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Impact of mother's education on the academic achievement of their children in Three Lower and Secondary Schools of Samtse Dzongkhag: An Enquiry

Kinley Seden, Soren Willert, Dorji S and Kinzang Dorji

Abstract

The study on “impact of mother's education on the academic achievement of their children in school” was conducted using a mixed methods design. The aim was to understand children's academic performance partly as a function of their mothers' level of education. The study was implemented in two stages, beginning in school academic year, July 2014. In both stages, focus group interviews were conducted with mothers, students and teachers. Progress reports and semi-open questionnaires were other data sources. Participants included 48 children, 48 mothers and 15 teachers, the two first-mentioned groups being our primary, teachers being our secondary target population. Past studies claim level of parental education to be an important indicator of children's academic achievement. This study also indicated that mother's education contributes to enhancing children's academic achievement. On the one hand, mothers may, irrespective of their educational level, provide 'content-free' support to their children: showing interest, motivating them, etc. On top of that, educated mothers have the capacity to render help with homework and explain scholastic stuff that is unclear to child.

Keywords: *Socialization, Social stratification, Mother-child Interaction, Social identity, Scholastic achievement*

Introduction

Parental involvement in children's education is important because children learn both at home and in school settings. Previous studies have shown that level of parents' education is an important predictor of children's academic achievement (Lee & Croninger, 1994; Haveman & Wolfe, 1995). Thus, involving parents in children's academic work seems important. One way to ensure that all children succeed and graduate from high schools is to ensure that they get good guidance and support from home. Studies assert that variables like parents' occupation, parents' education, family income, race, family structure, and parents' work patterns are all related to children's achievement (Coleman et al. 1966).

In addition, parental behaviours and attitudes including reading exercises, library trips, providing academically oriented activities, and supervising homework affect children's academic

ability (Griffin & Morrison, 1997; Gorges & Elliot, 1995). Furthermore, studies have confirmed that parents and family members are powerful influences on student achievement across grades (Epstein & Sheldon, 2006; Henderson & Mapp, 2002; Jeynes, 2005; Snow, Burns, & Griffin, 1998; Wang, Haertel, & Walberg, 1993) and have consistently linked maternal educational attainment to children's academic achievement.

Despite the importance of parental education on children's academic learning, no study in this field has so far been done in a Bhutanese context. Our study aims to address this gap.

Literature Review

Research literature gives abundant evidence that parental support influences students' academic achievement positively. Of special relevance for our study, a distinction can be made between two generically different sets of parental support: 1) general, or, as we call it, content-free parental support, such as showing interest, motivating, reminding child to do her homework, etc.; 2) support of an academically related nature, i.e. explaining stuff that is unclear to child, helping with homework, commenting on school matters from an insider's perspective, etc. The former type of support can be rendered irrespective of parent's educational background. The latter is the privilege of parents with an educational background.

A number of studies claim that content-free, emotionally related parental support is actually the most important of the two support types. Thus, Flouri and Buchanan (2004) argue that parental involvement is a more powerful influence on child's academic success than any other family background variable such as social class, family size and level of parental education. Flouri (2006) likewise points at parental interest in child's education, through motivation, interest and support, as the major influence on children's educational attainment. Supporting Flouri (2006), Hill and Taylor (2004) assert that parental involvement and parents' interest in children's education is an important influence on children's educational outcome. Tizard, Blatchford, Burke, Farquhar and Plewis (1988) also stressed that parent's attitude and support for their children's learning influence performance on literacy tests irrespective of socio-economic status. Yet, Hackman et al. (2014) found that parental education has a bearing on children's academic success. His study shows that children with better educated parents are more likely to excel at schools.

The majority of studies in the field tend to agree with this last-mentioned conclusion. According to Sabates, Duckworth, & Feinstein (2011) parental education is one of the key factors in promoting children's academic development and educational success. In their study, children of parents with high levels of educational qualification or whose parents spent longer in education,

achieved higher school grades than children whose parents have lower levels of education. In many studies, research focus is more narrowly aimed at locating a possible co-relation between mothers' educational level and children's academic achievement. One such study is by Fan and Chen (2001), showing that parental involvement in their child's literacy practices positively affects children's academic performance. Carneiro, Meghir & Parey (2013) found maternal education to have positive influence both on children's cognitive and behavioral skills. Maternal education has been connected to children's performance on cognitive tasks as early as three months (Davs-Kean & Schnabel, 2001; Ensminger & Slusarick, 1992; Rumberger, 1983).

Hence, research seems to validate mother's educational level as having significant impact on her children's learning process. This notion is further elaborated in a recent study by Carneiro, Meghir, and Parey (2013). They found strong evidence that maternal education affects home environment and child's educational proficiency. Educated mothers provide better surroundings for their children by postponing and decreasing child bearing, by increasing family resources, and by assortative mating. They also invest more in their children through books, providing musical instruments, special lessons, or buying computer although they spend longer periods outside the home working and earning. Maternal education also seemed to reduce the incidence of behavioural problems and grade repetition. Even if educated mothers work more, they do not spend less time breastfeeding, reading to their children, or taking them on outings. In the same vein, Gratz and Kurth-Schai (2006) claimed that educated mothers are more involved in their children's learning and often interact with school while uneducated mothers had more unmanaged stress in their lives and hardly interact with their children and school.

Research Questions

Based on the knowledge gap identified in the research problem, one major question supplemented by three sub questions were formulated:

1. Does a significant quantitative correlation exist between mother's levels of education and; child's academic achievements in school as formally registered?

Sub-questions

2. Do mothers' school-related support activities vis-à-vis their children differ as a function of their level of education? – and if yes, how may such differences be described?
3. Do 'interesting differences' exist between the way in which research theme-related issues are perceived by members of the study's three different sub-target groups, mothers, students and teachers.

4. Are research findings from the study consistent with findings published internationally, or does the Bhutan context add a 'special flavor' to the research theme as lived reality?

Methodology, Data Collection and Analysis

Study approach was mixed method using both qualitative and quantitative techniques. Study also carried out relevant document analysis, interviews, focus group discussion with informants from four different schools under Samtse District. Participants were chosen by respective school's heads and selection of schools was based on school type, and proximity. Quantitative data consisted in progress reports of two consecutive years (Class I and II) of the same school beginner students. End year examination scores were analysed during two consecutive years. In addition, all participants filled in structured questionnaires where Likert scale ratings were supplemented by both closed and open-ended questions, so as to record feelings not covered in the Likert's scale and also to understand informants' backgrounds and experiences. Same questionnaire was used for all student informants. Questionnaires for mothers covered similar themes, but in a suitably re-worded version. Researchers communicated well in local dialects which was useful in helping non-educated mothers in translation and writing of responses.

Qualitative data was derived from the following sources: (1) Focus group interviews with secondary school students (based on group members' quantitative self-ratings); (2) focus group interviews with mothers of secondary school students and school beginners (based on group members' quantitative self-ratings); (3) focus group interviews with teachers. Teachers were a valuable source of information in giving experience-based reflections on their observations of students coming from homes with educated and non-educated mothers respectively.

Samples

The research involved two Higher Secondary Schools, one Middle Secondary School and one Lower Secondary School of Samtse District.

Table 1. School and No. of participants

Participants							
Schools	Mothers	Secondary Students		School Beginners		Teachers	
	Edu	Non-Edu	Edu.	Non-Edu	Edu	Non-Edu	
Tendu Higher SS	4	4	4	4	4	4	5
Ugyentse Middle SS	4	4	4	4	4	4	4
Samtse Higher SS	4	4	4	4	4	4	
Samtse Lower SS	4	4	4	4	4	4	3
Total	16	16	16	16	16	16	15

Data were collected in two stages. The first stage (of six months' duration) was targeted at secondary school students and their mothers, and explored the research theme in a retrospective manner. The second stage which lasted for two years as from project start allowed for the construction and enrichment of meaning components and targeted the school beginners. During the second stage the research theme was explored in real time.

Stage 1 and stage 2 involved two Higher Secondary schools and one Lower Secondary School. In each of the stages, student respondents consisted of 16 students, 16 mothers (8 illiterate and 8 literate mothers) and 8 teachers. Schools were asked to assist (1) in selecting mothers for polarized focus group interviews (literate/illiterate); (2) in providing progress reports for target group students; (3) in identifying students whose mothers differed with regard to educational level. This is explained in the table 1 below:

Data Analyses

A tentative answer to the main research question was provided by examining the degree of quantitative correlation between mothers' level of education/students' academic achievements.

Answers to sub-questions were searched for through analyses of multiple responses collected from different target informants in questionnaires as well as focus group discussion, whereby closed and open-ended questions supplemented each other.

The complete data pool comprised of facts, opinions, observations, case stories, etc. The materials were classified into sub-categories. Through content analysis, thematic clusters were established. Triangulation of data sub-categories led to thematic integration and/or differentiation.

Findings

Our results were analysed and will be presented considering each of the four research questions shown above. Analysis of quantitative data comes first, followed by qualitative data analysis.

Significant quantitative correlation between mother's levels of education and child's academic achievements in school as formally registered in pre-schooling

School achievements (Comparisons of Progress Report of children of grades 1 and 2 of 24 students at three schools)

The quantitative data indicated (table 2) a significant difference ($p=0.047$; $F=4.403$) between the mean scores of children's academic performance, indicating that children of educated mothers perform better than un-educated mothers' children. This finding may be associated with the conducive learning environment provided by the educated mothers in terms of resources, guidance and support related to school tasks, affordability of the parents and so on. This finding is consistent with the finding of study undertaken by Fan & Chen (2001) that states children perform better in an intellectually stimulating environment. In addition, the 2-tailed Pearson correlation tests also supported the above test performed with the significant value of 0.047 (Table 3). These findings mean that research question one can be answered positively.

Table 4 deals with research questions 2 and 3. The Y- and X-axes show different sub-categories of maternal support that were included in the questionnaires given to children and mothers respectively. In later sections, we shall add qualitative comments on these sub-categories (cf. research question 2). Further than that, table statistics show the degrees of quantitative mother-child agreement as regards the actual prevalence of individual sub-categories in their relationship (cf research question 3). As appears, for many sub-categories no significant degree of agreement was found. Correlations were found for sub-categories Framing work Schedule, helping with homework, and Explaining stuff that is unclear to child. At this point, we will not go into further analysis of other information that may be drawn from table 4.

Table 2. Results of the Independent Paired Sample T-Test

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Mean Avg. scores	Equal variances assumed	4.403	0.041	2.045	46	0.047	3.79167	1.85377
	Equal variances not assumed			2.045	40.949	0.047	3.79167	1.85377

Table 3: 2-tailed Pearson Correlation Test

Correlations		Mean marks	Parents Qualification
	Pearson Correlation	1	-0.289*
Mean	Sig. (2-tailed)		0.047
	N	48	48
Parents Qualification	Pearson Correlation	-0.289*	1
	Sig. (2-tailed)	0.047	
	N	48	192

*. Correlation is significant at the 0.05 level (2-tailed).

Table 4: 2-tailed Pearson Correlations between mother and child's opinion

	Encouraging me to study (Child)	Actively reminding me to study (Child)	Framing work schedule for me (Child)	Helping me in my homework (Child)	Explain s stuff that is unclear to me (Child)	Guiding and supporting me in my future in school and after (Child)
Encouraging child to study (Mother)	-.021	-.021	.055	.159	.152	-.080
	.886	.886	.710	.282	.302	.591
	-.021	-.021	.125	.542	.521	-.229
	.000	.000	.003	.012	.011	-.005
	48	48	48	48	48	48
Actively reminding child to study (Mother)	-.021	-.021	.055	.159	.152	-.080
	.886	.886	.710	.282	.302	.591
	-.021	-.021	.125	.542	.521	-.229
	.000	.000	.003	.012	.011	-.005
	48	48	48	48	48	48
Framing work schedule (Mother)	.055	.055	.429**	.348*	.363*	.056
	.710	.710	.002	.015	.011	.704
	.125	.125	2.250	2.750	2.875	.375
	.003	.003	.048	.059	.061	.008
	48	48	48	48	48	48
Helping with homework (Mother)	.134	.134	.158	.846**	.882**	.203
	.363	.363	.283	.000	.000	.166
	.458	.458	1.250	10.083	10.542	2.042
	.010	.010	.027	.215	.224	.043
	48	48	48	48	48	48
Explain stuff that is unclear to me (Mother)	.140	.140	.142	.882**	.920**	.225
	.343	.343	.336	.000	.000	.124
	.479	.479	1.125	10.542	11.021	2.271
	.010	.010	.024	.224	.234	.048
	48	48	48	48	48	48
Guiding and supporting child about future career issues (Mother)	-.065	-.065	.000	.486**	.466**	.155
	.660	.660	1.000	.000	.001	.292
	-.167	-.167	.000	4.333	4.167	1.167
	-.004	-.004	.000	.092	.089	.025
	48	48	48	48	48	48

Correlation is significant at the 0.01 level (2-tailed). **

Correlation is significant at the 0.05 level (2-tailed). *

Mother's School- related Support Activities for Children and Mother's, Student's and Teacher's perspectives on mother's school related support

The general trend in our study revealed that both educated and non-educated mothers encouraged, reminded and motivated their children to study. Yet, their style of support varied, and partly as an effect of mother's level of education. Both groups of mothers provided general support, i.e. content-free support, such as asking their child not to skip classes, not to indulge in bad behaviors, turn in homework, study for exam, do homework etc.

Although all 48 mothers encouraged, reminded and motivated their children to study, some differences can also be seen in the way they rendered their support. Most importantly, due to their educational status educated mothers were able to provide academically related support such as reading for the child, supervising and assisting them in their homework. In our data material, a sub-sample of 17 educated mothers provided academically related support, while 7 left it for their children to explore learning on their own initiatives. This latter position is exemplified in the following statement from an educated mother where she explains how she, even if she, so to speak, is capable of making herself her child's assistant teacher, has decided to do less than that:

I have withdrawn some of the support literally sitting beside him and guiding him through his home tasks. (Yangsa)

While the non-educated mothers made it clear that they were unable to, fully, assist their children in school-related activities, they did, however, emphasize that they could contribute in general ways such as instilling motivation and encouragement:

I encourage my children to study. However, being uneducated, I cannot assist them with their school work. So, I ask them to seek help from friends. (Dechen)

The findings from the mothers were further supported by data collected from the students' focus group interview. Among our full sample (48 students), we found three sub-samples who, with variations, all talked about their mothers giving them 'content-free', i. e. non-academic, motivational support and reminders.

- a) Mother actively reminds me to study;
- b) Mother encourages me to study;
- c) Through general support mother motivates me.

When it came to areas related to school content, however, only educated mothers supported their children, and the reasons attributed were that uneducated mothers, even though they had the time to stay up late, providing emotional support, making tea for their children etc., were unable to extend their help in content related support areas since they lacked the required knowledge.

All our 48 student respondents asserted that motivation from their mothers is definitely an important key to scholastic success. Some respondents, however, added that students whose mothers were also capable of rendering academically related support, had an extra advantage:

In my opinion, children of educated mothers perform better as they get guidance from their mothers. (Sonam)

Clearly, the general tenor among our student participants was that educated mothers, as compared to uneducated mothers, end up rendering stronger support to their children, thereby boosting their children's academic performance. This opinion was voiced by a majority of the grade II student and a few grade X respondents, most of whom had non-educated mothers. Teacher respondents were of the same mind. Reasons given were that educated mothers' children are groomed from small and that, in addition to their mothers' education-based resources, they have access to all sorts of additional learning facilities like computers and internet. Thus, student participants generally agreed that educated mothers had the needed skill to render help and support in relation to homework, reading, writing etc. By clarifying doubts as needed, providing ideas and giving feedback they helped improve their children's academic performance.

Furthermore, the findings from the mothers also indicated that as compared to non-educated mothers, educated mothers are more actively concerned with child's post-school career. According to some respondents, the educated mothers are more informed about the situation of the country like the issue of rising youth unemployment. With stiff competition existing among the school leavers and fewer employment opportunities, excelling in academic performance is pivotal to getting a good job in the future. With such awareness, the educated mothers are in a better position to render useful advice concerning their children's future.

One questionnaire item: 'Framing work schedule' for the child, indicates a very strong, possibly over-protective kind of support from mother to child. In our sample no mother, nor any student indicated that such support was given from mother to child.

Dissenting student voices

As apparent in the earlier section the majority of student respondents attached great importance to mother's educational level as differentially affecting child's school performance. Yet a not insignificant number of students from grade X (n=10; children of educated as well as non-educated mothers) strongly favoured the student's own inner drive as the main predictor of their academic success. These older students clearly indicated that, by the end of the day, the drive to perform well has to come from their own initiative no matter the kind of support received from the mothers. Cf. student statements like the following:

"You may have access to all kinds of study resources and an educated mother who is there to guide and scaffold your learning. Yet, if you lack the inner drive to study, these external factors really did not matter." (Karma)

In this way, these participants unanimously believed that educated and non-educated students performed equally well scholastically in so far as they were prepared to take personal initiatives for their own learning. Incidentally, such a stance may draw support from Teachman (1987) who concludes that children's educational achievement may not all together be explained as a function of such external variables as father's education, mother's education, parental income and number of siblings. The student's own perseverance, motivation, and enthusiasm for learning has an overriding significance.

Teachers' voices

The data from focus group interview with teachers indicated that the fifteen teachers were indeed mindful of school children's family background as a conditioning factor for them in dealing with students. On this background, they shared their views on issues related to relationships between school / parents / children.

One notable teacher statement ran as follows:

The kids are the losers. Educated parents have the capacity to help their children but don't have time. Uneducated parents would so much like to help their children, but they don't have the capacity, so, they're helpless. (Teacher 1)

Teachers also relay that the educated mother's children perform better as they receive support and help related to school work from their mothers, while uneducated children are left on their own to find solutions for their study problems. In this regard, peer tutoring comes in handy.

Children can, and do assist each other in their learning by teaching each other. Higher performing students can help lower performing students.

Some teachers made it a strong point, based on professional values, that *when in the classroom* they deliberately paid no attention to students' family background. In the normal classroom context, they are primarily interested in the students' scholastic performance and shouldn't be overly occupied with the fact that each and every student brings along a particular family history, including parental support patterns, which would in part shape the student's learning potential. This value-based stance is something interesting that came out from this study which can be an area for further exploration.

Yet, teachers also pointed out that they were indeed very attentive to parents' educational level (literate/illiterate) when they, e.g., met them at professional meetings related to their children's performance or behavior in school. They further aired the view that since educated mother's children are guided in a home atmosphere reigned by academic values, their school behaviour seems better than that of non-educated mothers' children. Hence, comparatively speaking, the latter, as students, show more bad behaviour and indulge in undesirable activities. This is apt to affect their academic performance negatively.

Additionally, teachers claimed that mothers, as compared to fathers, have a stronger role in gearing up their children's academic achievement. Their soft nature (it was said) attracts them to render care and support while the father does not have time unless he specifically intends to take on the role of caring, supporting father. Yet, it was also mentioned that gender roles are, today, changing rapidly in Bhutan.

One teacher used his own life-course as illustration of the "strains and stresses belonging to a Bhutan-in-extremely-rapid-development":

My parents (illiterate farmers) scolded me when I used school homework as an excuse for not helping with farm affairs (and [said with a smile] of course it did happen that 'the excuse' was not altogether justified). To them education was 'something foreign'. They could ignore it. Today (illiterate) parents don't dare to ignore school – yet they can't do anything constructive to 'tame' school. So, they feel trapped. (Teacher 3)

Same teacher also stated that uneducated mother's children perform well only if they are gifted by birth and educated mother's children perform well if they are guided. Otherwise, it remains the same for both, unless the child takes initiative for his or her own learning.

Comparison of our research findings with international findings; cf. research question 4

Most findings from this study align well with international study findings. However, one interesting theme was voiced in our study, namely that inner motivation good will should not be over-emphasized as predictor of the child's academic success. Besides parent-induced motivation, the child's personal initiative and drive can be important in gearing up his or her performance. Incidentally, this stance goes against findings by Stright and Yeo (2014) who posit mother's warmth as the main predictor in lower grade children's academic success. In our study, a significant number of – mostly older respondents – argued that inner drive, will power and determination help determine the course of their academic performance irrespective of their mother's education level. In this way, grit and initiative are found to be the most effective tool for them to excel academically.

Discussion

Previous studies have associated parental monitoring positively with a variety of desirable school-related outcomes such as children's grades, their interest in school and their self-initiation of school related work (Spera, 2006). Parents also matter for student behavior in the classroom. For example, Masten et al. (2009) found students' compliance in the classroom (e.g. following rules) to be related to students' perceptions of how important it is for their parents that they display or do not display certain behaviors. Because parents frequently remind their children to go to class, turn in homework etc., adolescents perceive their academic behavior to be particularly important to their parents. Especially, adolescents who receive high parental monitoring perceive their parents as holding strong educational goals and values, wanting their children to work hard and succeed in school (Spera, 2006). Generally speaking, these findings by Magnuson et al. (2009) and Spera (2006) resonated with our study finding. Yet, in our study we also registered instances – of relevance for our third research question – where parental support activities apparently went un-noticed by their children. A small sub-sample of students did in fact not perceive their academic behaviour to be important to their parents nor did they believe parental education automatically led to more qualified support. Yet, even in the case of these students, it appeared that the mothers provided timely general support which included advising children to behave well and avoid skipping classes, doing school related tasks on time including homework, and comply with school's norms and rules.

As a comment to studies reporting positive links between parental involvement in their children's education and these children's academic performance (Hara & Burke, 1998; Hill & Craft, 2003; Marcon, 1999; Stevenson & Baker, 1987), two thirds of our student sample (n=30) stated that educated mothers' children have added benefits in the form of a mother capable of providing qualified academically related support and help. Students from this sub-sample who had educated mothers definitely believed that these factors had enhanced their own academic

performance. They, thus, echo Ara (2012) who claims that “mother’s education is the means of support to polish her children deeds, activities, behaviour, academics and performance in education”. Similar ideas can be found in Fraja, Oliveira and Zanchi, (2010) for whom parental effort is more important than the school’s. Summing up, motivational support from the mother may be described as a separate support system for children’s learning.

Conclusion

Research shows mother’s education to be one key factor in promoting children’s academic development and educational success. Evidence shows that children of parents with high levels of educational qualifications, or whose parents spent longer in education, achieve higher school grades than children whose parents have lower levels of education. The results of this study generally provide positive support for the view that mother’s education is associated with increased academic achievement of her children. Thus, our major research question receives a positive answer. Based on our second research question, we found that the specific support and guidance ingredients provided by educated mothers were based on their academically relevant, experiential knowledge. Yet, apart from the *relative* support advantages enjoyed by children of educated mothers, our study did not point at any negative impact stemming from a child’s having an uneducated mother. Even if uneducated mothers might be relatively more burdened in terms of social and economic issues, they were still portrayed, and portrayed themselves as delivering emotional and motivation, so-called content-free support to their school children.

Apart from registering apparent positive correlation between mother’s level of education and children’s academic performance, our study also gave voice to student participants for whom inner drive and personal initiative were the all-important factors behind their academic performance. This interesting disparity, and the fact that our study has its limitations in terms of study participants, makes us conclude that more in-depth studies involving a bigger student sample from both urban and rural areas should be carried out in order to obtain more nuances to our study hypothesis. We further suggest that financial status of the child’s family might be included as one more potentially interrelated variable influencing children’s educational achievement.

Recommendations

Our study’s affirmation of a significant co-relation between mother’s education and children’s academic performance leads us to make the following recommendations.

As part of their community-directed policies, schools should to call for more participation from mother in school activities as well as to embark on accelerating their children’s academic

performance through active participation and support and also by maintaining balance between childcare, domestic work and job performance. Through such efforts, the quality differences between educated and uneducated mothers might to some degree be lessened.

