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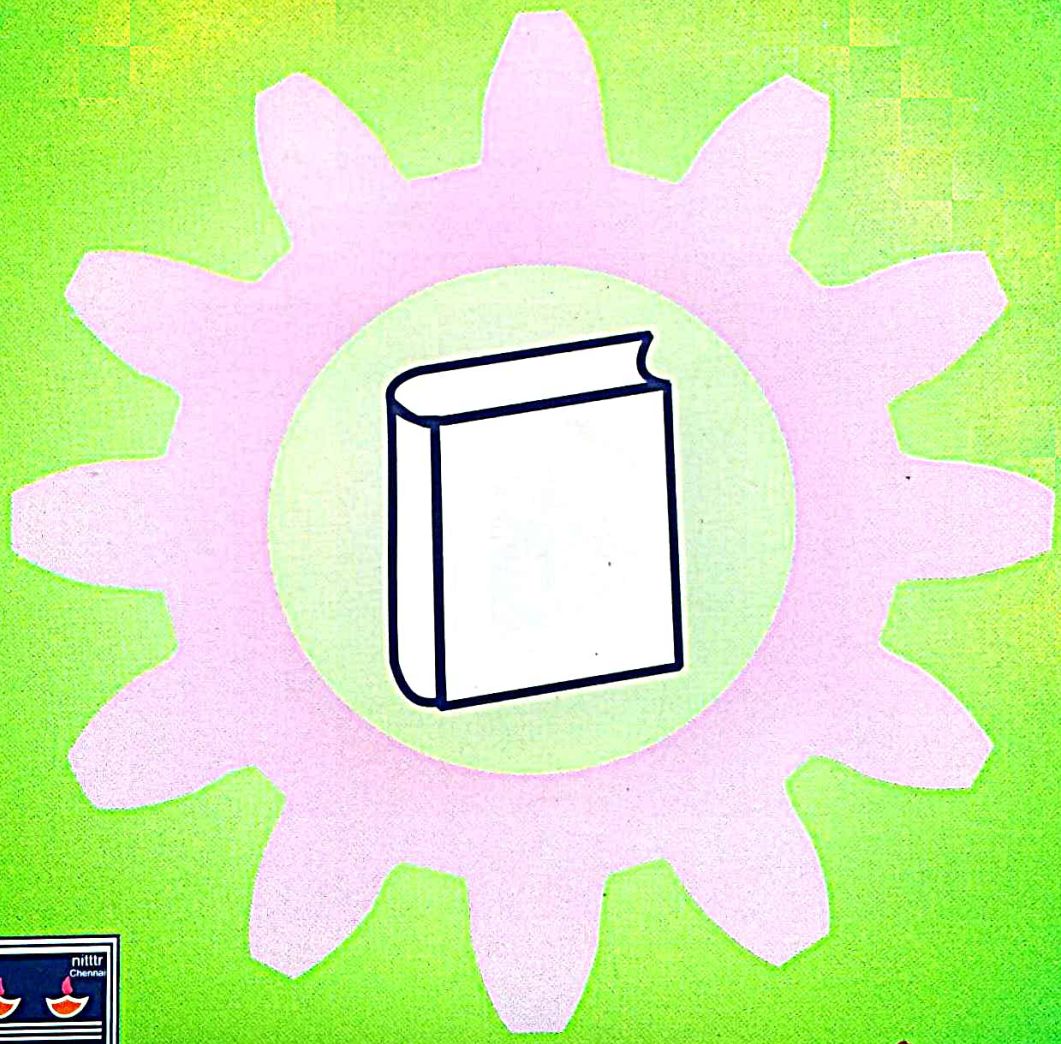

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EDITORIAL AND EDITORIAL ADVISORY BOARDS

EDITORIAL

We are glad to bring out the Volume 24 No.1 of the Journal of Technical and Vocational Education. The present volume contains a variety of articles and research papers in the area of technical education which will be of interest and importance to the readers.

Dr. Narendra K Sharma and Ms. Nisha Singh in their article "From Vision to Action : A model of Entrepreunerial Activity process" has detailed the study undertaken to understand the entrepreneurial process and the Role of vision, Self efficacy, Intention, Action and Business startup activities in the Business start up process.

Ms. Suriakala, Ms. Arul Deepa George, Shri. Mohammed Iqbal and Dr. Sambanthan in their article titled " Merrill's Taxonomy and Action Verbs for Information and Communication Technology Content Analysis" have explained how Merrill's Taxonomy a derivative of Information processing theory suited for content analysis of ICT Subjects.

Dr. Rajarshi Roy, Ms. Anjana and Dr. Biswas have reported on the study exploring the scope of indigenous technology as formal technical education curricula in eastern and northern India in the paper titled "Environment, sustainable development visa-vis scope of indigenous technology within formal technical education curricula in India : An Empirical study".

CE 2004 is a guideline curriculum developed by IEEE Computer Society. Dr. Dhanapal in his paper "Development of a UG Engineering curriculum in a dynamic field by a professional body for adaptation worldwide - A Case study" has detailed the salient features, the body of knowledge and the factors for local adaptation of IEEE guidelines".

The study titled "Impact of Video Recorded Microteaching in professional development of teachers" by Dr. Panch.Ramalingam reports the study done by the author in evaluating the impact of microteaching on teachers in higher education.

The article titled "Eklavya Technology" by Dr. Nagendra Rao outlines the Role of computers in instruction, essentials of instructional design and role of human contact.

In the paper titled "Role of trade unions on Education and Training", Dr. Govindan has reported on the research study undertaken by him to find out the contribution of trade unions on education and training in relation to several factors like gender, type of union, type of industries etc.

Shri. Kulanthaivel in his paper titled "Video Conferencing for Tele Education and Training" explains the technology behind video conferencing and how it can be used for education and also how it has been used in technical teachers training at NITTTR, Chennai.

Artificial Neural Networks (ANN) enables adaptive learning, self organization and real time operation. Shri Sathiyasekar, Dr.Thyagarjah, Dr.Krishnan and Shri.Ganeshan in their paper titled " A Novel partial discharge Analysis on the stator winding of 60MW/11KV Alternator using Neural network" proposes the use of ANNs in PD testing.

Dr. Srinivasan in the research report titled "Polytechnic teachers preparedness for teamwork - An Analysis" has reported on the analysis done for ascertaining preparedness for teamwork.

We sincerely thank and gratefully acknowledge the contributions of the authors for the present volume. We welcome papers and research articles from Academicians and Researchers in the area of technical and vocational education for our future publications.

– Editor

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From Vision to Action: A Model of Entrepreneurial Activity Process

NARENDRA K SHARMA AND NISHA SINGH

ABSTRACT

This study attempts to understand what is involved in starting a business. Vision, self-efficacy, intention, business start-up activities and action constructs were explored as the processes of business start-up. A model of business start-up involving these constructs was proposed to understand the entrepreneurial process. The model was validated on the basis of the sequencing and categorization responses obtained from 31 student participants. Categorization generated ranked data which were used to explore whether the subject agreed with the researchers in sequencing of various processes used in the model. The data were analyzed using non parametric statistics such as Friedman's two-way analysis of variance by ranks, multiple comparisons between ranks and Page's test for ordered alternatives. In general there was an agreement of the obtained data with the suggestion that in the entrepreneurial act vision, entrepreneurial self-efficacy, intention, business start-up activities, and action occur in the same time order as listed above.

Key Words: Action, Business start-up activities, intention, self-efficacy, vision

INTRODUCTION

Entrepreneurship is an interdisciplinary phenomenon and vast range of studies and researches have been done to understand the same. Cantilon (1755) was the pioneer, who defined the entrepreneurship as it appears in the modern sense. Nonetheless, it was Schumpeter (1928), who really launched the field of entrepreneurship by associating it clearly with innovation. According to him, entrepreneurs are business organizers and innovators. Various efforts have been made in order to define entrepreneurship. Gartner (1990) explored the underlying meaning of entrepreneurship as understood by researchers and practitioners. He concluded, "Entrepreneurship is a very complex idea. What we must all be concerned about is making sure that when we talk about entrepreneurship we recognize that it has many different meanings attached to it" (Gartner, 1990). The present study will accept the definition of entrepreneurship given by Gartner which states that entrepreneur is the founder of a new business or a person "who started a new business where there was none before".

How they manage to create new organization or what is the process of starting new business? This is the question researcher from different fields are trying to answer. In this regard, we can indicate that initially psychologists tried to emphasize the personality variable achievement motivation as the explanatory variable of entrepreneurial activity (McClleland, 1961). A number of researchers studied need for achievement, but none seem to have obtained conclusive results that associate it with entrepreneurial activity

(Durand & Shea, 1974; Hundall, 1971; Schrage, 1965; Singh & Singh, 1972). So far an absolute scientific psychological profile of an entrepreneur could not be established (Filion, 1998). Entrepreneurial cannot be understood by providing the profile of entrepreneurs. It should rather be an attempt to provide integration between the personality attributes and the process involved in creating a new venture. An obvious flaw in the personality theory is the assumption that the variables characterizing the entrepreneur and the environment are static. The reality is that the environment is changing constantly and traits or characteristics alone have little ability to explain behaviour (Delamar, 2000). Therefore a need was felt to understand the entrepreneurial activity as a process, which may occur in a particular time frame.

