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Contextualizing and Infusing Gross National Happiness (GNH) Values Through Teaching Primary Schools Mathematics: Approaches and Relevancy

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Abstract
This paper presents approaches and relevancies of contextualizing and infusing GNH values through teaching primary school Mathematics at Samtse, Bhutan. Teachers and principals of four primary schools were interviewed, classroom teachings were observed, and the relevant documents were studied. Findings confirmed contextualizing and infusion of core GNH values and higher degree GNH values are practised depending on their suitability and feasibility; teachers` most persistent difficulties are how to contextualize GNH values in Mathematics lessons, and infuse the values through teachings; through teaching GNH values students` temptation towards unsocial activities and unreachable materials are reduced, on other hands their positive behaviours, openness, and being responsible are enhanced. This study is important for all because it provides significant insights: teaching GNH values promotes principles of GNH values and holistic education, inculcates primarily required moral values, and maintains peace and harmony in society. Although no demerits of teaching GNH values were reported, the resilience of the practice of contextualizing and infusing GNH values through teaching Mathematics has been found weak.

Keywords: GNH, Contextualization, Infusion, Identify, Approaches, Relevancy

1. Introduction

In today`s world if we can balance materialistic development and spiritual development then the coexistence of these developments in our life would provide us with more happiness. Education is one of the most powerful tools that help people understand this "balance". Spirituality has positive effects on health, attitudes and behaviours in adolescents (Rew L and Wong YJ, 2006; Kub J and Solari-Twadell PA, 2013). Drukpa (2016) highlighted the review of Kesebir & Diener (2008) on Aristotle's quotation on happiness: happiness is the meaning and purpose of life, the whole aim and end of human existence. In a nation, it is unachievable to maintain happiness for every citizen, but it may be possible to manage happiness for most of the population (GNH,2005).

The Gross National Product (GNP) is not for measuring people's actual well-being (GNH,2005). The term `GNH` was first coined by the fourth King of Bhutan Jigme Singye Wangchuk in 1972 (Ura et al., 2012) for the happiness and well-being of the Bhutanese people. Since then, in Bhutan, the concept of GNH has been followed as the main philosophy of socio-economic development. As this philosophy is flourishing in Bhutan, happiness is being realized and promoted amongst Bhutanese people. As Ura et al.(2012a) maintained, `pursuit of happiness is collective effort`, the happiness index of the **GNH** concept is used to measure the collective happiness and well-being of people in Bhutan. The good moral values of an individual who generates happiness for himself/herself or others are the happiness values. For example, being kind, compassionate, considerate, dependable, forgiving, fair, just, generous, helpful, and cooperative are some good moral values that generate happiness by virtue in the mind of people. Such moral values in the Bhutanese context are termed GNH values.

Various workshops and training were provided to the school teachers, business communities and entrepreneurs, and other civil servants to educate Bhutanese citizens on the incorporation of concept and GNH values in teachings, business, health and social well-being of people (Hayward & Colman, 2010; Bedford,2011). The government of Bhutan implemented teaching GNH values in schools and institutions in 2011 (Bedford, 2011). Zangmo (2014) opined those moral values such as being kind, compassionate and considerate to each other should be inculcated in students` behavioural changes. She also contends that students appreciate and practice the GNH values, which are the desired goals of the GNH-infused curriculum. Her review of GNH perspectives has left a big space for the approach of contextualizing and infusing GNH values in teaching Mathematics in schools of Bhutan. Contextualizing and infusing GNH values in teaching Mathematics takes place in a specific socially structured context: relevant Mathematics topics, and as and when feasible.

The process of incorporation of GNH values takes place through the process of contextualization and is followed by the infusion of morals in teaching various subjects of the school curriculum. Contextualizing GNH values in teaching means placing relevant GNH values in a lesson and embed to prepare a GNH values-laden lesson. Otherway around, the lesson topic is identified that is relevant and appropriate to embed the chosen GNH values within it, and a GNH values-laden lesson is prepared. Infusion of GNH values means inculcating the concept and principles of GNH values in students` minds and their behavioural changes. So that they understand, realize, internalize and value the values by applying them in their real life.

'Education' is one of the associated GNH domains of the GNH Pillar 1 (See Table 1). One of the indicators of this domain is 'value' which includes teaching GNH values in schools and institutes, but this indicator doesn`t give a clear picture of how to contextualize and infuse GNH values in teaching Mathematics. The teaching of the GNH concept and GNH values has been implemented in all four different levels of schools in Bhutan: Primary School (PS), Lower Secondary School (LSS), Middle Secondary School (MSS) and Higher Secondary School (HSS).

Usually, a GNH value-laden lesson takes the form of a short story in an explicit description. For example, let us choose `subtraction` as a lesson topic in which we can contextualize GNH values and infuse them through this lesson. The GNH value 'Removal of hunger` is equivalent to the addition of `happiness`. When one GNH value is taught other associated GNH values automatically get infused into students' understanding, realizing, internalizing and valuing the values: being compassionate and cooperative are some of the GNH associated GNH values.

To know the GNH values-laden Mathematics lesson on subtraction and addition, it is good to first know a non-example of the lesson and infuse the essence of Mathematics and Logic. For example, there are FIVE birds resting on a branch of a tree. A hunter shoots down one bird with a gunshot, how many birds are left on the branch? The *mathematical answer* is '5 – 1 = 4 birds; the *Logical answer is* 4-4 = 0,' because the remaining birds would fly away due to the sound of the gunshot. Through this lesson, the GNH values infused in children`s learnings are none, since the messages conveyed from the question, are negative like killing, reduction in family members, separation from family, chaos, fear, and anxiety. On another hand, if the same question is rephrased and made more descriptive, and self-explanatory in a story form, then contextualization of the identified GNH values and infusing in students` learning takes place successfully.