In line with research reporting that parent-child interactions, specifically stimulating and responsive parenting practices, are important influences on a child's academic development (Christian, Morrison, & Bryant, 1998), the Ministry of Education should include in their policies to promote female education at the grass root level, not just for the sake of building a productive work force, but also for better parenting. Girl students are the mothers of future and if they are educated our future generations would progress academically, socially and economically.

References

- Ara, N. (2012). Educated working mothers to hoist children academic performance. *International Journal of Technology and Inclusive Education*. 1(2), pp. 79-88.
- Carneiro, P., Meghir, C., & Parey, M. (2013). Maternal education, home environments, and the development of children and adolescents. *Journal of the European Economic Association*, 11(s1), 123-160.
- Christian, K., Morrison, F.J. & Bryant, F.B. (1998). Predicting kindergarten academic skills: Interactions among child care, maternal education, and family literacy environments. *Early Childhood Research Quarterly*.1998;13:501–521.
- Coleman, J. S. et al. *Equality of educational opportunity survey*. Washington, D.C.: National Center for Educational Statistics, 1966.
- Davis-Kean, P. E., & Schnabel, K. (2001). The Impact of Socio-Economic Characteristic on Child Outcomes: The Mediating Role of Parents Beliefs and Behaviors. *International Society for the Study of Behavioral Development*, Ottawa, Canada.
- Epstein, J. L., & Sheldon, S. B. (2006). Moving forward: Ideas for research on school, family, and community partnerships. *SAGE handbook for research in education: Engaging ideas and enriching inquiry*, 117-138.
- Ensminger, M. E., & Slusarcick, A. L. (1992). Paths to high school graduation or dropout: A longitudinal study of a first-grade cohort. *Sociology of education*, 95-113.

- Fraja, D. G., Oliveira, T. & Zanchi, L. (2010). Supportive Parents Improve Children's School Results. *Education Journal, Issue 126*. Education Publishing Worldwide Ltd: United Kingdom.
- Flouri, E. (2006). Parental interest in children's education, children's self-esteem and locus of control and later educational attainment: Twenty-Six-year follow-up of the 1070 British Birth Cohort. *British Journal of Education, 76*, 41-55.
- Flouri, E. & Buchanan, A. (2004). Early father's and mother's involvement and child's later educational outcomes. *British Journal of Education Psychology, 74*, 141-153.
- Fan, X. & Chen, M. (2001). Parental Involvement and students' academic achievement: A meta-analysis. *Educational Psychology Review, 13*, 1-22.
- Griffin, E. A., & Morrison*, F. J. (1997). The unique contribution of home literacy environment to differences in early literacy skills 1. *Early Child Development and Care, 127*(1), 233-243.
- Gorges, T. C., & Elliott, S. N. (1995). Homework: Parent and student involvement and their effects on academic performance. *Canadian Journal of School Psychology, 11*(1), 18-31.
- Gratz, J. & Kurth-Schai, R. (2006). The impact of parents' background on their children's education. *Educational Studies, Vol, 268*, pp.1-12.
- Hackman, D. A., Betancourt, L. M., Gallop, R., Romer, D., Brodsky, N. L., Hurt, H., & Farah, M. J. (2014). Mapping the trajectory of socioeconomic disparity in working memory: Parental and neighbourhood factors. *Child development, 85*(4), 1433-1445.
- Hara, S. R. and Burke, D. J. (1998). Parent involvement: The key to improved student achievement. *The School Community Journal. 8*, 9–19.
- Haveman, R., & Wolfe, B. (1995). The determinants of children's attainments: A review of methods and findings. *Journal of economic literature, 33*(4), 1829-1878.
- Henderson, A. T., & Mapp, K. L. (2002). A New Wave of Evidence: The Impact of School, Family, and Community Connections on Student Achievement. Annual Synthesis 2002. *National Centre for Family and Community Connections with Schools*.

- Hill, N.E. & Craft, S. A. (2003). Parent-school involvement and school performance: Mediated pathways among socioeconomically comparable African American and Euro-American families. *Journal of Educational Psychology*, 96, 74–83.
- Jeynes, W. H. (2005). A meta-analysis of the relation of parental involvement to urban elementary school student academic achievement. *Urban education*, 40(3), 237-269.
- Lee, V. E., Croninger, R. G., & Smith, J. B. (1994). Parental choice of schools and social stratification in education: *The paradox of Detroit*. *Educational Evaluation and Policy Analysis*, 16(4), 434-457.
- Magnuson, K. A., Sexton, H. R., Davis-Kean, P. E., & Huston, A. C. (2009). Increases in maternal education and young children's language skills. *Merrill-Palmer Quarterly*, 55(3), 319-350.
- Marcon, R. A. (1999). Positive relationships between parent school involvement and public school inner-city pre-schoolers' development and academic performance. *School Psychology Review*, 28, 395–412.
- Rumberger, R. W. (1983). Dropping out of high school: The influence of race, sex, and family background. *American Educational Research Journal*, 20(2), pp. 199-220.
- Sabates, R. Duckworth, K. & Feinstein, L. (2011). The Impact of mother's adult learning on their children's academic performance at key stage 3: evidence from ALSPAC, *Oxford Review of Education*, Vol.37, No.4, pp.485-504.
- Snow, C. E., Burns, M. S., & Griffin, P. (1998). Preventing reading difficulties in young children. Washington, DC: National Academy Press.
- Spera, C. (2006). Adolescents' perceptions of parental goals, practices, and styles in relation to their motivation and achievement. *The Journal of Early Adolescence*, 26(4), pp. 456-490.
- Stevenson, D. L. & Baker, D. P. (1987). The family-school relation and the child's school performance. *Child Development*. 58, 1348–1357.
- Stright, A. D., & Yeo, K. L. (2014). Maternal parenting styles, school involvement, and children's school achievement and conduct in Singapore. *Journal of Educational Psychology*, 106(1), 301.

- Teachman, D. J. (1987). Family Background, Educational Resources, and Educational Attainment. *American Sociological Review* .52, (4), pp. 548-557.
- Tizard, B., Blatchford, P., Burke, J., Farquhar, C., & Plewis, I. (1988). *Young children at school in the inner city*. London: Lawrence Erlbaum Associates.
- Wang, M. C., Haertel, G. D., & Walberg, H. J. (1993). Toward a knowledge base for school learning. *Review of educational research*, 63(3), 249-294.

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Self-efficacy Belief and Perception Among Pre-service Bachelor of Education (B.Ed.) Primary Final Year Students in Teaching Primary Science After Graduating From Paro College of Education

Hari Maya Gurung and Jas Raj Subba

Abstract

Study was carried out, to find out the competency of the Pre-service B.Ed. primary final year students to teach primary science curriculum in school after graduation. For this study the sample size considered was about 110 final year students. Data was collected through interview and questionnaire. The data collected were analysed using a statistical package for the social sciences. The result showed that, students who have taken science in higher secondary schools are more prepared and competent to teach primary science in schools when compared to students studying arts and commerce. The result also indicated that, more time be given for this particular module while teaching in college, so that students get enough of first-hand experience to do all the prescribed activities. The finding also shows that different branch of science was given different weightage by the module tutors when they delivered the module.

Keyword: *Self-efficacy, Pre-service; competency; Primary Science; curriculum; first-hand experience; prescribed activities.*

Introduction

SCI201 (Primary Science) is one of the compulsory modules in B.Ed. primary program at Paro College of Education. It is offered to B.Ed. primary students during year II, semester II. The module carries 12 credit taught for 4 hours per week for 15 weeks. The teaching strategies includes lectures, field work, discussion and laboratory experiences. This module includes basic scientific principles which are applicable in day-to-day life and different forms of laboratory experiences and is contextualized and aligned to the primary school science curriculum that is taught in the schools across Bhutan. This module covers diverse topics from three branches of science viz. life science, material science and physical science. Many activities are integrated to make the teaching learner centered, interactive, fun and meaningful. The module also gears towards encouraging creativity and building up talent to create conducive learning environment for science.

This module is instituted as one of the important modules for the B.Ed. primary students. The main aim in offering this module is to equip student teachers with scientific concepts and skills to develop scientific attitudes. The module is delivered in a way that basic application of various teaching and learning principles are met, and proper assessment and its role in teaching and learning and teaching methods are well taught.

Though primary science module was taught for decade in college, the primary science curriculum in school was reviewed recently. Therefore, it was necessary to carry out this study to find out how well the B.Ed. primary students are prepared to teach the primary science curriculum in primary schools once they graduate from the college. So, the main idea behind carrying out this study was to find better insight into the preparation of B.Ed. primary student teachers with regard to handling primary science in school. The study also aims at evaluating the effectiveness of SCI201 module to prepare our student teachers in teaching primary science in school.

The result of the study will help identify the effective and ineffective components in primary science module content and teaching strategies and recognize the opportunities and threats to the implementation of this module. The results of the study will be used for reviewing of the module and to improve the teaching for better learning of the future learners.

Literature Review

Teachers' confidence in their own teaching abilities is known as self-efficacy. Teachers with high self-efficacy beliefs possess more beneficial characteristics than those with lower self-efficacy beliefs, making high self-efficacy a desirable trait for teachers (Allinder, 1994; Bandura, 1977). Efficacy beliefs determine individuals' initiation of behaviors, effort level and time spent in the face of obstacles, recovery from failures, and persistence in overcoming difficult situations. Bandura (2006) further states that, "perceived self-efficacy is a judgment of capability to execute a given type of performances; outcome expectations are judgment about the outcomes that are likely to flow from such performances" (p. 309). Further Tschannen-Moran and Hoy (2001) defined teacher efficacy as a teacher's "judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated" (p.783). Thus, information affecting teaching efficacy is valuable knowledge for instructional design decisions in pre-service teacher education program. Individuals' self-efficacy beliefs are constructed from four sources of information: enactive mastery experience, vicarious experience, verbal persuasion, and physiological and affective state (Bandura, 1997). In teacher education,

actual teaching experiences are the most powerful mastery experiences that convince teachers about their teaching ability (Tschannen-Moran, Hoy, & Hoy, 1998).

Allinder (1994), states that teachers with high teaching efficacy beliefs had a tendency to implement diverse methods in their instruction. Furthermore, the higher the teachers' teaching self-efficacy is, the more confidence they have in their instruction. These successful and direct teaching experiences also influence pre-service teachers and novice teachers in their efficacy development (Housego, 1992; Woolfolk & Hoy, 1990; Lee, 2002). It can be described as "a belief about one's own capability to organize and complete a course of action required to accomplish a specific task" (Eggen & Kauchak, 2007). As can be understood from the definition, self-efficacy "is concerned with judgments of what one can do with whatever skills they possess" (Bandura, 1986). It consists of two components, efficacy expectations, which are related to belief in personal capacity to affect behavior, and outcome expectations, which is a belief that the behavior will result in a particular outcome (Albion, 1999). Several research studies indicate that depending on these sources of judgments, individuals have negative or positive ideas about a behavior before they undertake it and these ideas affect their course of action (Bandura, 1986; Albion, 2001).

Recent studies on self-beliefs and perceived values has indicated that these parameters play an important role in affecting individual's behaviour and performance. For teachers, their self-beliefs about teaching and their valuing of learning are likely to influence the way they teach and the way they perceive their students' learning abilities (Wang, 2000; Yeung et al., 2012)

Teachers' efficacy is very important as programs for teacher preparation around the world attempt to address shortages of qualified, competent teachers. It is further stated that in the field of science education, monitoring and reacting to the issue of efficacy seems to be one way in which programs for teacher preparation are evaluating the structure of the programs. Study also suggest that two types of beliefs seemed relevant, belief that student learning can be influenced by effective teaching (outcome expectancy beliefs) and confidence or belief in one's own teaching ability (Çakiroglu & Boone, 2005).

Study shows in recent years there has been concern expressed about the state of science teaching in many primary and preschool (elementary and kindergarten) classrooms, and the poor science background knowledge of many teachers (Appleton, 2007). Many pre-service primary teachers have low self-efficacy for science teaching (Palmer, Dixon, & Archer, 2015). The teachers' lack of confidence to teach science has been largely attributed to their

poor background knowledge on content and scientific practical skills. When asked science teachers, “What kind of activities do you perform in science laboratories?” to which they received answers such as demonstration experiments, group work, and rotational experiments (Gott & Duggan, 1995; Pekmez, 2000). Many studies have shown that science teachers are not aware of the fact that various experiments they perform should have different objectives. Laboratories should not only aim to reinforce theoretical knowledge, but also allow students to discover knowledge on their own (Nott & Hodson, 1992; Wilkinson & Ward, 1997; Wellington, 1997).

Besides offering scientific knowledge, laboratory classes also contribute to improving student skills including, scientific thinking, observation, creative thinking, interpretation of events, data collection and analysis, and problem solving (Ausubel, 1968).

Methodology

Sample size

For this study the sample comprised of pre-service primary teachers enrolled in a four year B.Ed. primary program. All participants were final year students. Out of 130 final year students enrolled in the course, only 110 volunteered to participate in this study. So, the sample size was 110. All of the participants have taken SCI201 as one of the compulsory modules in their second year.

Survey Tool Design

The researchers developed a questionnaire targeted at answering the research questions. The questionnaires mainly composed of Likert scales, 1 (strongly disagree) being the lowest and 4-strongly agree and 5 not applicable. *Likert scale* is the most widely used approach to scaling responses in survey research to measure attitude, opinions and perceptions. The questionnaire also had a provision of space for extra information. A pre-test was done to evaluate the effectiveness of the questionnaire with regard to language and measure.

Survey Administration

The study was conducted in two phases. During the first phase, the questionnaires were distributed among the B.Ed. primary final year students. Each respondent's survey response was allocated a code to maintain the confidentiality. The questions were mainly focused on the student teacher's professional disposition on content & pedagogy and practical/laboratory skills. The questionnaire also comprised of some items on the primary science contents and lecturer's professional disposition on the delivery of the contents.

During the second phase, focus group interview and an individual interview were conducted to triangulate the data, fine tune and to get an in-depth information. Two representatives from the four sections were asked to volunteer, although there were not two representatives but there were at least one from each section. The focus group discussion was conducted for an hour or so using the semi structured question which focused on the student teacher's professional disposition on content & pedagogy and laboratory skills. One to one interview was also conducted with few student teachers.

Result Analysis

The study made use of statistical package for the social sciences (SPSS) to compute the results and generate analysis. To analyse the data, at first the factor analysis was done for all the items belonging to the Part C and Part D of questionnaire as these items directly pertains to the participants' self - efficacy belief and their preparedness to handle and teach primary science. Before analyzing any data, factor analysis was carried out. Factor analysis is widely used statistical technique in the social sciences. It attempts to identify underlying factors that explain the pattern of correlations within a set of observed variables and reduce the complexity in a set of data. The items which were loaded under different factor were put together and theme was generated based on the commonalities of the items. From the two broad sections of questions, several themes were generated based on item-wise factor loadings. Items which have factor loadings of < 0.40 or items which loaded on two or more factors were omitted. The themes that emerged after the factor analysis on Self-Efficacy Belief and Perception Among Pre-service B. Ed Primary (Pry) Final Year Students were on the students' competency in teaching the contents and use of teaching methods. The other themes that emerged were on their practical skills, laboratory safety, preparation of reagents, preservation techniques, improvisation, use of equipment and providing first aids during emergencies.

Result and discussions

The result and discussion are presented theme wise as follows;

Teaching of primary science contents

One of the themes considered after factor analysis was teaching of primary science contents in schools by the graduates of B.Ed. primary from PCE. The result shows that students with science background are more confident and well prepared to teach primary science curriculum in primary school when compared to commerce and arts background students (Fig.1.1). This clearly shows the self-efficacy beliefs in terms of enactive mastery experience and vicarious experience, since graduates with science background have more experience in learning science contents than the other graduates without science background.

PCE offers B.Ed. primary course to all the graduates of class 12 with pass certificates. Therefore, students joining the said course come with diverse background like arts, commerce and science background.

Use of different teaching methods (Pedagogy)

Question were asked to the students, on how well they are prepared to teach primary science using different teaching skills and strategies. How prepared are they in handling scientific apparatus and conducting fair testing experiment?

The result shows more than 65 percent of the B.Ed. primary students are confident in handling the primary science classes on their own in terms of handling and conducting fair testing experiment, using various kinds of skills and strategies (Fig.2.1). This shows that the module tutors are able to impart right kind of skills and strategies to the students in terms of teaching primary science in schools by the B.Ed. primary graduates. This result also shows the self-efficacy of lectures with regard to verbal persuasion one of the important sources to achieve self-efficacy. Result also shows that, number of fair testing experiment was conducted, and students were confident in conducting scientific fair testing experiment on their own. Moreover, students were given ample of firsthand experience in handling and caring of the scientific apparatus, result shows that students are confident and well aware on handling of the apparatus.

Professional disposition on practical skills

In terms of conducting primary science practical, the result clearly shows that B.Ed. primary students are well equipped with basic skills in designing and setting up an experiment (Fig.3.1). The result also shows that they are pretty good in handling the equipment and to write the problem statement correctly. When it comes to preserving the biological dead specimen in the laboratory students are not that confident. This might be because the students are not given the practical skills of preserving the specimen on their own, though they are briefed theoretically how to preserve the dead plant and animal specimens. So, it indicates that tutor need to focus more on giving student firsthand experience in handling and preserving the dead biological specimens. This result proves that lecturer lacks the self-efficacy of enactive mastery experience in-terms of teaching the students with regard to preserving the dead biological specimens to students.

Laboratory safety & first aids

When it comes to basic safety issues and providing simple first aid in emergency, in the laboratory maximum of the students are confident and competent in providing simple first aid in need. Students are also well aware about the safety issue in the laboratory (Fig. 4.2). This shows that students are well taught in terms of laboratory safety issues. They know that laboratory safety is of top priority when comes to conducting practical in laboratory. As per the result analysis, the tutors also taught the students about importance of laboratory safety and to provide simple first aid in emergency. Self-efficacy of lecturers in terms of preparing students about laboratory safety and first aids is clearly very high, having lots of mastery experience, vicarious experience and even good at verbal persuasion.

Preparation of reagents & mounting slides, preservation techniques

More than 60% of the students were of the opinion that they can easily prepare common laboratory reagents like dilute acids, some bases, can identify chemicals correctly and can mount specimen on slides comfortably (Fig.5.1). Students are very well aware of taking correct precautions during the mounting of slides and preparing any reagents. The result clearly shows that students were given enough of practice in terms of simple specimen mounting on slide, common reagent preparation with all the necessary precautions. This shows that the lecturers are lacking mastery experience and vicarious experience in terms of slide preparation and preservation techniques.

Operation and use of equipment

Questions were asked on whether students are confident in using and operating simple scientific equipment like compound microscope, screw gauze, Vernier calipers, etc. As per the result it shows that more than 70% of the students are confident in operating and using the simple scientific equipment (Fig.6.1). This shows that students were given ample of hands on experience in handling and operating the simple scientific equipment. It also shows that giving students to explore on their own plays an important part in learning and teaching science. Self-efficacy of lecturers are clearly reflected in this result. It shows that lecturers are having some mastery experience and vicarious experience in using and handling some simple scientific equipment.

Improvisation of apparatus and laboratory design

The result clearly shows that students are confident to improvise some simple laboratory equipment in need (Fig.7.1). It might be because students were asked to improvise simple

equipment like beakers, funnel, test tube holder, etc. Result also shows that students were given enough of practice in designing model chemistry laboratory for schools and colleges with all the safety facilities like fume hood, exhaust and enough ventilation. This result shows that lecturers have good experience in improvising some simple laboratory apparatus and have good experience of model laboratory designs having all the modern ambient in it.

Discussion on focus group (FG) interview

Few students volunteered for focus group interview, and they were asked varieties of questions based on content, style of delivery, lecturer competencies, student's preparedness and some general questions.

With regard to content, they felt that, some aspects of science were covered more and some aspect of science was taught less depending on the competencies and preparedness of the lecturers. This clearly shows some physiological and affective state of the lecturers, which has huge impact on overall delivery of the module. Students felt that some content of science was taught more, as most of respondent remembered the life science contents more than physical processes or materials and their properties and some content were never taught or overlooked. Students felt that all the three branches of science must be given equal importance and uniform coverage by the lecturers.

In terms of delivery of lesson, students felt that it depends on the lecturer how prepared are they for that particular class. Some lecturer taught the concept based on first-hand experience and some just give lecture with no demonstration, which had indirect impact on students learning. Students felt that three tutors coming and teaching three aspect of science was not good for the students since, different tutors focused on teaching differently.

When students were asked about how prepared are they to teach primary science in the school, some expressed that they were prepared enough since they got opportunity to teach primary science during their teaching practice. But many expressed that they are not prepared enough with regard to carrying out the activities and handling some of the practical classes.

In general, students felt that the timing allotted for the SCI201 (Primary Science) module was not enough, few of them suggested to make two primary science modules or to stretch the module for two semesters teaching. They would like to see that whole module is taught by single lecturer rather than shared by different lecturers. Beside this, students also aspect that lecturers to be well prepared and use some humour in class to make class lively and interesting. Students

also shared during the FG discussion that they need more hands on practices beside theory classes.

Conclusion

The general finding of this research shows that, students who have studied science during class twelve are more prepared and confident to teach primary science in schools after their graduation compared to students who have studied commerce and arts in class twelve. The findings also show that, students are well prepared to teach primary science in primary school after graduation by the respective module tutors. But when group of students were interviewed, they expressed that, the number of hours allocated for teaching of primary science module in the college was less and felt that they could be given more number of hours so that they get to learn more in-depth about three branches of science along with more hands on experience. The study also shows that students are given less practice on how to preserve the biological specimens, so there is need to give the students more of first-hand experience in biological specimens. Students expressed that there was some problem in delivering the module when taught by different module tutors for instance some tutor focuses more on theory part and some more on practicum.

Therefore, it is recommended to have a uniform understanding among different module tutors before teaching primary science module so that such problems can be addressed. It was also found that some tutor focus more on material science when compared to physical and life science. Therefore, it was found preparedness of students to teach primary science in school is dependent on module tutors assigned to teach the module in the college. It is therefore recommended that, module tutor with sound knowledge in all three sciences be assigned to teach this module. Moreover, it would be good that all the primary science module tutors sit and discuss the way forward to teach the module for different sections of students. It is further recommended that students with science background be identified and informed to ministry of education and be given to teach primary science in the school as far as possible so that primary students will enjoy learning science.

Figures

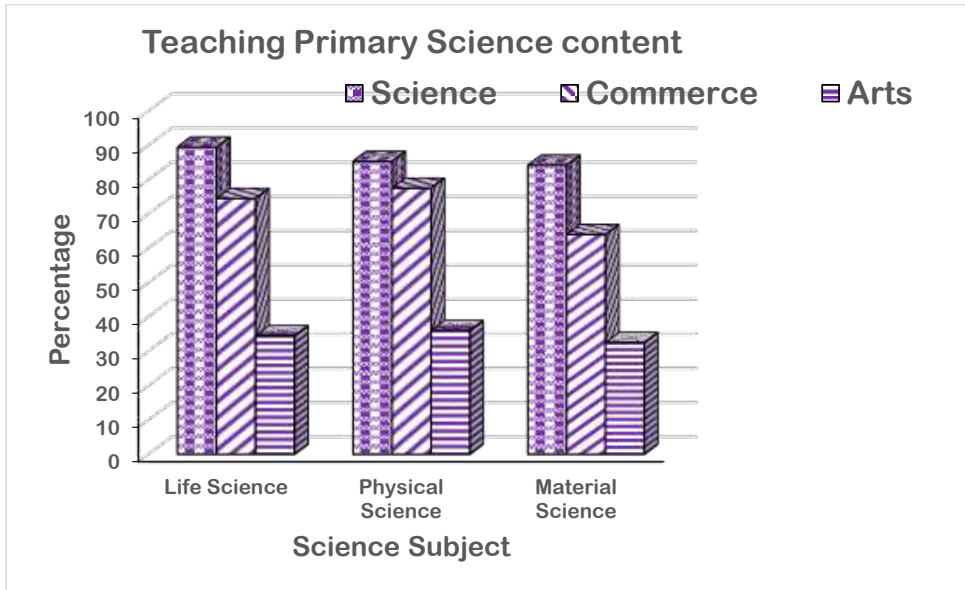


Figure 1.1 Stream wise competency in teaching primary science.

