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Evaluating the Impact of Mason Training on Residential Building Construction: A Case Study of Pokhara Metropolitan City, Nepal

Som Gurung[1*], Sushil Chandra Poudel[2]

[1]Department of Civil Engineering, Pokhara Engineering College, Pokhara, Nepal
[2]School of Engineering, Pokhara University

[*]Corresponding email: som.gurung@outlook.com

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Abstract

This paper aims to explore the application of masonry training and its impact on the building construction sector of Pokhara Metropolitan City. The main objectives of this study are to assess current status of masons, their preference of mason training program, and its impact on the local construction industries. A sample of 368 residential buildings with plinth tie beam construction completed or in progress was selected from the study area. In total, 284 masons who have participated in the program connected to mason training were identified while visiting 368 construction sites of residential buildings. The study found that most of the masons were migrated workers in the Pokhara valley and majority of them are between the ages of 30 to 41 years. The seven-day training module emerged as the most preferred among various options, including 15-day, 30-day, and longer-duration programs. The result showed that mason training is found effective in terms of knowledge and skills. However, it has been observed that the work on the site has not been found satisfactory because of the pressure from the supervisor and contractor to speed up the works and to minimize the cost.

Keywords: *Mason Training, Building, Construction Industries, Pokhara Metropolitan City*

1. Introduction

The theory-based research and training approaches with an empirical foundation were inspired by Campbell's (1971) analysis of the state of the training literature. Since Campbell's study, training research has expanded, produced empirically based concepts, and significantly influenced practice; as a result, the field of training research is now strong, fascinating,

dynamic, active, and pertinent to companies. This paper's aim is to give a thorough, in-depth practical study of the science behind organizational training and development. Rather than using data from education research, we predominantly rely on the training literature.

According to Hunt and Baruch (2003), some firms spend a lot of time and resources developing extensive training programs to enhance the so-called "soft skills" of management. However, it has been uncommon to evaluate the success of such projects. A method for pre- and post-training assessment has been made available by recent advancements in the utilization of survey responses. A renowned business school conducted research to evaluate the effect of interpersonal skills training on senior managers. Based on comments from subordinates collected prior to and six months after the training program, the training was evaluated. The outcome suggests that some but not all of the competencies and skills under consideration have experienced a substantial influence.

Aguinis and Kraiger (2009) cited multiple studies in European nations that relate corporate effectiveness metrics to training practices and policies. Studies like these demonstrate the importance of training in creating and sustaining a productive staff, which in turn maximizes the performance.

Vijayabanu and Amudha (2012) and Topno (2012) conducted an analytical study on effectiveness of a public sector organization's training program for various employee cadres. The outcome shows that, depending on their demographic characteristics, different employees responded differently to the training program. Additionally, it is implied that the organization's personnel's education and experience play a major role in selecting the training program.

Similarly, Saharan (2011) highlighted that the majority of organizations use employees' input to improve training effectiveness and increase benefits. Companies subscribe to the notion that more intelligent and better-trained people enhance the possibilities of success in the never-ending quest for a competitive edge. The study explains the perspectives of workers with various backgrounds and experiences regarding the goals of corporate training.

1.1 Assessment of the Demand for Skilled Workers from Nepal

In the fiscal year 2020/21, GDP was projected to increase by 3.94 percent in the base price and 4.01 percent in the producer's price. It has become challenging to achieve the projected economic growth due to the second wave of the Covid-19. An agreement between the Foreign Employment Board of Nepal and the Social Security Organization of Malaysia has been concluded with a view to make foreign employment safe, dignified and productive, and to link

the Nepali workers in Malaysia with the social security program of the Malaysian government. The Directive on Sending Nepali Care Givers to Israel, 2021 has been implemented with an objective of making the process of sending support workers to the long-term care centers in Israel systematic and transparent. As of mid-March 2021, the number of workers left for foreign employment with labor permits has reached 4,466,973, out of which the number of males is 4,248,547 and females is 218,426. As of mid-March, of the fiscal year 2020/21, the number of workers who have gone for foreign employment with labor permits was 33,161 and those who have re-obtained labor permits was 52,289. Covid-19 has become the major reason behind the increasing number of reobtaining of work permits (MoF, 2020).