The same lesson in GNH perspectives could be designed as follows: There are two parent birds and three young baby birds dwelling on a green tree. Since the weather was pleasant and beautiful, the baby birds were singing and dancing around their parents. After some time, the baby birds started crying due to hunger. The parent birds knew this, and the father bird flew out of the tree in search of food for the kids. The mother bird started calming down the kids. The baby birds knew their father would bring food for them, and stopped crying. How many birds are left there on the tree? In this example, the GNH value placed in the lesson on subtraction is 'removal of hunger' which is relevant and contextualizable in the context of subtraction in the Mathematical operation lesson.

Ura (2012) clearly states that GNH values are infused into different subjects including Mathematics. Thus, this study was conducted to explore approaches and relevancies of the practice of contextualizing and infusing GNH values in teaching Mathematics at PSs of Bhutan. This study was conducted in four primary schools located in Samtse. Samtse is one of the twenty districts located in southern Bhutan. Section 1.1(below) presents a brief report on a preliminary study conducted to find out if the practice of contextualizing and infusing GNH values in teaching Mathematics was happening at PSs of Bhutan, prior to this study.

1.1. Preliminary Studies

Methods applied to the preliminary study were semi-structured interviews and studying the lesson plans. The study revealed the practice of incorporating GNH values in the four levels of schools happened in progression: common GNH values (core GNH values) to higher degree GNH values. Some examples of common GNH values are sharing, helping, taking care of, integrity, reasoning, cooperation, mindfulness, sincerity, empathy, effective communication, leadership, readiness to learn, fair share, and interdependence whereas higher degree GNH values are thinking critically, creatively, and reflectively, self-analyzing, problem-solving, and decision making. The selected sample school (for preliminary study) also taught life skills in shopping, estimating, mental calculations and comparison in which there are hidden GNH values that can be infused indirectly while teaching Mathematics. The study also revealed that identifying and infusing GNH values depends on the nature of the lessons, and the most common approach applied was by converting the negative sense into a positive sense in the lessons, which gives meaning to infusing happiness in students.

However, designing and modelling approaches as reported by the PS teachers did not provide any clear idea of how contextualization and infusion of GNH values in teaching Mathematics can be carried out. On the other hand, teachers also reported contextualizing GNH values in teaching Mathematics is difficult as they also have to incorporate various methods of solving the same problem.

The preliminary study concludes that although the infusion of GNH values was happening one or another way, the teachers lack in skills of contextualizing GNH values in order to design GNH values-laden Mathematics lessons and infuse the values through teachings. As reflected in their lesson plans, teachers were using the same GNH values repeatedly most of the time. Most of the GNH values incorporated in the lessons were irrelevant to the nature of the lessons. The most persistent difficulties as indicated in this study are teachers' lack of competency and skills to identify GNH values relevant to the chosen lesson topics, and then design a GNH values-laden Mathematics lesson.

1.2. Problem Statement, Objectives and Research Questions

The most persistent difficulties of PS teachers as indicated by the preliminary study are teachers' lack of competency to identify relevant GNH values, contextualize the chosen lesson topics, and design a GNH values-laden Mathematics lesson to infuse the values in students` learning through teaching Mathematics. Sherab (2013, p.16) maintains that " `Educating for GNH` values and principles describes both prescribed formal as well as an informal educational process that teaches, discusses, practices, inquires and model about infusing human values in students through both curricular and extra-curricular programmes." Ahonen, Thinley and Korkeamaki (2013) shared that teachers are trained to infuse the contents of the four GNH pillars and the nine domains into different subjects they teach in different classes.

These pieces of literature advocate the existence of GNH values and principles embedded within some Mathematics lessons. However, they give only some insights into infusing GNH values in teachings, but nowhere the idea of contextualizing GNH values has been discussed. This study was carried out with the objective to explore types of Mathematics topics and the GNH values relevant for contextualization and infusion of GNH values in teaching PS Mathematics, analysing how resilient the process was, and informing the school teachers about the process. Following research, questions guided the researchers to achieve these objectives. The central research question was "How are GNH values incorporated in teaching-learning Mathematics at PSs at Samtse? The following sub-questions were used to support this study:

- What are the perspectives of school principals and teachers on educating GNH at PSs?
- What Mathematics topics and GNH values are relevant for contextualizing and infusing in teaching PS Mathematics?
- What approaches are used? What difficulties are associated with this process?
- What are the impacts of teaching GNH values on the change of attitude, behaviour and academic performance of students?

2. Literature reviews

There are a few studies on the concept and implementations of GNH over the World and on Educating GNH in Bhutan. In an effort to understand the approaches and relevancy of contextualizing and infusing GNH values in teaching mathematics, we presented the following results of the studies.

2.1. Educating for GNH in Bhutan

`Education` is one of the nine associated domains and `value` is one of the 33 associated indicators of happiness and well-being of Bhutanese people (Ura,2012). This has opened a broad way for the researchers to think that in the Bhutanese education system, teaching mathematics in schools is one of the most important focused areas of socio-economic development, but it doesn`t give a clear picture of how to contextualize and infuse GNH values in mathematics lessons. Moral values such as being kind, compassionate and considerate to each other should be inculcated in students` behavioural changes (Zangmo,2014). Zangmo also contends that the students appreciate and practice the GNH values, which are the desired goals of the GNH-infused curriculum. Zangmo`s review of GNH perspectives has left a big room for contextualizing and infusing GNH values in teaching Mathematics in schools of Bhutan.