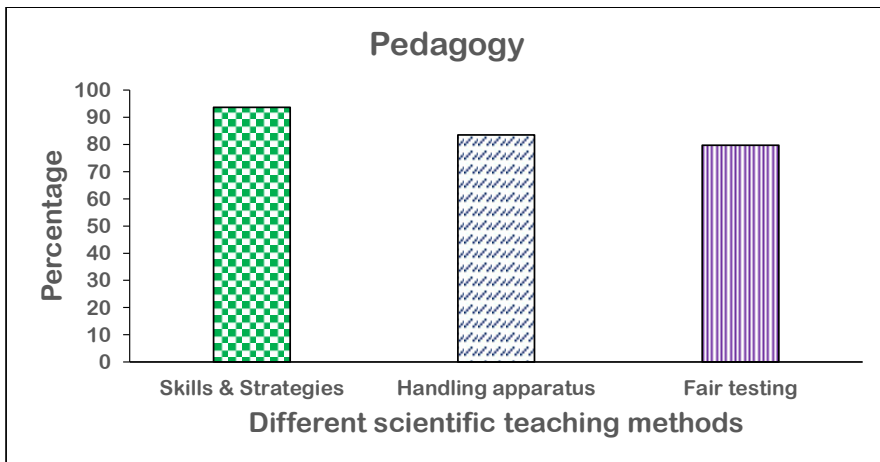


Figure 2.1 Use of various strategies to teach science subject.

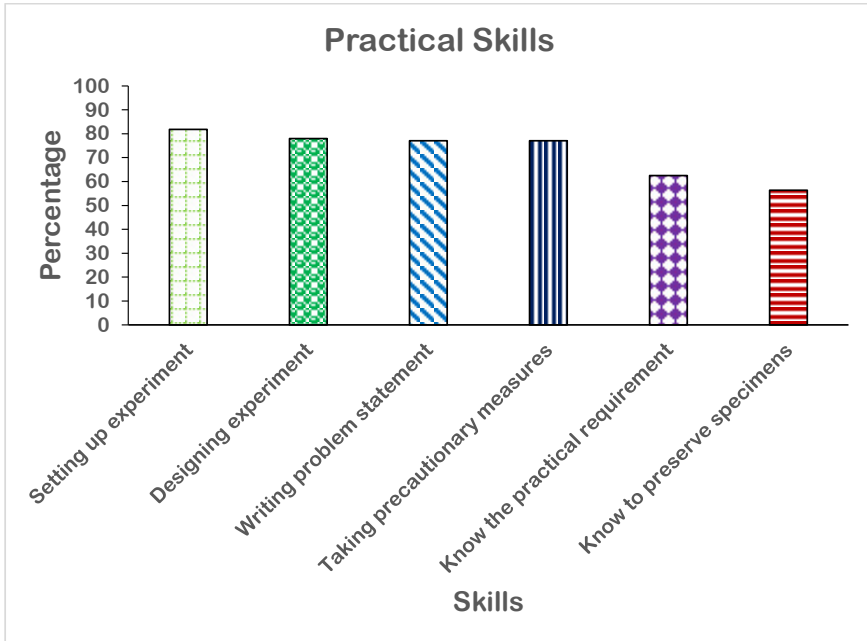


Figure 3.1 Different practical skill

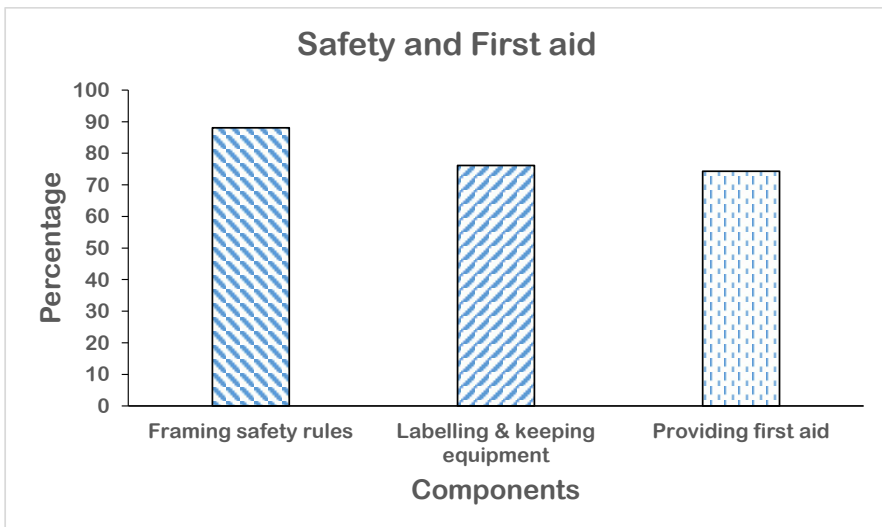


Figure 4.1 Laboratory safety and first aid.

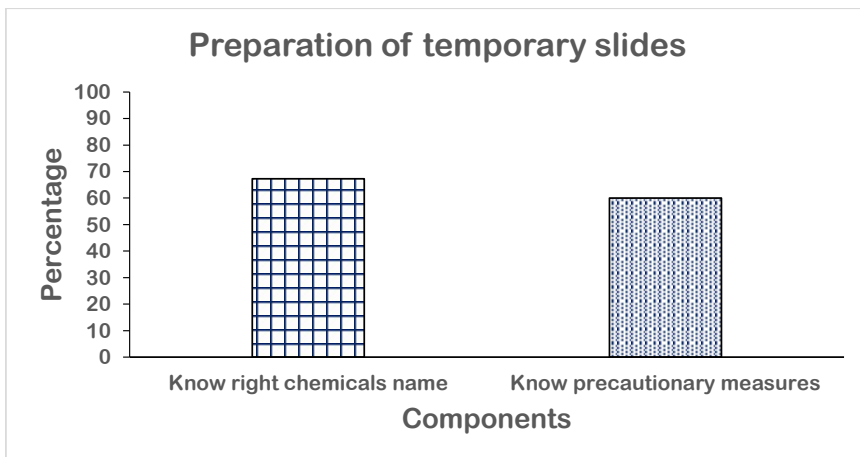


Figure 5.1. Preparation reagents and temporary slides.

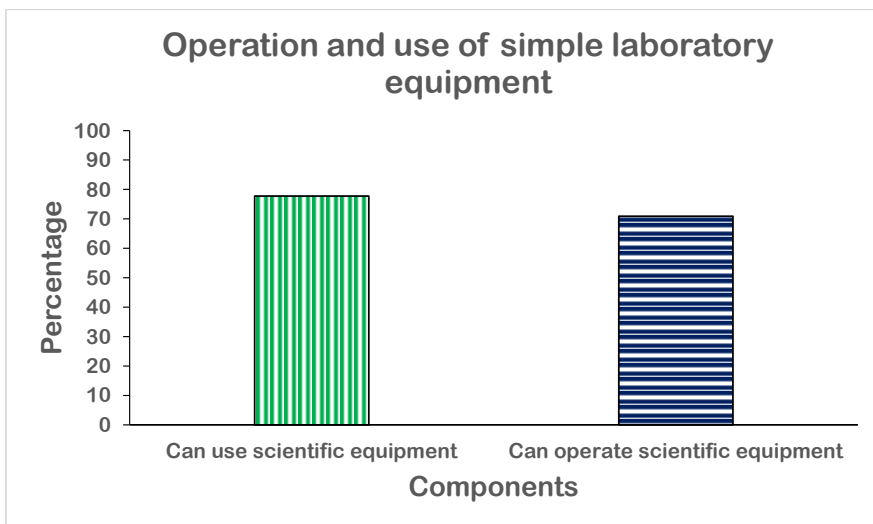


Figure 6.1. Use & operate scientific equipment.

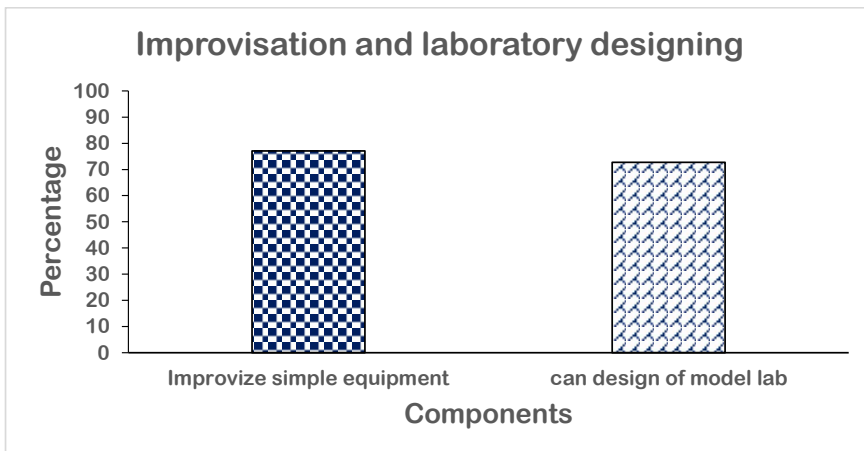


Figure 7.1 Improvising lab equipment and lab designing.

References

- Allinder, R. M. (1994). The relationship between efficacy and the instructional practices of special education teachers and consultants. *Teacher Education and Special Education*, 17(2), 86-95.
- Appleton, K., & Kindt, I. (2002). Beginning primary teachers' development as teachers of science. *Journal of Science Teacher Education*, 13(1), 43-61.
- Ausubel, D. P. (1968). *Educational psychology. A cognitive view*. New York: Holt, Rinehart and Winston, Inc.
- Aydin, S., & Boz, Y. (2010). Pre-Service Elementary Science Teachers' Science Teaching Efficacy Beliefs and Their Sources. *Elementary Education Online*, 9(2), 694–704.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review*, 84, 191-215.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, N.J.: Prentice-Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

- Bandura, A. (2006). *Guide to the construction of self-efficacy scales*. In: *Self-efficacy beliefs of adolescents*. In Pajares, F. and Urdan, T. (Eds.). Greenwich, CT: Information Age Publishing. 5, 307-337.
- Burak, F. (2009). An investigation of the relationship between science process skills efficient laboratory use and science achievement in chemistry education. *Journal of Turkish Science Education*, 114-132.
- Botha, A., & Herselman, M. (2015). A Teacher Tablet Toolkit to meet the challenges posed by 21st century rural teaching and learning environments. *South African Journal of Education*, Volume 35.
- Cakiroglu, J., Cakiroglu, E., & Boone, W. J. (2005). Pre-service teacher self-efficacy beliefs regarding science teaching: A comparison of pre-service teachers in Turkey and the USA. *Science Educator*, 14(1), 31- 40.
- Duggan, S., & Gott, R. (1995). The place of investigation in practical work in the UK National Curriculum for Science. *International Journal of Science Education*, 17(20), 137–147.
- Eggen, P., & Kauchak, D., (2007). *Educational psychology: Windows on classrooms* (7th ed.). New Jersey: Merrill, Prentice Hall.
- Enochs, L.G., & Riggs, I. M. (1990). Further development of an elementary science teaching efficacy belief instrument: A pre-service elementary scale. *School Science and Mathematics*, 90(8), 694-706
- Gott, R., & Duggan, S. (1995). *Investigative work in the Science Curriculum*. Open University Press.
- Hodson, D. (1993). Re-thinking old ways: Towards a more critical approach to practical work in school science. *Studies in Science Education*, 22, 85–142.
- Hoy, W. K., & Woolfolk, A. E. (1990). Socialization of student teachers. *American Educational Research Journal*, 27(2), 279-300.

- Muraskin, L.D. (1993). *Understanding Evaluation: The Way to Better Prevention Programs*. Department of Education, Washington, DC. Westgate, Inc., Rockville, MD.
- Palmer, D., Dixon, J., & Archer, J. (2015). Changes in Science Teaching Self-efficacy among Primary Teacher Education Students. *Australian Journal of Teacher Education*. Volume 40(12), n12.
- Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher Efficacy: Its Meaning and Measure. *Review of Educational Research*, 68(2), 202-248.
- Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and teacher education*, 17(7), 783-805.
- Wilkinson, J., & Ward, M. (1997). A comparative study of students' and their teacher's perceptions of laboratory work in secondary schools. *Research in Science Education*, 27(4), 599-610.
- Woolfolk, A. E., & Hoy, W. K. (1990). Prospective teachers' sense of efficacy and beliefs about control. *Journal of Educational Psychology*, 82(1), 81–91.
- Yeung, A. S., Craven, R. G., & Kaur, G. (2014). Teachers' self-concept and valuing of learning: Relations with teaching approaches and beliefs about students. *Asia-Pacific Journal of Teacher Education*, 42(3), 305-320.
- Yeung, A.S., Taylor, P.G., Hui, C., Lam-Chiang, A.C., & Low, E.L. (2012). Mandatory use of technology in teaching: Who cares and so what? *British Journal of Educational Technology*, 43(6), 859-870.

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Perception towards inclusive education: a comparative study of teachers teaching nondisabled and special need children

Sonam Zangmo and Harish Mittu

Abstract

The current research paper studies the perception of teachers towards Inclusive Education in Bhutan. The investigators compare the perception of teachers teaching nondisabled (n-group teachers) and special need children (e-group teachers) in regular classrooms of Bhutanese school. A sample of 31 teachers comprising of 18 n-group and 13 e-group teachers, were drawn from Changangkha Middle Secondary School, Thimphu, Bhutan through convenience sampling technique. Results revealed that n-group and n-group teachers differ partially in their perception towards inclusive education.

Keywords: *Inclusive Education, Perception, Middle Secondary School, Nondisabled and Special Need Children.*

Introduction

In the past years, Inclusive Education movement was initiated primarily for people with learning difficulties and disabilities. Later, it expanded to embrace those that are at risk of marginalizing or exclusion (Ainscow et al., 2006). It was more or less an approach that seek to address the barriers to participation and learning, and at the same time provide resources to support learning and full participation, be it extra co-curricular or academics, which would increase the capacities of concerned school to meet the diversity (Booth and Ainscow, 2002). According to British Psychological Society (2002), Inclusive Education is rethinking and restructuring policies, culture and practices, curriculum and methodologies, and learning environment followed in schools to meet the diverse learning needs, whatever the nature and origin and the degree of needs of the individuals.

Thus, Inclusive Education is a process which involves schools making and modifying changes in the curriculum and teaching strategies, a means to accommodating a wide range of needs and abilities among the pupils. It's a body where it builds the capacity to welcome all the pupil from all walks of life who wishes to attend and in doing so, it reduces the notion of exclusion.

Therefore, it is the prime duty of the teachers to have a sound perception towards pupil with or without disabilities in successful implementation of the inclusive education in our modern education system. According to Dema (2017) the standards for inclusive education were endorsed in the Annual Education Conference which aims to provide quality inclusive education to children with disabilities and improve the quality across all the schools and for all the children in Bhutan. This standard will act as a guideline or supporting tools for the school to reflect, plan and take relevant actions in becoming more inclusive in nature. It will also cater to the enhancement of participation in education and quality of learning. The standard also mentioned that children with disabilities and special need will have full access to the curriculum, participation in cultural and extra- curricular activities, artistic, recreational and other leisure activities.

To further support the standards and implementation of inclusive education, the Government of Bhutan has drafted the First National Policy for Person with Disabilities in 2018. The idea of inclusiveness for differently abled students in mainstream education not only aims to provide quality education that caters to their individual needs, abilities and aptitudes but also to equip them with life skills for the real world and life by living and learning together with non-disabled children.

Reviews of Related Literature

Dorji et al. (2019) conducted a study on the attitude of Bhutanese teachers towards inclusive education through online survey. The findings revealed that most teachers had favorably positive attitudes towards inclusion but at the same time, they felt the earnest need to improve pupil teacher ratio, accessibility of toilets, playground and more training of teachers and more support staff. The researchers also made aware of the importance of future policies and advancement of successful implementation of inclusion in Bhutanese schools.

Mngo & Mngo (2018) also carried out a study on teachers' perception of inclusion in a pilot Inclusive Education Program in Northwest Region of Cameroon. Their findings revealed that some teachers still prefer separate special education institutions to cater to special needs children. Those teachers who had training on teaching students with disabilities, more experienced and highly educated teachers found to have positive attitude and more supportive but felt that they are inadequate in preparedness than those without having access to such experiences. The less experienced teachers were found to be less or not seem to have known the benefits of inclusion, and therefore they lacked the ability to manage integrated classrooms and to teach disabled children. It implies that more training be given to teachers, and institutional support system should be strengthened and inclusion policy must be firm in place in education system itself.

Dukpa & Kamenopoulou (2017) explored on the perspectives of Bhutanese teachers, the concept of Disability and Inclusion associated with the children with disability. The researchers found out that most of the responses were related to genetic inheritance, due to accidents or some medical conditions. Some teachers held negative views that it is the karma (Bad fate) and parents are responsible for their own disabled child. The study also revealed the conflicting views on the concept of inclusion, because most of the teachers felt that implementation of inclusion is not ready in the country, due to the lack of trained teachers. The investigators further made recommendations on strengthening of teacher preparation and narrowing the gap between practice and policy. For the successful implementation of inclusive education in the mainstream education system, inclusion policies should be taken into consideration. And to uplift this, attitude and self-efficacy of teachers are crucial (Kuittinen, 2017).

In addition, Rodriguez et al. (2017) studied the perception of teachers on the inclusion of students with disabilities in the regular education classroom in Ecuador, South America. The study was conducted before the development of a programme of specialization on post graduate studies for special educational needs. The study found out that majority of the Ecuador teachers are of the view that academic career training on the issue of inclusion and accessibility demands more support in carrying out the teaching assignments and materials adapted to cater to the needs of the students. Beside the lack of inclusion and architectural barriers, teachers literally felt that they are not prepared fully to teach students with disabilities in regular classroom, and strongly felt the need of deeper special educational need training.

Bailey et al. (2015) researched on the perspective of inclusive education on 300 teachers in Malaysian primary schools. Most of the teachers expressed positive views towards inclusion principle. However, teachers lacked common consensus about the benefits of inclusion, expressed about the lack of teachers' skill in teaching special children and therefore often uttered negative opinion about the children with disabilities in their family and as well as in school, despite common professional development educational needs are felt. The team commented that the insufficient teacher educators in the field would hinder government's aim of operating inclusive education which would remain behind as an outlying goal.

Hussan et al. (2015) conducted the study in Jazan University to examine the influence of some variables on attitudes of general and special education teachers towards inclusion of autism students in regular setting. The team found out that there existed no significant differences in attitudes of special education teachers towards inclusive setting in relation to interaction with disable students and class size, but there do exist significant differences with respect to teachers' qualification and training courses offered to them. Since the result was positive, the researcher

further recommended that when students attend classes that reflect similarities and differences of learners in the real world, they recognize the value of diversity, develop respect and understanding among themselves, learn to accept others culture and enjoying learning through fun. The investigator also believed that school is the vital place for the children to develop friendship and social skills, where by internalized their learning from their immediate environment is meaningful for them in a natural way. Children with and without disabilities better learn from and with each other in inclusive classes, and learn to render help without condition.

Avramidis & Norwich (2010) assumed that the successful accomplishment of inclusive policy of inclusion of children with special educational needs in the mainstream school is the educator's positivity towards inclusive education. The researcher's examination of teacher's attitudes towards inclusion seemed to be influence not only by the nature of the severity of disabling condition at their disposal but also the availability of physical and human related support which is largely associated in inclusion itself.

Statement of Problem

Perception towards Inclusive Education: A Comparative Study of Teachers Teaching Nondisabled and Special Need Children.

Objective

To explore the perception differences of teachers teaching nondisabled (n-group) and special need children (e-group) towards inclusive education.

Hypothesis

There exists no difference in perception of n-group and e-group teachers towards inclusive education.

Design of the Study

In the present study, descriptive survey method was used to collect the data. A sample of 31 teachers comprising of 18 n-group and 13 e-group teachers, were drawn from Changangkha Middle Secondary School Thimphu, Bhutan through convenience sampling technique.

Tool

Teachers' Attitude to Inclusion (TATI) scale adapted from PATI scale by Palmer et al. (2001) was used by the investigators to measure the perception of n-group and e-group teachers towards inclusive education in inclusive classrooms of Bhutanese schools.

Delimitation

The present study was delimited to

- Changangkha Middle Secondary Schools, Thimphu, Bhutan.
- n-group and e-group teachers only.

Statistical Techniques

The objective and hypothesis of the study have been tested by using frequencies and percentages.

Results and Discussion

Analysis of data, result and interpretation of findings has been done keeping in view the objective and hypothesis of the study.

Results pertaining to difference in Perception of N-Group and E-Group Teachers towards Inclusive Education

The objective was to explore the perception differences of teachers teaching nondisabled (n-group) and special need children (e-group) towards inclusive education. After administrating the Teacher Attitude to Inclusion Scale; frequencies and percentages of the n-group and e-group teachers have been presented in table 1 as per their opinion corresponding to every statement.

H₀: There exists no significant difference in perception of n-group and e-group teachers towards inclusive education.

Table 1. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
1	Disagree	2	15.38	10	55.56
	Agree	11	84.62	8	44.44
2	Disagree	9	69.23	14	77.78
	Agree	4	30.76	4	22.22
3	Disagree	6	46.15	13	72.22
	Agree	7	53.85	5	27.78
4	Disagree	4	30.76	9	50.00
	Agree	9	69.23	9	50.00
5	Disagree	3	23.08	12	66.67
	Agree	10	76.92	6	33.33
6	Disagree	1	7.69	15	83.33
	Agree	12	92.31	3	16.67
7	Disagree	3	23.08	1	5.55
	Agree	10	76.92	18	94.45
8	Disagree	10	76.92	10	55.56
	Agree	3	23.08	8	44.44
9	Disagree	3	23.08	17	94.4
	Agree	10	76.92	1	5.6
10	Disagree	9	69.23	15	83.33
	Agree	4	30.77	3	16.67
11	Disagree	s2	15.38	4	22.22
	Agree	11	84.62	14	77.78

Interpretation of each statement is given below:

Statement#1- The more time special need children spend in a regular classroom; the more likely it is that the quality of their education will improve.

Table 2. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
1	Disagree	2	15.38	10	55.56
	Agree	11	84.62	8	44.44

Interpretation

Table 2 shows that majority (84.62%) of **e-group teachers** are of the opinion that there is significant improvement in the quality of education in special need children when they spend more time in the regular classroom whereas majority (55.56%) of **n-group teachers** disagree with the opinion of **e-group teachers**. The reason for the same may be the **e-group teachers** are of the view that special need children get equal exposure to various teaching techniques, materials and buddy support and get inspired by the nondisabled children performances. Special need children are also provided with scaffolding to maximum level by the teachers.

Statement#2- The more time special need children spend in a regular classroom, the more likely it is that they will be mistreated by other nondisabled children in that room.

Table 3. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
2	Disagree	9	69.23	14	77.78
	Agree	4	30.76	4	22.22

Interpretation

Table 3 shows that both **e-group** (69.23 %) and **n-group teachers** (77.78%) strongly stand by the view point that special need children in the regular classroom are well treated by the nondisabled children.

Statement#3- The more time special need children spend in a regular classroom, the more likely it is that would end up feeling lonely or left out around the regular education children.

Table 4. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
3	Disagree	6	46.15	13	72.22
	Agree	7	53.85	5	27.78

Interpretation

Table 4 shows that majority of **e-group teachers** (53.85%) in the regular classroom are of the view that special need children feel lonely and left out in the regular classroom, whereas **n-group teachers** disagree (72.22%) to the point that they would end up feeling lonely or left out from rest of the nondisabled children in the regular classroom. From the above table, it is concluded that **e-group teachers** do agree to the statement because they have the experience of teaching special need children and practically witnessed the real scenario in actual classroom situation, whereas **n-group teachers** have no idea of the practical situation and its assumed perspectives because they have never been in the inclusive classroom where psychological and social constraint are felt by the special children.

