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Indigenous Technologies and their Applicability in Classroom Instructions in Secondary Level

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Abstract

Indigenous technologies as local resources reflect definite practical skills that can be applied in classroom in order to bring real life tasks and activities for the students. This study aims at identifying the locally available indigenous technologies in school level classroom instructions and analyzes the applicability of such technologies in classroom instructions for the development of activity-oriented practical education. Based on qualitative method, the data have been collected through PRA, observation, and semi-structured interview. The collected data have been analyzed by carrying out immersion, understanding, abstraction, synthesis, illumination of phenomena and integration and critique of findings. The key finding of this study shows abundances of locally available technologies that can be applied in classroom instructions and can be implemented for the development of task-based, practical classroom instructions in study area and in general.

Key Words: Local people, indigenous technologies, activity-based instructions, practical skills

Introduction

Modern educational trends focus on application aspects through social interactions either regarding theories or technologies. The modern educationists claim that modern trends in education are all about encouraging and providing the proper environment to the students to learn through social interactive experiences applying practical tools for acquiring knowledge and skills leading them to productivity as these can help them to compete globally (Nwabueze & Isilebo, 2022).

Education and social experiences are interwoven to each other and go side by side. The western progressive educationist claimed many years ago that education is a continued process of experiencing and revising or reorganizing experiences into learning practical skills through the adjustment in environment and interaction with its resources; education is supposed to be a process of training for developing practical skills through the enrichment of inherent potentials (Dewey, 1916). For the same, the eastern educationist advocated that the productive aspect of education enables a person to do things by overcoming each and every problem through practical skills and social interactions (Agrawal, 1992). Hence, education equips students with knowledge and skills needed for bringing positive changes and development in the world around them through the interaction with resources available around them.

These aforementioned statements clearly reveal the fundamentals of modern educational concept that clearly prioritize the functional and practical aspects of education, relating it with productive and skill developing aspects through the application of activity-based instructions in classroom. Nwabueze and Isilebo (2022) put their view again that educational development is a systematic method of enhancing and improving teaching-learning for individual and societal development by the application of innovative and creative activities. Educational developers usually work closely with teaching-learning by the application of different technologies available around them and technology devices in teaching-learning as well as the development of electronic resources to support staff and students in academic institutions globally.

From a practical perspective of education, Smith (2006) argues "Eucation can be part of the problem as well as part of the solution. Policies and practices at all levels within the education system need to be analyzed in terms of their sensitivity to local diversities and their potentials for the overall social development" (p. 29). The remarks of Smith here reveal that diversity not only provides various types of opportunities through the varieties of knowledge but also provides experiences and practical skills for educational and social development through the inclusion of indigenous technologies in education system by formulation policies and practices via classroom instructions.

The above mentioned discussions reflect that there requires the students' involvement and interaction with the relevant resources available in the local environment in socio-cultural context in order to develop practical skills in students. Socio-cultural context includes human differences regarding their individual as well as group identification related to their particular knowledge, skills, experiences and practices. UNESCO (2011) puts forth the similar ideas on socio-cultural context stating that it includes race, class, ability, different learning conditions and styles, ethnicity, age, gender, sexual orientation, religion, nationality and other dimensions that make up the individual and group practices. According to Nwabueze and Isilebo (2022) the modern trends of education include event and task-oriented learning that is based on the phenomenon of social learning which requires the interaction of students with the locally available resources around them.

Indigenous population is taken as a fundamental resource. In order to clarify such population as one of the major resources, Senyucel (2009) claims that the really important element of the nature is the human capital and most importantly the local inhabitants or indigenous people. It possesses the characteristics and skills indigenous people bring to an organization such as commitment, loyalty, expertise etc. however, such human resources are very different from other resources in organizations. The particular experiences, technologies and skills inherent in the indigenous people are considered as resources in the real sense. Not only the nature but the peoples who have been living on it are also the major users of resources (Ehrlich & Ehrlich, 1990). Similar ideas on indigenous population have been put forth by Hope (2002) that the local people do not just determine the extent and type of use of resources that occur, the impact depends upon their demands for specific resources, how much, how they are extracted or otherwise used, where the impact occurs, the types of technologies employed the

habits and expectations of societies and cultures. Concerning the same Gratton (2015) claims that of all the functions in development, locally available human resource is the guardian of the future and the most influential in transforming culture.

As indigenous people have the capacity in mobilizing the locally available resources, their communities are thought to be responsible for the proper utilization of the resources since such people possess collective capacities in managing locally available natural resource as in community-based resource mobilization programmes, local people are responsible for utilizing the natural resources around them. Local indigenous people have the knowledge about the local resources. Similar remarks on indigenous people have been put forth by Weddell (2002); according to his study indigenous people from the poles to the tropics have initiated some highly effective and innovative conservation projects. These reflect a strong desire for self-determination as well as knowledge of local resources and an appreciation of the importance of managing them sustainably.