As educational choices take place in specific socially and economically structured contexts (Reay,1996), this study was based on one of the 4 pillars of GNH: Sustainable and equitable socio-economic development. Following table 1 illustrates the four pillars, nine domains and 33 indicators of the concept of GNH in Bhutan (CBS,2017).

Table 1: Four pillars, nine associated domains and 33 associated indicators of GNH in Bhutan

Sl#	Pillars	Associated domains	Associated indicators
1	Sustainable and equitable socio-economic development	Living Standards	Household per capita income, Assets, Housing
		Health	Self-reported health status, Number of healthy days, Disability, Mental Health
		Education	Literacy, Schooling, Knowledge, Value
2	Environmental conservation	Time Use	Work, Sleep
		Psychological Wellbeing	Life Satisfaction, Positive Emotion, Negative Emotion, Spirituality
		Community Vitality	Donation (time & money), Safety, Community relationship, Family

		Cultural Diversity and Resilience	Zorig chusum skills (Artisan skills), Cultural participation, Speaking the native language, Driglam Namzha (code of etiquette and conduct)
3	Conservation and promotion of culture	Ecological Diversity and Resilience	Wildlife damage, Urban issues, Responsibility towards the environment, Ecological issues**.**
4	Good Governance	Good Governance	Political participation, Services, Government performance, Fundamental rights

In another study, Riley (2011) reported, "Bhutan's education system will effectively cultivate GNH principles and values, including deep critical and creative thinking, ecological literacy, the practice of the country's profound, ancient wisdom and culture, contemplative learning, a holistic understanding of the world, genuine care for nature and for others, competency to deal effectively with the modern world, preparation for right livelihood, and informed civic engagement. To this end, the government is working to develop a country-wide rich and rigorous curriculum founded on GNH principles, making learning more relevant, thoughtful and aligned with sustainable practices'' (p.1).

2.2. Social Wellness

According to Jones (2018), Gross National Well-being/Wellness (GNW) same as Gross National Happiness (GNH) is **a socioeconomic development and measurement framework.** The GNW/GNH consists of seven measurement areas of the happiness index of wellness such as mental, physical, workplace, social, economic, environmental and political. The International Institute of Management (IIM) published the first GNH / GNW socioeconomic development and measurement model measurements in 2005, as a working paper and in 2006 as a policy white paper (p.8). One of the seven areas of this measurement index is the social wellness of people such as education quality and education levels per capita, discrimination, safety, divorce rates, complaints of domestic conflicts and family lawsuits, public lawsuits, and crime rates (p.5).

2.3. Approaches to Infusing GNH

The following excerpt has been taken from the GNH manual-Educating for GNH published by Education Monitoring and Support Division, 2013, p 38-39:

> ***Direct Integration/Bringing out inherent values*****:** *Identify values with each topic to integrate into teachings; Include value objective in the teaching of subject lessons; Plan teaching of values without diluting the main lesson objective; Include activities on values wherever relevant to academic goals".*

The researchers' point of argument in this literature is: that this approach is only one-directional. It identifies the GNH values embedded in the topic/subject and integrates them into the lesson but it does not capture the other way round: *identify the topic/subject relevant to the chosen GNH values and integrate them into the lesson*. It also doesn`t give clear information regarding how much time is required to deliver the GNH values-laden lesson without diluting the main lesson objective. For instance, if the time allotted for the main lesson objective is say 15 minutes, then we certainly need another 10-15 minutes to integrate the GNH values into this lesson. Also, this approach does not mention anything about assessing students in education for GNH.

> ***Interdisciplinary Integration: Mathematics:*** *Example: Aum Zam uses 90 units of electricity last month. To help improve the environment she decides to save electricity in her house. This month she uses 72 units. If the cost per unit is Nu.2, by how much is her electricity bill reduced?*

The GNH values embedded in this lesson are saving energy and resulting ecological value and are relevant to teaching mathematics at the PS level.

2.4. Contextualization, Mathematics and Happiness

Rathburn(2015), slightly touches on mathematics from a contextualization point of view and defines contextualization as a practice of connecting academic skills (usually reading, writing and mathematics) to specific content that is meaningful and useful to the students. Further, she claims that the theory of contextualization focuses on connections to personal and professional growth, not on assessment. She gives an example of contextualized teaching: teaching how nuclear power works by citing an example of the Fukushima nuclear disaster in Japan. Although this lesson`s pedagogical intervention is based on the theory of contextualization using real-world examples, there is a lack of justification in this statement that contextualization can be done on both types of educational assessment: formative as well as summative for any value(s) contextualized in teaching a subject. Generally, contextualization was found to be more effective. The more contextualization and assistance provided to students in contextualizing new information, the more motivated, dynamic, and connected students are to the material and the class (Ambrose,2013). Although Ambrose doesn`t specify(mathematics) contextualizing in any subject matter, his argument can be supported very well, because well-contextualized information/values will add more clarity to the understanding of the concept.

Smith (2008) reviewed that Mathematics work is a part of the project of the self which is expected to be ongoing, limitless and aimed at happiness. Students who made such claims were also understood to be good at mathematics. It means, that implementing contextual learning in the classroom requires new teaching techniques. For contextual learning to have its maximum effect on students, teachers must be acquainted with the knowledge of contextual learning and its translation into classroom-specific practices. However, substantial evidence is not available in Smith`s statement on how students good at mathematics become happy.