Statement#4- When students with severe disabilities are enrolled in regular education classrooms, the positive benefits to the regular education students outweigh any possible problems that this practice may present.

Table 5. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
4	Disagree	4	30.76	9	50.00
	Agree	9	69.23	9	50.00

Interpretation

Table 5 shows that **e-group teachers** (69.23%) strongly agree to the statement whereas **n-group teachers** neither agree nor disagree that the positive benefits outweigh the issues and problems. **E-group teachers** do have the clear idea of what things work and what do not since they have been dealing with the special children for longer period of time whereas **n-group teachers** held neutral attitude because they have never had the opportunity to work with special need children.

Statement#5- It is possible to modify most lessons and materials in a regular classroom to meet the needs of these children.

Table 6. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
5	Disagree	3	23.08	12	66.67
	Agree	10	76.92	6	33.33

Interpretation

Table 6 shows that **e-group teachers** (76.92%) think that lesson can be modified as per the requirement of special need students. This is because teachers know that the different kind of accommodation is given to the special need children, such as respond accommodation-students are allowed to response either in a oral or written form which is easier to them; setting accommodation-students are allowed to work or take test in a quiet room with few or no distractions; time accommodation- students are allowed to complete their work in their own pace; organizational skills accommodation-students are allowed to use alarm with time management, mark the text and receive study skill instruction. 66.67% **n-group teachers** disagree that lesson

can't be modified. Those have the contrasting agreement because they have never tried working with the special need children in the regular classroom.

Statement#6- If special need children were to spend a lot of time in a regular classroom, they would end up not getting extra help they need.

Table 7. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
6	Disagree	1	7.69	15	83.33
	Agree	12	92.31	3	16.67

Interpretation

Table 7 shows that **e-group teachers** i.e. 92.31% agree that special need children do not get extra time in the regular classroom whereas **n-group teachers** disagree that special need children extra help in the regular. **E-group teachers** agree to the statement due to the fact that they have practically implemented inclusion in their classrooms and they know what goes well and what does not. They have to deal with the special children all by themselves without class support services and itinerant teacher services.

Statement#7-If special need children were to spend much of their day in a regular classroom, they would end up becoming friends with nondisabled students in that classroom.

Table 8. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
7	Disagree	3	23.08	1	5.55
	Agree	10	76.92	18	94.45

Interpretation

It is concluded from the table 8 that both **e-group teachers** (76.92%) and **n-group teachers** (94.45%) are on the positive side that special need children make more friends if they spend lot of time in the regular classroom. **N-group teachers** favour more that they believe nondisabled children are much aware about the disabled children in integrated classroom. And nondisabled student are often reminded to help others any time anywhere is a noble deed. Values like empathy, kindness, love, respect and responsibility is taught in the value classes.

Statement#8- The quality of regular students' education is enriched when students with severe disabilities participate in their classes.

Table 9. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
8	Disagree	10	76.92	10	55.56
	Agree	3	23.08	8	44.44

Interpretation

It is concluded from the table 9 that majority of **e-group teachers** i.e. 76.92% and **n-group teachers** i.e. 55.56% strongly disagree with the statement that the quality of the nondisabled children education is improved when special need children are enrolled in the mainstream classroom. **E-group teachers** mostly disagree because they believe that providing accommodation and modification itself is a slow pace for learning of both type of children i.e. special need and nondisabled children. Teachers feel that accommodation itself is a distraction for the nondisabled children without itinerant teacher support in the regular classroom. One untrained teacher handling both kinds of children is a distressful task.

Statement#9- If special need children were to spend much of the day in a regular classroom, they would end up not getting all the necessary special services that would be provided in the special educations classrooms.

Table 10. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
9	Disagree	3	23.08	17	94.4
	Agree	10	76.92	1	5.6

Interpretation

It is concluded from the table 10 that 76.92 % of **e-group teachers** held the opinion that special need children have limited access to services in the regular classroom than in the special education classroom if they have to spend more time with nondisabled students. **N-group teachers** do not favor the statement that special need children are often left out in the corner of the classroom because it is the responsibility of the concern teacher caters to rest all 45 children (average number of students in Bhutanese classroom) in the regular classroom. If teachers don't do this than the meaning of inclusion would in total failure.

Statement#10- Regular education classrooms provide more meaningful opportunities for special need children to learn than special education classrooms.

Table 11. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
10	Disagree	9	69.23	15	83.33
	Agree	4	30.77	3	16.67

Interpretation

It is concluded from the table 11 that 69.23 % of **e-group teachers** and 83.33% of **n-group teachers** are having same notion that the regular education classroom does not provide meaningful learning opportunities to the special need children as it is done in special education classrooms. Teachers are of the view that individual needs and interest of the special children are not meet due to the large class size, lack appropriate resources which could meet the requirement of the special need children and of course the untrained teachers in the regular classroom.

Statement#11- The more time special need children spend in regular classrooms, the more likely it is that they will be treated kindly by the nondisabled students in those rooms.

Table 12. Frequencies and Percentages of E-Group and N-Group Teachers towards Inclusive Education

Statement No.	Opinions	E-Group Teachers		N-Group Teachers	
		Frequency	Percentage	Frequency	Percentage
11	Disagree	2	15.38	4	22.22
	Agree	11	84.62	14	77.78

Interpretation

It is concluded from the table 12 that 84.62 % of **e-group teachers** and 77.78% **n-group teachers** are having strong opinion that the special need children gain more love and care when they spend more time with nondisabled children in the regular classrooms. **E-group teachers** have more positive attitude than teachers teaching nondisabled children because teachers teaching integrated classroom have already witness how the nondisabled children treat the special need children. Moreover, due to the constant reminder exposure to the help create better awareness among the nondisabled children.

It shows that **e-group** and **n-group teachers** differ partially in their perception towards inclusive education.

Hence, the stated hypothesis that there exists no difference in teachers' perception towards inclusive education with respect to **e-group** and **n-group teachers** is partially rejected or accepted.

Finding of the Study

1. Majority of **e-group** and **n-group teachers** did not differ in their perception with respect to the statements-special needs children would make friends with regular children; regular children would treat special need children more kindly; positive benefits outweigh any possible problem; special need children would not be mistreated by nondisabled children; inclusion would not increase the quality of regular children education; and inclusive education would not increase learning opportunities.

2. **Majority of e-group and n-group teachers** differ in their perception with respect to the statements-improvement in educational quality of the special need children if they spent more time in a regular classroom; special need children feel less lonely or left out around the regular education children if they spent more time in a regular classroom; possibility to modify most lessons and materials in a regular classroom to meet the needs of these children; special need children would not getting extra help as required if they were to spend a lot of time in a regular classrooms; and special need children would not getting all the necessary special services that would be provided in the special education classrooms if they were to spend much of the day in a regular classroom.

The above discussion resulted that **e-group and n-group teachers** differ partially in their perception towards inclusive education.

Conclusions

To ensure inclusive education as successful, it is paramount that teachers' attitude are positively favourable along with relevant resources such as appropriate learning materials, assistive technology, adaptive instruction, proper training facilities, barrier free environment, good architectural design which would cater to the needs of the diverse learners. For the successful implementation of inclusion in regular school setting, the policy needs to be in firm place. Support from the school administration, Ministry of Education, communities and other relevant agencies are some of the crucial factors in the successful implementing of inclusive education. To ensure quality inclusiveness education, proper monitoring and necessary follow up must be carried out time to time so that it does not get compromised with the motive of education for all.

References

- Ainscow, M. et al. (2006). *Improving Schools, Developing Inclusion*. London: Routledge. Retrieved on December 13, 2018 from [https://www.research.manchester.ac.uk/portal/en/publications/improving-schools-developing-inclusion\(9e3af663-a90d-418c-b6c7-08fd02eb2589\)/export.html](https://www.research.manchester.ac.uk/portal/en/publications/improving-schools-developing-inclusion(9e3af663-a90d-418c-b6c7-08fd02eb2589)/export.html).
- Avramidis, E. and Norwich, B. (2010). Teachers' attitudes towards integration/inclusion: A review of the literature. *European Journal of Special Needs Education*, 17 (2), 129-147.
- Bailey, L., Nomanbhoy, A. and Tubpun, T. (2015). Inclusive education: Teacher perspectives from Malaysia. *International Journal of Inclusive Education*, 19:5, pages 547-559.

- Booth, T. and Ainscow, M. (2002). Index for inclusion: Developing learning and participation in schools. *Bristol: Centre for Studies on Inclusive Education*.
- British Psychological Society (2002). Inclusive education: Position paper UK: BPS. Available at: www.bps.org.uk
- Tshering, D. (2017). Standards for inclusive education endorsed. *The Bhutanese- Leading the Way*. Retrieved on March 21, 2019 from <https://thebhutanese.bt/11401-2/>.
- Dorji, R. (2017). Towards inclusive Education in Bhutan: Attitudes of Bhutanese school principals, teachers and past students with sensory impairments towards inclusive education in Bhutan. *International Graduate Research, Research Plus*.
- Dukpa, D. and Kamenopoulou, L. (2017). Karma and human rights: Bhutanese teachers' perspectives on inclusion and disability. *International Journal of Inclusive education*, V3, 323-338 Pages
- Hassan, A. E. H., Alasmari, A. and Ahmed, E. Y. (2015). Attitudes of special education students towards including students with disabilities in general classes related with some variables. *Research Gate. Vol.2(7)*. Retrieved on January 13, 2019 from <https://www.Researchgate.net/publication/279176850>.
- Hoskin, J., Boyle, C. and Anderson, J. (2015). Inclusive education in pre-schools: predictors of pre-service teacher attitudes in Australia. *Teachers and Teaching*, 21:8, pages 974-989.
- Kuittinen, E. (2017). Inclusive education from teachers' perspective: Exploring Chilean teachers' attitudes and self-efficacy. *Master's Thesis in Special Education, Department of Education and Psychology*, University of Jyväskylä. Retrieved on April 13, 2018 from <https://jyx.jyu.fi/bitstream/handle/123456789/56467/URN:NBN:fi:jyu-201712204823.pdf?sequence=1>
- National Policy for Persons with Disabilities First Draft (2018). Research and Evaluation Division. *Gross National Happiness Commission Secretariat*. Retrieved on March 13, 2018 from <https://www.gnhc.gov.bt/en/wp-content/uploads/2017/05/nppwds-draft-3-jan-2018.pdf>.
- Mngo, A. Y. (2018). Teachers' Perceptions of Inclusion in a Pilot Inclusive Education Program, *Educational Research International*.
- Palmer, D. S. et al. (2001). Taking sides: Parents' views on inclusion for their children with severe disabilities. *Exceptional Children*, 67, 467-484.

Rodriguez, R. M., Lopez, J., Perez, J. and Garrote, I. (2017). Teachers' perception on inclusion of students with disabilities in the regular education classroom in Ecuador. *Research Gate*, v5i9.2573.

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Interventions for Substance Abuse by the Central Monastic Body (*Gzhung Gra Tshang*) in Bhutan

Dechen Doma

Abstract

The increasing number of Bhutanese youth engaging in drugs has become a national concern. In 2017, The Bhutan Narcotics Control Authority has reported that the use of cannabis was highest among the high school students with 24 percent followed by pharmaceuticals opioids. Realizing the need to protect the future leaders of the nation from drugs and alcohol, the *Gzhung Gra Tshang* proposed an intervention. The *Gzhung Gra Tshang* has been actively engaged in controlling addiction from a Buddhist perspective since 2003. However, it is unclear about the type of interventions that are currently practiced. Therefore, this qualitative study was carried out to understand the intervention approaches practiced by the *Gzhung Gra Tshang*. *Chos Bshad Las Rim* was one of the interventions conducted by *Gzhung Gra Tshang*. The participants comprised of seven program implementers and seven students who had attended the *Chos Bshad Las Rim* in their respective schools in Bhutan. The study identified *Chos Bshad Las Rim* as an effective intervention to substance abuse by Buddhist monasteries in Bhutan. The other key findings reveal that teaching Cause and Effect (Karma), meditation, and engaging youth in monasteries have a significant effect in bringing attitudinal changes in them.

Key words: *Gzhung Gra Tshang, Chos Bshad Las Rim, Addiction, Cause and Effect, Meditation*

Introduction

In order to tackle addiction from a Buddhist perspective, His Holiness the 70th Je Khenpo Trulku Ngawang Jigme Choedrak, instructed the Central Monastic Body (*Gzhung Gra Tshang*) in 2003 to develop and implement Dharma teaching in all schools across Bhutan. Accordingly, the Ministry of Education, the Royal University of Bhutan and the *Gzhung Gra Tshang* came together and launched the Choeshed programme (*Chos Bshad Las Rim*) or the Dharma discourse in all the middle and higher secondary schools and the two Colleges of Education in 2003.

The programme was initially introduced with the aim to prepare youth with values and principles, positive hopes and aspirations that will build compassionate, tolerant and a caring society, and drive Bhutan to be one of the most secure, prosperous and happy nations in the world (Ngedup, 2006, p.1). Similarly, in 2010 to further strengthen and establish a strong working

committee to facilitate the *Chos Bshad Las Rim*, the representatives from the *Gzhung Gra Tshang*, the Royal University of Bhutan and the Ministry of Education formed an association led by a joint committee called *Samjor Leckchoed Tshogpa* under the patronage of Her Royal Highness Ashi Sonam Dechan Wangchuck. The former Letshog Lopen travelled across the country to deliver the *Chos Bshad Las Rim* and in 2013 he wrote the book *Nazhoen Samjor Lekchey* (Positive Intent Action for Youth), based on his experience of teaching *Chos Bshad Las Rim* across the country, which became the required text for teaching *Chos Bshad Las Rim* in schools (Rinchen, 2014). Currently, the *Lam Netens* (district Abbots) in the twenty districts across Bhutan conduct the *Chos Bshad Las Rim* in the schools twice a year. Recently, the *Gzhung Gra Tshang* has appointed a *Khenpo* (Master in Buddhist studies) in various districts to conduct *Chos Bshad Las Rim* at least twice a year.

Objectives of the Study

The purpose of this study was to explore and understand the Buddhist approach to drug addiction prevention carried out by the Buddhist monasteries in Bhutan.

Literature Review

From the Western perspective, addiction is seen as a chronic relapsing brain disease, whereas Buddhism does not consider the root cause of problems to be an external agent of this life, but rather an internal agent developed over many lifetimes - the habitual tendencies of our own mind (Tsering, 2006). Buddha recognised that all cravings arise from addiction or intoxication of the mind and he declared addiction as the repetitive cravings as a root cause of suffering. Similarly, Satel and Lilienfeld (2014) report, "addiction is in the minds of addicts that contains the stories of how addiction happens, why people continue to use drugs, and if they decide to stop, how they manage to do so" (p.24).

According to Taylor (2010), medication helps to rebalance the body of an addict but if the mind is still dissatisfied, then the addict is likely to head straight back to addiction (p.9). Similarly, in the Buddhist cosmology, addiction is described as hungry ghost, "a state of intense and unsatisfied cravings" (Groves, 2014, p.987). Hungry ghosts are creatures with large empty bellies with small scrawny neck and tiny little mouth, so they never get enough to fill the empty bellies (Maté, 2010).

In the Bhutanese context, addiction is seen through the lens of religion and spirituality and is recognised as the root cause of misdeeds. His Majesty the Great Fourth King of Bhutan, Jigme Singye Wangchuck has repeatedly reminded the stakeholders to remind youth regarding the fundamental values that the mind is capable of cultivating. These includes taking care of one's

mind (*semdagzinthabin*), making one's mind strong founded on what is true and right as opposed to being feeble (*semdringdi zoni*); and making the mind useful (*semgochoepzoni*). These values will help the youth to understand that their actions should not cause harm to others, which includes the nature as a whole, but rather benefit them, and hence these, bring greater peace, harmony and happiness among others and themselves (as cited in Thinley, 2016, p.31).

In recent times, the Chokyi Gyatsho Institute in Dewathang, Samdrup Jongkhar in eastern Bhutan has started offering mindfulness camps for Bhutanese educators, youths, social workers, counselors, and others. Buddhist monks lead such programmes, unlike the other institutions (Gyeltshen, 2018). Within the Buddhist tradition, mindfulness practice as described by Dzongtsar Khyentse Rinpoche helps a person to understand the fact that the essence of human development begins with looking into the inner quality and state of one's own mind (as cited in Gyeltshen, 2018, p.2). Studies have demonstrated that mindfulness-based approaches have been applied to a number of psychological problems including stress reduction, substance use, addiction, relapse prevention, behavioral changes, psychological disorders, grieving and mental health issues (Bowen et al., 2009; de Dios et al., 2012; Sharma, Sharma, & Marimuthu, 2016).

Buddhist Approaches to Addiction

According to McWilliams (2014), the Buddhist approach helps to address mental well-being, recognise the changing nature of phenomena experience and separate disruptive thought and emotions, as it arises moment to moment and that does not require adherence to any religious elements. Prominent religious figures from the *Gzhung Gra Tshang* conduct *Chos Bshad Las Rim* (dharma talk) programme through mass sermons and religious talks to the common people through television and radio services (Royal Government of Bhutan, 2015). The *Chos Bshad Las Rim* programme covers dharma talks on the preciousness of human existence, the law of cause and effect, and highlights the negative karma that could accumulate from alcohol and drug. These information are disseminated to the general public, schools and institutions to discourage consumption of alcohol, drug use and also help youth change their perspective towards life (Thinley, 2012).

According to Groves (2014), Thamkrabok monastery in Thailand uses an approach to treating addiction which typically includes the use of medicinal plants during the detoxification phase and often induces extensive vomiting. The healing process also employs various procedures for internal and external purification (e.g., purging). This treatment includes rhythmic repetitive readings, cleansing baths, and massages; and the use of group ritual providing a support system for developing a positive identity and coping skills (p.342). It also includes practices such as making the addicts take a vow, meditation sessions, dharma talks and daily

chanting (p.989). Similarly, Narong Chaiyatha, a Buddhist monk at the Mongkol temple in Thailand, claims that practicing mindfulness or meditation and applying morality (shila), concentration (Samadhi), and wisdom (Panna) are the only Buddhist approaches to treatment of addiction (as cited in Sayadaw, 1994, p.196).

Buddhist monasteries in Bhutan do not run rehabilitation or treatment centers. However, prominent religious figures from the *Gzhung Gra Tshang* conduct *Chos Bshad Las Rim* (dharma talk). The *Chos Bshad Las Rim* for the youth emphasises on the five faults of indulging in drugs: i) obstruction of studies which focuses on the importance of education and living a meaningful life, and recognises the negative impacts of drugs; ii) disregard for others and being useless even if one is learned: understanding the negative impact of indulging in drugs and possessing a negative mind can lead to become unworthy of one's own learning; iii) cause of unhappiness for parents and teachers: drugs can destroy their relationship with parents and teacher and their own life; iv) wastage of wealth and resources: use of drugs and alcohol can lead to loss of resources, may experience rejection of loved ones and also give rise to problems such as imprisonment; and v) cause of conflict and impediments to prosperity: drugs can lead to family conflicts, gang fights which destroys oneself and others (Rinchen, 2014, pp.185 – 188).

Besides, *Chos Bshad Las Rim* also talks on the truth of Cause and Affect (Karma). The programme teaches how cause and effect arises and everything that exists is a result of various conditions and causes. In the Buddhist tradition, karma refers to action driven by intention (cetanā), which leads to future consequences. For example, good intentions make good actions whereas bad intentions make bad actions (Cozort, 2016). The addict is responsible for creating the cause of their experiences like suffering and destructive actions (Chödrön, 2017).

Buddhist monks in Bhutan are regarded as spiritual teachers in the society (Marma, 2017). Therefore, it is common amongst individuals with addiction problems visiting monasteries to seek psychological support and to get back serenity in their life. Some individuals who are dependent on drugs prefer to take refuge, by taking a vow in front of a wrathful local deity. The Buddhist monks help the individual by performing some sacred ceremonies and providing instructions about the sacredness of the vow and the consequences of breaking the vow.

In addition, people prefer to seek a shaman to conduct rituals to cure diseases related to addiction and relapse. Rituals and astrology are seen as a dominant factor for continuing positive emotional well-being of the Bhutanese people (Calabrese & Dorji, 2013). Previous studies indicate that youth who are more involved in religious ceremony and activities are less likely to be involved in abusing drugs than those who do not participate (Adamczyk & Palmer, 2008). Attending religious ceremonies and activities provide emotional support, which often acts as a

protective influence for youth to keep away from abusing drugs (Knight et al., 2007). In addition, family religiosity with strong religious beliefs may inculcate anti-drug attitude in children, which could influence youth to stay away from peers using marijuana.

In Bhutan, most of the traditional healing practices are based on rituals and spiritual beliefs, which are deeply guided by Buddhism. The National Institute of Traditional Medicines (NITM), recently renamed Faculty of Traditional Medicine (FTM) under the Khesar Gyalpo University of Medical Sciences of Bhutan (KGUMSB), has been providing some indigenous medicine to treat drug addiction. Historically, Bhutan is also known as the *Menjong Gyalkhab*, which means the land of medicinal plants for centuries (Rinchen, 2014). The physicians who practice traditional medicine at FTM under KGUMSB prescribe *Wangpo Kuensel* as a substitution to cure addiction. *Wangpo kuensel* (clearing all the sense faculties) is a researched and registered medicine since 1967. This medicine is made from herbal plants and used for clearing the five senses. This medicine is also prescribed for the treatment of Yam Yathra (sinusitis).

Research Question

1. What are some of the approaches adopted by the Central Monastic Body (*Gzhung Gra Tshang*) to tackle drug use and addiction among the youth of Bhutan?
2. How effective is the Chos Bshad Las Rim provided by the *Gzhung Gra Tshang* in curbing drug use?

Research Approach

The researcher sought to investigate the model and approaches that are adopted by *Gzhung Gra Tshang* to treat drug abuse and addiction. Data were gathered through a qualitative investigation of 14 participants. The participants included in the study consisted of two groups: the first groups were Buddhist monks (programme implementers) [PI] from the *Gzhung Gra Tshang*, who have been teaching *Chos Bshad Las Rim* (dharma course) in schools in Bhutan. The second group consisted of participants (CI) who were substance abusers and have attended the *Chos Bshad Las Rim* programme in their respective schools in Bhutan.

Semi structured interview guides were used to elicit information based on the research questions. The interview was conducted in Dzongkha for the Buddhist monks and English and Dzongkha for the students, depending on their preference. Each interview lasted between 25 – 30 minutes.

Ethical Consideration and Institutional Approval

Approval for the clients in the schools was sought and obtained from the school counselors and concerned clients. Approval for the Buddhist monks was sought from the individual participants. The researcher followed the research ethical guidelines for approval from the office of the Vice chancellor, Royal University of Bhutan (RUB).

Data Analysis

The data from the interview were analysed systematically following a series of steps as suggested by research perspectives from Braun and Clark (2006). The first stage began with transcribing the recorded interviews into readable text, followed by close and repeated reading of the transcripts, which enabled the researcher, to generate thematic codes followed by development of thematic categories.

Findings and Discussion

Major theme

An iterative process of creating the categories and codes for each theme resulted in the formation of two themes namely model and approaches. Under the theme model, *Chos Bshad Las Rim* was discussed as the model adopted by the *Gzhung Gra Tshang*. The theme approaches were discussed under three sub themes; a) cause and effect (karma), b) Meditation, and c) youth engagement in the monastery.

To avoid misinterpretations, syntactical errors conveying the participant's quotes from the interview have not been corrected; therefore, the participant's quotes are written verbatim.