1.2 Strong, Sustainable, and Balanced Growth Requires a Skilled Workforce

The cornerstones of a policy framework for creating a workforce with the necessary skills are: making high-quality education widely accessible as a basis for future training; closely matching the skills supply to the needs of businesses and labor markets; assisting workers and businesses in adjusting to changes in technology and markets; and anticipating and preparing for the skills requirements of the future (ILO, 2000).

As a result, strong foundational skills and deeper ties between the worlds of school and work must be the cornerstones of any skills strategy. In turn, this calls for high-quality early education, accurate knowledge of changes in skill demand, responsive education and training systems to fundamental economic and social changes, acknowledgement of skills and competencies, and increased use of them in the workplace. The goals for economic and social policy must be closely linked for these policy endeavors to be successful (OECD, 2008).

1.3 Role of Mason in Construction Industry

Masons are essential to the building process in Nepal for all kinds of construction projects. Studies from many fields have also supported this. Masons have been identified as the primary actors in the production of 90% of the buildings in Nepal to date. Only 10% of building output is done by engineers and other professionals, especially in the urban areas. Despite playing a significant part in the development of buildings, masons have not been able to get enough support from the government to advance their knowledge and competence. Thus, it is intriguing to observe how the nation's resources are being employed to create these two important characters. According to the report, engineers use 90% of all resources, whereas 10% of all resources are used to produce masons. Masons need substantial training in lowering earthquake hazards in buildings due to their lack of official training, ignorance of earthquake-resistant technologies, and many other reasons (Parajuli, 2000).

1.4 Need for Mason Training

Masons are the key actors in the building construction in Nepal. However, they are not aware of earthquake technology and other knowledge that can reduce the earthquake risk. Hence earthquake risk reduction can be mainstreamed by giving the training to the masons. There are numerous reasons for the need of training for the masons. The role of mason is vital in every type of construction even in engineered construction as they are the real implementer. If they do not understand, they cannot perform accordingly and the quality does not improve. The engineers and professionals only work on papers and can tell verbally. Furthermore, the number of non-engineered buildings outweighs the engineered building where their role becomes the most important. Masons are the ones who recommend house owner on materials selection and construction process, house owners also listen more to mason than engineers. Mason has a greater role in building production in terms of quantity as well. Each mason constructs at least 3 to 4 houses every year. So, giving a training to mason has a multiplier effect (Parajuli, 2000).

1.5 Understanding and Teaching of Mason

This is a training for masons, and in order to accomplish the program's main goal successfully, it is crucial to first comprehend masons. Understanding masons requires familiarity with their regional building jargon, aptitude for reading blueprints, relationships with engineers and home owners, language use, assertiveness, and many other sociocultural facets. Knowing about these aspects enables the trainer to focus on the right areas and make any necessary adjustments to the delivery and field exercises without deviating from the training's core goal. The training group is typically diverse in terms of age range, work experience, language, educational attainment, and geographic area. In Nepal, the majority of masons are literate, therefore they are able to read and write. Few people are illiterate, nevertheless. Some people have even completed their college education. But the best approach is to prioritize illustrations and practical information supported by numerous instances rather than theory (Tandingan and Dixit, 2012).

1.6 Preparing Mason to Convince House Owners

As 90% of buildings in Nepal are currently produced under the supervision and with the participation of a head mason or a petty contractor as key actors, masons play a significant role in the construction of buildings in Nepal. Masons are the ones who advise home owners on the choice of materials and the construction process. Every year, each mason builds at least 3/4 dwellings. The owners of the homes and the masons have a close relationship. Because masons are the primary players in the construction of buildings, they can also be the important players

in persuading the homeowner to support safer construction techniques and so lower the seismic risk. Therefore, one of the techniques has been to get the mason ready for persuading the homeowners (Parajuli, 2000).