Psychologists and management scientists have proposed a number of models of entrepreneurial activity (Bird 1988; Boyd & Vozikis 1994; Shapro & Sokol, 1982), which are generally based on Ajzen and Fishbien's theory of reasoned action (TRA). Ajzen and Fishbien (1977) formulated the theory of reasoned action after trying to estimate the discrepancy between attitude and behavior. Later on they modified the theory of reasoned action and suggested theory of planned action (TPA) according to which the behaviour would be determined by the perceived behaviour control. This theory predicts that behaviour can be deliberate and planned (Ajzen, 2002). According to TPA, the best predictor of behaviour is intention, which is the cognitive representation of an individual's readiness to perform a given behaviour, and it is considered to be the immediate antecedent of behaviour. Three things determine this intention: 1. attitude towards the specific behaviour, 2. their subjective norms, and 3. their perceived behavioral control.

However, there is little empirical evidence in support of these entrepreneurial models. Bird (1989) proposed the "Model of Intentionality for Entrepreneurial Activity", which Boyd and Vozikis (1994) modified and suggested that mere intentionality was not enough to start a new venture. Their suggestion was that self-efficacy could be a deterministic factor for entrepreneurial activity. Boyd and Vozikis (1994) included self-efficacy in their model instead of including perceived behavioral control because of special characteristic of self-efficacy. Ajzen (2002) described that the concept of perceived behavioral control is closely related to Bandura's concept of self-efficacy (Bandura 1977). Both concepts refer to perceptual factors that are specific to the attainment of a given behavior or behavioral goal. In the words of Boyd and Vozikis (1994), "however, self-efficacy appears to be a broader construct that also provides insight in to the sources of efficacy judgement that subsequently influence behavior and goal attainment. The integration of self-efficacy in to Bird's model provides added insight in to the cognitive process by which entrepreneurial intentions are both developed and carried out through specific behavior".

The models of entrepreneurial activity are largely based on the attitude model of Ajzen and Fieshbien, they do not explain "planned action" that may be very important for the start-up of new venture and that should come in the entrepreneurial process before any real action has taken place. The present paper attempts to understand the relationship between vision, entrepreneurial self-efficacy, intention, planned action (i.e., Business Start-up Activities BSUA) and action, and presents a preliminary validation of the model.

Entrepreneurial activity is a multidimensional process. It includes not only personal variables but also the social and economic context in which entrepreneurial activity takes place. Extant studies on environmental factors show that these factors facilitate but do not necessarily determine the entrepreneurial activity (Shapiro & Sokol, 1981; Low & Macmilan, 1988). Entrepreneurial activity is an act, which has a psychological aspect. The proposed model in this present paper attempts to include all those constructs which were found as important explanatory variables. The present model assumes that these particular constructs act as processes that occur in a specific time frame in an entrepreneur's life for starting a new venture.

The present paper is an attempt to propose and provide a preliminary validation of a parsimonious model to explore how an entrepreneur gets involved in the new venture. The proposed model assumes a timeframe (a sequence of 'one-after-the-other' order) in which the relevant entrepreneurial processes occur as sketched in Figure 1.

In the proposed model (Figure 1), instead of including many construct of Boyd and Vozikis Model, vision was included as the first step to start any venture creation. This is because, vision is the primary construct for an entrepreneurial activity. As Amit, Glosten and Muller (1993) suggested, "the entrepreneurial value comes not from concrete assets but from the entrepreneurial vision". Filion (1991) defined vision as "a projection: an image projected in to the future of the place the entrepreneur wants his products to occupy eventually in the market, and also an image of type of enterprise needed to get there. In short, vision refers to where he wants to take his enterprise".

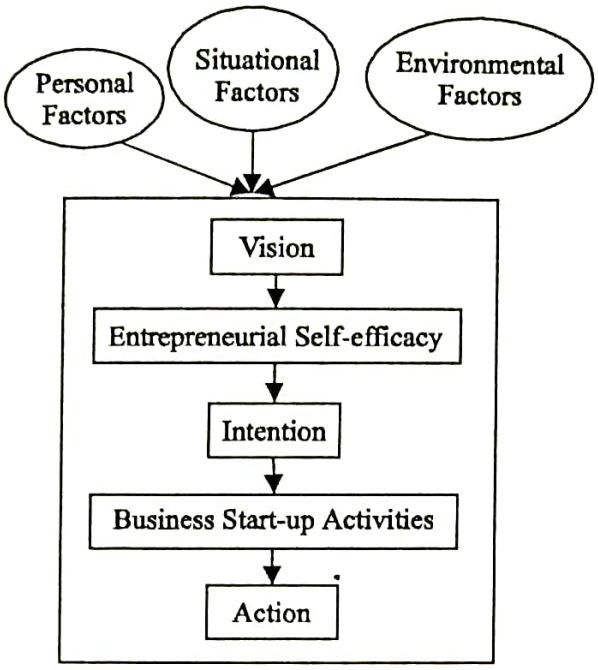

Fig.1 The proposed model of the process of Business-Start-up

Vision is a construct which is composed of three basic parts, namely, core values, purpose and mission (Collins, 1992; p63). According to Collins, vision gets developed from the personal, situational, and economic contexts of the entrepreneur. These contexts shape an entrepreneur's dreams, purpose, mission and future planning. Core values and benefits constitute a system of guiding principles and tenets that include philosophy of business and life, principles that are to be held inviolate, an extension of the personal core values and beliefs. Purpose is the fundamental reason for the organization to exist, which grows out of core values and is always worked towards but never fully attained. Mission is a bold, compelling, audacious goal that has a clear finish line and specific timeframe. Once completed, a new mission is set.

These components produce a broader framework of vision, which includes the total mindset of the entrepreneurs when they go to

start a new venture. According to the above research definition, though vision has latent characteristics and is abstract, it is comprehensible and can be verbalized. Vision is the base of development of entrepreneurial activity. If there is no vision, there is nothing to establish in the life of a person. Establishing a vision is most important for entrepreneurs.

The model presented in Figure 1 proposes that vision will determine entrepreneurial self-efficacy because an entrepreneur tries to acquire the skills and information according to the goals set to be achieved, through implicit learning. Entrepreneurs prepare themselves towards their vision, sometimes without consciously knowing about it. When they think of starting new business, they evaluate themselves according to their own vision. Birly (1985) found that entrepreneurs in her study tended to rely primarily on informal sources of information and help (business and social contacts, family and close friends) in locating new employees, locating the business and planning the future activities of the business. Formal sources of support (banks, accountants, lawyers, local government, and chambers of commerce) were used, but only as a last resort (Bull & Willard, 1993). Self-efficacy or confidence in one's own ability to perform tasks is considered to be prerequisite for intending to start a new venture (Boyd and Vozikis, 1994; Chandler & Jensen, 1992; Chen, Greene & Crick, 1998; Krueger, 1993; Krueger & Brazeal, 1994). Entrepreneurs gather this kind of information to enhance their ability, their sense of efficacy. Vision defines the area in which entrepreneurs will gather the information to enhance their entrepreneurial self-efficacy.

Self-efficacy is belief about ones own ability. It is important for entrepreneurs to believe that they are capable of starting their business in all circumstances, are able to fulfill their mission, purpose, and core-values. If mission is very broad, the entrepreneurs must develop their capability according to that mission. That is, the entrepreneurs should be sure of their capability and have belief in the same. The make-up of self-efficacy can be understood from the following: "Self-efficacy is an individual's cognitive estimate of his or her capabilities to mobilize the motivation, cognitive resources, and courses of action needed to exercise control over events in their lives" (Wood & Bandura, 1989). Self-efficacy has three dimensions: 1. Magnitude, 2. Generality, and 3. Strength. Henry (1992, p168) has defined these dimensions as below – Magnitude: "the level of task difficulty with in the same domain of performance, which can be low to high, higher magnitude of self-efficacy means more difficult task will be undertaken and can be performed;" Generality: "the width or the range of the activities and situation that a person's efficacy entails and reflects how widely the self-efficacy can be applied to a narrow or wide selection of related tasks;" Strength: "the degree to which a person's self-efficacy can withstand disconfirming evidences and reflects the resilience of belief. Stronger self-efficacy persists despite several failures; weaker self-efficacy declines with failures" (Bandura, 1986).

The sources of self-efficacy are performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal (Bandura, 1986). The aim of the present paper is not to analyze as to how an entrepreneur acquires self-efficacy, instead we assume that entrepreneurs decide to acquire self-efficacy according to their goal, core values, mission and purpose; in other words, according to their vision. For example, an

entrepreneur may get involved in a new venture. Thus, the objective of the empirical part of the study was to validate the model of entrepreneurial activity process suggested above.

METHOD

Participants

This study collected data from 31 students pursuing doctoral research or Masters level studies in the disciplines of science, technology and humanities and social sciences at an institute of technology. The average age of the participants were 25 years.

Design

The study employed a categorization procedure with repeated measures design. Nonparametric statistics were used to analyze the data.

The Material for the Experiment

We adopted a self-testing approach in which questions were written on cards (e.g., "Will I succeed if I start my own venture/firm?"). The objective behind adopting self-testing approach was used to encourage active engagement of the participants, as an entrepreneur would do in real life. The stimulus materials included 20 cards on which questions related to the five processes suggested in the model were written. Each card contained one question; four questions were used for each process. These questions are given in Appendix A. Cards were assigned numbers from 1 to 20. Five envelops on which category names (vision, self-efficacy, intention, business start-up or action) were written, and an extra envelope marked 'any other category' (if a participant wanted to suggest a category other than the five processes included in the model) were prepared for categorization of cards. The instruction sheet and response sheet on which the participants gave rank for each category and each card were also prepared. The instruction sheet provided operational definitions of the processes included in the model. Instructions given to the participants are presented in Appendix B.

The Task

The participants had to carry out the following tasks in sequential order. The first task required participants to categorize the cards in to given five categories (as written on the envelopes). Participants were asked to put these cards in to the envelopes according to category name. The second task of the participants was to rank the categories according to the time frame in which they thought the suggested categories of activities take place. Finally the participants ranked the cards according to the time frame in which the questions written on the cards would become relevant.