Model: Choeshed Layrim (*Chos Bshad Las Rim*)

Chos Bshad Las Rim in this study refers to the model adopted by the Buddhist monasteries to tackle drug addiction among the youth of Bhutan. According to programme implementers *Chos Bshad Las Rim* means religious discourse where students are taught and informed about the essence of life and help them develop positive thinking in order to cultivate good values and attitude. Majority of programme implementers are of the view that today's youth do not understand the Buddhist value education, and the best way is to teach these values is through *Chos Bshad Las Rim*. Conducting *Chos Bshad Las Rim* can help youth to understand the three elements. For example, Programme Implementers (PI6) expressed:

Three main elements for learning, first youth should be aware of what is learning or knowledge is: second, they should be aware of the purpose of learning; and third, be aware of the various obstacles to learning. If youth are aware of these three points, they

will not indulge in abusing drugs. And understanding the three main purpose of learning is equivalent to *dham phe choe* or dharma teaching.

Similarly, P11 mentioned, teaching conduct (*choelam*), meditation and etiquette (*bjawa and choepa*) as one of the best interventions to drug use and addiction. Similar studies by Rowan et al., (2014) on cultural intervention to treat addiction in indigenous populations found out that various indigenous cultural interventions treatment programme can be a standalone intervention to treat addiction, as this intervention addresses the wellbeing: spirit, physical, mind, social and emotional (p.23). Similar practices were also found in a study by Sanesathid et al., (2018), where Buddhist monks in Laos, were found conducting dharma teaching on moral (*sin-tham*) and meditation to the student, and in the rehabilitation centers.

The participants (students), who attended the *Chos Bshad Las Rim* felt that they could not connect themselves with traditional monastic teaching, which are directly translated from the religious scriptures, and also the teaching is mostly in form of lecture. However, when taught with visual presentation, they are able to connect and understand the content taught. For instance, participant C112 said, “the picture of hell realm caught my attention, and it reminded me of my action towards my parents and my addiction.” Similarly, some of the participants said that it is easier and relatable when *Chos Bshad Las Rim* is taught through stories and relevant examples. While others said *Chos Bshad Las Rim* is boring and lengthy but if shortened ... it would be more exciting”.

The conduct of *Chos Bshad Las Rim* has shown significant impact on the attitude of youth towards drugs. Some of the programme implementers said that youth who attended *Chos Bshad Las Rim* are less likely to involve in drug use, than those who have not attended. For example, C111 said, “After attending *Chos Bshad Las Rim*, it empowered me to fight drug addiction.” Several studies have identified religiosity as a protective factor against drug use and addiction (Adamezky & Palmer, 2008; Knight, et al., 2007). Similar findings were also reflected in Nuken (2011), which reports that youth, who are exposed to religiosity, has significant impact on the attitude towards substance use.

When asked about the effectiveness of the programme, the participants said that *Chos Bshad Las Rim* was a timely intervention. For example, participant C112 said, “It is an opportunity to train our mind, and I learnt about ethics and eight-fold path. Similarly, C19 said, “I learnt the importance of life, value of helping people in need, and “it empowers us to fight our depression not by drugs” (C111). On the contrary, one participant said “To be honest, it is difficult to

understand the meaning” (CI14). These could be attributed to the fact that most of the teachings are directly from the Buddhist text. For example, one of the programme implementer stated that:

There are many Buddhist approaches to treat addiction. However, it is not easy to apply these real situations because most of the Buddhist terms are in *Chokyed* (religious language), and difficult to translate precisely in Dzongkha (National language) and make them understand (PI2).

In addition, some programme implementers said, students have little exposure to Buddhist studies in the school. This limited exposure to Buddhist studies deprive youth from understanding the sacred values and principles of Buddhist teaching (PI4 &PI5). Similar finding was also reflected in Rinchen (2014), which reported that the current mode of education system in Bhutan, does not focus more on time-tested vehicle of profound wisdom to help youth develop positive mind. Besides that, the mode of instruction to Buddhist values and ethics in schools is through one single Dzongkha language class which deprives youth from understanding the sacred values and principles of Buddhist teaching.

Approaches to impart *Chos Bshad Las Rim*

Buddhism does not stop at explaining human suffering but also provides a path to alleviate this suffering and realise the ultimate truth which gives rise to inner happiness and peace. The programme implementers from the Buddhist monasteries view Buddhism as a religion and associate its approaches with elements of beliefs and local practices, often leading to treat Buddha as deity, who can heal all sufferings.

The key findings that emerged from the data were discussed under three themes: (a) cause and effect (Karma); (b) meditation; and (c) youth engagement in the monastery.

Cause and effect (Karma)

Choeshed programme emphasises on cause and effect or Karma, which is considered to be the foundation of all Buddhist study and practice. In the Buddhist tradition, karma refers to the action driven by intention (*cetana*), which leads to future consequences. This concept has been related to drug addiction (which causes harm for self and other sentient beings) as an act, which gathers a lot of negative karma. In other words, an addict is the cause of his/her own suffering but also suffering of others around him or her (Chodron, 2009).

A majority of the programme implementers highlighted cause and effect as one of the effective approaches to deal with drug addiction. According to them, Karma means essentially

the moral causality that good actions bring good results, and bad actions bring bad results. This could be attributed to the strong influence of Buddhist worldview of accumulating good deeds in this birth that leads to rebirth in the higher realm. In the Bhutanese society where buddhist principles and beliefs have a strong influence in people's daily lives, the concept of karma is often associated with the traditional way of explaining illness, misfortune and unsuccessful life. The misfortune a person experiences is often attributed to the law of karma. For example, the common term (*Tsho ma saap*), which means one has not accumulated good merit in the previous birth, is often heard, to describe the unequal suffering of human beings in the world. And most often, the term (*Tsho ma saap*) is also thrown at youth who are addicted to drugs, as they are found engaging in destructive behavior and not valuing the preciousness of human life (Calabrese & Dorji, 2013).

Some of the programme implementers said linking karmic actions with the six realms was found to be effective in making youth realise the consequences of taking drugs. For example, PI6 said, "visually showing them the hell realm was effective in explaining about the consequences of drug use and addiction". The programme implementers also strongly felt that youth should be made aware of the ten virtuous deeds: three sins of the body, three sins of speech, and four sins of mind. Teaching youth to refrain from destructive behaviors caused by lack of self-discipline, discipline of mind, body and speech and how these sins can be avoided by understanding the concepts of cause and effect (karma). Studies have explained that good or bad karma can be modified by the conditions under which present actions are performed. For example, when someone indulges in drugs, the effect or the side effect is evident within a short period of time such as loss of health, loss of jobs and family (Santina, 1984).

Some of the participants with problem of substance abuse and addiction articulated the benefit of attending sessions on cause and effect. These benefits include understanding of the preciousness of life and value of right living, right understanding and right communication (CI10, CI14). According to Venerable Sayadaw (1994), the law of karma is not rigid but allows for modification. For example, Buddha has said, "Everyone has a certain amount of free will to mould one's life or modify one's action". Even the most vicious person can become virtuous if he wants to bring change in his life and make the effort accordingly. However, everything in this world, including man himself is subject to conditions and without the necessary conditions, nothing can arise (as cited in Sayadaw, 1994, p.84).

The findings too showed that teaching the concept of Karma has shown a positive impact in bringing change in the youth's attitudinal behavior. However, the findings also revealed that

there is lack of learning materials in print as most of the *Chos Bshad Las Rim* is carried out through oral transmission.

Meditation

The programme implementers from the Buddhist monasteries reported meditation as one of the effective tools to train the mind of youth with addiction. According to them, meditation is considered as a personal religious practice to train one's mind for better mental ability, and to attain nirvana. Meditation was seen as one of the effective tools to train the mind and bring a sense of purpose in life for those youth with addiction. For example, one of the programme implementers expressed that, "If someone is sick due to illness then the patient has to be treated with medicine, but for addiction issues, training of the mind is required to treat addicted youth" (P12).

These findings are supported by numerous literature. For example, the Dalai Lama (2005) emphasises that meditation helps to become aware and see things as they are. Similarly, Kyabgon (2013) reports that through the practice of meditation, we are able to differentiate the good thoughts from bad thoughts.

The participants who attended the *Chos Bshad Las Rim* expressed different understanding of meditation through their own experiences. For some, it was a practice to control their mind and eradicate their negative thoughts, while for others it was showing direction to righteous living and conduct. Some of the participants also mentioned that attending *Chos Bshad Las Rim* was like social gathering where they get to meet their friends.

Some of the programme implementers questioned the validity of the current practice of meditation introduced in schools. One of the programme implementers argued that meditation practice with no proper guidance, is a kind of punishment for youth and instructing them to stay silent for a while and "remaining silent is not a real meditation in Buddhism" (P15). In Buddhism, it is important to train the mind to be in better control of itself, meditate for a long duration and subdue one's mind from the five poisons (*dug lnga*), the five negative emotions, which are bewilderment (*gti mug*), attachment (*dod chags*), aversion (*zhe sdang dvesa*), jealousy (*phra dog, irsya*), and pride (*nga rgyal*) (P16). These could be attributed to the fact that most of the meditation practice taught under the green school project were teachers, who may have undergone a week training and lack experiential experience. In addition, meditation session is carried out as a part of school culture, where the students are asked to stand still for few minutes during the morning assembly. These findings are significant and may have implication on the Ministry of Education (MoE).

On the contrary, the *Gzhung Gra Tshang* has introduced meditation in schools and colleges. Although, the importance of meditation along with the religious discourse are highlighted, there is no follow up on the programme taught by the *Gzhung Gra Tshang* in schools. These findings are significant and have implications for the *Gzhung Gra Tshang* and the Ministry of Education.

Currently, *Chos Bshad Las Rim* is conducted only once a year and most often not scheduled in the annual calendar. Therefore, most of the students find it difficult to practice meditation on their own. These findings have implications for the Ministry of Education (MoE) as *Chos Bshad Las Rim* is offered in the educational settings. MoE could collaborate with *Gzhung Gra Tshang* and train teachers in meditation so that they can continue the practice of meditation effectively and efficiently.

Youth engagement in the monastery

One of the key findings that emerged from the interview was youth engagement in the monasteries. Youth engagement in this study refers to engaging youth in programme such as “*lekshey lamten*” and “*namshey gomdrel*” for higher secondary to primary schools in the monastery during their summer and winter break. Majority of the programme implementers said such engagements provide an opportunity for youth to enroll in the monastery for ten days to recite prayers, attend and experience the life of a monk which helped them to discipline their mind and habits.

The programme implementers believed that engaging youth in the monasteries helped them to reflect on their addictive behavior and following a disciplined life helped the youth in controlling their mind. For example, P16 said, “visiting religious sites, chanting prayers, and following a disciplined life helped youth in controlling their mind”. Such engagement has brought significant change in the behavior of students with addiction issues. A majority of the programme implementers feel that the inability to be in control of one’s mind is the cause of drug addiction. Therefore, it is important to isolate them from the present environment (P17). Majority of the programme implementers reported positively on the youth engagement programme. For example, C19 said, “This programme helped me to understand suffering and cause and effect of taking drugs”. Likewise, Participant C113 said “circumambulating chorten, chanting mantra and visiting religious sites helped me to overcome my problems. These findings were supported by Groves and Farmer (1994), which highlight that engaging in dharma provides confidence for an addicted person to believe that they can be happy without indulging in addictive behavior. Studies on similar practices emphasise the importance of Buddha dharma teaching in shaping youth and engaging

in ethical behavior in terms of speech, bodily action and livelihood (Borchert, 2008; Groves & Farmer, 1994).

Conclusion and Recommendations

The current study provides an insight into the Buddhist approaches taken by the *Gzhung Gra Tshang* to tackle drug addiction among youths. This study identified *Chos Bshad Las Rim* as the model adopted by the *Gzhung Gra Tshang*. This study also identified approaches such as teaching cause and effect (Karma), meditation and engaging youth in the monasteries as effective methods for bringing about attitudinal change in their behavior. It is also evident that Buddhist intervention to drug addiction was context based and has shown significant impact in bringing positive change in the mind of the youth. Hence, the practice of teaching *Chos Bshad Las Rim* could be continued and strengthened.

The participants also identified meditation as one of the tools for mind training, although there is no follow up after the delivery of the *Chos Bshad Las Rim*. Therefore, it is imperative for the *Gzhung Gra Tshang* to collaborate with Ministry of Education to bring a systematic way to incorporate *Chos Bshad Las Rim* across the schools in Bhutan. Similarly, they can also collaborate with the Ministry of Education in developing reading materials and meditation programmes for the teachers so that they can train the students to continue and follow the meditation practice in a systematic way.

The study also showed that engaging youth in programme such as *lekshey lamten* and *namshey gomdrel* were found to be effective in a way of engaging youth with spiritual and cultural values, hereby cultivating positive attitude towards life. The *Gzhung Gra Tshang* could continue and strengthen to reach out across all schools in Bhutan. This study recommends the Ministry of Education to consider taking *Chos Bshad Las Rim* as part of the value education programme delivered in schools. MoE could also collaborate with *Gzhung Gra Tshang* on strategizing uniform delivery of the *Chos Bshad Las Rim* programme across all schools in Bhutan. Further for effective learning, MoE could collaborate with *Gzhung Gra Tshang* in developing materials on *Chos Bshad Las Rim*. A programme on mindfulness training could be imparted for the educators, which will bring in efficiency in the delivery the programme to the students.

Furthermore, the researcher recommends to *Gzhung Gra Tshang* to offer youth engagement programme across all schools in Bhutan.

References

- Adamczyk, A., & Palmer, I. (2008). Religion and initiation into marijuana use: The deterring role of religious friends. *Journal of Drug Issues*, 38(3), 717-741.
- Bhutan Narcotics Control Authority (2017). *Review of functions of drop –in- centre services*. Thimphu: Bhutan Narcotic Control Authority.
- Bowen, S., Chawla, N., Collins, S. E., Witkiewitz, K., Hsu, S., Grow, J., ... & Marlatt, A. (2009). Mindfulness-based relapse prevention for substance use disorders: A pilot efficacy trial. *Substance Abuse*, 30(4), 295-305.
- Borchert, T. (2008). Worry for the Dai Nation: Sipsongpannā, Chinese modernity, and the problems of buddhist modernism. *The Journal of Asian Studies*, 67(1), 107-142.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101.
- Calabrese, J. D., & Dorji, C. (2013). *Traditional and modern understandings of mental illness in Bhutan: Preserving the benefits of each to support Gross National Happiness*.
- Cozort, D. (2016). Inaugural conference on Buddhist ethics: A report. *Journal of Buddhist Ethics*, 23, 146-147.
- Chödrön, P. (2017). *Perfect just as you are: Buddhist practices on the four limitless ones: Loving-kindness, compassion, joy, and equanimity*. Penguin Random House Audio Publishing Group.
- Chodron, P. (2009). *Perfect just as you are: Buddhist practices on the four limitless ones: Loving-kindness, compassion, joy, and equanimity*.
- Lama, D. (2005). *The universe in a single atom: The convergence of science and spirituality*. Broadway & ISBN 978-0-7679-2066, 7.
- de Dios, M. A., Herman, D. S., Britton, W. B., Hagerty, C. E., Anderson, B. J., & Stein, M. D. (2012). Motivational and mindfulness intervention for young adult female marijuana users. *Journal of substance abuse treatment*, 42(1), 56-64.

- Groves, P. (2014). Buddhist approaches to addiction recovery. *Religions*, 5(4), 985-1000.
- Groves, P., & Farmer, R. (1994). Buddhism and addictions. *Addiction Research*, 2(2), 183-194.
- Gyeltshen, Y. (2018, January, 13). 4th winter mindfulness camp for Bhutanese educators and others: Organized by the Samdrup Jongkhar Initiative (SJI) and the Chokyi Gyatso Institute (CGI), Dewathang.
- Kyabgon, T. (2013). *The essence of Buddhism: An introduction to its philosophy and practice*. Boston: Shambhala Publications Inc.
- Knight, J. R., Sherritt, L., Harris, S. K., Holder, D. W., Kulig, J., Shrier, L. A., ... & Chang, G. (2007). Alcohol use and religiousness/spirituality among adolescents. *Southern Medical Journal*, 100(4), 349.
- Marma, A. (2017). Counseling and its importance: A Buddhist perspective. *Journal of the International Association of Buddhist Universities (JIABU)*, 7(1).
- Maté, G. (2010). *In the realm of hungry ghosts: Close encounters with addiction*. North Atlantic Books.
- McWilliams, S. A. (2014). Foundations of mindfulness and contemplation: Traditional and contemporary perspectives. *International Journal of Mental Health and Addiction*, 12(2), 116-128.
- Ngedup, S. (2006). *Executive order: Quality of education in MoE, 26th Education policy guidelines and instructions* (vol.26). (CoM/04/06/160).Thimphu: Retrieved from <http://www/education.gov.bt>
- Nuken, A. B. (2011). Risk taking behaviour a study of youth in Dimapur Nagaland. *International Journal of Scientific and Research Publications*,3(3).
- Rinchen, Y. (2014). *Feast for the fortunate: Positive intent action for youth*: Thimphu. Clear Light Production.

- Royal Government of Bhutan (2015). *National policy and strategic framework to reduce harmful use of alcohol*, 2015-2020. Retrieved from <https://www.gnhc.gov.bt>.
- Sanesathid, Q., Syladeth, S., Siripanya, K., & Boulidam, S. (2018). The current situation of Buddhist social work in Lao PDR. *Exploring Buddhist Social Work*. Shibuya, S. & Sanesathid (Eds.). Tokyo: Gakubunsha.
- Satel, S., & Lilienfeld, S. O. (2014). Addiction and the brain-disease fallacy. *Frontiers in Psychiatry*, 4, 141.
- Sayadaw, M. (1994). *The progress of insight: A treatise on satipatthana meditation*. Buddhist Publication Society.
- Sharma, M. K., Sharma, M. P., & Marimuthu, P. (2016). Mindfulness-based program for management of aggression among youth: A follow-up study. *Indian Journal of Psychological Medicine*, 38(3), 213.
- Taylor, C. (2010). *Enough! A buddhist approach to finding release from addictive patterns*. Boston: Shambhala Publications Inc.
- Thinley, D. P. (2012). Mindfulness education in the Royal University of Bhutan: Context, present status, and future possibilities. *Happiness (GNH) in Bhutan Janet Ward Schofield 1 the Role of Critical Pedagogy in enhancing the Values and Principles of Gross National Happiness in the Royal University of Bhutan*, 97.
- Thinley, P. (2016). Overview and 'heart essence' of the Bhutanese education System. *In Education in Bhutan* (pp. 19-37). Springer Singapore.
- Tsering, T. (2006). *Buddhist psychology: The foundation of Buddhist thought* (Vol. 3). Simon and Schuster.

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The Educational Relationship between Bhutan and Australia

Dolay Tshering, Jeanette Berman and Judith Miller

Abstract

Education has been the central pillar of friendship and cooperation between Australia and Bhutan for more than five decades. Formal diplomatic relations between the two countries started in September 2002 and since then, areas of collaboration have diversified to agriculture, trade, water, energy and connectivity as well as support for Non-Government Organisations and volunteer programs. Enduringly, education remains the core basis of the friendship and cooperation between the two countries since the first cohort of five Bhutanese students were admitted at Hale School in Western Australia under the Colombo Plan in 1969. This article provides a comprehensive foregrounding of the bilateral areas of educational cooperation, enduring and productive partnerships between the two countries. This historical account of the relationship in education between the two countries of Bhutan and Australia is based on a range of information sources gathered from government websites, unpublished reports from universities, press releases, and peer reviewed book chapters and journal articles. The culmination of this report identifies a need for an empirical investigation of the personal and professional outcomes of this relationship.

Key words: *Bhutan, Australia, collaboration, education, scholarships*

Introduction

Since 2005, close to 7,000 Bhutanese students have graduated from Australian institutions (Department of Home Affairs (DHA), 2019) and Australia has been the preferred English-speaking destination for higher education for decades. As an integral part of the Royal Government's long-term human resource development programme in critical areas and to meet the growing demand of Bhutan's fast-growing economy, Bhutanese students are sent to Australia for higher education annually (Department of Adult and Higher Education (DAHE), 2019a). Bhutanese students' access to higher education in Australia has been on the rise especially in the last five years and is expected to grow as Australia stands in a strategic position to grasp opportunities from the Asian century and continues to stand as the most favoured destination for international education (Department of Defence (DOF), 2012). In return, Australian students visit Bhutan under the New Colombo Plan initiative of the Australian Government to encourage young Australian students to study in Asian countries, representing now a two-way flow of students and 'lift knowledge' of the Indo-pacific within the citizens

(Department of Foreign Affairs and Trade (DFAT), 2019b).

Bhutan's Educational Journey

Bhutan chose to live in the state of self-imposed isolation for centuries, until opening her door to modernization with the first five-year plan of 1961 (Planning Commission (PC), 1999). Prior to the start of the first plan, there were about 400 students and around 45 teachers in 11 schools throughout Bhutan (Powdyel, 2005). Realising the need to develop human resources to expand much-needed socio-economic development, western education in Bhutan progressed specifically from 1962. Father William Mackey, a Canadian Jesuit priest was invited to Bhutan to start a school in the far east of Bhutan, using the English language as the medium of instruction. Accordingly, Fr. Mackey started Trashigang High School in 1962 from where the first batch of students graduated in 1969 (Dorji, 2016). From these humble beginnings of modern education, with a few schools and students in the 1960s, Bhutan today has 512 schools and 167,000 children who are taught by over 9,000 teachers (Ministry of Education (MoE), 2018).

As the number of schools and students grew and the demand for higher education rose, some schools were upgraded, and new colleges were established. Trashigang High School, which was upgraded to Sherubtse College, began providing undergraduate tertiary programs in 1983 under the auspices of Delhi University of India (Schofield, 2016). In the same year, the first Bachelor of Education (B. Ed) programme was also introduced at the National Institute of Education (NIE) in Samtse. Indeed, secular tertiary education in Bhutan is relatively new.

In line with the global higher education system and to incorporate and direct the colleges and institutes previously functioning under different ministries, the Royal University of Bhutan (RUB) was established in 2003 under the Royal Charter (Royal University of Bhutan (RUB), 2019). In addition to catering for undergraduate programs, Paro College of Education and Samtse College of Education which are constituent colleges under RUB offers Master degrees in education. The College of Natural Resources started the Master of Science in Natural Resources Management and Master in Development Practice in 2014 (College of Natural Resources (CNR), 2019). Gaeddu College of Business Studies offers a Master of Business Administration (MBA) program. The Royal Institute of Management, an independent institution, also offers a Master of Business Administration (MBA) in collaboration with the University of Canberra in Australia (Schofield, 2016) and some postgraduate diplomastudies. Except for the limited programs mentioned above, tertiary institutes so far have not been able to offer master's level courses across all areas of need, and the limited offerings have impacted on the availability of student placements within the country.

The second independent Bhutanese university, the Khesar Gyalpo University of Medical Sciences of Bhutan (KGUMSB) was officially launched in 2015 under an act of Parliament. KGUMSB offers few bachelor degrees and diplomas in paramedics besides offering limited Doctor of Medicine (M.D.) courses as a residency program (Khesar Gyalpo University of Medical Sciences of Bhutan (KGUMSB), 2019). In addition, the university plans to start a Bachelor of Medicine and Bachelor of Surgery degree (MBBS) for offer in 2022. Further, three private colleges; Royal Thimphu College, Norbuling Rigter College and Reldri Academy of Health Sciences which are operational currently provide undergraduate programs.

Notwithstanding, the increasing number of tertiary institutions in the recent past has not only given many Bhutanese students access to higher education but also contributed to much needed human resource requirement of the country. Currently, there are 19 Tertiary Education Institutes (TEI) offering various courses to 11,311 students (Gross National Happiness Commission (GHC), 2019). However, owing to limited places for study, government scholarships and choice of programs available in the colleges within Bhutan, access to higher education is limited to less than half of the students graduating high school annually (Department of Adult and Higher Education (DAHE), 2018b). The other half of graduating students, in order to gain access to higher education, have to travel abroad. Further, at least 10% of the students drop out of the system due to various reasons.