As per the insights got from the preliminary study the researchers felt that there was a big gap to be filled. Brulé and Veen hoven (2014) define happiness as “the degree to which someone evaluates the overall quality of his or her present life-as-a-whole positively. In other words, how much one likes the life one lives. (p.236), and happiness can be assessed using questioning” (p.237)

2.5. Qualities of a GNH Graduate

Riley (2011) remarked, “A GNH graduate will be conscious about our nature of interdependence and impermanence."(p.2). Of many other good qualities, GNH graduates from school will have qualities: of positive thinking, mindful, calm, has high self-esteem and civic sense, manage time efficiently (Education Monitoring and Support Division, 2013, p. 13).

The review of this literature provided insight to view the approaches and relevancy of contextualizing and infusing GNH values in teaching Mathematics in schools and institutes. These insights helped us to construct a conceptual framework (below) that guided us to carry out this study.

3. Conceptual Framework

Constructivism is basically a theory based on observation and scientific study about how people learn: people construct their own understanding and knowledge of the world, by experiencing things and reflecting on those experiences. According to Brooks (2011), in a constructivist classroom, the teacher searches for students` understandings of concepts and then structures opportunities for students to refine or revise these understandings by posing contradictions, presenting new information, asking questions, encouraging research, and /or engaging students in inquiries designed to challenge current concepts. It is believed that through teaching Mathematics in a constructivist classroom scenario we can nurture our students to become stronger in other subjects to understand, think, give a reason, create, design, retain and own the ownership of learning since Mathematics is related to the study of all other subjects.

The concepts and principles of GNH exist in different levels of understanding of people and the nature of the subject matter. In line with this we believe that by incorporating GNH values and principles in teaching-learning

Mathematics at schools, we can streamline the thoughts and behaviour of students towards the promotion of GNH in a progression: practice, implement and make it a way of life.

Since GNH is a happiness-driven philosophy, contextualization and infusion of GNH values in teaching may not happen in all lessons. They are applicable as and when it is possible and accessible depending upon the nature of the lesson, time constraint and level of the learners. However, it is not necessary to contextualize GNH values all the time. In many cases, GNH values would not be spelt out yet they have been already infused through the lesson if it was taught in a way of infusion of GNH values. Students achieve happiness by introspecting, internalizing and practising the values. An idea can be constructed on how to contextualize and infuse GNH values in teaching-learning Mathematics through a series of discussions using survey questionnaires, observing the classroom teachings, studying the relevant documents, and interviews with the principals, teachers and students of schools. The following figure depicts a conceptual framework on how the process of contextualization and infusion of GNH values may take place through teaching mathematics.

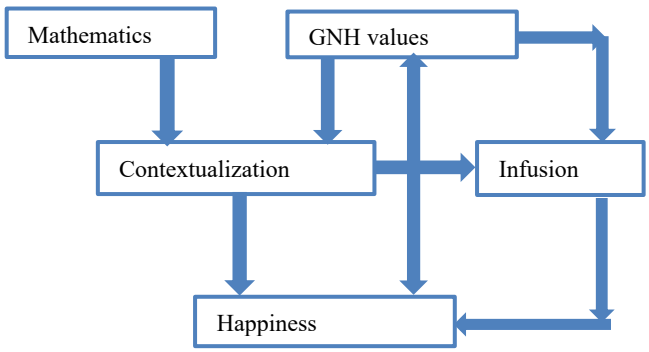

Figure 1: Conceptual framework of the study

4. Methodology

4.1. Sampling procedure, data collection and analysis procedure

The system and approaches of teaching, learning and assessment are practised uniformly in all primary schools across all 20 districts of Bhutan: the curriculum, pedagogy, time and policy are the same. However, it differs in levels of schools (PS, LSS, MSS and HSS). Also, irrespective of the levels of school, type of curriculum and pedagogies, time, system and approaches, the GNH values remain the same across the school education system in all districts of Bhutan. Due to this reason, the nature of this study remains the same throughout the process. It means any district could well represent all districts of Bhutan for this study. Therefore, for the convenience of the researcher Samtse district was selected that well represents all the districts of Bhutan. The inculcation of concepts and principles of GNH values in students is more important and effective at the grassroots level of school education. So right from the beginning of their schooling, Bhutanese children start learning concepts and principles of GNH values. Therefore, the following PSs of Samtse were selected for this study (see Table 2).

Table 2: Schools and Participants

School	No.of trs. interviewed	No.of school heads interviewed	No.of trs. observed	Total people involved
1. Primary School 1	4	1	2	7
2. Primary School 2	2	0	0	2
3. Primary School 3	2	1	2	5
4. Primary School 4	2	1	2	5
	10	3	6	19

We used interviews, lesson observations and relevant documents to collect data on Mathematics contents, relevant GNH values, and appropriate approaches to contextualize and infuse the values in teachings of Mathematics at the selected PSs. The randomly selected ten PS Mathematics teachers and three PS principals were interviewed, and eight PS Mathematics teachers teaching Mathematics lessons were observed. One principal was not available for interviews, and two teachers from UPS were not available for their lesson observations. Since the PS students were not competent enough to face an interview, they were not interviewed. Consistency in the methods of data collection and the gender equity of the participants were maintained well.