Various scientific studies show the necessary of assimilating local knowledge and technologies of the indigenous people and partnership with local communities for the proper mobilization of natural resources. In this regard, Timsina and Ojha (2008) illustrate that scientists have appreciated the importance of incorporating local knowledge and partnership with local communities. Scientists themselves admitted that knowledge base of almost all the scientists in their organization comes from the school and university based education, and recognizes the significance of the indigenous knowledge and technology system which has existed with the community and farmers for generations.

The discussion above makes it clear that the scientists from their studies have admitted the existence of indigenous knowledge and technologies of local farmers for generations and are the fundamental assets to use for school and university based education. Surveying in the issue of participatory natural resource management and knowledge of indigenous people in order to get varied levels of innovations and generate useful insights into deliberative interface of diverse knowledge systems in the context of Nepal, Ojha et al. (2008) state that there is a significant potential of analysis of knowledge and technology systems driving such practices towards understanding how better results can be achieved. According to them, lessons from the analysis of case studies on natural resource management in Nepal with varied levels of innovations generate useful insights into how deliberative interface of diverse knowledge and technology systems can be strengthened to achieve effective and equitable impact.

Indigenous technology and its analysis is very important in making policies and programmes on participatory natural resource management and understanding how better result can be achieved. This is mostly applicable in Nepal like in any other developing countries. The outcomes from the case studies concerning the same in Nepal show that the diverse knowledge of local people are the effective tools in making policies and programmes on the proper management and utilization of the locally available natural resources.

In order to carry out developments in technologies in the field of resource utilization such as in farming and others, the studies have found that the knowledge of local people plays a vital role to enhance the technology knowledge of scientists. Focusing on the value of indigenous knowledge for the development of technologies in the field of resource management, Timsina and Ojha (2008) further elucidate, "The participatory variety selection is one of the effective approaches which combine the knowledge of scientists and the technologies local people however, the challenge is to fully recognize the value of indigenous knowledge system while developing technologies" (p.27).

The issue emerges here is the challenge to recognize the value of indigenous technology system while developing technologies in the field of resource mobilization. Illustrating the solution for the challenges mentioned, Jazairy et al. (1992) state, "Indigenous intelligence, combined with enlightened training and other external assistance, may result in agricultural and other technologies which are manageable in scope do not rely unduly on imported technology, have low recurrent costs, and can be voluntarily maintained by farmers themselves" (p.37). Jazairy's statement on the other hand suggests for carrying out proper trainings and other external supports for making them enable to develop and cope with the technologies in their own field. Giving the focus on indigenous farmers and highlighting them to be considered as the major stakeholders as an indigenous feature for the innovation of technologies in their own arena, Timsina and Ojha (2008) elucidate that in all modalities of agricultural research, farmers are the major stakeholders to utilize the agricultural technology generated. They need to be considered as the active agents of knowledge development process. Similarly, the policy and institutions of agriculture development need to be crafted in a way to promote a network of farmers, a form of civil society that promotes the knowledge system suitable for the farmers.

The above discussion advocates for the establishment and promotion of the network of local people, their knowledge of indigenous technologies, and formation of their community institutions and include it in the policy of the nation in order to promote their knowledge and technologies system. This discussion suggests that indigenous people are the fundamental assets that play a vital role in the mobilization of natural resources available locally. They also play a crucial role in developing technologies required in the field of resource utilization this is because they possess the unique capacity, experience and skill based on their locally acquired indigenous knowledge and technologies. Such resources are available around the schools and can be brought in classroom to create a learning environment in real life situation. Such practices in classroom instructions develop practical skills. But the irony is that the classroom instructions in the study areas in present are solely based on traditional approaches that practices textbook-based theoretical learning. Hence, identification of such indigenous technologies, analyzing their applicability in classroom instructions for the development of activity-based and skill-oriented practical education seems to be crucial.

This study aims to identify the locally available indigenous technologies in the study areas and analyze the applicability of available indigenous technologies in classroom instructions in study areas.

Research questions

This study seeks the answers to the following questions:

- Are there indigenous technologies available in the study areas?
- Can the available indigenous technologies be applied in classroom instructions?
- How can the available indigenous technologies be applied in classroom instructions?

