from class ten to 11. In class 11 and 12, many new concepts like integration and differentiation are learned in detail. Moreover, students also learn about trigonometric functions and logarithms which are not there in class nine and 10 mathematics. I think we need to introduce these concepts in class nine and 10".

3.3. Theme 3- Developmentally Inappropriate

Unlike for PP to third-grade curriculum, it emerged significantly that mathematics curriculum from fourth to 10th-grade is challenging. In this regard, participants maintained that the mathematics curriculum from fourth to 10th-grade is largely difficult due to the prevalence of word problems. They made it explicit that students often fail to extrapolate, reason out, and decipher the patterns implied in the word problems. Concurrently, many participants linked the difficulties faced by students to solve word problems with the standard of the language. Perhaps, there was an acknowledgment that the standard of language used in the fourth to 10th-grade mathematics is beyond students' language proficiency. Given below is verbatim from one of the participants:

T11 "We don't find the problem with mathematics from PP to class three. I think class four to 10 mathematics is quite difficult. Um ... our students find it difficult to understand the questions asked in the form of word problems. I think the standard of language used in word problems are quite high … that's what I feel".

3.4. Theme 4- Laborious Nature

Surprisingly, it appeared that the mathematics curriculum from fourth to 12th-grade is laborious or taxing in nature. For these participants, the fourth to 10th-grade mathematics curriculum is so taxing that mathematical standards demand students and teachers to use a variety of methods and solutions. There was an argument from the participants that there is no point in solving mathematical problems using various methods if students have built an understanding using one or two methods. However, the laborious nature of the 11th to 12th-grade mathematics curriculum appeared different. Predominantly, participants mentioned that 11th to 12th-grade mathematical problems entail students to solve using lengthy or exhaustive steps. There was frustration amongst the participants that a solution to a single mathematical problem commonly spans across one or two pages. Therefore, there was a call from the participants to focus on delivering mathematical concepts not necessarily using a lengthy step demanded by the curricular standards. Given below are the excerpt from two participants:

T8 "I think mathematics from class four 10 is taxing. We have to use multiple methods to solve one problem. That is a demand by the curriculum. I think there is no point to use many methods if students understand from one or two methods".

T4 “Class 11 and 12 mathematics is quite boring. We have to follow lengthy steps to solve one problem. One problem takes more than one or two pages. I think we don't need to follow lengthy steps. We should look for steps that are understandable to students”.

3.5. Theme 5- Rigid and Prescriptive

Participants felt that PP to the 12th-grade mathematics curriculum is rigid and prescriptive. There was a consensus amongst the participants that teaching in mathematics is never encouraged to situate beyond the prescribed scopes nor based on one's choices and flexibility. Surprisingly, participants felt that the prescriptive nature of the mathematics curriculum is considerably linked with the assessment system. There was an acknowledgment from the participants that classroom instructions are done merely to score high marks to get admitted to higher grades or to get a job. Therefore, there was a loud call from participants to move away from the traditional paper-pencil test to a performance-based assessment. Given below is an extract from one of the interviews:

T10 “I think our mathematics curriculum is rigid. There is no scope for teachers and students to teach other than what's given in the textbooks. We teach what we expected in examinations. That is because whatever you do, what counts is how much marks are scored in exams… students get to higher grades or job with marks … Now I think we need to leave the examination system and look for how students perform in reality”.