Data collected from interviews were analyzed using the process of emerging themes. Data collected from lesson observations and the documents: textbooks, lesson plans and the GNH manual were analyzed using the content analysis approach. Findings revealed from these sources were compared and merged in order to get the most authenticated result.

4.2. Data instrumentation

Formal interviews were conducted in person with the individual participant for 45 minutes each. Interviews were focused on content areas, approaches, relevancy, impact, effectiveness, and students` appreciation of contextualizing and infusing GNH values in teaching Mathematics, support and guidance from the government. Ten teachers and three principals were interviewed. All interviews were audiotaped with permission from the participants to transcribe the verbatim successfully and preserve the information. Classroom teaching of the randomly selected teachers was observed respectively during their allotted teaching periods. The observation was focused on the relevancy of contents, approaches, and effectiveness of contextualizing and infusing GNH values in teaching Mathematics. The three relevant documents collected for this study were the Grade IV-VI Primary School Mathematics textbooks, the GNH manual and the lesson plans of teachers. These textbooks were studied to see which mathematics topics were relevant for contextualizing and infusing GNH values. All the main concepts / sub-concepts of topics provided in these textbooks were recorded for document analysis. The GNH manual was studied thoroughly in order to find out the approaches to contextualizing and infusing GNH values in teaching mathematics at PSs of Bhutan. A few lesson plan books of PS Mathematics teachers also were studied to see how did they contextualize and infuse GNH values in the lessons.

5. Results

For easy reading and clear understanding to the reader, this section presents findings in three parts: Part I- Interviews; Part II- Lesson observations, and Part III- Document analysis. Findings from these three sources were compared and merged using Convergent Parallel Mixed Design (Creswell, 2014) and have been presented in the discussion section.

5.1. Part I: Findings from interviews

5.1.1. Perspectives and experiences

All participating teachers shared their perspectives: despite underlying difficulties, they feel happy to infuse GNH values through teaching Mathematics. Principle 3 shared his presence at the first GNH workshop in 2012 and learned that temptation makes us unhappy. He elaborated, that the infusion of GNH values in lesson plans gradually reduces the temptation of students towards unsocial activities or unreachable properties/materials. This reduction of temptation makes people happy. Principal 5 shared, that dealing with the implementation of GNH concepts has changed his behaviour.

The incorporation of GNH values makes lessons comfortable to handle and easy to teach (Teachers 14 and 40). Teachers 41 and 42 view, “it has a positive impact on both teaching and learning, and it also includes the 21st-century pedagogies which is working well in the classroom teachings”. Teacher 13 opined that it also helps students become good-hearted human beings. Teacher 7 added, “Due to the infusion of GNH values students` behaviour has been seen improved. It makes both teacher and student learn”. Teacher 8 reported it is due to the

incorporation of the GNH concept in the education system, present students are found to be quite different to the students of the past. He also shared his experiences:

> I have been teaching Mathematics for the last 10 years and attended many workshops on GNH. GNH has played an important role in the education system. I am teaching GNH values through teaching Mathematics. This has helped students impart their knowledge of GNH to their parents and the community as a whole.

5.1.2. Practice

The study has revealed the practice of contextualizing and infusing the GNH values in teaching PS Mathematics in terms of Mathematics topics, GNH values, approaches, and difficulties, presented below:

Mathematics Topics: The topics in PS Mathematics for contextualizing and infusing GNH values are estimation, place value, number and operations, measurement, data and Probability, 3D representation, elementary geometry, representing a number, fractions, and patterns and shapes. Most of the teachers reported, that they contextualize and infuse GNH values in these Mathematics topics as and when required.

GNH values: There are two types of GNH values incorporated in teachings at PSs of Bhutan: core GNH values and Higher degree GNH values. Core GNH values are also called morals. They are common, simple and easy to achieve. Since these values are primarily required morals to maintain peace and harmony in society, they are normally taught not only in schools but also at home and in public places. For example, sharing, helping, cooperative learning, unity, love, respect, and taking initiative are core GNH values taught to the lower primary students (Teacher 8). Higher degree GNH values critical thinking, analysis, evaluating and creating. This can happen in some higher levels of lessons. These GNH values are usually seen practised by senior students. Principals 1 and 4 reported that their teachers infused GNH values daily basis. Despite encouraging to infuse GNH values in daily lessons, some teachers did not do it on a daily basis (Principal 3).

Approaches: Teachers reported that the infusion of GNH values gives meaning to the lesson making it interesting for learners, and easy to understand. Through teaching PS Mathematics, GNH values can be infused by applying activity-based teachings. GNH values come automatically, as and when the situation arises. Usually, core GNH values are not spelt out but used in the lesson and infusion is done through rephrasing questions using positive words/phrases. For example,

Teacher 7 recalled:

> First, I frame objectives of educating GNH and developing activities using effective GNH values in the lessons. To teach "Mathematical operations", first I teach the concepts and conduct group activities. During the activities, we can see students cooperating with each other and learning a GNH value called "cooperating learning". They are seen as happy to be taught in this manner.

Similarly, Teacher 13 shared:

> Normally, I allocate less content to the subject matter but more GNH values. Firstly, I introduce the mathematics lesson, provide an overall concept of GNH values relevant to that particular lesson, and conduct activities.

Further, Teacher 14 viewed it as a daily-life experience that GNH values are used knowingly or unknowingly. Principal 1 suggested, that while infusing GNH values in the lesson, teachers should align the lesson to real-life experiences and be mindful of what they are teaching. On the other hand, some teachers do not infuse GNH values due to inadequate knowledge of GNH concepts, curriculum mismatch and some topics being irrelevant for infusion of GNH values (Principal 3).