Bhutan's educational relationship with Australia

As Bhutanese tertiary education is in its infancy, with limited student placements, high school students, university graduates and many in-service people have to travel abroad for further studies. India has been hosting the maximum number of Bhutanese students especially at the undergraduate level owing to the geographical proximity, lower cost and other conveniences. Notwithstanding, Australia has been the preferred destination for higher education since 1969 when the first batch of five Bhutanese students from Trashigang High School were accepted at Hale School in Western Australia (Australia Awards (AA), 2019).

The journey of friendship between Australia and Bhutan started much earlier and Australia has been, from the beginning, unconditionally supporting human resources development which is the backbone of modern Bhutan (Dorji, 2016). In October 1962, Ashi Tashi Cheudzom Dorji, the Grand Aunt of His Majesty the Fifth King represented Bhutan as an observer at the 14th Colombo Plan Consultative Committee Meeting held in Melbourne. With support through the

then Senator John Grey Gorton who later became the 19th Prime Minister of Australia, helped Bhutan gain early membership to the Colombo Plan (Australian High Commission (AHC), 2017) and this membership eventually led Bhutan's entry into the United Nations in 1971.

With the entry into the Colombo Plan as a member nation, Bhutan not only achieved access to much needed socio-economic assistance, but also helped reveal to the world the existence of a small Himalayan Sovereign Kingdom of Bhutan. Furthermore, the Colombo Plan laid the foundation for relations between the two countries. Australia announced its first gift to Bhutan in August 1963, four-wheel drive trucks along with spare parts valued at £65,000 followed by awarding of scholarships to five Bhutanese students to study in Australia under the Colombo Plan. This event is important as it began the journey of educational partnership, support and assistance between Bhutan and Australia. Notable among the first group of students who came to Australia was the first Vice-Chancellor of the Royal University of Bhutan; Dasho Dr. Pema Thinley.

Formal diplomatic relations between the two countries was established in September 2002 (Ministry of Foreign Affairs (MoFA), 2019). In recognition to fostering Australia-Bhutan relations particularly in the education sector, the ambassador of Australia to Bhutan, Harinder Sidhu, on behalf of the Australian government, awarded the insignia of Honorary Officer within the General Division of the Order of Australia to Ashi Tashi Cheudzom Dorji in July 2018 ("Australia Confers", 2018). Further, the two countries celebrated 15 years of diplomatic relations and more than five decades of informal educational collaboration and friendship in 2018.

From the very beginning of capacity building initiatives in the 1960s, Bhutan has turned towards Australia for training of skilled and knowledgeable professionals across the critical areas of need. As a result of continued support received, around 50% of RUB's current faculty members have Australian qualifications. Furthermore, amongst the 29,000 civil servants currently working, more than 2,000 employees at the professional category have an Australian degree (Royal Civil Service Commission (RCSC), 2019). In addition, hundreds of Bhutanese students are currently studying at various tertiary institutions. Australia, for over five decades has unconditionally supported Bhutan in the field of education and is evident from the important projects and programs initiated so far. As suggested earlier, Bhutan's educational relationship with Australia is an outcome of cautious decisions, considering future human resource development opportunities amongst many other factors. Some of the notable initiatives that has impacted life of individuals and country are identifiable in terms of: resources committed (financial, capacity building, soft diplomacy) and tertiary institutional collaborations.

In terms of the resources committed, the financial supports can be identified through a range of sources including: the Australia Awards, Australian tertiary institutional scholarships, RGoB scholarships as well as many students fund themselves to study in Australia.

Australia Awards

Government of Australia has been investing a huge amount in education and training of emerging leaders and professionals from developing countries for over five decades by forming effective partnerships with national governments in the Asia-Pacific region (Cassity, 2010). It is a prestigious international scholarship offered by the government of Australia. The budget for 2019-2020 alone is \$305 million hosting 3,161 individuals from 55 different countries and the total expenditure for the award is consistent above \$300 million annually over the past decade (Department of Foreign Affairs and Trade (DFAT), 2019c). The total grant under the Australian Official Development Assistance (ODA) to Bhutan alone in 2019-2020 is estimated at \$6.4 million (Department of Foreign Affairs and Trade (DFAT), 2019d).

The objective of awarding scholarships and fellowships is to develop capacity of individuals, build people-to-people linkages and to return home to contribute to the socio-economic development of home countries (Department of Foreign Affairs and Trade (DFAT), 2019c). Bhutan has been a recipient country with more than 600 students since 2007 who have been beneficiaries of the Australia Awards initiative (Department of Foreign Affairs and Trade (DFAT), 2019d). Several Bhutanese students have also studied in Australia under the Colombo Plan, prior to reframing the country's aid policy in 2006 with the adoption of the White Paper (Henry et al., 2012).

Similarly, in order to contribute to the deep and lasting ties between Australia and partner countries, the Australian government has been supporting domestic students to study in the region under the New Colombo Plan. Until 2018 December, 208 Australian students have visited Bhutan under the New Colombo Plan (Department of Foreign Affairs and Trade (DFAT), 2019b).

Education has always been the flagship program of Australia's overseas aid initiative as it is viewed critically to delivering benefits in nation building, health, governance, productivity and gender equality resulting in achieving Millennium Development Goals (Henry et al., 2012). Politically, Australia, as a nation is viewed as a neutral country not only by Asia but also Africa and other aid recipient countries (Amazan, Negin, Howie, & Wood, 2016). For Bhutan, one of

the main priorities of the relationship is strengthening institutional capacity of tertiary institutes and Royal Institute of Management (RIM), a leading tertiary institute in Bhutan has been a recipient of the support program. Postgraduate study courses in public and business administration at the Royal Institute of Management have been established with the support of Australia's development initiative. Under the development cooperation, assistance has also been provided for Technical and Vocational Education and Training sector (TVET) to address youth unemployment and trade skill shortages. A two-year project to build capacity in Bhutan's TVET sector commenced in 2019 and scholarships for diploma studies were also started beginning 2020 academic session.

Australia's support to Bhutan has diversified in the recent past to agriculture, trade, water, energy and connectivity as well as support for NGO and volunteer programs. The support has also been extended to school feeding programs under the global development program (World Food Programme- WFP) and has provided regular funding under the partnership (Australian High Commission (AHC), 2017). In addition, a Memorandum of Understanding (MoU) was signed on 15 May 2012 between Australia and Bhutan to formalise the launching of a volunteer program in Bhutan by the Government of Australia (Ministry of Foreign Affairs (MoFA), 2019). The volunteers are focused especially in the fields of health and education, including special education, in Bhutan. Notably, diversification of support programs and development cooperation is evidence of Australian willingness to render continued support to Bhutan and strengthen bilateral relations to the next level. As Bhutan and Australia celebrated 15 years of successful diplomatic relations, the people of two countries must also rejoice the five decades of relationship in the field of education.

Australian tertiary institutional scholarships

Notable amongst Australian universities that has educated Bhutanese students and also made significant contributions to Bhutan's education system since late 1990s is the University of New England (UNE). UNE has a long-standing linkage with Bhutan through Dr Barry Harley, a 1960-1961 Bathurst Teachers' College and later a UNE Master of Educational Administration graduate, who became a faculty member at the Armidale Teachers' College during the 1960s (School of Education, University of New England (UNE), 2019). As per the vision of Dr Harley, Dr Jim Irvine, since 1991 through UNICEF, has helped Bhutan to establish small community schools, train young Bhutanese teachers in curriculum design, teaching pedagogy and monitoring besides many other important assignments. With the professional support of UNE, Bhutanese educators were admitted in mixed-mode study and the program was designed for senior Bhutanese educators to continue working full-time in Bhutan while undertaking UNE

courses which included mandatory residence at UNE for at least one month per year. The university's education faculty members such as Dr David Laird and Dr Tom Maxwell played key roles in the early days of the 'mixed mode studies' programme, and the associated attachment to local schools, and made support visits to Bhutan on several occasions (School of Education, University of New England (UNE), 2008). It should be noted that the schools attachment programme was hailed within the South Asia Region as a unique approach to observing and rewarding commitment of teachers serving in isolated and difficult schooling situations. Their significant contributions to UNE- Bhutan links extended to other important areas of support during the past 30 years.

One of the important projects implemented by UNE was the Bhutan Multigrade Attachment Program (BMAP). Multigrade teaching was chosen by the Ministry of Education in Bhutan as an urgent and strategic move to teach children in rural areas where it is not feasible to create full primary schools and the distances were too long to get all the children to existing schools (Maxwell, 2001). During this critical time, UNE, with support from the regional schools in Armidale, New South Wales came forward to help Bhutan in training Bhutanese teachers and school leaders in multigrade teaching. As highlighted in a BMAP report submitted to Ministry of Education from 1993 to 2008, there has been significant student learning and professional development in the classrooms of the educators involved in BMAP program and a wider range of teachers have benefitted through the professional development activities initiated by BMAP participants. BMAP is a successful story and provides strong evidence of undisputed educational partnership and collaboration between MoE, Bhutan and UNE. UNE faculty members such as Dr Tom Maxwell, Dr David Laird, Dr Warren Halloway and Dr Peter Ninnes have played a very important role in making the program effective and beneficial to Bhutanese schools for more than a decade, and Bhutan owes the deepest gratitude to these pioneers. The outcome of this project was that the university advised and trained 155 multigrade teachers under the BMAP program that started in 1993 and formally ended in 2008 (School of Education, University of New England (UNE), 2008).

UNE has been actively participating in the educational journey of Bhutan in the last three decades and the collaboration and friendship has not ended. Another commendable educational relationship worth highlighting between UNE and Bhutan is the capacity building in research. UNE so far, has awarded 18 PhD degrees to Bhutanese scholars which is the highest amongst all universities around the world (University of New England (UNE), 2019). The university also awarded an honorary doctorate to the first Vice Chancellor of the Royal University of Bhutan, Dasho Pema Thinley. Further, UNE has trained 35 undergraduate students in technical and professional field including urban and regional planning and awarded 40 master's degree in

various programs (School of Education, University of New England (UNE), 2019). There are nine current PhD students and one scheduled to join for 2020 academic session, mostly on UNE HDR scholarships who will soon add to the doctoral cohort in Bhutan. With the increasing number of PhD graduates, research capacity especially within RUB is expected to become stronger.

Since the inauguration of the Royal University of Bhutan (RUB) in 2003, UNE has continued its involvement especially with the two colleges of education. UNE was involved in developing a Diploma programme in Early Childhood Education through the expertise of Dr Margaret Brooks and Dr Robin Jones. Tertiary study for inclusive education in Bhutan, which is still in its infancy stage, is being restructured with support from Dr Jeanette Berman. Dr John Haynes and Dr Judith Miller are supporting two colleges of education in designing Diploma curriculum in Sport Coaching and Administration. In addition, UNE has helped in drafting a RUB higher degree research (HDR) pathway, policy and associated procedures for Royal Education Council (REC), INSET projects, reviewed Bachelor of Education (Primary) in distance education mode in-service program besides many other commendable joint projects initiated (School of Education, University of New England (UNE), 2019). The RUB Centre for University Learning and Teaching (CULT) was established in 2008 to improve learning and teaching at the Royal University of Bhutan (RUB). The Project was directed by Dr. Tom Maxwell with Ms Jennifer Reid as research assistant and Ms Deki Gyamtso and Mr Kinzang Dorji were the in-country associates. These developments highlight the opportunity to continue to grow the joint research publications between UNE academics and those from the two colleges of education in Bhutan.

Queensland University of Technology (QUT) has also a longstanding relationship with Bhutan and has been supporting human resource development for many years. The university, through Australia Awards has supported Bhutan in building capacity of the country's first Family Bench to deal with cases of violence involving child abuse (Queensland University of Technology (QUT), 2018). University of Canberra (UC) in collaboration with Royal Institute of Management (RIM) is offering a joint UC-RIM Master of Business Administration (MBA) program which is first of its kind in Bhutan (University of Canberra (UC), 2018). RUB has also signed Memorandum of Understanding (MoU) with several Australian universities including Edith Cowan University (ECU) in Western Australia (Lhamo, 2018) and UNE to foster collaboration in student and faculty exchange, capacity building and joint research.

Universities from all other states in Australia have also either hosted Bhutanese students, initiated joint projects or organised study trips to Bhutan under the New Colombo Plan initiative

which is evidence of new levels of educational access and relationship between the people of the two countries. Currently, tertiary institutes in Canberra, Queensland and Western Australia are hosting maximum Bhutanese students owing to various factors including free access to education for dependents and better part-time job opportunities. As the internationalization of Australian education continues to expand with the growth of global educational mobility (Hayden & McIntosh, 2018), Bhutanese students' access to higher education in Australia will continue to rise and is expected to double in the coming years.

Royal Government of Bhutan (RGoB) Scholarships

As an integral part of the Royal Government's long-term human resource development programme in critical areas and to meet the growing demands of Bhutan's fast-growing economy, various ex-country scholarships in both professional and generic fields are implemented annually (Department of Adult and Higher Education (DAHE, 2019a). The Royal Civil Service Commission deals with in-service training of civil servants and the Department of Adult and Higher Education under the Ministry of Education is mandated to look after the training of pre-service candidates. These two government agencies have been collaborating and building linkage with Australian educational institutes to place students for higher studies. Non-governmental organizations, corporations, autonomous agencies and private sector agencies have also been working with Australian tertiary institutes for training of their employees. As a result, hundreds of graduates trained in Australian universities are currently working in various technical and professional fields in Bhutan and are contributing to socio-economic development of the country. Some of the technical programs such as Bachelor of Urban and Regional Planning were recently implemented for the first time and are expected to contribute to systematic planning of infrastructure development in extended cities and new district towns across the country. Besides building academic proficiency, educational experience and exposure to language and culture has helped our teachers at both school and tertiary institutions to teach international best practices to our young children and teacher trainees who have had very less exposure to the western world.

Self-funding

Access to tertiary education in Australia is not only limited to sponsored students. In fact, large numbers of students on self-funding have already found a place to study in Australia's multicultural institutions. As of November 2018, ongoing Bhutanese student numbers has increased to over 2000 (Australian High Commission (AHC), 2017) and by June 2020, the number is expected double largely comprising students who are self-funded. Considering the

size of population in Bhutan, having more than four thousand students in Australia is a huge number by any standard. With better access to financial institutions in Bhutan for student loans, improved living standards, a greater number of students completing undergraduate programs, friendlier Australian immigration regulations, proximity to home country, better quality of education, job opportunities and other progressive factors, the student number is expected to grow even higher in the coming years.

Undoubtedly, the movement of students in large numbers has helped strengthen people-to-people contact, to portray Bhutan's cultural identity in a multi-cultural environment, to learn best practices and a working culture that contributes to encouraging civic disciplines upon returning to Bhutan and to gain skills and knowledge that is instrumental in the country's socio-economic development. The inter-movement of students between the two nations is an evidence of undisputed educational relationship which is expected to grow in the years to come.

Outcome of the Educational Relationship

The outcome of international education is visible in this globalized world. Undisputedly, globalization has become a core connecting phenomenon in all aspects, no matter which continent you are located, or how small a country is (Hirst, Thompson, & Bromley, 2015). Movement of goods and services between countries and regions has become inevitable in this era and education is no exception. Consequently, globalization in education is so rampant that even educational policies in many countries are influenced significantly (Lauder, Brown, Dillabough, & Halsey, 2006). Student movement across the regions is on the rise and countries such as United States, United Kingdom, China, Australia, Canada and France are top host destinations for international students. For various reasons, such as better education, job prospects, the desire to discover new life in a foreign land, or a combination of these reasons, millions of students travel across the globe every year (Baas, 2006). For Australia, education is the third largest service export, a soft diplomacy and an important source of revenue (Sawir, 2005).

International education includes the movement of books, ideas or persons across borders and represents cultural, educational or intellectual relationships of groups from different countries (Fraser & Brickman, 1968). It also involves mobility of faculty, students or institutions across the frontiers (Laifer & Kitchen, 2017). However, some argue that international education is about learning ideologies from different perspectives and not necessarily taking on the views of one single host country (Hayden & Thompson, 1995). Whatever it may be, internationalization of education in English speaking countries has attracted thousands of

students into these countries every year and Australia currently has close to a million international students (Department of Education & Training, 2018). For Bhutanese students, getting the opportunity to study abroad is a lifetime experience and an eye-opening journey that must have an impact on each of them, their families and on the Bhutan itself.

Even students from developed countries agree that studying abroad is an important part of their academic achievement and personal growth. In a study conducted by the International Education of Students (IES) to over 3,400 American students who studied abroad between 1950 to 1999, it was reported that the participants were benefitting immensely from the academic and intercultural implications of an educational experience abroad (Dwyer, 2004). As a result of study abroad, students have been increasingly getting jobs in international and multinational organizations in addition to student's personal, intercultural and social growth. The study abroad has also led to long-lasting friendships with countrymen and impacts on current relationships (Dwyer & Peters, 2004). Such positive experiences are consistent with a similar study where Saudi Shiites and Sunni students, while studying in the United States have had much greater level of interaction and cooperation in contrast to their religious rivals back home (Hall, 2013). This is one example of the positive engagement and powerful impact of study abroad.

Several studies are also consistent in their findings on the expected outcome of study abroad. Chinese and Asian students pursue postgraduate studies abroad as the enhanced qualification and foreign degree will give them added advantage over other students who have had no additional qualifications from abroad. In a study on the impact of western education on future Chinese Asian managers, participants agreed that western qualifications gave them a competitive advantage at home along with improved opportunities. The participants also shared that the additional degree would provide career mobility and enable them to go into a different field when they returned home (Curtis & Lu, 2004). Interestingly, many returning Bhutanese doctorates lost their seniority in service due to study abroad (Maxwell, 2019). Notwithstanding, overall opportunities are expected to be better with enhanced knowledge, skills and qualifications.

From the economic perspective, education is the third largest service export for Australia (Sawir, 2005). Since the commencement of the Colombo Plan for Co-operative Economic Development in South and Southeast Asia in 1950s, international education has not only been a soft diplomacy but also Australia's biggest services export earner, contributing over \$17.1 billion in 2014-2015, \$ 20.3 billion in 2015-2016 and \$ 34 billion in 2017-2018 to Gross Domestic

Product (Universities Australia (UA), 2016).

Bhutan, however, should be viewed from a different perspective as it definitely is insignificant in terms of the international student market. The Australian Government and the educational institutions continue to provide access to Bhutanese students under a range of scholarship schemes due to the longstanding relationship between the two countries. The government of Australia has so far awarded scholarships to over 600 students under the Australia Awards scholarship program besides many students sponsored by each of the tertiary institutions (Department of Foreign Affairs and Trade (DFAT), 2019d).

Bhutan too has started hosting international students, mostly from Australia and United States. As part of the international education program, students from other countries such as Japan, India, Switzerland, Thailand, Poland and Canada are being hosted in Bhutan (Royal University of Bhutan (RUB), 2017). By December 2018, 208 Australian students including students from the University of New England, Edith Cowen University, University of Canberra, University of Technology Sydney, and Queensland University of Technology have had the opportunity to study in Bhutan under the Australian Government's New Colombo Plan Scholarship scheme. For this particular initiative, Australia's former Foreign Minister Julie Bishop has clearly stated to the New Colombo Plan scholarship recipients that the nation has relied upon the friendship and connections that Colombo Plan scholars would make and people-to-people relationships that are nurtured (Minister for Foreign Affairs (MFA), 2016). It is evident, from this statement that education plays a critical role in building friendship amongst nations and that from an Australian perspective, internationalization of education is a potential source and expression of soft power especially in Indo-Pacific region (Laifer & Kitchen, 2017).

Laifer (2017) asserts that the idea behind such programs is to encourage international students to experience multicultural values and diversity of Australia and build a strong international network and relationship with the scholars who have the potential to rise to influential positions over the years. For instance, some of the current Bhutanese government ministers, senior bureaucrats and several executives are alumnus of Australian tertiary institutions and this is exactly what is desired. It fulfils Australia's education strategy as these leaders understand more about Australia and has potential to create conditions for greater educational, cultural and economic exchange and cooperation between the two countries (Wyeth, 2018). But what is it doing to Bhutan?

Bhutan has a population of 681,720 persons (National Statistics Bureau of Bhutan (NSB), 2018), and has hundreds of students and their dependents returning from abroad annually. Bhutanese students' access to tertiary education in Australia has been on a consistent rise over five decades and the nature of educational relationship between educational institutes and organizations of Bhutan and Australia is exemplary. Australia has not only given access to Bhutanese students to experience international education but also sends their own students to Bhutan to learn best practices, experience pristine environment, rich ecology, undiluted culture and education system.

Conclusion

Irrespective of policy initiatives, five decades of educational collaboration between Bhutan and Australia is a successful story and will be cherished in the history of the educational journey of Bhutan. Australia's contribution in building strong foundations of education, both in school and tertiary level in Bhutan is commendable. Further, as hundreds of Bhutanese students flock to Australia, people-to-people contact, friendship and connections are going to grow from strength to strength and continue to fulfil the aspirations of both the countries. What is of vital interest is how the personal and professional lives of the Bhutanese scholars are impacted by this living and studying opportunity in Australia, and what difference this makes when they return to educate young Bhutanese in this complex, global world. There appears to be no known published studies on this topic available. Therefore, these questions are currently forming the basis of an empirical study to understand the implications of the educational relationship between Bhutan and Australia.

References

- Amazan, R., Negin, J., Howie, L., & Wood, J. (2016). From extraction to knowledge reproduct - ion: The impact of Australia's development awards on Uganda and Mozambique. *International Education Journal: Comparative Perspectives*, 15(1), 45- 65.
- Australia Awards (2019). Stories. Dasho Pema Thinley. Retrieved from <https://australiaawardsbhutan.org/stories/dasho-pema-thinley/>
- Australian High Commission, New Delhi. (2017). High Commissioner's Keynote Address on the Australia-Bhutan Education Partnership. Retrieved from <https://india.embassy.gov.au/ndli/HOMspeech211117.html>

Baas, M. (2006). Students of migration: Indian overseas students and the question of permanent residency. *People and Place*, 14(1), 8-23.

Cassity, E. (2010). New partnerships and education policy in Asia and the Pacific. *International Journal of Educational Development*, 30(5), 508-517.

College of Natural Resources. Programs. Retrieved from http://www.cnr.edu.bt/?page_id=248

Curtis, S., & Lu, W. (2004). The impact of western education on future Chinese Asian managers. *Management research news*, 27(10), 58-68.

Department of Adult and Higher Education. (2019a). Publications and Forms. Retrieved from <http://dahe.gov.bt/index.php/publications>

Department of Adult and Higher Education. (2018b). State of Tertiary Education in Bhutan 2017. Retrieved from http://dahe.gov.bt/images/pdf/State_of_Tertiary_Educatin_in_Bhutan_2017.pdf

Department of Defence. (2012). Australia in the Asian Century White Paper. Canberra, Australia: Author. Retrieved from: http://www.defence.gov.au/whitepaper/2013/docs/australia_in_the_asian_century_white_paper.pdf

Department of Education and Training. (2018). International Student Data 2018. Retrieved from https://internationaleducation.gov.au/research/International-StudentData/Pages/InternationalStudentData2018.aspx#Annual_Series

Department of Foreign Affairs and Trade. (2019a). Development cooperation fact sheet. Retrieved from <https://dfat.gov.au/about-us/publications/Documents/development-cooperation-fact-sheet-bhutan.pdf>.