4. Discussion

In the context of *bulky and voluminous* theme, the results revealed that the opinion of the participants on PP to third-grade mathematics curriculum was neither bulky nor taxing. However, they admitted that the fourth to 12th-grade mathematics curriculum is vast with an exhaustive list of mathematical problems. This finding implies that the fourth to 12th-grade mathematics curriculum is considerably heavy in content and taxing to students. A similar issue is also reported in the *National Education Assessment* conducted by BCSEA (2013) and *National Curriculum Conference Report 2016* carried out by REC (2016). In a similar light, Rinzin (2018) states that “our school curriculum is so voluminous … teachers leave no stone unturned to complete the vast syllabus on time” (para. 8-9). Participants also remarked that teachers forcefully adopt tactics, such as accelerating the pace of teaching, theory-driven lecture method; or conduct extra-classes and focus more on certain portions to merely complete the syllabus. These remarks by teacher participants mirror their claim that the fourth to 12th-grade mathematics curriculum is voluminous in content. More importantly, these remarks by teacher participants explicitly explain that the prescribed instructional hour allotted for teaching fourth to 12th-grade mathematics is considerably short or inadequate by a large margin. The dominant use of the lecture method in classroom instruction is widely reported by Sherab and Dorji (2013) in their study on Bhutanese teachers' pedagogical orientation.

Concurrently, participants felt the need to remove concepts, such as, trigonometry and calculus offered to arts and commerce students. This must be from the point that mathematical concepts, such as trigonometry and calculus are either not much relevant to arts and commerce students or these concepts make the mathematics curriculum overly taxing and heavy. In the recent few years, REC thinned all the school curricula, including the mathematics curriculum. According to REC (2018) and Wangchuk (2019), curriculum thinning was done to remove redundant, overlapping, or irrelevant topics, learning activities, and assessment items. However, going by the findings of this study, it seems that the curriculum thinning carried out by REC has a long way to achieve its intention for the mathematics curriculum offered to arts and commerce students.

In terms of Piecemeal or Fragmented theme, participants expressed that 11th and 12th-grade mathematical concepts have taken a big leap from the ninth and 10th-grade mathematics curriculum. They maintained that the standards and the multitudes of concepts offered in the ninth and 10th-grade mathematics curriculum do not prepare students matured enough to face 11th and 12th-grade mathematical concepts. These findings imply that ninth to 12th-grade mathematical concepts lack logical progression or coherency from one grade to another. As such, the lack of conceptual progression from the ninth to 12th-grade mathematics curriculum can be explained with two plausible reasons. One, most of ninth to 10th-grade mathematical concepts are either largely shallow, hierarchically low in standard, or lack the essence required by 11th and 12th-grade mathematics curriculum as pre-requite knowledge. Two, most parts of 11th and 12th-grade mathematical concepts are either intricate, hierarchically abstract or complex or overly loaded in content. A similar finding is also reported in the needs assessment study conducted by REC (2019b). The *National School Curriculum Conference Report 2016* by REC (2016) called for reorganising the logical sequence of mathematical concepts both within and across the classes in all the subjects, including mathematics.

Theoretically, the lack of conceptual progression from the ninth to 12th-grade mathematics curriculum may be resolved either by increasing the standards of ninth and 10th-grade mathematics or lowering the standards of 11th and 12th-grade mathematics. Overall, the findings refute the stand of *Mathematics Curriculum Framework: PP-XII* which stands on the principle to provide logically coherent, well-articulated, and focused mathematical

concepts from PP to 12th-grade (REC, 2019a). The findings also contradict the claim by Dolma's (2016) stand that the new mathematics curriculum addressed the conceptual gap through the gradual construction of concepts, allowing students time to assimilate ideas before moving on to more complex ideas.

With regard to the Developmentally Inappropriate theme, significantly, participants claimed that the fourth to 10th-grade mathematics curriculum is largely challenging. There was an acknowledgment amongst the participants that students often find difficult to deduce or generalise, reason out, and decipher the mathematical patterns presented in words or sentence case. Surprisingly, the teacher participants admitted that the majority of the Bhutanese students lack the proficiency in English to cope up with the standards of the language used in the mathematics curriculum. The study conducted by Tshewang (2015) on the new Bhutanese mathematics curriculum also reports similar findings. As per Dolma (2016) and MoE (2014), mathematics itself is a language of thought, and to communicate that in English has indeed been a very challenging task for Bhutanese students and teachers.