Procedure

Researchers approached the participants individually, briefed them about the purpose of the study and gave instructions as presented in Appendix B. Operational definitions of the categories were provided to the participants as given in the instruction sheet. Participants were provided with cards, response sheet and envelopes and they were asked to follow the instructions. After getting the categorization responses of the participants, the investigator (one of the authors) turned the cards out of the envelopes to record the category to which each card was assigned, reshuffled the cards, and gave the same to the participants to rank order them as per the instructions.

RESULTS

An extra envelope was given to the participants to suggest any category other than those included in the procedure they thought

would be necessary for the business start-up. This was done to asses whether the proposed model was comprehensive. A few categories were suggested by different participants (opportunity, market demand, goal-setting, ethical values, knowledge about market mechanism, passion, practically evaluation, social obligations, networking, management, communication, ample back-up for risk-taking, management, being informed about the area, market judgment, resources), but none of these categories came up significantly; no two participants suggested similar categories. Therefore the five categories (processes) in the model were taken as exhaustive to understand the entrepreneurial process.

Mean ranks were computed for each category on the basis of the ranks provided by the participants to the categories. Table 1 shows that the mean ranks were generally in an increasing order as would be expected on the basis of the proposed model, with an exception for vision and entrepreneurial self-efficacy.

Weighted means were computed by providing weights to each category according to the rank assumed for each category on the basis of the proposed model. The assumed weights were: vision - 1, self-efficacy - 2, intention-3, BSUA-4 and action-5. The frequency of each card obtained under each category was multiplied by the weight of the corresponding category. As shown in Table 2, the overall mean ranks for the categories were in an increasing order from vision (1.80) through self-efficacy (2.09), intention (2.56), business start-up activities (3.11) and action (3.87), as expected.

Are the processes suggested in the model distinct? Friedman's two-way analysis of

TABLE 1: Mean Ranks of Categories (N=31)

Category	Vision	Self-efficacy	Intention	BSUA	Action
Mean	2.00 (1.06)	1.77 (.72)	2.83 (1.27)	3.58 (0.72)	4.87 (0.34)

Note: Values in parentheses represent standard deviations.

BSUA: Business Start-Up Activities

TABLE 2: Weighted Mean Ranks of Cards and Overall Means Based on Frequency of Sorting of Individual Cards Under the Categories in the Proposed Model

Weighted Mean	Vision	Self-efficacy	Intention	BSUA	Action
	1.87[4]	2.08[1]	2.37[3]	2.45[6]	2.94[2]
Individual cards in the category	1.42[7]	2.07[11]	2.77[5]	3.79[9]	4.55[8]
	1.27[12]	2.08[15]	2.39[10]	3.39[13]	4.10[17]
	2.67[20]	2.15[19]	2.70[14]	2.79[16]	3.88[18]
Overall	1.80	2.09	2.56	3.11	3.87
	(.63)	(.04)	(.21)	(.60)	(.68)

Note: Values in parenthesis represent standard deviations.

BSUA: Business Start-Up Activities

Values in square brackets indicate card number

variance by ranks (Siegel and Castellan, 1989, p. 174), as given in Equation (1) below, was used to answer this question:

$$F_r = \left[\frac{12}{Nk(k+1)} \sum_{j=1}^{k} R_j^2 \right] - 3N(k+1) \quad (1)$$

Where N = number of rows (participants, 31); k = number of columns (variables or conditions, 5); R_j = sum of ranks in the j th variable. The F_r statistic follows a X^2 distribution with $k-1$ degrees of freedom. The analysis revealed a significant difference between the ranks of the categories ($F_r = 83.7, p < .001$).

Multiple comparisons between ranks of categories were conducted to determine which pairs of processes differed significantly from each other by using the inequality given in Equation (2) (Siegel and Castellan, 1989, p. 180). The value of α used in computing the critical value of the absolute difference was taken as .05. The critical value of the absolute difference between ranks (for one-tailed test) is 34.98; any difference greater than this value would be significant with $p < .05$. The results of this analysis, summarized in Table 3, revealed that action differed significantly from all other processes, and BSUA differed significantly from vision and self-efficacy. No other pair wise differences were found to be significant.

$$|R_u - R_y| \geq Z_{\alpha/k(k-1)} \sqrt{\frac{NK(k+1)}{6}} \quad (2)$$

Do the processes occur in the time frame as suggested in the model? Page's test for ordered alternatives (Siegal and Castellan, 1989, p184) was applied to answer this question. The L statistic based on the Page's test was computed using the formula given in Equation (3), where R_j = sum of the ranks for the j^{th} category. The computed value of L ($L = 1635$) was tested for significance using Equation (4) and the resulting value was found to be significant ($Z_L = 48.82, p < .001$).

$$L = \sum_{j=1}^{k} j R_j \quad (3)$$

$$Z_L = \frac{12L - 3Nk(k+1)^2}{k(k^2-1)} \sqrt{\frac{k-1}{N}} \quad (4)$$

DISCUSSION

The first question raised about the model was "Are the process suggested in the model distinct?" Friedman's two-way analysis of variance by ranks revealed that there was significant difference ($F_r = 83.7, p < .001$) between these processes. This means every process has its distinct characteristics and therefore all these processes are necessary to be included in the model. The second question raised about the entrepreneurial activity was

TABLE 3: Results of Multiple Comparisons Analysis Based on the Ranks of Categories

	Self-efficacy	vision	Intention	BSUA	Action
Self-efficacy		7	33	56*	96*
Vision			26	49*	89*
Intention				23	63*
BSUA					40*
Action					–

"Do the process occur in the time frame suggested in the model?" Page Test was significant ($L = 1635, p < .001$) for the ranks of the categories; this showed that ranking given to the categories was in increasing order. Therefore, it could be concluded that the ranks the participants gave to the categories were significantly described according to the timeframe. Baum and Locke (2004) studied over 200 entrepreneurs over a period of six years and found that goals, vision and self-efficacy were the most important explanatory factors for new venture, which were more successful and had grown over time.

In our model of entrepreneurial activity (Figure 1) we assumed on the basis of the available literature that vision comes first to start any new venture. However, participants (although the subjects were not entrepreneurs) gave responses indicating that they were not able to distinguish between self-efficacy and vision on the time frame suggested here. As Bhide (1996) described in his three-step sequence of questions, "The first step clarifies entrepreneur's current goals, the second evaluates their strategies for attaining those goals, and third helps them to assess their capacity to execute their strategies". If there is no idea, there is no question to evaluate capability. It may be possible that both constructs may overlap in this process. A possible reason for not finding difference in the sequential order of vision and self-efficacy is that subjects were not real entrepreneurs; they were students. It might be the case that when they started to think about the sequence of activities involved in starting a new business, they presumed that they have a goal to start a new business. Immediately they may start to think about the capability to start the business as the first step, without thinking that in the first step an entrepreneur must have some mission, purpose and core values to evaluate his capability. "Self-efficacy, more than perhaps any other psychological concept, is associated with persistence in the pursuit of goals, certainly a requisite characteristic of entrepreneurs who must continue in the face of difficulty for years to develop ideas and run them in to marketable products or services, introduce and continue to increase sales, creates a new organization" (Lucas & Cooper, 2005). However the weighted means reassumed the rank of vision and self-efficacy as suggested in the model. To obtain clear-cut findings, further investigation is needed.

The model presented here suggests that self-efficacy will lead to intention. Although there was difference between the rank means of intention (2.83) and business start-up activities (3.58), but the difference was not significant. It may be possible that both constructs may overlap in this process. But there was a difference in time frame between intention, BSUA and action. As shown in Table 2 the weighted means for categories were - vision: 1.80; self-efficacy: 2.09; intention: 2.56; business start-up activities: 3.11; and action: 3.87. The weighted means increased from vision to action. Hence, it can be concluded that the process of starting new business will begin with vision. Entrepreneurs develop their self-efficacy according to vision and self-efficacy in turn provokes intention to start a new venture. Finally, intention leads the entrepreneur to engage in to business start-up activities that will be further converted in to action. Business start-up activities help the entrepreneur to know the real situation of starting the new venture. It includes gathering information, estimating potential profit, finishing the ground work, and developing the structure of venture and setting-up business operations. These are more instrumental activities then intention.

The proposed model has some limitations. It was validated on master degree and research students; their responses might be confounded. There is a need to test this model on real entrepreneur. The model is based on time frame therefore more sophisticated technique should be used to tap the time frame. Further, the model is based purely on the psychological perspective where as entrepreneurial activity is a dynamic process, which can be more comprehensively captured by taking into consideration economic and managerial factors. Entrepreneurial activity is a long-term process and to comprehend this activity properly it is important that real situations are to be studied. A case study can provide a more comprehensive support to the model.

The model gives an insight for venture creation and the process of entrepreneurial activity. The model presented in this paper is beneficial for pedagogical purpose as students of entrepreneurship can be encouraged to generate their vision. On the basis of their vision, they can be provided training to acquire the entrpreneurical self-efficacy. Entrepreneurs also can be provided counseling about their enhancement of entrepreneurial self-efficacy and resilience to failure. Business start-up activities are the activities, which should be taken properly before launching the business. The process of entrepreneurial activity is interdependent on each process and every process is important in a particular time.