The practice of activity-based teachings has been found to be an effective approach to contextualising and infusing GNH values in the lessons. This is practised even in homes and communities where relevant GNH values are contextualized in real-life situations and infusion takes place through understanding and realization of the moral values. According to Teacher 7, there are two stages in this practice in teaching Mathematics: contextualizing and

infusing GNH values: ***First stage (c****ontextualization)*-choosing the GNH values relevant to the lesson, forming groups of students, and narrating a relevant story with explanations. ***The second stage*** *(infusion)***-** using the relevant teaching aids matrix and conducting group activities. Explaining is needed to be done wherever required. For example, Teacher 14 recalled:

> In order to contextualize GNH value(s), first, choose a lesson topic, identify relevant GNH values to incorporate into the lesson, and then infuse the GNH values by relating them to real-life situation.

Teacher 41 added, "Through student's activities, identify the relevant GNH values and incorporate them in the activities". Teacher 42 said that in teaching division (Mathematics) GNH values can be contextualized, but he did not elaborate on how it is contextualized. Another teacher reported that contextualizing GNH values can be done easily by teaching the usage of roads, footpaths, temples and traditional structures.

Difficulties: The most persistent difficulties faced by teachers are identifying the relevant GNH values and contextualising them in the lesson. The majority of the teachers reported that it is easy to incorporate GNH values in teaching PS Mathematics. For example, Teacher 13 recalled, "It is easy to teach GNH values-laden Mathematics lessons but difficult in planning". Other associated difficulties in contextualizing and infusing GNH values are the incompetency of teachers, time consumption, and assessment.

Many teachers do not have adequate competency to contextualize and infuse GNH values in Mathematics lessons. Teachers 8 and 41 reported that inadequate competencies have hindered them to incorporate GNH values in the lessons. Inadequate training, time constraints and irrelevancy of some topics are barriers to contextualizing and infusing GNH values (Teachers 13, 14 and 40). Four teachers said it is time-consuming to teach GNH values-laden Mathematics lessons in PS. For example, Teachers 7 and 13 reported it is more time-consuming in order to give the right GNH values since it depends on how children understand it: some understand it quickly whereas some understand it slowly, but lesson planning takes more time than usual. Since PSs did not have standard tools to evaluate and monitor education for GNH, assessments were normally done through general observations and asking critical questions about students' holistic educational development (Principals 3 and 4). All the participating teachers reported that a child who is really good at GNH value is better than other children in terms of behaviour, attitude and academic performance. According to Teacher 5, the child who is good at GNH values is also good in academic performance.

5.1.3. Impact

Due to the implementation of GNH in schools, students have become more responsible, interactive, open, talk of good values, come forward to help others, attentive, calm, participating, less self-centred, interested in learning (Teachers 40,42 and 43), and students' willingness to cooperate in any sorts of group activities has been enhanced. For example, Teacher 8 reported that students who are good in GNH values are found to be sincere, honest and know all disciplines of games/sports and participate actively. However, the case was not the same in all schools. For instance, Principal 4 reported that they haven't seen an impact in their students except for the enhancement of their cooperation in group activities.

5.1.4. Students` appreciations and reactions

It is quite hard to understand the appreciation expressed by Bhutanese students because they do not spell out their appreciation openly in the form of words or actions, but actually, they are found appreciating one or another way. According to Principal 4, Bhutanese students are not open. Students taking an interest in learning feeling free to communicate, and becoming polite and respectful to teachers/others have been concluded by the teachers as an indirect way for the student to show their appreciation. Students were seen feeling happy, and proud, becoming more forward and open up to expression, presenting themselves positively, gesturing realization of values, and demonstrating likeness towards the subject. Principal1 expressed:

> So far, we have not yet looked at the infusion of GNH focusing subject-wise. We are doing it on an overall basis only or holistically. However, I feel that there is a shift from unknown to known due to the infusion of GNH values in the teaching-learning process. Students are found working together in a team.

5.1.5. Support from the Government

The only support provided by the government is GHN manual guidebooks, workshops and training for the principals and core teachers. The trained teachers facilitate other teachers in the school. For example, Teacher 7 reported, "I was facilitated by trained teachers to infuse GNH values in a lesson, but I am not clear about the approaches and relevancy of infusion and contextualizing GNH values in teaching Mathematics." The study also revealed that some principals are not aware of whether support from the government has been provided for contextualizing and infusion of GNH values in teaching subject matter. For example, Principal 3 said, "I do not remember any support from the government". Principal 1 expressed, "The present research on contextualizing and infusing GNH values in teaching Mathematics curriculum is doing a great job. Teachers need more training on GNH values and its infusion in teaching."

5.1.6. Recommendations of the participants

The following recommendations were provided by the participants:

- Teachers should be provided adequate training on GNH concepts, and approaches to contextualize and infuse GNH values, through teachings in Mathematics.
- More examples of GNH values should be provided in textbooks.
- Curriculum needs to be slightly reframed incorporating GNH values.
- GNH values should be incorporated into all the subjects.

5.2. Part II: Findings from Lesson Observations

5.2.1. Lessons topics

Mathematics lessons during the classroom teaching scenarios of 8 PS Mathematics teachers were observed from grades 3 to 6 with 35 to 40 students in each class. Each Mathematics period was of 50 minutes and the lessons were purely based on Mathematics content prescribed in the syllabus. The lessons were measuring the perimeter of a given shape, estimation and measurement of an area, understanding the concepts of construction and bisecting, skill to construct, uses of orthographic drawing in day-to-day lives, creating/measuring turns and angles, and calculating areas of rectangles.