Virtually, students' difficulty in learning mathematics may not be necessarily due to their low proficiency in English. On this account, one may also suppose that the standards of the English used in the mathematics curriculum are rather beyond students' developmental appropriateness. The *National School Curriculum Conference 2016* (REC, 2016) and nationwide consultation study carried out by MoE (2014) report that the standard of language used in Bhutanese mathematics curriculum is high and students find it difficult to comprehend the language. A similar finding has also been reported by REC (2008) and more recently by BCSEA (2019) in the *Programme for International Student Assessment for Developing countries* (PISA-D). As per REC (2019a), to allow students to communicate mathematical ideas and patterns is one of the curriculum intentions of the Bhutanese mathematics curriculum framework. However, going by the findings, it seems that this curricular aspiration of the mathematics curriculum is far difficult to realise. Therefore, the mathematics curriculum framework's intention to allow the communication of mathematical patterns, either in oral or written forms looks more like a distant dream (REC, 2019a).

In terms of laborious nature theme, participants expressed that the fourth to 10th-grade mathematics curriculum is taxing in nature. They argued that the fourth to 10th-grade mathematics curriculum is largely laborious that entails both teachers and students to use a multitude of methods or solutions to a single mathematical problem. As per REC (2019a), the mathematics curriculum requires students to try and map underlying mathematical patterns from various points of view. Moreover, REC (2019a) further maintains that the liberty to use varieties of solutions is only encouraged to facilitate differentiated instruction; and to meet the needs of the different learners. Perhaps, there is no rule of thumb in the mathematics curriculum that mandates the use of multiple methods in ascertaining underlying mathematical patterns. Therefore, it seems that the participating teachers did not hold a clear understanding of why liberty to choose the range of methods to a particular mathematical problem is provided in the mathematics curriculum.

According to REC (2019a), one of the envisages of *Mathematics Curriculum Framework: Classes PP-XII* is to allow students and teachers to choose any suitable strategy that meets their needs (REC, 2019a). Recently, the PISA-D test conducted by BCSEA (2019) also recommends practicing mathematic teachers use a diverse range of methods to meet the needs of different learners. Overall, going by the curricular intention of the mathematics curriculum, it appears that the laborious nature of mathematics is not largely due to the curricular intention. The laborious nature of the fourth to 10th-grade mathematics curriculum, as perceived by the participating teachers, seems rather due to their lack of adequate understanding of why multiple methods or solutions are entertained to a particular mathematical problem.

Conversely, the laborious nature of the 11th and 12th-grade mathematics curriculum appeared different from fourth to 10th grade. As reported by the findings from BCSEA (2019) and REC (2019b), for these participants, the 11th to 12th-grade mathematics curriculum is taxing in that it entails students to employ long or exhaustive steps to derive a conclusion. Going by the curricular intention of the mathematics curriculum framework (REC, 2019a), one may employ any step or solution as long as one reaches the desired conclusion. Therefore, the taxing nature of the 11th to 12th-grade mathematics curriculum, as viewed by the participating teachers, appears not necessarily due to the nature of the curriculum but rather teachers' lack of awareness of curricular intentions. Moreover, going by the teacher participants' claim, it seems that there is a misalignment between curricular intentions and classroom practices. Dolma et al. (2018) also documented similar findings in their investigation on the alignment of Bhutanese mathematics teacher's practices and curricular intentions.

Finally, Rigid and Prescriptive theme results showed that the participants felt that mathematics from PP to 12th-grade is rigid and prescriptive as inferred by Schuelka (2012, 2013) and Dorji and Schuelka (2016). They stated that the fourth to 12th-grade mathematics curriculum neither encourage the learning to situate beyond the prescribed scopes nor based on one's choices and flexibility. From the curriculum intention point of view, this claim by teacher participants should not be a glaring issue. Bhutanese mathematics curriculum by its curricular intention demands teachers to situate teaching in mathematics using local or immediate contexts (REC, 2019a).

Thus, teachers' claim on the issue of Bhutanese being prescriptive, at least from, curricular intention point of view is certainly not plausible. Moreover, this only indicates that the teacher participants did not hold a clear view of mathematics curriculum intention.