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APPENDICES

Appendix A

(Identify the cards as to be belonging to Vision, Self-efficacy, Intention, Business start-up activities and Action)

Vision: "Do I have some purpose in my mind to start the new venture?"(4), "Do I have my own mission to start the new venture?" (7), "Do I have broad goal for my venture?" (12), "Do I have any guiding principles for my business venture" (20); **Self-efficacy:** "Will I succeed if I start my own venture/firm?" (1), "Do I have the skills and capabilities required for starting the new venture?" (11), "Am I physically and mentally strong to handle the venture starting problems?" (15), "Is it very difficult to start new venture for me?" (19); **Intention:** "Do I surely like to start my own venture" (3), "Am I really interested in setting-up my own venture?" (5), "Have I mentally prepared my self for starting the new venture?" (10), "Am I determined to start my own venture?" (14); **Business start-up activities:** "Do I have a plan to start new venture?" (6), "Do I have sufficient information to start the new venture?" (9), "Do I have knowledge about the resources for starting the new venture?" (13), "Do I have any tactics to start my own venture?" (16); **Action:** "Is it time to establish the venture?" (2), "Can I hire the employees now?" (8), "Can I get loan for my venture?" (17), "Do I execute my venture now?" (18)

Appendix B

Instructions: "*Several questions come to the mind of a person planning to start something new, for example, a business venture. These questions make sense with in a time frame. That is, a question becomes meaningful only if it is followed by some other question(s). For example, if I want to eat in a restaurant, I must pay for the same. So the first question may be, "Should I eat in a restaurant?" The next question would be, "Do I have money to pay?"*

Here I am giving you some cards on which questions related to starting a new venture are written. Your task is first categorize these questions in to five categories according to relevant timeframe. We are assuming that these categories could be vision, self-efficacy, intention, business start-up activities and action. Where:

1. *Self-efficacy-one's own belief about his/her capability to execute particular task.*
2. *Business start-up activities preplanning for executing new venture.*
3. *Vision-a frame for future, includes purpose, mission.*
4. *Intention-likelihood to execute some task.*
5. *Action-really starting new venture.*
6. *Any-other-(please suggest the name).*

If you don't agree with these categories for any question, you may suggest a new category for the same. After categorizing it put these cards in to the envelopes according to category name and write the rank of these categories on the response sheet given to you. Similarly, please write the rank for each card on the response sheet. For example, card number 11 may get rank 2.

Merrill's Taxonomy and Action Verbs for Information and Communication Technology Content Analysis

M. SURIAKALA, ARUL DEEPA GEORGE, T.M. MOHAMED IQBAL AND T.G. SAMBANTHAN

ABSTRACT

Phenomenal growth potential of Information and Communication Technology (ICT) industries, with over 50% growth rate in the last 10 years, has been witnessed in India. The Software industry in the country, which employed 12,000 people in 1991, would be employing 2.2 million by 2008, as per McKinsey report (Narayana Murthy-2006). No other industry has created job on such a massive scale in India. This has led to introduction of several Computer and Information Technology (IT) related Science and Technology courses in different streams of education, in both Institutionalized as well as Non-formal Education sectors. Due to this rapid introduction of these types of courses, prescription of "Objectives" of any course outcome is almost missing in most of these course curricula of different streams. The importance of objectives pertaining to the competency levels for the ICT discipline, which is essentially required, is highlighted in this paper. This paper presents David Merrill's taxonomy as competency levels, which may be used for defining objectives for different programmes in Computer/IT disciplines. As David Merrill's model is based on Information Processing theory, the paper suggests the use of action verbs pertaining to the simplified phases of the Merrill's model, for any related subject content analysis of ICT discipline.

INTRODUCTION

Information and Communication Technology educational systems have to prepare their learners, in playing important roles in this rapidly changing knowledge society. This requires dynamic changes in the ICT curricula, which increases strain in its educational system. Hence a paradigm shift in the design and development of ICT curriculum and instruction is foreseen. Educators become facilitators and the source of learning is not limited to them, but includes study material from authors, magazines, journals from publications, websites etc. ICT educational system includes curriculum and instructional design through the above sources.

A multitude of instructional design theories are being developed to assist educators in their new role of assisting the learner in their self-learning process, which includes Bloom's Taxonomy (1965), Gagne's Taxonomy (1985) and that of Merrill's (1987, 1994). According to Helga (2002), "Education and training worldwide is changing from standardization to customization; from educator centered to learner-centered; from memorization to understanding. Learners are expected to direct their own learning, pace

their learning activities and to become lifelong learners. Companies need 'employees who can take initiative, think critically, and solve problems'". This is more so in the areas of ICT.

Over the past several years, the concept of Instructional Systems Design (ISD) has taken its knocks. Writing in '*Educational Technology*', Merrienboer, Van and Jeroen J.G (1997), comment that ISD "is too slow and clumsy...produces bad solutions...[and] clings to a wrong world view". Commenting in draft materials, Clark (2003), comments "The Instructional Systems Design (ISD) paradigm has essentially limited trainers' perspective". David Merrill's (2002) taxonomy has been derived from 'Information processing theory' and would certainly suit well in the design of ICT curricula, if applied in the Instruction design stage. This paper elaborates this theory and suggests a set of action verbs suitable to the simplified phases of the model, derived from several literature studies, so as to help researchers in directly using them, while performing subject content analyses of ICT subjects.

MERRILL'S THEORY

Instructional designers have long recognized the importance of analyzing subject matter for the purpose of facilitating learning, via appropriate knowledge selection, organization, and sequencing. Bloom and his associates (Bloom *et al.* 1965, Krathwohl *et al.* 1964) have introduced a set of categories, which are widely used for subject content analyses. Gagne (1965, 1985) proposed taxonomy of learning objectives that also found wide acceptance in the instructional design community. For each of his categories Gagne proposed unique conditions for learning, based on Information Processing theory. David Merrill elaborated and extended Gagne's categories in his work on Component Display Theory (Merrill, 1994). Hence Merrill's theory may be well suited to ICT subject content analysis.

Merrill's approach of putting a real-life problem in to the centre of the instructional episode is particularly suited to any problem-based learning approach (Nordhoff, Helga I 2002). As ICT education is problem-based, Merrill's theory is best suited for it (Merrill 2002).

In the Merrill's design theory, first Principles of Instruction, is emphasized along with the following aspects: the value of using the real-life problems in the instructional event; the importance of activation of existing knowledge of the learner; the role of demonstration; guided problem solving and the integration of new knowledge with existing knowledge. Merrill's theory is explained through his model.

MERRILL'S MODEL

Merill divides the instructional event in to four phases, which he calls Activation, Demonstration, Application and Integration. Central to his instructional model is a real-time problem-solving theme, called 'Problem'. Merrill suggests that fundamental principles of instructional design should be relied on and these apply regardless of any instructional design model used. Violating this would produce a decrement in learning and performance. His model is shown in Fig 1. The problem-solving theme (Problem) is surrounded by these four phases viz., 'Activation', 'Demonstration', 'Application', and 'Integration'. Each phase is defined and explained through Fig 1.

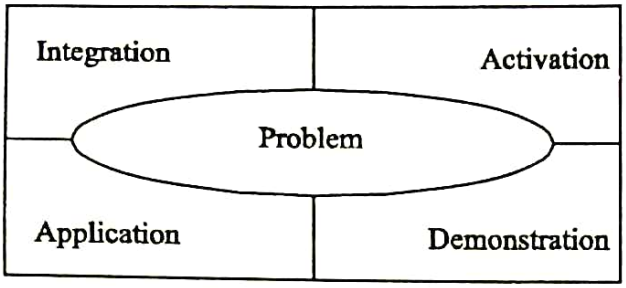

Fig 1. David Merrill's Instructional Design Model

It can be inferred that the model is 'Problem Centric'. Merrill goes on to show that, the most effective learning environment is problem-based and involve the students in these four distinct phases of learning as modeled in Fig 1. Learning is facilitated through these four phases and each one along with the theme is explained as below:

PROBLEM

Learners are engaged in solving real-world problems. Learners are shown with the task that they will be able to do or the problem they will be able to solve as a result of completing a module or a course. Problem-based learning (PBL) is perceived by some, as one of the most exciting approaches to education and learning, which has been developed in the last thirty years. The term PBL is used to describe a variety of projects, from research and solving case studies, to guided design and engineering design projects. Merrill explores several elements in the process of PBL.

ACTIVATION

New knowledge builds on the learner's existing knowledge. Learners recall or apply knowledge from relevant past experience as a foundation for new knowledge. This could be from previous courses or job experiences undergone by the learner. For instance, recall the old relevant information such as dates, events and places. The importance of activation of existing knowledge has been addressed by a number of educational psychologists. During Merrill's Activation phase, prior knowledge (or experience) is recalled and emotions are triggered. Not only pre-knowledge should be activated during this phase, but mental models as well. If these mental models consist of misconceptions, the instructional process could modify them.

DEMONSTRATION

New knowledge is demonstrated to the learner. Learners learn when the instruction demonstrates what is to be learnt, rather then merely telling information about what is to be told. The media used in the process is expected to play the relevant instructional role. Explain with examples, understand information with meanings, predict consequences, order, group, and infer causes are some samples for demonstration. During this phase, the instructor presents new material and demonstrates new skills. Demonstration focuses the learner's attention on relevant information and promotes the development of appropriate mental models. It shows actions in a certain sequence, which can simplify complex tasks and facilitate learning.

APPLICATION

The leaner to his problem applies new knowledge. This is the practice phase, where learners are required to use their knowledge and skill to solve the problem. Some samples are: Use information; solve problems using required skills or knowledge. The purpose of a practice phase in the instructional events is to provide an oppurtunity for learners to develop proficiency and become experts. During this phase, cognitive processes come in to play; and there is a search for meaningful patterns and mental programmes occur in the learner's mind.