Numerous studies have shown that adding specific components and improving particular construction methods can significantly lower the building's seismic risk. People believe that it costs a lot of money to make buildings earthquake-resistant. Convincing people to use safer construction practices is a difficult task for experts. Mason finds it harder to get people to recognize the value of earthquake-resistant construction. It costs more to create a structure with earthquake-resistant components, and people are obviously quite concerned about this. It clearly raises the expense of the construction, but not by as much as may be expected. Thus, it is important to clarify this impression. Mason needs to be ready for this situation (Saharan, 2011).

1.7 Building Code Enforcement in Nepal

Although improving the seismic performance of new building construction was the ultimate goal, the initial focus was on better understanding earthquake hazards, risks, and vulnerabilities as well as jointly developing and putting potential techniques for reducing earthquake risk into action. A persistent fatalistic worldview, a lack of catastrophe awareness, and poor policy and law all contributed to the slow implementation of National Society for Earthquake Technology (NSET). NSET has been able to advance to the point where it can currently carry out earthquake risk operations and offer technical support to other institutions in Nepal because it has a clear mission, vision, and set of strategic goals. Over time, NSET received requests from various countries to share its expertise and experiences, including those following the earthquakes in Pakistan and Gujarat as well as the 2004 tsunami in Banda Aceh (Shiwaku, 2007).

NBC-205 (1994), under Mandatory Rules of Thumb Reinforced Concrete Buildings without Masonry Infill stated that primary goal of these Mandatory Rules of Thumb (MRT) is to provide the ready-to-use dimensions and details for a variety of structural and non-structural elements for up to three-story reinforced concrete (RC), framed, typical residential buildings that are typically constructed by owner-builders in Nepal. To meet the minimal seismic safety requirements outlined by NBC 105, they want to replace the non-engineered building now used with pre-engineered construction (a draft Nepal Seismic Design Standard). This MRT is primarily meant to meet the needs of mid-level technicians (overseers and draft persons) who are not qualified to handle the structural design of buildings on their own. However, by utilizing

the design processes described here, civil engineers might also use this text to make efficient use of their time.

NBC-105 (2020): Seismic Design of Buildings in Nepal is the title of this document. The document is the result of the 1994 Seismic Design of Buildings in Nepal chapter of NBC 105 being revised. This code contains the specifications for seismic analysis and design of different building structures to be built on the Federal Republic of Nepal's territory. All buildings, from low-rise to high-rise, must abide by this regulation. Buildings made of reinforced concrete, structural steel, steel concrete composite, wood, and masonry must comply with the standards of this standard. Buildings that are base-isolated as well as those that are fitted with and treated for structural control can be built with reference to specialized literature.

2. Materials and Methods

A mixed method has been adopted for this research. Primary data were collected in the form of questionnaire and through field observations. Whereas, secondary data were gathered from Pokhara Metropolitan City Office and peer reviewed scientific journals and articles. The study area of this research is the residential building construction projects of Pokhara valley built under the guidelines of Pokhara Metropolitan City. The building projects registered on the Pokhara Metropolitan City, under construction phase were taken for the research. As per Electronic Building System (e-bps), in fiscal year 2077/2078 & 2078/2079, 4169 and 4478 houses were registered.

The research was done by direct observation of the site, when all the mason present on the site. The total sample size of 367.8 i.e. 368 was obtained using the equation (1) given by Krejcie and Morgan (1970).

$$n = \frac{X^2\,(1-\mathrm{p})}{e^2(N-1)+X^2p(1-p)} \quad (1)$$

Where, n= sample size, N= population size (8647), e= acceptable error of sample size (5%), X^2= 3.841and p= population proportion (0.5)

For the purpose of this study, judgmental sampling was used. Houses which plinth tie beam under completed were only taken. The questionnaires were distributed proportionately among the sites and direct site observations were done.

2.1 Study Area

The study was carried out in Pokhara Metropolitan City. It lies in the Kaski District of Gandaki Province Nepal.