Methodology

Qualitative research approach has been chosen in order to address and seek the answers of the research questions. Hermeneutic phenomenology has been applied to find out people's lived experience (Langdridge, 2007) by using a method of making sense of the world as people experience it by interpreting the meaning of the experiences (Van Manen, 2014). The aim of researcher through this phenomenology is to explore the hidden meanings of peoples' experiences their practiced knowledge and skills by applying 'interpretive paradigm' which is viewed as a social construction having a central goal of seeking to interpret the social-world (Higgs, 2001). Relevant phenomenological questions through unstructured or semi-structured interview are used for collecting experiential data from participants (Beck, 2021). The experience contained data are utilized for proper phenomenological analysis and reflection which is meant to serve the purpose of producing categories to unlock meaning through the process of phenomenological interpretation, analysis, reflection, and writing (Stolz, 2023). For the purpose, PRA (Participatory Rural Appraisal), classroom observation, and semi- structured interview have been applied as processes. Field notes, photographs and voice recording were also carried out as supportive tools and techniques. The collected data were analyzed by carrying out six stages: immersion, understanding, abstraction, synthesis, illumination and illustration of phenomena and integration and critique of findings.

Considering the diverse features in the selection of study sites (Rowland & Leu, 2011), I have collected the required data from three geographical pocket areas: arable plain, riverside area, and tourist area in suburbs of Sainamaina Municipality-6, Tillottama Municipality-14 and Lumbini Cultural Municipality-10 of Rupandehi district Nepal respectively.

The participants in this study belonged to both the indigenous and migrant dwellers of identical geographical pocket areas: arable plain, riverside area and tourist area of Rupandehi district, Lumbini Province, Nepal. The local inhabitants of selected pocket areas have been prioritized for the identification of indigenous technologies. The participants include: 30 local dwellers, 6 teachers, 6 students, 3 parents, 3 social workers, 3 SMC members, 3 local ward representatives and 1 educationist.

Results and Discussion

The identified indigenous technologies through PRA, observation and semi-structured interview in the study area have been presented in the table 1.

Table 1

The Identified Indigenous Technologies

Geo-pocket Areas	Indigenous Technologies
Arable Plain	Planting rice/wheat/ potato, Kohl(oil mill), Chhataki (mouse trapping device) Dhenki, Making Spears, Making ploughing equipment set, Reaping sickle Ladhiya (slow motion jolting cart), Making walls made of straw and mud
Riverside Area	Planting potato/paddy/wheat, Planting seasonal vegetables, Chakki (for making pulse), Making walls made of straw and mud, Making boats (Mallah), Making Khasi (blocking reproduction of male goat) Muslim, Processing the skin of dead cattle (Harijan), Making Khapada(roofing materials), Making ploughing equipments set(used to)
Tourist Area	Planting potato/paddy/wheat, Making ploughing equipment set(by Badhai people), Chakiya (for making pulse), Making walls made of straw and mud, Making boats (by Badhai people), Making Khasi (blocking reproduction of male goat) Muslim, Processing the skin of dead cattle (Harijan/Chamar), Making Khapada(roofing materials), Making puffed rice, Pottering(by Kumal), Jato (flour making device)

(Source: field survey)

Table 1 reveals that indigenous technologies in three of the study pocket areas to be different to some extent. I also found that these technologies mostly accountable for two major fields or aspects: agricultural and housing. Such technologies present excellent possibilities of scientific innovations and methods in their own fields.

Such technologies could be used from multiple aspects and purposes to develop various skills in students. I have categorized the use of above stated indigenous technologies from two perspectives as: possible common use and possible pedagogy specific use.

Possible General Use of Indigenous Technologies

The possible common uses of indigenous technologies identified in my study areas have been presented in Table 2.

Table 2

Possible Common Use of Indigenous Technologies

Geo-pocket Areas	**Potential Use of Indigenous Technologies**
Arable Plain	-Development of plantation techniques
	-Scientific development of agricultural tools
	-Development of housing techniques
	-Development of storing, processing, recycling techniques
Riverside Area	-Production of seasonal vegetable
	- Scientific development of agricultural tools
	-Development of leather processing
	-Development of roofing techniques
	-Development of storing, processing, recycling techniques
Tourist Areas	-Development of plantation techniques
	-Development of housing techniques
	-Development of leather processing
	-Scientific development of pottering
	-development of grinding devices

(Source: field survey)

Table 2 reveals the available indigenous technologies in three of the study pocket areas. The identified indigenous technologies possess various potentialities and can be used for common purposes that primarily indicate the uses of daily activities and for the solution of daily life problems as well as from the perspective of development of infrastructure in the studies such as development of plantation techniques, housing, harvesting, processing, recycling, constructing pottering and so on.

Pedagogic use of Indigenous Technologies

Keeping the available indigenous technologies in my mind and seeking their possible linkage with the development of concept on various subject items and topics linking them with teaching learning process including the possible activities in classroom instructions, I have identified the possible use of indigenous technologies in classroom instructions. These possible pedagogy specific uses of indigenous technologies are based on locally available resources which were found to have been involved, mobilized and proceeded by the local people of respective geo-pocket areas as shown in Table 3.