INTEGRATION

New knowledge is integrated in the learner's terminal behaviour. This is the transfer phase where learners apply or transfer their newly found knowledge or skills in to their work day practices. This is felt, if learners can (a) demonstrate their new knowledge or skills, (b) reflect-on, discuss their new knowledge and skills and (c) create, invent and explore new ways to use their new knowledge and skills. Seeing patterns and organizing by recognition of hidden meanings, are some samples. Use old ideas to create new ones (relate knowledge from several areas). Assess values of ideas (make choices based on supported arguments). Most of the instructional events end with an assessment phase. During this phase learners have to prove themselves, that they have acquired the new knowledge and skills. Merrill calls this as the Integration phase, during which the learners get the opportunity to prove new capabilities and show newly acquired skills. This integration phase uses the higher order thinking skills of the Bloom's taxonomy, viz., Analysis, synthesis and evaluation.

From the above five components of Merrill's model, the 4 phases can be used for any study on instructional methods or subject content analysis, provided useful action verbs for these components are arrived at.

ACTION VERBS FOR ICT SUBJECT CONTENT ANALYSIS

Learning objectives communicate the expectations of the faculty member. Consequently, the learning objectives have to identify the knowledge base, the appropriate depth or detail, and how the students are able to use the knowledge. For a traditional 50-minute lecture, usually three to seven learning objectives can be constructed. Action verb may be used, which indicates the depth of understanding expected from the learner.

For the purpose of arriving at action verbs pertaining to ICT, the categories as simplified and defined according to a practical situation (Merrill – 2004), along with a set of action verbs which may be directly used in ICT subject analysis is detailed below:

ACTIVATION ("WHERE DO I START?")

(i) Does the instruction direct learners to recall, relate, remember or repeat or recognize the knowledge from relevant past experience that can be used as a foundation for the new knowledge (problem)?

(ii) If learners have limited prior experience, does the instruction provide relevant experience that can be used as a foundation for the new knowledge?

Based on the above questions a set of action verbs for this phase, as taken from literature are presented below:

list, define, tell, name, locate, identify, distinguish, acquire, write, underline, relate, state, recall, select, repeat, recognize, reproduce, measure, memorize.

DEMONSTRATION *("Don't just tell me, show me!")*

(i) Does the instruction demonstrate (show example) of what is to be learned rather than merely telling information about what is to be learned?

(ii) Are the demonstrations examples consistent with the content being taught?

Based on the above questions a set of action verbs for this phase, as taken from literature are presented below:

demonstrate, summarize, illustrate, interpret, contrast, predict, associate, or distinguish, identify, show, label, collect, illustrate or experiment, recite, classify, discuss, select, compare, translate, prepare, change, rephrase, interpret, differentiate, draw, explain, estimate, fill in, choose, operate, perform, organize.

APPLICATION ("LET ME DO IT!")

(i) Do learners have an oppurtunity to practice and apply their newly acquired knowledge or skill?

(ii) Are the application (practice) and assessment (tests) consistent with the stated or implied objectives?

Based on the above questions a set of action verbs for this phase, as taken from literature are presented below:

apply, calculate, illustrate, solve, make use of, predict, construct, assess, practice, restructure, classify.

INTEGRATION ("WATCH ME!")

(i) Does the instruction provide techniques that encourage learners to integrate (transfer) the new knowledge or skill in to their every day professional life?

(ii) Does the instruction provide an opportunity for learners to create, invent, or explore new and personal ways to use their new knowledge or skill?

Based on the above questions a set of action verbs for this phase, as taken from literature are presented below:

analyze, resolve, justify, infer, combine, integrate, plan, create, design, or generalize, assess, decide, rank, grade, test, recommend, select, explain or judge, contrast, survery, examine, differentiate, investigate, compose, invent improve, imagine, hypothesize, decide, judge, prove, predict, evaluate, prove, rate.

CONCLUDING REMARKS

As David Merrill's taxonomy is derived from Information Processing theory, it may be well suited for content analyses of Information and Communication Technology (ICT) subjects.

Suggested Action verbs, which are arrived from the simplified definitions of the four phases of David Merrill's taxonomy may be used for content analyses of ICT subjects.

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Environment, Sustainable Development vis-a-vis Scope of Indigenous Technology Within Formal Technical Education Curricula In India: An Empirical Study

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EXTENDED ABSTRACT

Technology, being applied field of science, provides knowledge to satisfy human needs [and sometimes, human greed too], at the cost of the environment. Education, Science and Technology provide knowledge through formal curricula and there by help humanity to produce dramatic improvements to enrich human propensities and needs. Right now, we are in a landmark of human history, accompanied with enhanced intelligence and creativity, we are changing the basic components of our environment and there by changing the environment as a whole.

Environment Education in India possess a significant contribution from its history, which is reflected in the rituals of the people of this land since the Indian civilization came in the existence. Accordingly, our norms, customs values, mores and over all, culture developed in such a way that follows the worship of nature and its various components, and there by ensure preservation of the environment.

The basic forms of development is to enhance 'creativity', which ultimately generates the potentialities of techno-capabilities. The ultimate significance of the present day is to empower people by enabling them to use and contribute to the worlds' collective knowledge, through 'appropriate curricula'. Recent Human Development Reports utter that richest one percent of the world population owns as much as fifty seven percent of the resources and income. Therefore the role of technology in creating and generating resources is expected to follow the path where by inequalities between rich and poor, developed and developing, be minimized. Discrimination among the people from varied ethnicity also needs to be erased.

Every technological advancement posses potential benefits as well as risks and threats, and also possesses widely varying capacities of the nation to handle those risks. The third world countries, as recent experiences says, becomes the worst sufferers of such risks. Technology in coming days is expected to eradicate inequalities in absorbing risks of technological development. But how? The question needs to be answered.

India possesses massive variations so far its land, population, culture, and society are concerned. Among all those, it is probably the people, who exhibit a significant variation, resulting from the massive cultural differences, including norms, customs, values and mores, and 'utilization pattern of technology'. The historic base of the nation is essentially

tradition-oriented. As a result a strong social-bondage prevails among the population of the country. These may be reflected by the social structure of the ethnic population, especially among various social groups, belonging to various tribes.

Nowadays value of globalization is blowing across the planet, which thrives to achieve the objective of 'one-world culture', also referred to as 'modernization'. The impact of modernization is influencing tradition-oriented societies, along with 'sankritization' of the mainstream non-tribal folks. Sometimes it appears as a cultural-shock towards every group of indigenous people, which breaks down their family structure, society and culture. As a result, the groups are marginalized and are facing a tremendous psychosocial pressure from the mainstream population.

Irrespective of several psychosocial factors, since the time immoral, tribal groups are positively responding towards the developmental aspects and issues, may be, the extent of responses are different. They are having their own pattern of lifestyle, which draws a stable distinctive mark among them. However, all these communities are following their own ways of development, which is prominent from their 'lifestyle', and in this way, culture as well as use of indigenous technology is appearing intertwined among the very groups of population. Keeping in view the natural habitation within which they live and grew up, they evolve their own way of development, having a significant variation with that of so-called civilized societies. The most distinctive feature of these two forms of development is that while the technology, used by the ethnic population at large is comparatively less expensive, less-dynamic and having less adverse impact over the social structure, the modern technology just possess the reverse feature, most of the cases experienced detrimental to the environmental setting in due course of time.

Education is considered to be the key of (and for) development. Infact it is a precondition for development. Unfortunately, even sixty years of intervention since independence, with a view to enhance their level of education, success is yet to be achieved. From the existing statistics, it appears to be a distant dream. Participation of indigenous population in formal education establishes the scenario. Shifting the attention from liberal education if one zooms his/her views over technical education, obviously it will be much more shocking experience. Irrespective of special attentions and plans, participation of Indian tribes in technical education is quite meagre. But why is it so? Aren't they aware about the fruits of technology? Are not they interested to use technology?

Experience reveals, since the early days various tribal groups, for the sake of their survival, utilizing good many technologies, commonly termed as 'indigenous technology'. In consequence those technologies has made their life 'more comfortable' and 'safe'.

The paper, in its preface, discusses the social scenario in close relation to development. Development in consonance with sustenance is enumerated in this section of the paper, which is followed by establishing the rationale of environment friendly development for the planet. Scope of Indigenous technology, [which mostly follows an oral form of dissemination of knowledge among the ethnic population of India.] in the formal technical education curricula is critically analyzed in the very next section. Third section of the paper synthesizes the need of initiating

research on indigenious technologies with a view to explore the possible areas to which such studies needs to address for the sake of sustainable development of humankind. Penultimate section of the paper depicts the methodology and empirical findings in consonance with the scope to accord indigenous technology in the formal technical and vocational education curricula in India.

Key Words: Indigenous Technology, Creativity, Sustainable Development, Globalization, Cultural Shock & Technical Education Curricula.

I

INTRODUCTION

The basic requirements for survival of any species may be termed as propensities. A list of human propensity includes ***food, shelter, health*** and ***safety*** (commonly known as survival propensities), ***education, employment*** and at the present day, possibly the ***various forms of agro and industrial development***, which in the post modern society, shifted towards ***development of information technology*** and ***knowledge-development*** for the sake of maintaining life style (commonly known as developmental needs) and ***security***.

Of, course, we don't survive only on rice and bread. As human beings, our needs go beyond the purely physical aspects and are immersed in social, economic, and environment as well. We do require meaningful employment, job satisfaction, environment, leisure and sequels. Human qualities like respect, care and affection, mostly come under affective domain. Deprived of these, a person may languish just as surely as if deprived of food and water.