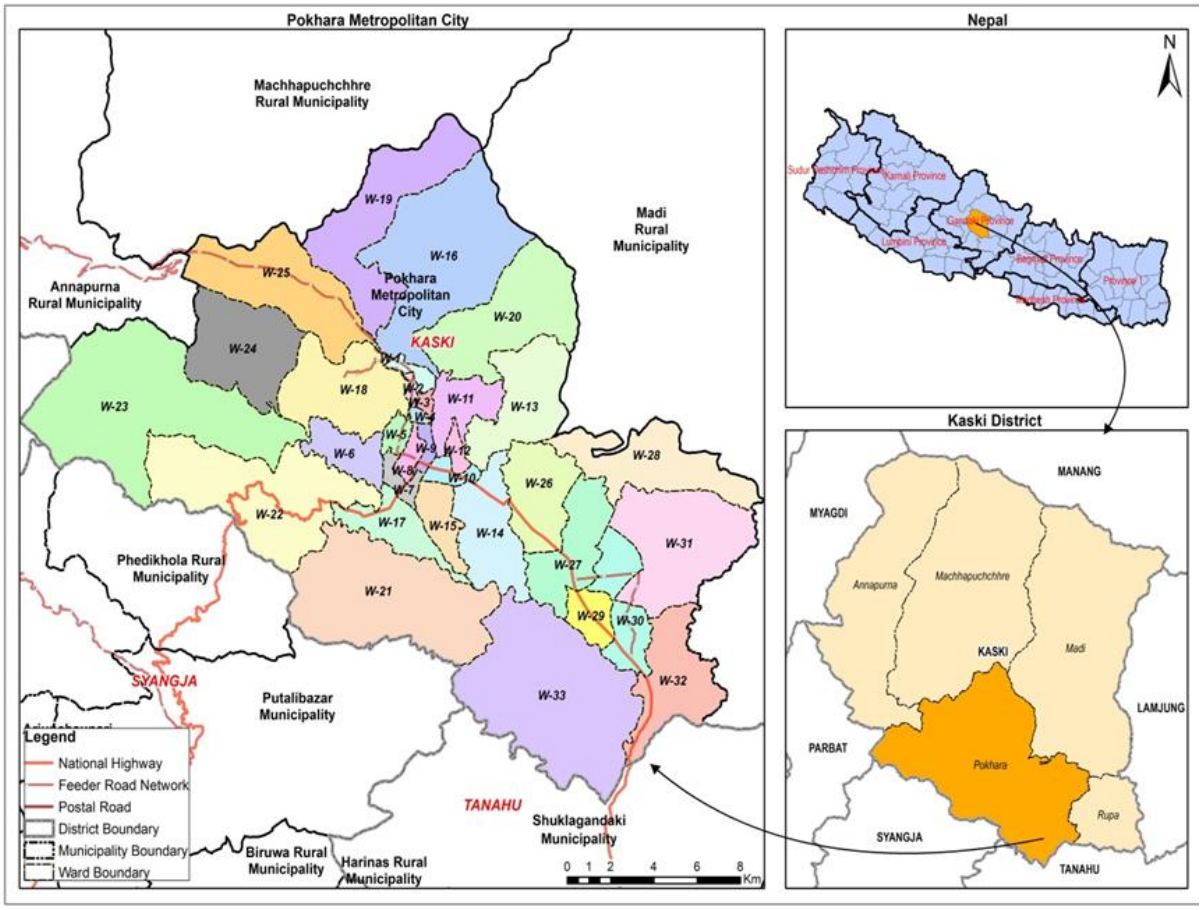

Figure 1: Pokhara Metropolitan City with Wards

After Kathmandu, the capital city, Pokhara is the second-largest city in terms of population. Madi Rural Municipality, Rupa Rural Municipality, Parbat and Syanja District on the East, Annapurna Rural Municipality, Syangja and Tanahu on the West, Machhapurchhre and Madi Rural Municipality on the North, and Madi Rural Municipality and Rupa Rural Municipality on the South surround Pokhara Metropolitan City. The metropolitan has categorized 17 wards in urban wards such as 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 15, 17, 27, 29 and 30 whereas 8 wards in semi urban wards such as 11, 13, 16, 18, 19, 25, 26, 32 and remaining 8 wards in rural wards. They are wards 20, 21, 23, 24, 28, 31 and 33.