Department of Foreign Affairs and Trade. (2019b). About the New Colombo Plan. Retrieved from <https://www.dfat.gov.au/people-to-people/new-colombo-plan/about/Pages/about>

Department of Foreign Affairs and Trade. (2019c). Australia Awards. Retrieved from <https://dfat.gov.au/people-to-people/australia-awards/pages/australia-awards.aspx>

- Department of Foreign Affairs and Trade. (2019d). Overview of Australia's aid program to Bhutan. Retrieved from <https://www.dfat.gov.au/geo/bhutan/development-assistance/Pages/development-assistance-in-bhutan>
- Department of Foreign Affairs and Trade. (2019). DFAT Blog. Retrieved from <https://blog.dfat.gov.au/2017/08/31/an-aussie-volunteer-returns-home-to-bhutan/>
- Department of Home Affairs and Trade (2019). Student Visa Data. Retrieved from <https://data.gov.au/dataset/ds-dga-324aa4f7-46bb-4d56-bc2d-772333a2317e/distribution/dist-dga-a0726af7-8e0f-4fe0-ac30-f8217483f6e9/details?q=student%20visa%20data>.
- Dorji, J. (2016). International Influence and Support for Educational Development in Bhutan. Chapter in *Education in Bhutan: Culture, Schooling, and Gross National Happiness*. Matthew Schuelka & T.W. Maxwell (eds). (pp 109-124). Singapore: Springer.
- Dwyer, M. M. (2004). Charting the impact of studying abroad. *International educator*, 13(1), 14-17, 19-20.
- Dwyer, M. M., & Peters, C. K. (2004). The benefits of study abroad. *Transitions abroad*, 37(5), 56-58.
- Fraser, S. E., & Brickman, W. W. (1968). *A history of international and comparative education: Nineteenth-century documents*: Scott, Foresman.
- Gross National Happiness Commission (2019). Twelfth Five Year Plan 2018-2023. Retrieved from https://www.gnhc.gov.bt/WEB_Version_Updated-27MAY.pdf
- Hall, T. R. (2013). *Saudi male perceptions of study in the United States: An analysis of King Abdullah scholarship program participants*. Kentucky, USA. A Dissertation Presented to The Faculty of the Educational Leadership Doctoral Program.
- Hayden, M., & McIntosh, S. (2018). International education: the transformative potential of experiential learning. United Kingdom: *Oxford Review of Education*, 44(4), 403-413.
- Hayden, M., & Thompson, J. (1995). International schools and international education: A relationship reviewed. Oxford, UK: *Oxford review of Education*, 21(3), 327-345.

- Henry, K., Drysdale, P., Livingstone, C., Denton, J., de Brouwer, G., Gruen, D., & Smith, H. (2012). Australia in the Asian Century White Paper, Canberra: The Commonwealth of Australia. In.
- Hilal, K. T., Scott, S., & Maadad, N. (2015). The Political, Socio-Economic and Sociocultural Impacts of the King Abdullah Scholarship Program (KASP) on Saudi Arabia. *Australia: International Journal of Higher Education*, 4(1), 254-267.
- Hirst, P., Thompson, G., & Bromley, S. (2015). *Globalization in question*: John Wiley & Sons.
- Khesar Gyalpo University of Medical Sciences of Bhutan. (2019). Faculty of Postgraduate Medicine. Retrieved from http://www.kgumsb.edu.bt/?page_id=60
- Australia confers Order of Australia honour to Ashi Tashi Cheudzom Dorji. (2018, July 12). Kuensel. Retrieved from <http://www.kuenselonline.com/australia-confers-order-of-australia-honour-to-ashi-tashi-chodzom-dorji/>
- Kuensel. (2018). ECU and RUB sign MoU for academic collaborations. Retrieved from <http://www.kuenselonline.com/ecu-and-rub-sign-mou-for-academic-collaborations/>
- Laifer, N., & Kitchen, N. (2017). *Making Soft Power Work: Theory and Practice in Australia's International Education Policy*. London, UK: Politics & Policy, 45(5), 813-840.
- Lauder, H., Brown, P., Dillabough, J. A., & Halsey, A. H. (2006). *Education, globalization, and social change*. Oxford, United Kingdom:
- Lhamo, P. (2018, August 18). ECU and RUB sign MoU for academic collaborations. Kuensel. Retrieved from <http://www.kuenselonline.com/ecu-and-rub-sign-mou-for-academic-collaboration>.
- Maxwell, T. (2001). International Collaboration for In-service: The Bhutanese Multigrade Attachment Program Australia. *Asia-Pacific Journal of Teacher Education*, 29(3), 289-296.
- Maxwell, T. (2019). Impact of education doctorates: the case of developing country, Bhutan. *Studies in Continuing Education*, 41(2), 226-240.

- Ministry of Education (2018). Annual Education Statistics 2018. Retrieved from <http://www.education.gov.bt/wp-content/downloads/publications/aes/Annual-Education-Statistics-Book-2018.pdf>
- Minister for Foreign Affairs. (2016). Retrieved from https://foreignminister.gov.au/releases/Pages/2015/jb_mr_151201.asp.
- Ministry of Foreign Affairs (2019). Press Release on the Signing of Memorandum of Subsidiary Arrangement (MSA) between the Royal Government of Bhutan and the Government of Australia concerning the Australian Volunteers Program to Assist Bhutan. Retrieved from <https://www.mfa.gov.bt/?p=879>
- Ministry of Foreign Affairs (2019). Press Release on Fifth Annual Bhutan-Australia Bilateral Consultation. Retrieved from <https://www.mfa.gov.bt/wp-content/uploads/2018/03/PR-182.pdf>
- National Statistics Bureau of Bhutan (2018). Population and Housing Census of Bhutan, 2017. Retrieved from http://www.nsb.gov.bt/publication/files/PHCB2017_national.pdf
- Planning Commission (1999). Bhutan 2020, A Vision for Peace, Prosperity and Happiness. Powdyel, T. (2005). The Bhutanese education assessment experience: Some reflections. *Quarterly Review of comparative Education* 35(1), 45-57.
- Queensland University of Technology (2018). QUT supports Bhutan's first Family Bench to combat domestic violence. Retrieved from <https://www.qut.edu.au/law/about/news-events/news?news-id=128828>.
- Royal Civil Service Commission. 2019. Civil Service Information System. Retrieved from <http://csis.rcsc.gov.bt/WebUI/Default.aspx>
- Royal Institute of Management (2019). International MBA Degree from RIM. Retrieved
- Royal University of Bhutan (2017). Annual Report, 2017. Retrieved from <http://www.rub.edu.bt/index.php/en/annual-reports/475-annual-report-2017>

- Sawir, E. (2005). Language difficulties of international students in Australia: The effects of prior learning experience. *International Education Journal*, 6(5), 567-580.
- Schofield, J. W. (2016). Higher education in Bhutan: Progress and challenges. Chapter in *Education in Bhutan: Culture, Schooling, and Gross National Happiness*. Matthew Schuelka & T.W. Maxwell (eds). (pp. 73-90). Singapore: Springer.
- School of Education, University of New England. (2008). Bhutan Multigrade Attachment Program, 2008 Final Report.
- Universities Australia. (2016). The Voice of Australia's Universities. International education generates a record \$20.3 billion for Australia. Retrieved from <https://releases/Internationaleducation-generates-a-record--20-3-billion-for-Australia#.XLPd-aYRXow>
- University of Canberra. (2018). UC Strengthening Ties with the Kingdom of Bhutan. Retrieved from <https://blog.canberra.edu.au/dvca/2018/06/28/uc-strengthening-ties-with-the-kingdom-of-bhutan/>
- University of New England. (2019). HDR Scholarships. Retrieved from <https://www.une.edu.au/research/hdr/hdr-scholarships>
- University of New England. (2019). Bhutan and UNE. Retrieved from <https://www.une.edu.au/about-une/faculty-of-humanities-arts-social-sciences-and-education/school-of-education/research/bhutan-une>
- Wyeth, G. (2018). In Bhutan, a win for Australia's International Education Strategy. The Diplomat. Retrieved from <https://thediplomat.com/2018/11/in-bhutan-a-win-for-australias-international-education-strategy/>

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Redesigning Direct Air Capture using Renewable Energy

Abhar Bhattarai, Bivek Baral and Malesh Shah

Abstract

With the increasing global threat of climate change, the world is very seriously looking into rapid solutions to the problem. Among the major identified solutions—increase in energy efficiency, development of renewables and the development of carbon capture and storage/utilization technologies, the case of Direct Air Capture, is relatively new and needs much research. Being a technology that's still in its early stage, the cost of this technology is still very high but given the urgency of climate change, this needs to be corrected and brought down to easily deployable levels. Thus, this research looks to explore simple solutions to decrease the running cost of Direct Air Capture by using renewable energy. Using the reference as the Direct Air Capture plant of Carbon Engineering, this research proposes the replacement of the contactor fans and the calciner (the most energy-intensive parts of the process) with a solar updraft tower and a solar power tower respectively, to show that ideally, 0.219 GJ energy could be saved in the air contactors, and a maximum value of 4.05 GJ energy could be saved in the calciner, thus leading to an economically much viable process for Direct Air Capture.

Key words – *climate change, direct air capture (DAC), carbon dioxide*

Introduction

Carbon Dioxide plays a significant role in the heat budget of the atmosphere (Hole, n.d.) (Fasihi, Efimova, & Breyer, 2019; Hole, n.d.). Since the very beginning of the planet, Carbon Dioxide and GHGs in general, have played a vital role in maintaining the temperature in the planet, thus keeping it habitable. But, with the increase in human intervention into natural process and cycles, and rapid burning of large quantities of fossil fuel, the level of CO₂ in our atmosphere has greatly increased, reaching dangerous levels. The planet has always regulated the balance of carbon dioxide in the atmosphere through natural sources and sinks like forests, surface, intermediate and deep waters of water bodies (Hole, n.d.). The ocean too, has always greatly buffered the immediate consequences of the rise in Carbon Dioxide levels, by acting as a huge sink. The level of Carbon Dioxide in the atmosphere today cannot be balanced merely by natural bodies. Thus, a method needs to be devised to bring the concentration of these GHGs in the atmosphere back to normal, to prevent any permanent damage from taking place.



Fig. 1. Levels of CO₂ in the atmosphere (“Climate Change,” n.d.)

The recent data for concentration of CO₂ in the atmosphere reads 408.55ppm for September 2019 (“Earth’s CO₂ Home Page,” n.d.). This concentration used to be around 280ppm for the pre-industrial era. Just comparing this data to the corresponding data in the previous year shows that September 2018 had a concentration of 405.59 ppm CO₂ in the atmosphere (“Earth’s CO₂ Home Page,” n.d.). This pace of increase of carbon concentration in our atmosphere is alarming.

Objectives of the Study

The purpose of this study was to explore and determine ways by which the current cost of direct air capture can be brought down. The research was performed with the objective of redesigning the existing general layout of Direct Air Capture used in Carbon Engineering using renewable source of energy, to investigate how the cost of direct air capture could be brought down.

Review of Literature

The Paris agreement aims to mitigate the effects of climate change by keeping the global rise in temperature well below 2°C and preferably even 1.5°C compared to pre-industrial era through the united effort of all the countries. To achieve this goal, the following three pillars have been set [4]:

1. Increase in energy efficiency
2. Increase in the use of low and zero-carbon sources of energy
3. Carbon capture and secure storage

Though the first two solutions to climate change have always been highly researched and worked upon (energy efficiency has always been prioritized, and the research and development of renewable sources of energy is at an all-time high); still, research into Carbon Capture and Utilization/ Storage is at a very young stage with only very few companies having recently started capturing CO₂ from the atmosphere in a large, commercial scale. Besides these companies, many have proposed novel and innovative solutions to capturing carbon from all their fields, but almost all of these remain only functional in laboratories or small demonstrative models, at max.

Even in the case of development of low and zero-carbon alternatives to fossil fuels, the development of the following key media is necessary (Jiang, Xiao, Kuznetsov, & Edwards, 2010):

1. Electric (battery) (This will require the upstream source of energy to be decarbonized first. Batteries are also further limited by their low net gravimetric and volumetric energy densities.)
2. Development of hydrogen combustion (Hydrogen, although ranking higher than batteries, is unlikely to compete with carbonaceous fuels.) Further, both these will require fundamental large-scale changes in energy infrastructure.
3. Biofuels (There are forecasts indicating a biomass limit, and biomass only will not be remotely enough in meeting the exceptional demands of transportation fuels.)

Reports like these conclude with the conversion of CO₂ back to carbonaceous fuels to be the only sustainable solution going forwards, highlighting even more the importance of carbon capture to keep the cycle going.

The capture of Carbon Dioxide from flue gas sources and exhausts is divided into the following three processes (Jiang et al., 2010):

1. Post-combustion capture
2. Pre-combustion capture
3. Oxy-fuel combustion

These three processes have varying degrees of efficiencies in the removal of CO₂ from exhaust gas streams. The average efficiencies of carbon capture in plants range from 50-94% (Leeson, Fennell, Shah, Petit, & Dowell, 2017). Further, the emissions from long distance transport like airplanes and other means of transportation like the millions of cars in streets all over the world cannot be captured using such devices (Fasihi et al., 2019). The use of conventional CO₂ capture technologies for the capture of emissions from small, widely distributed emitters like the transport sector, which in total account for 50% of the GHGs in the atmosphere,

is near to impossible (Seipp, Williams, Kidder, & Custelcean, 2017). These facts thus substantiate the need of a CO₂ capture solution that capture CO₂ independent of location and origin.

Direct Air Capture

Direct air capture (DAC) is a branch of technologies developed to capture CO₂ from air (Isobe et al., n.d.). Compared to capturing CO₂ from flue gases and exhaust streams, capturing CO₂ from air directly is thermodynamically unfavorable. Thus, to make DAC feasible, the energy requirements must be minimized and the corresponding carbon capture maximized (Isobe et al., n.d.).

Although plants alone have sustained this operation for centuries, the increasing anthropogenic emissions is now too much for the plants to take in (Goeppert, Czaun, Surya Prakash, & Olah, 2012). Biologically, these measures can be enhanced through the increase in activities like afforestation and BECCS, but these pose the problem of taking up too much land and food, and other enhanced biological methods like ocean fertilization and enhanced weathering can greatly bring out adverse side effects like changing ocean pH and altering its chemistry (Kohler, Hartmann, & Wolf-Gladrow, 2010; Smith et al., 2016). Other BECCS options include biochar, soil carbon sequestration, etc., that can be applied to a whole portfolio of NETs for effective climate change mitigation (Fuss et al., 2018; Minx et al., 2018).

The first artificial application of capturing CO₂ from the ambient air was introduced in the 1930s for cryogenic applications, after which it was further adopted into manned closed systems such as submarines and space stations (Schellnhuber, 2011). These systems dated back to 1965, were not regeneratable, however (Isobe et al., n.d.).

Due to the very dilute concentration of CO₂ in the atmosphere (400ppm), chemical sorbents with strong binding characteristics became widely discussed and researched. An aqueous solution of strong bases like Sodium Hydroxide and Potassium Hydroxide is used in PSCC technologies and researchers are now investigating its applicability to DAC technologies. An analysis was carried out for the physical and economic limits for BECCS and aqueous sorbent DAC, and it was concluded that the second option was more feasible in the long term (Keith, Ha-Duong, & Stolaroff, 2006). However, the requirement for high-grade (900°C) heat for aqueous solution-based DAC could increase the costs and require a dedicated source for heat, instead of just being able to utilize waste heat (Fasihi et al., 2019). Many researches have worked on improving this system through steps like minimization of energy usage in the air contactor, modifications in contactor packing, etc. (Stolaroff, Keith, & Lowry, 2008). After many theoretical

and experimental research in the field in the field of chemical and process engineering, reference (Keith, Holmes, St. Angelo, & Heidel, 2018) provided for the first time, a technical paper for a plant for capture of 1Mt CO₂/year using potassium hydroxide (KOH) based on a real pilot plant.

There have also been many researches in the field of carbon capture using solid absorbents and adsorbents, employing processes like TSA and MSA for capture and more efficient regeneration of the sorbent material requiring low-grade heat that can be more easily available ("About Global Thermostat," n.d.; Kulkarni & Sholl, 2012; Sinha, Darunte, Jones, Realf, & Kawajiri, 2017).

More radical methods have also been suggested for DAC. There have been solutions suggesting electrochemical capture of CO₂ (Eisaman et al., n.d.) and then solutions introducing novel nanofilter materials that can capture CO₂ from the atmosphere at costs as low as around 18USD per ton CO₂ captured. The many solutions brought forward in solving this global crisis also range from biological mutants for accelerated carbon uptake in green plants (e.g, mutations in Rubisco), to catalysis of hydroxylation and solvation into the ocean, to even using aerosols to block out the sun, preventing the amount of radiation entering the planet in the first place. Now while all of them may not seem feasible at a large scale and only be limited as theoretically feasible solutions, many do hold large potential in solving the planet's carbon crisis. The return of the planet to its natural condition is not possible without the collective action of all these remedies. Artificial processes like catalytic conversion of CO₂ into all valuable higher alcohols, via a process run at low temperature in the liquid state are promising if the required energy can be derived directly from the sun by having the catalyst supported on a photoactive carrier such as titanium dioxide. Furthermore, many sorbents like Dimethyl ester of polyethylene glycol, cold methanol, MEA, DEA, MDEA, ammonia, Hot potassium carbonate etc. have also been well-researched for the purpose.

Still, most carbon capture options are expensive and energy intensive, thus causing them to be unusable. The reason why capturing CO₂ from the atmosphere is so difficult is that it is chemically inert (Sullivan, Krist, & Guard, 1993). This is one of the major reasons behind the difficulty in solving this problem.

Other Direct Air Capture models have been discussed in the methodology section of the report.

Renewable Energy in Direct air Capture

Since Direct Air Capture of CO₂ from the atmosphere takes place with the help of a high amount of energy, many reports have discussed using renewable sources of energy in fulfilling the energy demands of the process. Since this report focuses on Solar Energy for the fulfillment of the process, a literature review in the field of solar thermal has been carried out and given below:

Solar Thermal Energy

Solar thermal energy is being used all around the world using various technologies. The attraction to the source is justified by it being free of cost and relatively dependable for many parts of the world.

Solar Updraft Towers

Solar updraft towers use solar radiation to create a convection-driven updraft current. Air is heated in a greenhouse-like structure and directed up a chimney or tower, where the buoyancy-based pressure difference drives the air across a turbine or array of turbines. The simplicity of solar updraft towers, their lack of moving parts and expensive materials, and their ability to utilize diffuse or indirect solar radiation present a contrast to other solar-thermal technologies.

The solar updraft tower's three essential elements – solar air collector, chimney/tower, and wind turbines – have thus been familiar for centuries but are combined now in a novel way. Air is heated by solar radiation under a low circular transparent roof open at the periphery; the roof and the natural ground below form an air collector. In the middle of the roof is a vertical tower with large air inlets at its base. The joint between the roof and the tower base is airtight. As hot air is lighter than cold air it rises up the tower. Suction from the tower then draws in more hot air from the collector, and cold air comes in from the outer perimeter. Thus, solar radiation causes a constant updraft in the tower. The energy contained in the updraft is converted into mechanical energy by pressure-staged turbines at the base of the tower, and into electrical energy by conventional generators. Continuous 24-hour operation can be achieved by placing tight water-filled tubes or bags under the roof. The water heats up during daytime and releases its heat at night. These tubes are filled only once, no further water is needed. This design of an updraft wind turbine has been used in this project with modification to fulfill the necessities of a direct air capture system.

Concentrated solar power towers

Concentrated solar power (CSP) systems generate electricity by using computer-controlled mirrors (known as heliostats) in a large area to reflect and focus sunlight onto a small area to create intense heat to vaporize water. The water steam then drives turbines connected to electrical power generators.

Molten salt tanks can be used to storage thermal energy absorbed during the day to allows CSP plants to continue to generate electricity even after sunset.

Applicability in the DAC Scenario

Basic air capture models consist primarily of an air contactor, a sorbent material, and a regeneration module. The materials and assemblies adopted for these purposes vary greatly with the method employed for DAC. The variation of those technologies can be seen below in Fig. 2 :

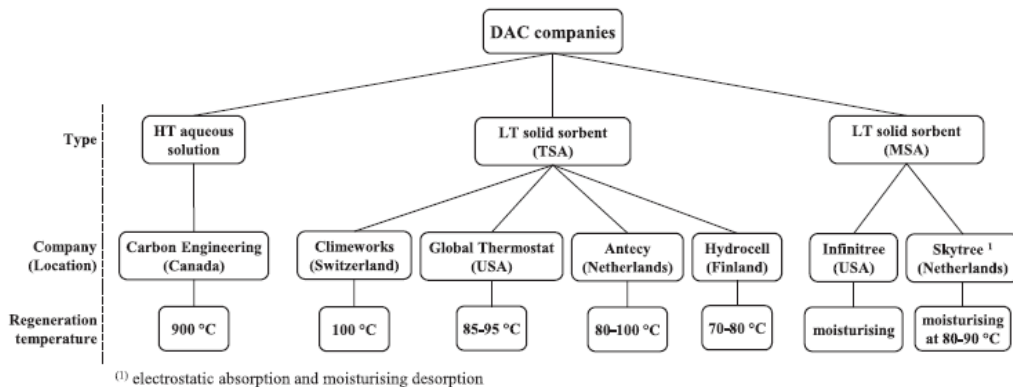


Fig. 2. Companies active in the field of CO₂ DAC and methods employed (Fasihi et al., 2019)
High Temperature (HT) aqueous solution

High Temperature (HT) aqueous solution process consists of two cycles taking place simultaneously, as illustrated in the figure below in Fig. 3:

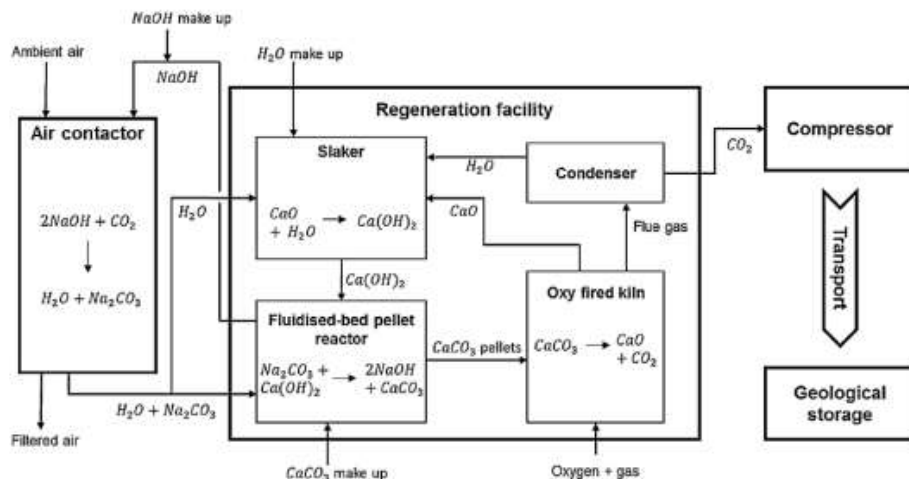


Fig. 3. Schematic Representation of a DAC Facility (Fasihi et al., 2019)

In the first cycle (to the left), air is brought in contact with the sorbent solution (in packing wetted with sorbent, or with sprayed sorbent), where the air flow is maintained either by natural draft or with the aid of fans (Fasihi et al., 2019). In this process, the CO_2 react with the strong hydroxide sorbent ($-\text{OH}$) forming a carbonate salt ($-\text{CO}_3$) of the metal in the hydroxide, and liberating water.

This absorption takes place in room temperature and pressure and the air remaining after the carbon dioxide has been stripped off it, is released back to the atmosphere (Fasihi et al., 2019). The CO_2 in the air is already removed in this step of the process. The remainder of the process (the second cycle) focuses on the regeneration of the sorbent solution, while retrieving pure Carbon Dioxide from the carbonate salt.

Thus, in the second cycle, the carbonate salt is reacted with calcium hydroxide ($\text{Ca}(\text{OH})_2$) solution, thus regenerating the sorbent and precipitating solid calcium carbonate (CaCO_3). The next step and the most energy intensive step in the process is the retrieval of the captured CO_2 for safe storage/ conversion to other useful products (Fasihi et al., 2019).

The products thus released from the reaction- calcium oxide (CaO) and CO_2 , are thus sent for the regeneration of calcium hydroxide and for storage/ utilization purposes respectively (Fasihi et al., 2019).