Most of our physical needs demand access to natural resources such as land, water and air, which, with the aid of radiant energy from the sun, generate plants and animals. The so-called non-renewable resource such as minerals and fossil fuels, are also needed for human survival and development. All these resources are present on a thin layer of the earth's surface, which we commonly termed as *environment*. It is the environment with in which we live. Therefore it is considerably clearly that the link remains among the environment, human beings and, their needs.

On the other hand, Technology is the applied field of science, which provides knowledge to satisfy human needs and sometimes, human greed too, at the cost of the environment. Education, Science and technology provide knowledge and there by help humanity to produce dramatic improvements to enrich human propensities and needs. Right now, we are in a landmark of human theory, accompanied with enhanced intelligence and creativity, we are changing the basic components of our environment by adding synthetic and chemical products and by-products and there by changing the *hydrosphere* and *atmosphere*.

Environmental Education in India possesses a significant contribution from its history. Our epic ***Isho Upanishad*** uttered long ago, "... *this universe is the creation of the supreme power and is meant for the benefit of all; Individual species must therefore learn to enjoy its benefits by regarding themselves as a part of the system in close relationship with other species; therefore let not any one species encroach upon the right of others.*"

These thoughts are represented in the rituals of the people of this land since the Indian civilization came in to existence, and since then, our norms, custom values, mores and over all, culture developed in such a way that follows the worship of nature and its

various components, and there by ensure preservation of the environment. However, this philosophy was attacked since the end of last century with the propagation of exotic-philosophies. As a result, the policy of education got boost from exotic agencies in such a way, which hindered the preservation of environment resources. Being in sanskrit, the *Upanishadic* thoughts have remained a close look far from use not only on account of the language barrier, but also due to lack of good environmental communicators among those who know the *Sanskrit* language.

The basic form of development is to enhance 'creativity', which generates the potentialities of techno-capabilities (Roy *et al.*, 2004). The ultimate significance of the present day is to empower people by enabling them to use and contribute to the worlds' collective knowledge. Recent Human Development Reports utter that richest one percent of the world population owns as much as fifty-seven percent of the resources and income. Therefore the role of technology in creating and generating resources is expected to follow the path where by inequalities between rich and poor, developed and developing, be minimized. Discrimination among the people from varied ethnicity also needs to be erased (*Roy & Mandal*, 2004). Every technological advancement possesses potential benefits and risks and also possesses widely varying capacities to handle those risks. The third world countries, as recent experiences says, becomes the worst sufferers of such risks. Technology in coming days is expected to eradicate the inequalities in absorbing or in preventing risks and shocks of technological development (*Roy, 2005*). But how? To respond to the query, one must accept the fact that it is only and only possible to develop a cadre of experts, well equipped with advanced knowledge and skill. Such skill and knowledge many only be imparted through appropriately developed curricula in the arena of technical and technological education and further, the same needs to be incorporated in an innovative manner. It is to be noted here that the terminology 'curricula' itself is an 'innovative connotation', starting from its sketching till its implementation phase.

II

INDIGENOUS TECHNOLOGY AND SUSTAINABLE DEVELOPMENT

Zooming view over India, our motherland, it may be observed that the country possesses massive variations so far its land, population, culture, and society are concerned. Among all those, it is obviously the people, who exhibit a significant variation, resulting from exhibition of massive cultural differences, including norms, customs, values and mores, and finally 'utilization pattern of technology'. The historic base of the nation up till now is essentially tradition-oriented. As a result a strong social-bondage prevails among the population of the country. These may be reflected by the social structure of the ethnic population, especially among various social groups, belonging to various tribes *(Roy, 2005a)*. These ethnic groups constitutes a sizable proportion of the entire population, numbered around nine crores, as estimated by the latest census report [i.e., 2001]. The ethnic communities are rooted with a number of clans; inter-clan variations in terms of social customs are quite prominent in some specific regions. Whatever the cultural variations exist among them, all of these population-groups are related to unique umbilical cord and are referred to as tribes.

Now a day waive of globalization is blowing across the planate, which thrives to achieve the objective of 'one-world-culture',

also referred to as 'modernization'. Modernization is essentially an old process following which comparatively less developed societies use to acquire characteristics of so-called 'more-developed' society in a given time frame *(Dube, 1988)*. The impact of modernization is influencing the tradition-oriented societies even through formal education, along with 'sankritization' of the mainstream non-tribal folks. Sometimes it appears as a cultural-shock towards the very group of indigenous people, which breaks down their family structure, society and culture, all of which are not desirable, as opined by the sociologists. As a result, the groups are being marginalized and are facing tremendous psychosocial pressure from the mainstream population.

Irrespective of several psychosocial factors, since the time immortal, these tribal groups are positively responding towards the development aspects and issues, may be, the extends of responses are different *(Roy, 2005b)*. They are having their own pattern of lifestyle, which draws a stable distinctive mark among them. For example, in respect of formal educational and literacy, one of the major parameter of development, while the hill-tribes of northeast India [i.e., the Khasis, the Mizos, the Nagas etc.] are quite in an advantageous position, the plane-tribes from the Chhotonagpur [for example, the kole, the Vill, the Munda, the Bhumij, the Santhal, the Kheriar etc.] are far behind. This justiy that response towards developmental issues are creating 'some' differences among the tribal communities in terms of specific parameters. However, all these communities are following their own way of development, which is prominent from their pattern of house/shelter, sanitation system, use of water resources and its transportation, use of medicinal practices, food habits and drinks, musical instruments, dress habits, pattern of preventing natural enemies, communication modes and so on. Actually all these are the methods and modes of their survival-strategies, which contributes a lot for determining their culture. In this way, cultures as well as use of indigenous technology are appearing intertwined among the very groups of population. Keeping in view the natural habitation with in which they live and grew up, they evolved their own way of development, having a significant variation with that of so-called civilized societies.

The most distinctive feature of these two forms of development is, while the technology, used by the ethnic population at large is comparatively less expensive, less-dynamic and having less impact over the social structure, the modern technology possess just the reverse features, most of the cases experienced detrimental to the environmental setting in due course of time.

INDIGENOUS TECHNOLOGIES AND SOCIAL SCENARIO

Education in general and technological education in specific is considered to be the key of (and for) development. Infact it is a precondition for development. Unfortunately, even six decades' of intervention since independence, with a view to enhance the level of education of the ethnic population, success is yet to be achieved. From the existing statistics, it appears to be a distant dream. Participation of indigenous population in formal education establishes the scenario. Shifting the attention from liberal education if one zooms his/her views over technical education, obviously it will be much more shocking experience. Irrespective of special attentions and plans, participation of Indian tribes in technical education is quite meager. Following table advocates the very fact, where in rare occasions, the levels of 'formal

Table: 1. Participation of tribe students in formal technical/technological education system.

Levels of formal technical education	NT boys	Tribe boys	% of tribe to that of NT boys	NT girls	Tribe girls	% of tribe to that of NT girls	NT total	Tribe Total	% of tribe to that of NT girls
No of students at technical/ industrial craft schools	408000	17962	4.4025	67682	3323	4.909	475683	21285	4.475
No of students at Polytechnic colleges	314945	10517	3.339	80012	2660	3.325	384857	13177	3.424
No of students at BE/ B.Arch/ B.Sc [Engg] colleges	324914	11978	3.687	93279	1730	1.855	418193	13708	3.278
Total enrolment in three tire	1047859	40457	3.861	240973	7713	3.201	1278733	48170	3.767

Source: Selected Educational Statistics, 2001, PP. 17,21, 43, 53 & 54; MHRD, Govt. of India;

**NT → Non-tribe*

three-tire technical education system', the figure of enrolment of tribe students goes beyond 4% of the intake of their non-tribe counter folk. Data is also insufficient about dropout rates, if any and extent thereof.

But why the situation is so? Are not they aware about the fruits of technology? Are not they interested to use technology?

Experience reveals, since the early days, various tribal groups, for the sake of their survival, utilizing good many technologies, commonly termed as indigenous technology. In consequence, those technologies have made their life more comfortable and safe, which establishes the fact that the preconceived notion of so-called mainstream about lack of interest of indigenous people towards technology is mere a myth and not a fact *(Roy, 2005)*. Several sphere of life-activities viz. pattern of traditional shelter, room-ventilation and cooling system, protective-devices from enemies in the shelter, sanitation system in the shelter, method of water preservation, its use, and utilization as well as transportation, land utilization, food habit, food processing system, drink and dress habits, use of medicinal plants- all stands testimony to their close association with utilization of technology in different sphere of life; these are also coexisted with their society, culture and social norms. The societies imposed restrictions or

taboos in these contexts. Different tribal groups use all these as indigenous technologies. Keeping partity with oral-culture, most of the cases, knowledge concerned with indigenous technologies is disseminated from generation to generations mostly through 'verbal communication'. Unfortunately , due to massive waive of globalization, in most of the cases these technologies are disappearing quite rapidly, due to its oral form of dissemination. On the other hand, reluctance is quite prominent among these ethnic groups towards so-called modern technology mostly due to the fact that this does not match with the lifestyle and culture of these ethnic groups. Therefore immediate intervention is needed to take up appropriate measures to revive the indigenous technologies. This is possible by identifying these forms of technologies and there by incorporating those in to formal and non-formal system of technical education as the components of curricula. The approach, if adopted, will definitely attract attention of the ethnic groups and will help in enhancing their attention towards technical education. It may be assumed that such education will further contribute toward their development, without effecting their lifestyle and customs.