5.2.2. GNH values

It has been recorded that core GNH values and higher degree GNH values were embedded in the lessons as and when they were applicable. The core GNH values practised by both the teachers and students in Mathematics class are sharing ideas/materials and respecting each other`s views/opinions. Maintaining these core GNH values as a basis, the mathematics lessons were carried out at a higher cognitive level. This was observed to be an achievement of happiness through their analytical, critical and creative thinking. Also, the ability to analyze, compare, differentiate and reflect was observed to be an important factor in students` achievement of happiness. Following higher degrees GNH values were observed to be infused and practised in Mathematics lessons (*See table 3*).

Table 3: Examples of higher degree GNH values

Higher degree GNH values	Example
Analytical thinking	Why do we need to construct?
Problem-solving	How do you know it is a rectangle? Why not a square?
Compare and differentiate	Using a diagram for full, half and quarter-turn; compare rectangles on the grid and plain paper.
Self-reliance	Learning by doing.
Reflective thinking	Review of the previous lesson.

Creative thinking	Create rectangles on grids
Critical thinking	Apply formula to calculate the area of rectangles

These observations of Mathematics lessons provided the following insights.

5.2.3. Approaches

Teachers introduced the concept of estimation and finding areas by estimating and then slightly relating to real-life situations. Students were informed that engineers use this idea in their daily lives. Similar exercises were given where students were supposed to relate to their day-to-day life. Fast learners were asked to help the slow learners. Teachers were observed being kind, soft and supportive, sharing their personal experiences of success stories, monitoring, probing and providing positive reinforcements while students were trying to solve the exercises.

5.2.4. Students` reactions

Students were seen cooperating with teachers and friends in the group. For example, when the teacher gave an exercise to measure the dimensions of a geometric figure using a ruler and labelling each side of the figure, the following reactions of the students were observed:

> They were seen as active, alert, observant, happy, eager to perform activities, interested and wanted to do all questions. They tried to recollect, discuss, and respond to the teacher and helped each other. With much enthusiasm and interest, they were found very engaged in drawing the shape, measuring its dimensions and also labelling each side. Towards the end of the activity, everyone was rushing to show their work to the teacher.

5.3. Part III- Findings from document analysis

5.3.1. Relevant Mathematics topics

The Mathematics topics relevant for contextualizing and infusion GNH values reflected in the textbooks are *Data and Probability* (Collecting, interpreting and representing data, describing and predicting likelihood hood, describing probability, choosing a sample, mean, median, mode, theoretical probability, Estimation; *Geometry* (2D and 3D shapes, transformations, classifying/combining triangles, properties of rectangles, transformations, orthogonal drawings, measuring angles); *Measurement* (Length, area, perimeter, volume, capacity, Mass, angles); *Number* (Number, Fractions, Number patterns, Number relationship, Operations with numbers; Number place value, Number sentence, Large whole number, Decimal and Integer, Number Theory); *3D Shapes Metric Unit* (Metric Units, volume, Capacity); and *3D-Representations* (Representing a number, patterns and shapes)

Similarly, the relevant topics revealed from lesson plans are numbers, representing a number, representing 100 as a combination of 10s, representing 2-digit numbers, operations, fractions, place value, estimating products, data and probability, creating a pattern, length measurement, measuring volumes using cubes, shapes (2D,3D), prism and pyramid, dividing shape to create new shapes. No specific mathematics topics are mentioned in the GNH manual since it has been designed applicable to the general curriculum of all four levels of schools (PS, LSS, MSS and HSS) of Bhutan for educating GNH.

5.3.2. Relevant GNH values

The PS Mathematics textbooks do not reflect any GNH values. The GNH values reflected in lesson plans are being positive and constructive, team spirit, helping others, fair share, equal share, loving, equality, estimating, economizing, critical thinking, creative thinking, effective communications, good decision making, interdependence, problem-solving, balancing, self-awareness, respecting other`s views, inter-personal relationship, time use, and wellbeing, all related to the GNH concept and principles. GNH Manual reflects domain 1 (Sustainable and equitable Socio-economic development) of the GNH Principle, and the pillars (Standard of

Living; Health; and Education), of which this study`s concern is the implementation of GNH Principles in "Education".

5.3.3. Relevant approaches

The PS Mathematics textbooks and lesson plans do not reflect any approach to contextualizing and infusing GNH values. They neither provide any information regarding the infusion of GNH values in teaching Mathematics at PSs of Bhutan. The lesson plans simply reflect the same traditional methods of teaching mathematics. The GNH manual reflected the following broad approaches to contextualize GNH values in the teaching curriculum (including Mathematics):

- conducting quiz on the concept and principles of GNH,
- educating students on GNH and its domain,
- mapping the GNH activities,
- portrait of a child as a GNH graduate,
- presenting the GNH Graduate,
- quality of a GNH graduate,
- teacher as a role model, and nurturing a Green School.

The approach applied to *infuse* GNH values through teaching school curriculum as mentioned in this manual is termed as *Graffiti Wall of approach*. It has the following steps:

Step 1 (Activity): Pair Activities with different approaches to infusing GNH values and principles into the curriculum.
Step 2 (Presentation): Presentations and discussions to get the right approaches to infuse GNH values and principles
Step 3 (Generalizing): Acknowledgement for the contributions made, finding many ways to infuse GNH values and principles into the curriculum.