3. Results and Discussion

The demographic characteristics of mason participated in the training program have been categorized as gender, age, education level, marital status, place of origin, category of mason, area of involvement, category of building involved and module of training. The information

collected through the questionnaire regarding the demographic variables was recorded and analyzed in percentiles

Table 1: Demographic Profile of Respondents

Profile	Group	Frequency	Percent (%)
Gender	Male	261	91.90
	Female	23	8.10
Age	Below 18	4	1.41
	(18-29) years	72	25.35
	(30-41) years	94	33.10
	(42-53) years	78	27.46
	54 and Above years	36	12.68
Education	Literate	139	48.94
	Illiterate	68	23.94
	Basic Education (1-9)	55	19.37
	Secondary Education (9-12)	16	5.63
	Higher Level	6	2.11
Place of Origin	Inside of Valley	102	35.92
	Outside of Valley	182	64.08
Marital Status	Married	228	80.28
	Unmarried	56	19.72
Years of Experience	(1-3) years	102	35.92
	(4-6) years	58	20.42
	(7-9) years	47	16.55
	(10-13) years	35	12.32
	13 and Above years	42	14.79
Category of Mason	Skilled	198	69.72
	Semi-Skilled	86	30.28
Area of Involvement	Private Sector	271	95.42

	Public Sector	13	4.58
Category of Building Involved	Residential	251	88.38
	Commercial	33	11.62
Module of Training	Less than 7 days	44	15.49
	7 days	217	76.41
	15 days	10	3.52
	30 days	4	1.41
	More than 30 days	9	3.17
	Total (N)	**284**	**100.0**

Table 1 shows the demographic characteristics of the respondents. The gender distribution of the respondents shows that 78.80 percent are male while the remaining percent are female. Age group involved in construction industry in which 33.10 percent are in category of 30-41 age group likewise 27.46 percentage is 42-53 age group. Likewise, 54 and above are 12.68. But 48.94 percentage are literate whereas 23.94 percent are illiterate likewise 19.37 percentage have attended basic education and few have gained secondary and higher-level education. Construction mason involved in construction industry due to some family problems in the context of Nepal; so many leave their education after being literate thinking money is greater than education. As the study was conducted in Pokhara Metropolitan City most of the respondent are from outside of the city which is 64.08 percentage. Mason from outside the valley visit Pokhara in search of opportunity. About 80.28 percent of the respondents were married and 19.72 percent of them were unmarried. Engagement in construction industry may be increase in responsibility after marriage for income. Most of workers were from age group of 1-3 years of expertise and the least number of respondents were from group 10-13 years of experience. Most of people are interested in construction industry since their good payment system with good wages which is better than other industry. In total, 284 were respondents out of which skilled mason were 198 (69.72 %) and the rest were either semi-skilled or unskilled mason. Mason mostly gets engaged in construction industry by upgrading from labor so they are not skilled. However, 95.42 percentage and 4.58 percentage were involved in public sector construction. Billing system in private is fast and reliable than public system since bill payment system is long in the case of public system. Similarly, 88.38 percentage of respondents are involved in residential buildings and 11.62 percentage of respondents are involved in

commercial buildings. Residential building construction are increasing at Pokhara as it is capital city of Gandaki Province. So, masons prefer residential building work since they should stay any day off. In addition, 76.41 percentage attended 7 days of training program and 15.49 percentage attended less than 7 days training which is similar result given by Silwal and Bhatta (2017). For instance, 7 days training program is widely organized as mason training program campaign. With attending 7 days module of training, they will miss less construction days' work at site.