Since the last eighty years, huge number of researches has been carried out, centering round the domain 'research on ethnic population'. Scholars from numerous fields tried to explore the tribes of India from their respective disciplinary-view point. Sociologists, social anthropologists, historians, political scientists, educationists, economists, social workers, anthologists as well as philanthropists took up studies of varied kinds. Unfortunately the bulk of studies failed to develop these communities up to the level of expectation of the nation; and much astonishingly, technologists and engineers of the day rarely got time to explore the scientific bases of the indigenous technologies, used by these groups.

III

INDIGENOUS TECHNOLOGY: NEED FOR RESEARCH

In course of time, TRIBAL-EDUCATION has established itself as a well-recognized area of studies since 1950s *(Edwin, 1960)*. However a careful analysis over the dissertation abstracts establishes the fact that not even a single study has yet been carried out emphasizing over the ***indigenous technology*** of the tribes in India. Dearth of application-oriented research is also prominent in the area of rural technology, where almost all of the studies have focused over such technology, which can be offered to the interested rural mass, and no way those studies considered indigenous technology and knowledge base, used for the ages by various tribe groups, as a factor. As a whole, out of around 6763 studies in the areas like sociology of education, tribal education, social anthropology and rural technology, it is felt essential to feel the gap of knowledge in the very area through appropriate study for evolving a practical approach for their development in its true sense. Such study needs to identify basic indigenous technologies as the core curricula components, used by the ethnic groups, residing in hills and plains of India, apart from exploring the beneficial impact of identified indigenous technologies among the ethnic communities, vis-a-vis the scientific bases of those indigenous technologies. Scope of accommodating indigenous technological components in the curricula of formal technical/technical education may also be accorded as the aim of such studies. Scope of introducing exclusive curricula at post-school-level technical education, incorporating components of

indigenous technology may also be well examined through such research studies. To frame such curricula, basic dimensions to be addressed involves:

1. Identification of basic indigenous technologies, used by the ethnic groups, residing in hills and plains in India.
2. Exploration of possible beneficial impact to identify indigenous technologies among the ethnic communities.
3. Exploration of scientific bases of indigenous technologies.
4. Study of applicability of identified technologies for the development of ethnic communities at present juncture of time.
5. Modification, if needed, to include in the identified indigenous technologies to accord to those in formal technical education sphere.
6. Identifying the scope of accommodating indigenous technological components in the curricula of formal technical education.
7. Exploring the scope of introducing 'exclusive curricula' at post-school-level/ under graduate level technical education, incorporating components of indigenous technology.
8. Exploring the scope of offering indigenous-technical-education for the community development in various tribal blocks of India.

CURRICULAR FACTORS

While exploring scope of indigenous technology, curricular issues and factors, needs to be explored by the curricula planners should essentially include

(A) Indigenous technology in relation to-

(a) Housing status and allied technology

(b) Communication technology

(c) Water, sanitation and allied technology

(d) Preservation of natural resources

(e) Environmental factors and protective-technology

(f) Economy-sustaining technology

(g) Health-sustaining technology

(h) Medicinal/pharmacy-technology

(B) Developing integrity between curricula of existing formal technical education and indigenous technology.

(C) Scope of developing/ offering a non-formal technical educational curriculum.

In the process of initiating research on the very gamete of curricula studies, some basic axioms need to be taken in to consideration by the researchers my be listed as follows:

1. The ethnic groups, residing in hills and plains of India, use sizable number of basic indigenous technologies.
2. Indigenous technologies possess beneficial impacts among the ethnic communities.
3. Indigenous technologies possess scientific bases.
4. Specific indigenous technologies possess developmental-impact among the ethnic communities even at present juncture of time.
5. Minor modifications are needed for the identified indigenous technologies to integrate those with formal knowledge base of technology.
6. Indigenous technological components can be accommodated in the curricula of formal technical education.

All the possible indigenous technologies, with which they are/were familiar, need to be chalked out separately. Those would be further matched with the respective tribal groups, who are using those.

IV

THE STUDY

In the very direction a surface level pilot study is already in progress, which hinges on exploring the scope of indigenous technology as formal technical education curricula in eastern and northeastern India.

OBJECTIVES

The study was initiated keeping in view the following objectives:

1. To explore the scope of indigenous technology as formal technical education curricula as perceived by the enlightened section of ethnic groups in eastern and northeastern India.
2. To explore the scope of indigenous technology as formal technical education curricula as perceived by the students, belonging to ethnic denomination and are enrolled in diploma and degree level engineering education in eastern and northeastern India.
3. To explore the scope of indigenous technology as formal technical education curricula as perceived by the potential expert-groups in eastern and northeastern India.

FROM POPULATION TO THE SAMPLE

As in its pilot study phase, population of the study includes

(A) **Enlightened sections of ethnic groups:** The group members include mostly the cross-section of tribe population involved in teaching or allied white collared jobs.

(B) **Engineering students from tribe denomination:** The group-members are enrolled either in diploma or in degree level engineering education.

(C) **Potential expert-group:** This third group includes academicians of the following types and is imparting education at higher education level

(a) Curriculum planners

(b) Sociologists

(c) Technocrats

(d) Educationists

The sample for the pilot study was drawn following a situational sampling technique. They are mostly residing in Assam [from northeastern region] and West Bengal [from eastern region]. Apart from these, a group of sample is also scattered in Meghalaya and Delhi.

Number wise distribution of the sample for the pilot group is depicted in the following table 2:

As depicted in the above table, while 93% of the respondents ascribe ethnic denomination, just 7% of them are from non-tribe denomination however having sufficient understanding with tribal life and culture.

TOOLS AND TECHNIQUES

A structured opinionnaire has been administered over the respondents with a view to collect basic data over the issue, emphasizing the possibility to incorporate indigenous technology components in the formal technical education curricula. Apart, depth-interview is on with the third group of respondents.

Table: 2. Distribution of the respondents

Sample Type	N=100	Sub-Type	Ethnicity	Assam	W.Bengal
1. Enlightened sections of ethnic groups	30	*Teachers*	Tribe	10	8
			Non-Tribe	0	0
		Other white-collar job holders	Tribe	6	6
			Non-Tribe	0	0
2. Engineering Students	40	*Diploma*	Tribe	13	7
			Non-Tribe	0	0
		Degree	Tribe	11	9
			Non-Tribe	0	0
3. Potential expert group from higher learning institutions	30	*Curriculum planner*	Tribe	2	
			Non-Tribe	2	
		Sociologists	Tribe	5	
			Non-Tribe	2	
		Technocrats	Tribe	4	
			Non-Tribe	7	
		Educationists	Tribe	4	
			Non-Tribe	4	

ANALYSIS OF DATA

So far data collected for the study, by and large, qualitative in nature at the pilot study phase, which in the latter phase would be analyzed through quantitative method, after finalizing more sophisticated tools for the purpose.

FINDINGS

Initial findings of the study reveals:

Average age of the first group of respondents is 48.5 years [with a variation ranging from 34 to 59 years]. The same in case of second and third groups are 25 and 58 years, respectively.

While grand majority of students group [93.33%] holds that they are not much sure about the possibility of incorporating indigenous technology in the formal curricula of engineering education, rest 6.66% strongly advocates for the.

Above finding reveals that the existing formal education system is simply de-rooting the present generation students from their heritage and indigenous knowledge and there by developing them as 'hollow man'.

Cent percent of the first group of respondents opine that tribe societies are having significant number of indigenous technology and such indigenous technology - components need to be included in the formal technical education curricula.

The first and third groups utters possibility of disappearance of important and potential indigenous technology and further adds that some such technology-components are already become 'forgotten' by the present tribe societies of their own.

The third group specifically advocates introducing 'exclusive' curricula, parallely with the existing formal curricula and they are not to that extent in favour of clubbing indigenous technology and ongoing technology curricula. This very observation makes significant difference between the perception of first and the third group of respondents.

Juxtaposition of opinion of the expert group, belonging to northeastern region and outside northeastern region exhibits significant variation in terms of 'need' of introducing formal courses on indigenous technology.

Offering of 'hypothetical formal technological curriculum based on indigenous technology' while perceived by the first group of respondents as 'ought to be exclusive' for the tribe students only, the second and third group of respondents wants to offer the curricula of the kind to 'those who are interested on it, irrespective of social denomination'.

Expert group [third group] expressed their serious concern over possibility of snatching the rights of Indian people in general over 'numerous indigenous technology' by the foreigner-scientists with the help of international patent act, which are, as per their version, 'yet to be recorded'.

POST SCRIPT

It should be accepted by almost each and every hand that participation of tribal population in higher education in general and that too in higher technical/technological education, in specific, is too meagre and needs to be enhanced. To ease the task, unitary technical universities needs to be established in the midst of natural habitation of the tribal population. As an alternative, the affiliating universities may also think of developing 'technology-campus' in such zones, with a view to make 'indigenous technology' popular to them and others too, and thereby attracting them towards advanced technology through appropriately framed technology- curricula. Sooner the policy makers and curriculum framers took the issue as a serious concern, better it would be for the ethnic people initially, and for the nation, in course of time.

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Development of a UG Engineering Curriculum in a Dynamic Field by a Professional Body for Adaptation Worldwide – A Case Study

S. DHANAPAL

INTRODUCTION

The IEEE Computer Society is the largest professional body in the area of Electrical Engineering / Computers. This society in collaboration with Association of Computing Machinery has developed a *model curriculum guideline* for Undergraduate degree programme in Computer Engineering. The guideline is called as CE2004. The CE2004 is a guideline curriculum intended to provide interested educational institutions worldwide, a flexible way to implement a strong program in Computer Engineering. Any institution, depending on its programme goals, local needs of industry, existing institutional resources and range of postgraduate options available for students, may use the guideline to design an implementation that meets their needs.