Specific approaches embedded within the Graffiti wall of approach to infusing GNH values into the school curriculum are Direct Integration/ Bringing out inherent values; Inter-Disciplinary integration; Songs; Stories; Changing negativity into a positive lesson; Fun and Games; Smiles/Metaphor.

6. Discussions

Based on the theory of constructivism, this study was carried out successfully with the objective to explore approaches and relevancy in the practice of contextualizing and infusing GNH values through teaching Mathematics in the four selected PSs and also to see how resilient this practice was. Methods used were semi-structured interviews, lesson observations and document analysis. Some distinguished findings as indicated from this study are:70% that PS Mathematics curricula are relevant for this practice; the types of GNH values reflected in the documents are 90% the same as that revealed from interviews; PSs practice two categories of GNH values: Core GNH values and Higher degree GNH values; and there is a huge impact of infusion of GNH values in teaching at PSs if the practice is carried out properly. The impacts revealed are students` enhanced positive behaviours and openness, students being responsible and more interactive.

In classroom teachings, we would not always see the process of contextualizing GNH values explicitly spelt out to make them visible in the lessons. Of the three documents, it is only the GNH manual designed for the general curriculum of all four levels of schools in Bhutan that provides approaches applicable to contextualize and infuse GNH values in teaching Mathematics. Although it does not mention the approaches specifically for the subject wise, they can be applied in teaching Mathematics at PSs as and where possible, but not in all Mathematics topics. The reason why school textbooks do not reflect GNH values could be that these textbooks were first published and printed in 2008 when there was no plan of the Royal Government of Bhutan to implement concepts of GNH values in the school curriculum. The lesson plans were written in the standard format, but nowhere approaches for

contextualizing and infusing GNH values in teaching primary Mathematics were reflected. The flow of lessons looks the same as that happens during the normal way of teaching. There exist some common approaches to infusing GNH values across all three sources of data, but approaches to contextualising lack.

As revealed from the findings, the significant persistent difficulties faced by the teachers are identifying GNH values relevant to the current Mathematics lesson or vice-versa: how to design a GNH values-laden Mathematics lesson, so that it would not affect the coverage of the syllabus and also it would not cause dilution of concepts of the main Mathematics lesson? and how to assess students in aspects of GNH values-laden lessons taught? Although Ahonen et al. and Sherab advocate the existence of GNH values and principles embedded at least within some Mathematics lessons such as algebra, probability, commercial Mathematics and analytic geometry, they give only some insights into infusing GNH values in teaching in schools, but nowhere the idea of contextualizing GNH values is discussed. Few Mathematics teachers knew the two stages of the process of contextualizing and infusing GNH values but were not observed practising them making it explicitly visible in the classroom teachings.

Teachers` perspectives are important factors to understand in educating GNH. Although GNH education reduces students` temptation toward unsocial activities or unreachable materials (Principal 3) and educating for GNH is enhancing students` morale (Teachers 40,41 and 42), the study has revealed it is quite difficult to teach GNH values through teaching Mathematics. Reay`s finding (educational choices take place in specific socially and economically structured contexts) has been well confirmed by this study that the practice of contextualizing and infusing GNH values in teaching Mathematics takes place in a specific context, meaning not all GNH values are relevant for all the mathematics topics for contextualization. Rathbun`s claim on "contextualization cannot be done on assessment of the student's learning outcomes", has been disconfirmed by this study that contextualizing GNH values in Mathematics topics and infusing them in teaching can be assessed by asking critical questions to the students and observing the change in their behaviour and personality (Principals and Teachers).

Researchers have concluded that the attempt to generate and promote happiness through teaching Mathematics at PSs was quite well-focused, but the difficulties and hindrances faced by the teachers in contextualizing and infusing GNH values stood as the main cause of the weak resilience of this practice.

However, the findings are significant as they emerged from a real field study since researchers involved themselves in person in collecting data and interacting with the concerned teachers. Thus, this study is important for all because it provides the following significant insights:

- Educating for GNH provides primarily required morals and values to maintain peace and harmony in the society by producing good-hearted and humble citizens. It promotes the concept of GNH and its principles in the country in a specific social context (Reay,1996).
- Practicing GNH values inculcate students` behavioural changes (Zangmo,2014), and promotes the importance of a holistic educational approach that ensures learners gain a deep foundation in traditional knowledge, common values and happiness.
- Since contextualization is a more effective (Ambrose, 2013) approach in teaching, the contextualized information/values will add more clarity to the understanding of the concept.
- The impacts of the infusion of GNH values can also be seen through other disciplines of the school curriculum.

This study was confined to only 4 PSs. The interviews were limited to the principals (3) and teachers (10), and 6 teachers` lessons observation since PS students were not competent enough to attend the interviews to perform the cross-sectional study. Since schools do not have standard tools to measure and assess the GNH values-laden lessons, assessing students on teachings of GNH values is limited to observing and interviewing. Teachers need to be cautious that normally GNH values-laden lessons take more time to complete, and also there is a danger of getting the lesson diluted and losing its original concept if more time is spent on GNH values. However, no demerits of infusion of GNH values in Mathematics lessons were reported.

The researchers recommend that teachers test this approach of contextualizing and infusing GNH values before they formally implement it in teachings. Future researchers can replicate this research, use mixed methods, and do an in-depth study involving a larger number of schools and come up with more concrete findings for its implementations.

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