The chemical reactions described above are listed below (considering NaOH as the sorbent in the process):

Contactor	$2\text{NaOH} + \text{CO}_2 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$
Causticizer	$\text{Na}_2\text{CO}_3 + \text{Ca}(\text{OH})_2 \rightarrow 2.\text{NaOH} + \text{CaCO}_3$
Calciner	$\text{CaCO}_3 + \text{heat} \rightarrow \text{CaO} + \text{CO}_2$
Slaker	$\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$

The energy requirement other than that required for the chemical reaction to take place, is for the fan to pass air through the contactor, spraying the sorbent and moving the reactants and products from one facility to another (Fasihi et al., 2019).

Results and Discussion

A schematic process of the Carbon Engineering plant has been shown below:

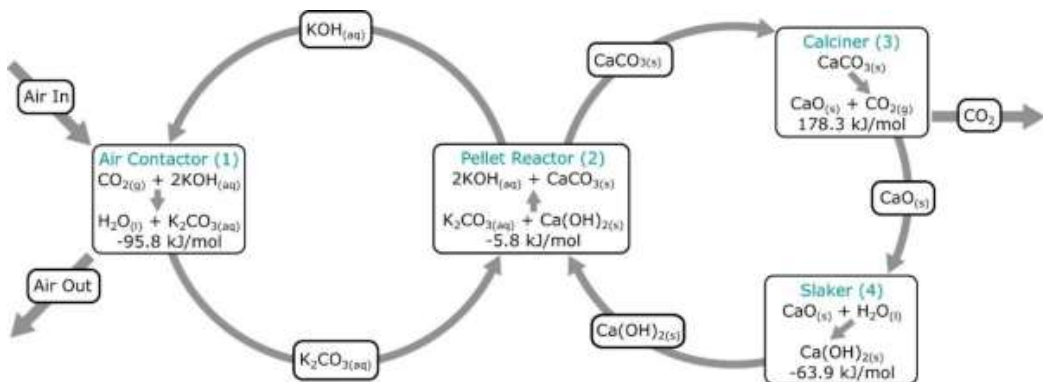


Fig.4. Calcium Cycle Recovery process employed in Carbon Engineering’s plant (Keith et al., 2018)

The components of the system are described and assessed in detail below:

1. Air contactor

The contactor is one of the more energy intensive units in the process of Direct Air Capture. Currently, large fans are used to serve this purpose. The large fans serve the purpose of sucking in large volumes of air and providing the necessary pressure difference required to pass the air through the gas-sorbent contactor. In this report, in order to economize the process, a solar thermal solution to the problem has been introduced.

Using a solar updraft tower to create the required pressure difference to pass the ambient air through the packing, has been investigated below:

System Design:

There is 0.04% CO₂ by default in air.

Ignoring losses, to remove 1Mt CO₂ per year, the total mass of air to be processed:

$$\dot{M}_{CO_2} = 10^9 \text{ kg / year}$$

$$\dot{M}_{air} = 2.5 \times 10^{12} \text{ kg air / year}$$

Density of air: $\rho_{air} = 1.183 \text{ kg/m}^3$ at 25°C

Thus, volume of air to be processed in a year

$$\dot{V}_{air} = 2.04 \times 10^{12} \text{ m}^3 / \text{year}$$

The number of days of operation in a year is assumed to be 300 days and the hours of operation in a day is 10 hours/day.

The volumetric flow required in the contactor

$$\begin{aligned} \dot{V}_{air} &= \frac{V_{air}}{300 \cdot 10 \cdot 60 \cdot 60} & (1a) \\ &= 188964.4747 \text{ m}^3/\text{s} \end{aligned}$$

The corresponding mass flow rate in the contactor

$$\dot{m}_{air} = 231481.5 \text{ kg/s}$$

(Keith et al., 2018) has provided the following data in his research, which we can extract as:

a) Economically optimized velocity of air through contactor

$$v_o = 1.4 \text{ m/s}$$

b) Optimum pressure-drop in the packing

$$\Delta p_d = 9.7 \text{ Pa/m at } 1.4 \text{ m/s}$$

c) Optimum air travel depth in packing

$$l_p = 7 \text{ m}$$

From this, we can calculate the total pressure drop in packing as

$$\begin{aligned}\Delta p_{\text{tot}} &= \Delta p_d \cdot l_p \\ &= 67.9 \text{ Pa}\end{aligned}$$

d) packing sp. surface for optimized material

$$\rho_{\text{packing}} = 210 \text{ m}^2/\text{m}^3$$

Using the volumetric air flow rate (\dot{V}_{air}) and the optimum velocity of air through the contactor (v_o), we can calculate the total face area for air flow as

$$A_{\text{tot}} = 134974.62 \text{ m}^2$$

To provide this surface area for air contact with sorbent, the volume of packing material required is

$$\begin{aligned}V_{\text{packing}} &= A_{\text{tot}} / \rho_{\text{packing}} \\ &= 642.73 \text{ m}^3\end{aligned}\tag{1b}$$

Using the optimum depth of packing, the face area of the packing can be determined by

$$\begin{aligned}A_{\text{packing}} &= V_{\text{packing}} / l_p \\ &= 91.82 \text{ m}^2\end{aligned}\tag{1c}$$

This face area of the packing is equal to the area of the cross-section of the tower

$$\begin{aligned}A_{\text{tower}} &= \pi \cdot (r_{\text{tower}})^2 \\ \text{Thus, } r_{\text{tower}} &= 5.40 \text{ m}\end{aligned}\tag{1d}$$

Now,

Power output of solar chimney can be calculated as the product of solar input and the efficiency of the plant.

$$P = \dot{Q}_{\text{solar}} \cdot \eta_{\text{plant}}\tag{1e}$$

The solar energy input \dot{Q}_{solar} into the system can be written as the product of global horizontal radiation G_h and collector area A_{coll} .

$$\dot{Q}_{\text{solar}} = G_h \cdot A_{\text{coll}} \quad (1f)$$

The pressure difference created between the base (the collector) and the top of the chimney, can be divided into a static and a dynamic component, neglecting friction losses,

$$\Delta p_{\text{tot}} = \Delta p_s + \Delta p_d \quad (1g)$$

The static pressure difference drops at the base of the packing, the dynamic component describes the kinetic energy of the airflow

With the total pressure difference and the volume flow of the air at $\Delta p_s = 0$ the power P_{tot} contained in the flow is now:

$$P_{\text{tot}} = \Delta p_{\text{tot}} \cdot V_{\text{tower,max}} \cdot A_{\text{coll}} \quad (1h)$$

Using equations above, with plant efficiency (η_{plant}) set to 90% and global horizontal radiation (G_h) set to 1000W/m^2 ,

$$V_{\text{tower,max}} = 13.25\text{m/s}$$

The total kinetic energy of the flow can be written as

$$P_{\text{tot}} = 0.5 \cdot \dot{m} (V_{\text{tower,max}})^2 \quad (1i)$$

Thus, the area of the collector can be determined as

$$\begin{aligned} A_{\text{coll}} &= 0.5 \cdot \dot{m} \cdot V_{\text{tower,max}} / \Delta p_{\text{tot}} \\ &= 22593.65 \text{ m}^2 \end{aligned} \quad (1j)$$

Thus, radius of collector,

$$\begin{aligned} r_{\text{coll}} &= (A_{\text{coll}} / \pi)^{0.5} \\ &= 84.78 \text{ m} \end{aligned} \quad (1k)$$

Using the Boussinesq approximation, the speed reached by free convection currents can be expressed as

$$V_{\text{tower,max}} = (2 \cdot g \cdot H_{\text{tower}} \cdot \Delta T/T_0)^{0.5} \quad (1)$$

$$= 642.73 \text{ m}^3$$

From experimental observations conducted inside a solar coffee dryer (project carried out by the author) it was observed that a temperature difference of 25K° can be obtained on a sunny day for a similar setup. For a $\Delta T=25 \text{ K}^\circ$,

$H_{\text{tower}} = 90 \text{ m}$

Simulation:

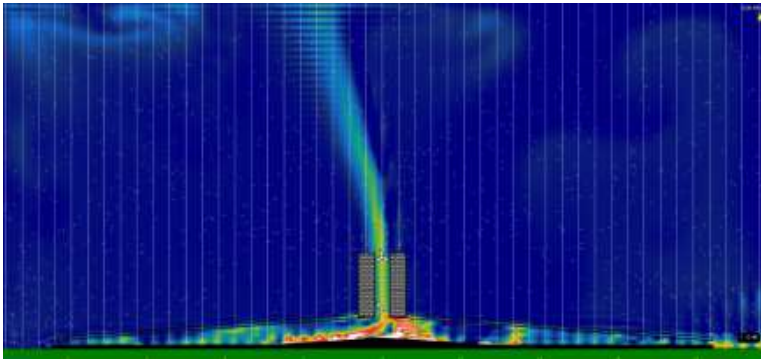


Fig. 5. A computer simulation of the updraft tower with optimized height to replace the contactor fan (2D simulation only for visual conception)

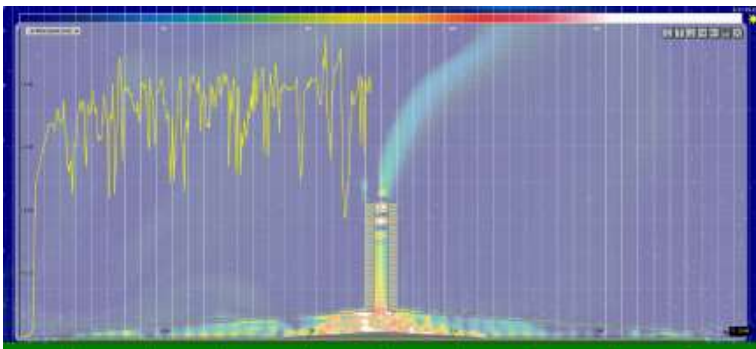


Fig. 6. Updraft Tower for contactor with an iterative result of the variation of air velocity (scaled 0.05X) in the tower with variation in height (2D simulation only for visual conception)

Thus, using a solar updraft tower can eliminate all the cost of using fans in current DAC plants.

Savings

Thus, for the air contactor units, replacement of the fans with a solar updraft tower will result in the following savings:

Operational Savings:

Energy used in Fans for air contactor = 61 kWh/ton CO₂ (Keith et al., 2018)

Energy used in the operation of the solar updraft tower = 0

Net Energy Savings

= 61 kWh/ton CO₂

= **0.2196 GJ/ton CO₂**

Pellet Reactor

Carbonate ion is removed from solution by causticization in the pellet reactor. The fluidized bed reactor has been custom designed for this particular product and is not an energy intensive unit. Thus, a redesign prospect for the pellet reactor has been dropped.

Calciner

Currently, a Circulating Fluidized Bed CFB is used in the purpose of calcination. This part of the process is the most energy intensive one and thus, further research has been carried out for its possible replacement.

Solar Power Tower as a calciner

From previous researches, it has been known that a solar power tower can reach temperatures of 500 degrees Celsius or higher, thus allowing for a huge boost in energy savings, as compared to fossil fuels-based heating, where all the energy is required in heating to 900 degrees.

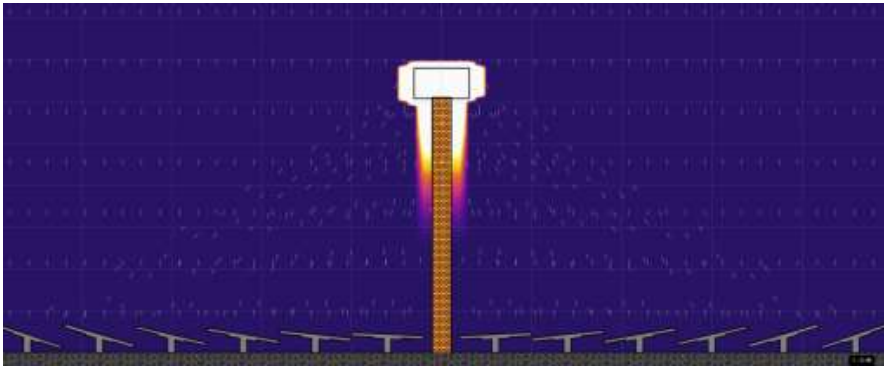


Fig. 7. 2-D Thermal simulation of the solar power tower (2D simulation only for visual conception)

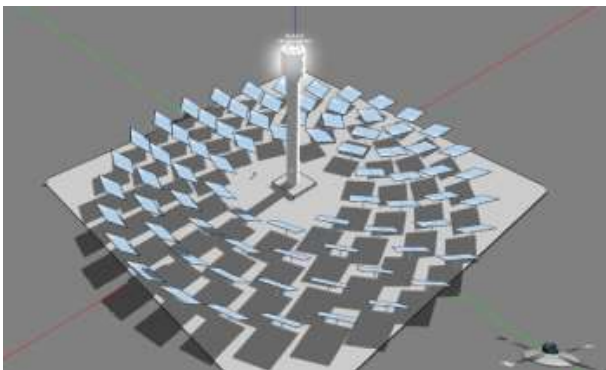


Fig. 8. A model of a solar power tower (Xie, Schimpf, Chao, Nourian, & Massicotte, 2018)

The only operational cost in this scenario is for the solar tracking mechanisms in heliostats.

Savings

Thus, for the calciner, replacement of the fossil-fueled heat source with a solar power tower will result in the following savings:

Operational Savings:

Energy used in circulating fluidized bed = 4.05 GJ/ton CO₂ (Keith et al., 2018)

Energy used in the operation of the solar power tower = energy used in the tracking mechanism for heliostats (minimum compared to the value above)

For static field of heliostats,

Energy used in the operation of the solar power tower = 0

Net energy savings (maximum value)

= 4.05 GJ/ton CO₂

Slaker

Similarly, for slaker also, the processing equipment is an energy- liberating one, and thus, the redesign prospect has been dropped.

Miscellaneous**Parabolic Trough for preheating**

The system involved plenty of preheaters and pumps in between components. The function of these components can be achieved using a solar parabolic trough heater that performs very well functions in heating fluids to a moderate temperature.

Final Plant Layout

Thus, after all the calculations as given above, a new plant design for the direct air capture of CO₂ has been devised and a schematic design is given below:

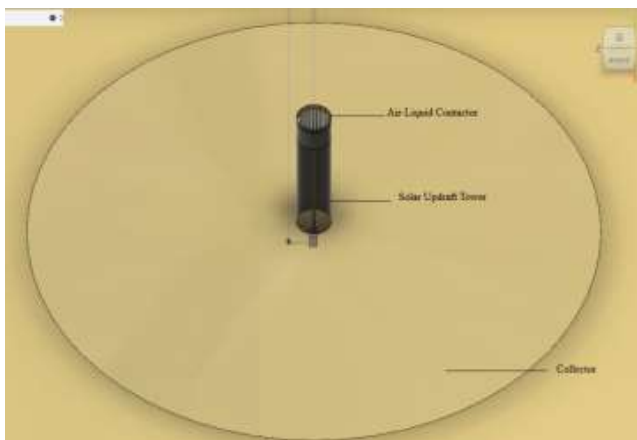


Fig. 9. Fusion 360 model of a Solar Updraft Tower with gas-liquid contactor packing

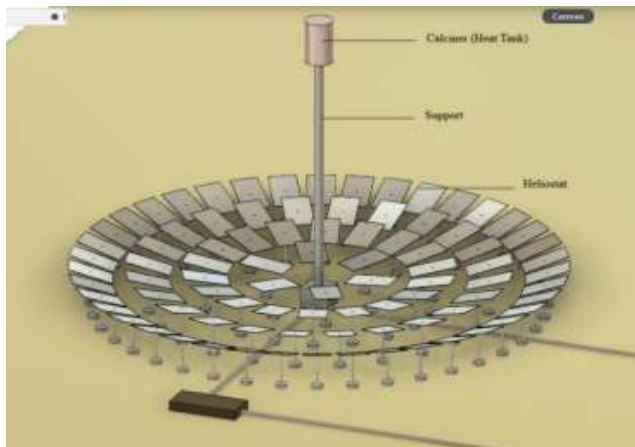


Fig. 10. Fusion 360 model of a Solar Power Tower to be used as a calciner

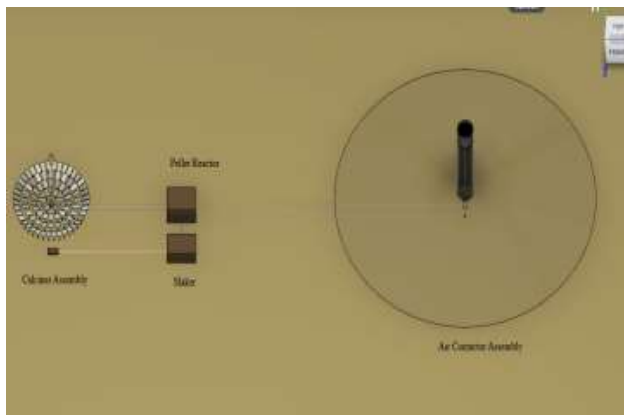


Fig. 11. Simple Fusion 360 model of a DAC plant running on renewable (solar thermal) energy

The units are far placed to ensure that the solar energy received by any of the collectors aren't obstructed significantly

Conclusion

Thus, it was concluded after the research that DAC plants can be redesigned using renewable energy and they would still function with the same efficiency, but with a much better economic efficiency. It was further concluded that 0.219 GJ energy can be saved in the air contactors and a maximum value of 4.05 GJ energy could be saved in the calciner. Thus, Solar thermal

technologies can be developed in deserted areas and infertile lands, and thus put wasted land to use, while providing the important function of Carbon capture.

References

About Global Thermostat. (n.d.). Retrieved December 4, 2019, from Global Thermostat website: <https://globalthermostat.com/about-global-thermostat/>

Bacocchi, R., Storti, G., & Mazzotti, M. (2006). Process design and energy requirements for the capture of carbon dioxide from air. *Chemical Engineering and Processing: Process Intensification*, 45(12), 1047–1058. <https://doi.org/10.1016/j.cep.2006.03.015>

Climate Change: Vital Signs of the Planet. (n.d.). Retrieved December 4, 2019, from Climate Change: Vital Signs of the Planet website: <https://climate.nasa.gov/>

Earth's CO2 Home Page. (n.d.). Retrieved December 4, 2019, from <https://www.co2.earth/>

Eisaman, M. D., Schwartz, D. E., Amic, S., Lerner, D., Zesch, J., Torres, F., & Littau, K. (n.d.). *Energy-efficient electrochemical CO2 capture from the atmosphere*.

Fasihi, M., Efimova, O., & Breyer, C. (2019). Techno-economic assessment of CO2 direct air capture plants. *Journal of Cleaner Production*, 224, 957–980. <https://doi.org/10.1016/j.jclepro.2019.03.086>

Fuss, S., Lamb, W. F., Callaghan, M. W., Hilaire, J., Creutzig, F., Amann, T., ... Minx, J. C. (2018). Negative emissions—Part 2: Costs, potentials and side effects. *Environmental Research Letters*, 13(6), 063002. <https://doi.org/10.1088/1748-9326/aabf9f>

Goeppert, A., Czaun, M., Surya Prakash, G. K., & Olah, G. A. (2012). Air as the renewable carbon source of the future: An overview of CO2 capture from the atmosphere. *Energy & Environmental Science*, 5(7), 7833. <https://doi.org/10.1039/c2ee21586a>

- Hole, W. (n.d.). *Carbon Dioxide and Climate: A Scientific Assessment*. 20.
- Isobe, J., Henson, P., MacKnight, A., Yates, S., Schuck, D., & Winton, D. (n.d.). *Carbon Dioxide Removal Technologies for U.S. Space Vehicles: Past, Present, and Future*. 10.
- Jiang, Z., Xiao, T., Kuznetsov, V. L., & Edwards, P. P. (2010). *Turning carbon dioxide into fuel. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 368(1923), 3343–3364. <https://doi.org/10.1098/rsta.2010.0119>
- Keith, D. W., Ha-Duong, M., & Stolaroff, J. K. (2006). Climate Strategy with Co₂ Capture from the Air. *Climatic Change*, 74(1–3), 17–45. <https://doi.org/10.1007/s10584-005-9026-x>
- Keith, D. W., Holmes, G., St. Angelo, D., & Heidel, K. (2018). A Process for Capturing CO₂ from the Atmosphere. *Joule*, 2(8), 1573–1594. <https://doi.org/10.1016/j.joule.2018.05.006>
- Kohler, P., Hartmann, J., & Wolf-Gladrow, D. A. (2010). Geoengineering potential of artificially enhanced silicate weathering of olivine. *Proceedings of the National Academy of Sciences*, 107(47), 20228–20233. <https://doi.org/10.1073/pnas.1000545107>
- Kulkarni, A. R., & Sholl, D. S. (2012). Analysis of Equilibrium-Based TSA Processes for Direct Capture of CO₂ from Air. *Industrial & Engineering Chemistry Research*, 51(25), 8631–8645. <https://doi.org/10.1021/ie300691c>
- Leeson, D., Fennell, P., Shah, N., Petit, C., & Dowell, N. M. (2017). A Techno-economic Analysis and Systematic Review of Carbon Capture and Storage (CCS) Applied to the Iron and Steel, Cement, Oil Refining and Pulp and Paper Industries. *Energy Procedia*, 114, 6297–6302. <https://doi.org/10.1016/j.egypro.2017.03.1766>
- Minx, J. C., Lamb, W. F., Callaghan, M. W., Fuss, S., Hilaire, J., Creutzig, F., ... del Mar Zamora Dominguez, M. (2018). Negative emissions—Part 1: Research landscape and

synthesis. *Environmental Research Letters*, 13(6), 063001. <https://doi.org/10.188/1748-9326/aabf9b>

Schellnhuber, H. J. (2011). Geoengineering: The good, the MAD, and the sensible. *Proceedings of the National Academy of Sciences*, 108(51), 20277–20278. <https://doi.org/10.1073/pnas.1115966108>

Schlaich, J., Bergemann, R., Schiel, W., & Weinrebe, G. (2005). Design of Commercial Solar Updraft Tower Systems—Utilization of Solar Induced Convective Flows for Power Generation. *Journal of Solar Energy Engineering*, 127(1), 117–124. <https://doi.org/10.1115/1.1823493>

Seipp, C. A., Williams, N. J., Kidder, M. K., & Custelcean, R. (2017). CO₂ Capture from Ambient Air by Crystallization with a Guanidine Sorbent. *Angewandte Chemie International Edition*, 56(4), 1042–1045. <https://doi.org/10.1002/anie.201610916>

Sinha, A., Darunte, L. A., Jones, C. W., Realf, M. J., & Kawajiri, Y. (2017). Systems Design and Economic Analysis of Direct Air Capture of CO₂ through Temperature Vacuum Swing Adsorption Using MIL-101(Cr)-PEI-800 and mmen-Mg₂ (dobpdc) MOF Adsorbents. *Industrial & Engineering Chemistry Research*, 56(3), 750–764. <https://doi.org/10.1021/acs.iecr.6b03887>

Smith, P., Davis, S. J., Creutzig, F., Fuss, S., Minx, J., Gabrielle, B.,...Yongsung, C. (2016). Biophysical and economic limits to negative CO₂ emissions. *Nature Climate Change*, 6(1), 42–50. <https://doi.org/10.1038/nclimate2870>

Stolaroff, J. K., Keith, D. W., & Lowry, G. V. (2008). Carbon Dioxide Capture from Atmospheric Air Using Sodium Hydroxide Spray. *Environmental Science & Technology*, 42(8), 2728–2735. <https://doi.org/10.1021/es702607w>

Sullivan, B. P., Krist, K., & Guard, H. E. (Eds.). (1993). *Electrochemical and electrocatalytic reactions of carbon dioxide*. Amsterdam; New York: Elsevier.

Xie, C., Schimpf, C., Chao, J., Nourian, S., & Massicotte, J. (2018). Learning and teaching engineering design through modeling and simulation on a CAD platform. *Computer Applications in Engineering Education*, 26(4), 824–840. <https://doi.org/10.1002/cae.21920>

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