However, as reported by BCSEA (2017, 2019) and REC (2019), participants also felt that the prescriptive nature of the mathematics curriculum is considerably influenced by the exam-driven assessment system. There was a consensus amongst the participants that classroom instructions are tailored merely to score marks in the exam to get admitted to higher grades or to get absorbed into the job market. Tshewang (2015) in his study on reformed mathematics curriculum also reported about the predominance of cookbook-style and exam-driven instruction adopted by Bhutanese mathematics teachers. According to Luyten and Dolkar 2010), it is mandatory for Bhutanese students all over the country to sit for both the home and national examination and successfully pass to be able to gain admission to the next level of education or to get absorbed into the job market. Hence, these findings imply that the prescriptive nature of the Bhutanese mathematics curriculum is largely driven by the exam-driven assessment mode.

5. Conclusions

This study revealed that the mathematics curriculum from fourth to 12th-grade is bulky and voluminous. Connected to this, it emerged that teachers forcefully adopt tactics, such as, accelerating the pace of teaching, lecture method, or conduct extra-classes. There were also indications that teachers commonly focus more on certain portions and leave off other concepts deliberately. Concurrently, the mathematics curriculum from ninth to 12th-grade appeared largely fragmented or disjointed. It came out explicitly that concepts offered in ninth and 10th-grade do not make students prepared to face the concepts offered in 11th and 12th grade.

On the other hand, the standard of language used in the fourth to 10th-grade mathematics curriculum is not age-appropriate. At the same time, the mathematics curriculum for these grades also appeared laborious and taxing in nature. There were claims that the mathematics curriculum for these grades entails teachers to use a multitude of methods to solve a particular mathematical problem. Surprisingly, it emerged that the mathematics curriculum from PP to 12th-grade is rigid and prescriptive. There was an assertion that the rigidity or prescriptive nature of the mathematics curriculum is largely driven by the exam-centered assessment style.

5.1. Limitations

This study selected teacher participants based on the inclusion criteria of purposive sampling design. As such, the teacher participants did not have the representativeness of the larger section of Bhutanese mathematics teachers. Thus, findings from this study cannot be generalised or account for a larger population of Bhutanese mathematics teachers. Moreover, the study collected data only from a few selected teacher participants. There, the study lacks the data from other relevant informants, such as school principals, students, and educators from different departments of MoE and REC. At the same time, the study also did not lend the views from documents and artifacts related to the mathematics curriculum. Overall, a future study may underpin to address the issues by focusing on representative samples; collecting data from different strata of education fraternity, documents, and artifacts.

5.2. Educational Implications and Recommendations

The present mathematics curriculum from PP to 12th-grade was revised and implemented in 2008 (Tshewang, 2015). It was implemented to rectify the conceptual gaps, re-distribution of concepts, or to make the mathematical concepts relevant or appropriate. On the contrary, it emerged that the Bhutanese mathematics curriculum is plagued by several issues and challenges. Therefore, it looks genuine that relevant agencies and stakeholders take stock of the issues and address them accordingly as:

1. Downsize the volume of fourth to the 12th-grade mathematics curriculum. This may be achieved by removing topics, learning activities, or assessment items that are redundant, overlapping, or inappropriate
2. Improve the flow of mathematical concepts from the ninth to 12th-grade mathematics curriculum. Ensure that there are no disjoint mathematical concepts across these grades. This may be addressed by enhancing the standards of concepts in the ninth 10th-grade mathematics curriculum or decreasing the standards of 11th to 12th-grade mathematical concepts.
3. Ensure that the standard of language used in the fourth to 10th-grade mathematics curriculum is developmentally appropriate or comparable to the students' language competency. This may be achieved by lowering the standards of the language used in the fourth to 10th-grade mathematics curriculum.
4. Ensure that the mathematics curriculum from PP to 12th-grade is neither rigid nor prescriptive. Ensure that mathematics instruction is allowed to happen base on the choices and flexibility of both students

and teachers. Moreover, ensure that assessment is focused more on performance tasks than term-end or year-end paper-pencil tests.

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