Table 3

Pedagogic Use of Indigenous Technologies

Geo-pocket Areas	**Pedagogical use of indigenous technologies**	**Areas of use in the curriculum, textbooks, and teaching guide**		
		In curriculum	**In textbook**	**In teachers' guide**
Arable plain	-Teaching concept of plantation and its techniques -Concept illustration of tools and their construction skills in agriculture, housing and daily use requirements	Grades: 8,9 and 10 Subjects: Agriculture Education, Occupation, Business and Technical Education and Social Studies	Grades: 8,9 and 10 Subjects: Agriculture Education, Occupation, Business and Technical Education and Social Studies	Grades: 8,9 and 10 Subjects: Agriculture Education, Occupation, Business and Technical Education and Social Studies
Riverside area	-Teaching concept of seasonal plantation of vegetable and crops -Concept illustration of tools and their construction skills in agriculture, housing and daily use requirements -Leather processing and various uses	Grades: 8,9 and 10 Subjects: Agriculture Education, Occupation, Business and Technical Education and Social Studies	Grades: 8,9 and 10 Subjects: Agriculture Education, Occupation, Business and Technical Education and Social Studies	Grades: 8,9 and 10 Subjects: Agriculture Education, Occupation, Business and Technical Education and Social Studies
Tourist areas	-Teaching concept of plantation and its techniques -Concept illustration of tools and their construction skills in agriculture,	Grades: 8,9 and 10 Subjects: Agriculture Education, Occupation, Business and	Grades: 8,9 and 10 Subjects: Agriculture Education, Occupation, Business and	Grades: 8,9 and 10 Subjects: Agriculture Education, Occupation, Business and

	housing and daily use requirements -Leather processing and various uses - Concept formation for the development of locally available indigenous techniques including practical uses	Technical Education, Social Studies Science Education	Technical Education, Social Studies Science Education	Technical Education, Social Studies Science Education

(Source: field survey)

The stated indigenous technologies above could be addressed and mentioned in secondary level curriculum; the above found technologies could be proceed in application through the formulation of local curriculum associating them with the objectives through an establishment of local needs as a base for the problem solving, vocational and professional skills as also mentioned in CDC Nepal (2010), (2014) as stated in National Education policy (2019). But I found neither the systematic inclusion of such technologies in curriculum nor the proper practice in teaching learning. The teaching-learning activities found in field observation shows that the teachers are giving lectures solely based on the lines of textbooks. Some of the teachers are found to have been just reading the lessons of the textbooks. Searching upon the reasons on why the teachers do not show interest for the application of such technologies in teaching, it has been found from the respondents that they haven't got any orientations for such techniques and methods that bring the application of such indigenous technologies in classroom instructions. Moreover, the respondent teachers also argue that they have been focusing on students' good results in their exams and there is no provision for the practical examination for such application. Seeking the reasons from the educationist and local representative, it has been found that there is no adequate research on indigenous technologies for the inclusion in curriculum.

Conclusion

Resources mayn't have meaning until they are utilized for purposes of solving human problems. Naturally, the interaction of human beings with the locally available resources generates knowledge, experiences and practical skills and when such interactions are brought in classroom through the activity-based instructions, the students automatically develop practical experiences and skills in themselves. Indigenous technologies are such locally available resources which can be brought in classroom and can be applied for carrying out various activities leading students to develop practical skills through real life situation. An abundance of indigenous technologies were found in my three of the study areas, such as planting different crops,

making farming equipments set, making different equipments and devices for daily uses and so many others. These technologies can be applied in classroom instructions for teaching the contents like scientific development of agricultural, housing, daily use tools etc. through demonstration, presentation, observation, participation, field work, modeling etc. Such technologies could be used from multiple aspects and purposes to develop various skills in students. The uses of above stated indigenous technologies have been categorized from two perspectives as: possible common use and possible pedagogy specific use. Keeping the available indigenous technologies in mind and seeking their possible linkage with the development of concept on various subject items and topics, linking them with teaching learning process including the possible activities in classroom instructions, the possible pedagogic uses of indigenous technologies in classroom instructions have been identified. These possible pedagogy specific uses of indigenous technologies are based on locally available resources which were found to have been involved, mobilized and proceeded by the local people of respective geo-pocket areas. The stated indigenous technologies above could be addressed and mentioned in secondary level curriculum and the above found technologies could be proceed in application through the formulation of local curriculum associating them with the objectives through an establishment of local needs as a base for the problem solving, vocational and professional skills as also mentioned in CDC Nepal (2010), (2014) as stated in National Education policy (2019).

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