Table 2: Descriptive Analysis of Implementation of Training Program

Statements	Min	Max	Mean	SD
Mason who learnt about the basic concept and construction practices of earthquake resistant building construction.	2	5	3.68	0.606
Mason who knew about various codes, specification and guidelines issued by the DUDBC, GON, applicable for the earthquake resistance building construction.	1	5	3.84	0.645
Mason who became knowledgeable about the frequent probable errors and omissions likely to be encountered during the construction practices.	1	5	3.88	0.651
Mason who were involved in the real case demonstration at site right from setting layout of the building till necessary sill, bands, lintels, etc .	2	5	4.24	0.696
Mason who become competent in the construction of earthquake resistant structures.	2	5	3.92	0.707
	Overall Mean		**3.91**	

Table 2. depicts the result of descriptive analysis of the scales to assess mason involve in construction of residential building in Pokhara Metropolitan City. Respondents were asked to indicate their likeliness on implementation of mason training in construction industry of the study area through five-point Likert scale ranging from 1 being extremely disagree to 5 extremely agree. From table 2., based on the mean score 3.91, it can be said that implementation

of mason training is good at questionnaire basis. All five questions have supported implementation since their mean is above 3.5. Likewise, mean score 4.24 it can say that majority mason who were involved in the real case demonstration at site right from setting layout of the building till necessary sill, bands, lintels, etc. is highly supporting implementation on mason training program.

The result obtained from the field observation of 368 building construction sites is shown in table 3.

Table 3: Field Observation of Building Construction Sites

Type of Work	Description of Items	No of House Within Criteria (Frequency)	Percent (%)
Brick Work	Use of correct mortar mix	290	78.80
	Vertical Joints Avoided	268	72.83
Steel Work	Overlap of rebar maintained at 60d	270	73.36
	Column bar equally cut not cut different height	301	81.79
Form Work	Use of chair in slab casting	20	5.43
	Use of smooth surface formwork	70	19.02
	Column cover maintained at 40mm	28	7.61
	Small portion of brick, plastic, stone, paper used to fill gap of formwork	300	81.52
Concreting Work	Use of Concrete blocks	30	8.15
	Use of batching box	5	1.36
	Use of vibrator	368	100
Curing Work	Pond curing	368	100
	Use of jute bag for column/beam curing	20	5

According to field observation assessment, it was found that more than 72 % have followed the rule but it is not enough. Brickwork is the work which help labor to get upgrade to mason. Therefore, the work of brick is good in houses at most. This is supported by the findings of Hussian and Xuetong (2020). About 368 houses were on process of steel work. Similarly, 270

of 368 houses followed overlap concept of 60 times diameter of bar. Likewise, 18.21 percentage column bar were cut at different height mostly which is less in practice. Chair using while casting of slabs is also below 6 percentage. Overlap of rebar are usually followed as it is not hard to do. But column bar is equally cut at same height which is unacceptable and it is seen at 81.79 houses due to negligence of contractor and mason. As making of chair is loss of manpower time so contractor direct mason to skip chair to save their wages. Below 20 % only used smooth surface. Column cover was more than 40 mm of maximum houses which is 7.61 percentage as it is due negligence of contractor and mason workmanship. In addition, small plastic, bricks, etc. were used to fill gap of formwork in construction building which is 81.52 percentage which is worst and it is because contractor is saving money for buying good formwork as old formwork as at use. Maximum constructions site did not use concrete block; batching box was not seen at any sites. Vibrator was used remarkable which is 100 percentage. Unregular stone are observed at site as it is easily available and making of concrete block takes time and client is unaware of concrete block. Ponding curing was at almost all site we visited but jute bag curing for beam and column was just observed at 20 building constructions site. Client, mason is unaware about curing system of jute bag and client also does not buy jute bag to save costing.

4. Conclusions

The study revealed that mason knew well about the content of mason training program which shows the positive impact of training program. Moreover, the status of training, awareness programs, and knowledge retention among masons was found to be satisfactory. While the questionnaire survey indicated effective learning, field observations revealed a gap between knowledge and practical implementation. In many cases, trained techniques and knowledge were not applied on-site. This discrepancy was attributed to pressure from supervisors and contractors to accelerate progress and reduce costs, often at the expense of quality. These results highlighted the requirement of monitoring of work, refresher training and upgrading 7 days of module of training program. It was also found that there were inadequate training programs in the study area due to lack of required trainers as compared to the construction works done by the masons. Further, the study identified that there is a growing demand for skilled masons in Pokhara to meet the workforce requirements of the rapidly growing construction sector.

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