In this paper, the salient features of the design process adapted by IEEE for the guideline are summarized. The structure of the Body of Knowledge, which is the central theme of the guideline is also explained. The factors to be considered for local adaptation are discussed.

Computer Engineering - Definition

The IEEE considers that the field of computing has evolved into several disciplines; Computer Science, Information Systems, Software Engineering, Information Technology and Computer Engineering.

Computer Engineering is defined as *"the discipline that embodies the science and technology of design, construction, implementation, and maintenance of software and hardware components of modern computing systems and computer-controlled equipment"*.

Computer engineering is a combination of both computer science and electrical engineering. Computer engineering is solidly grounded in the theories and principles of computing, mathematics, science, and engineering and it applies these theories and principles to solve technical problems through the design of computing hardware, software, networks, and processes.

Approach Followed by IEEE for the Development

The salient features of the approach followed by IEEE in the development of the CE2004 curriculum guideline are summarized in the following:

1. Recognising that Computer Engineering, as a distinct discipline of computing and defining its scope for the current level of technology.
2. Recognising that the rapidly evolving Computer Engineering, requires a review of the curriculum.

3. Determining the Body of Knowledge(BoK) representing broad knowledge areas that are fundamental and applicable to any UG degree of Computer Engineering field.
4. Initial design of Body of Knowledge by a Task force of leading academicians and revision through review and comment by academicians and industry professionals.
5. Defining within the Body of Knowledge, the *core,* which are areas essential for any UG degree and *electives* which are areas relevant for various flavours of UG programme.
6. Provision for exposure of the students, across the breadth of the discipline, with advanced knowledge in one or more areas.
7. Flexibility for institutions to design individualized programmes through a mix of core and electives and additional areas..
8. Provision of design experience in intermediate and advanced laboratory courses, complemented by a culminating project towards the end of the programme.

Structure of Body of Knowledge

The central theme of the CE2004 curriculum guideline is the definition of a Body of Knowledge for the discipline of Computer Engineering. The Body of Knowledge has a hierarchical organization described as follows.

Knowledge area: Represents a major subject matter of Computer Engineering discipline. A knowledge area has a significant theoretical base, abstractions and design and implementation aspects. The Task Force identified 18 knowledge areas (listed in Table 1) covering the entire discipline of Computer Engineering. Each knowledge area contains certain fundamental subjects that should be required in all undergraduate programs in Computer Engineering.

Knowledge unit:

Each knowledge area is broken down into smaller divisions called knowledge units, which represent individual thematic modules within an area. A Knowledge unit represents

Table – 1 Knowledge Areas for Computer Engineering

Sl.No	Code	Description	Sl. No	Code	Description
1	CE – ALG	Algorithms	10	CE – HCI	Human – Computer Interface
2	CE – CAO	Computer architecture and Organisation	11	CE – NWK	Computer Networks
3	CE – CSE	Computer Systems engineering	12	CE – OPS	Operating Systems
4	CE – CSG	Circuits and Signals	13	CE – PRF	Programming Fundamentals
5	CE – DBS	Database Systems	14	CE – SPR	Social Professional Issues
6	CE – DIG	Digital Logic	15	CE – SWE	Software Engineering
7	CE – DSP	Digital Signal Processing	16	CE – VLS	VLSI Design and Fabrication
8	CE – ELE	Electronics	17	CE – DSC	Discrete Structures
9	CE – ESY	Embedded Systems	18	CE – PRS	Probability and Statistics

Table – 2 Knowledge Areas and Knowledge Units – Sample

CE – DIG Digital Logic [57 core hours]			
CE-DIG0	History and Overview [1]	CE-DIG5	Sequential logic circuits [10]
CE-DIG1	Switching Theory [6]	CE-DIG6	Digital system design [12]
CE-DIG2	Combinational Logic circuits [4]	CE-DIG7	Modeling and simulation [5]
CE-DIG3	Modular design of combinational circuits [6]	CE-DIG8	Formal verification [5]
CE-DIG4	Memory elements [3]	CE-DIG9	Fault models and testing [5]
		CE-DIG10	Design for testability

Table – 3 Topics and learning outcomes – Sample

CE-DIG4 Memory Elements (Core)

Minimum Core coverage time: 3 Hrs.

Topics:

Unclocked and clocked memory devices (latches, flip flops)
Level vs. edge-sensiive and master slave devices
Basic flip flops (SR,D,JK,T)
Asynchronous flip flop inputs (preset and clear)
Timing constraints (setup, hold) and propagation delays
Data registers
Random access memory(RAM)

Learning outcomes:

1. Design basic memory elements
2. Analyse circuits containing basic memory elements
3. Apply the concepts of basic timing constraints and propagation delays for design

a single concept such as Processor Design or Fourier Analysis. Knowledge units for a sample knowledge area is listed in Table 2.

Topic:

It is the lowest level of the hierarchy and represents the contents of a Knowledge unit. The set of topics for a Knowledge unit are further clarified by a set of related learning outcomes. Topics and learning outcomes for a knowledge unit is listed in Table 3.

Design Experience as an Integral Aspect of Curriculum

The CE2004 attempts to integrate design experience into the curriculum. The design experience includes designing, building and testing hardware and software systems. Introductory laboratory practices are designed to reinforce concepts presented in lecture classes.

The CE2004 recommends intermediate and advanced laboratory courses to have problems that are more open ended, requiring

students to design and implement solutions. Laboratories should include some physical implementation of design such as electronic circuits, bread boarding, microprocessor interfacing, prototyping and implementation of hardware and software. Laboratories should provide simulation tools to model and study real systems.

Besides integrating design into laboratory courses, a *culminating* design project towards the end of the programme complements the design experience for the students. The culminating project must involve design and implementation of a product containing hardware and software components.

Core and Elective Knowledge Units

The task force has defined a minimal core, consisting of those knowledge units which are essential to anyone getting a UG degree in Computer Engineering. Knowledge units other than core are electives.

The core is kept very minimum and does not constitute a complete UG curriculum. Every UG programme must include additional elective knowledge units. A complete curriculum must also contain courses from mathematics, science, business and humanities.

The core knowledge units are not necessarily limited to a set of introductory courses. The core units also include advanced areas, which are determined essential.

Adaptation of CE2004 Into a Specific Programme

The CE2004 guideline helps and lends itself to institutions for developing a new Computer Engineering Curriculum or improve an existing one.

The factors that influence a local adaptation of the guideline curriculum are the following:

- The structure and scope of the institution:
  - a small college offering 3 year degree programme
  - a research university offering a 4 year degree programme
- The range of post graduate options for students:
  - Some institutions may have the primary goal of preparing skilled workforce
  - while others may prepare students for graduate study / research
- The faculty resource available to an institution:
  - The number of faculty, their interest and expertise
- The needs of local industry: the industry in a region / country may have focus on specific areas for development and the curriculum adaptation should reflect this. At certain stage of development of economy, the emphasis may be on research and development.

Creating a workable curriculum requires finding an appropriate balance among these factors. While an institution attempts to adapt the guideline curriculum for its own requirement, it has to observe the following key aspects.

- The curriculum must respond to technological changes: The rapid pace of development in Computer Engineering field requires that the curriculum be updated on a regular basis as well as to teach the students to respond to changes - that is to make them life long learners.
- The curriculum design guided by the goals of the programme : The adaptation must meet the goals of the programme

and the specific capabilities the students acquire at the end of the programme.

- The curriculum should provide a culminating design project : The students towards the end of the programme should do a project work so that they can apply knowledge and techniques to solve a substantial problem.

CONCLUSION

The CE2004 is a curriculum guideline in Computer Engineering developed for worldwide adaptation by a group of leading academicians and fine tuned by a wide section of academic and professional community.

With the guideline as a base, an institution can design a programme with focus on specific aspects of hardware or software: (e-g) embedded systems, computer networking.

The major considerations that guide a local adaptation of CE2004 by an institution are the needs of local industry, structure of the institution, faculty resource available and range of postgraduate options for students.

The guideline gives a basic framework of core and elective material, leaving plenty of scope for adaptation by institutions for local needs.

The guideline places emphasis for providing design experience as an integral part of the courses complemented by a culminating project work.

The guideline does not seek to endorse the lecture method of instruction and is open for alternative methods. The institutions may employ student centered instructional methods like problem based learning for part of some of the courses. This approach would contribute to the development of critical thinking and problem solving skills in students and further integrate design experience into programmes.

For the core and elective material, the guideline focuses on content which is of permanent in nature and not on fleeting skills, some of which may be short lived. The focus of the guideline is to develop analytical skill and lifelong learning in students than to teach them specific software products / technologies.

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Impact of Video Recorded Micro teaching in the Professional Development of Teachers

PANCH. RAMALINGAM

ABSTRACT

The present study examines the impact of video recorded micro teaching in the professional development of teachers in higher education. The major objectives are (i) to explore the impact of video recorded micro teaching for the professional development of the teachers in the orientation courses conducted by the Academic Staff Colleges (ASC). The sample for the present investigation was 328 teachers who attended orientation courses conducted by the UGC-Academic Staff Colleges of the Pondicherry University, Bharathiyar University, and Mysore University during 2005-06. The required data were collected from the teachers through specially designed instruments and analysed. The findings of the study reveal that (i) the effectiveness of video recorded micro teaching for the professional development of the teachers in the orientation courses conducted by the ASCs is highly effective, invariably all the participants have shown a keen interest to practice micro teaching skills and suggested that the orientation course is necessary for understanding various skills in teaching. There is significant difference among teachers of various age groups and experience in teaching with regard to micro teaching. There is no significant difference between male and female teachers, among the teachers of the three ASCs, different orientation courses, teachers of different subjects of teaching, place of working, and different States in which they belong with regard to micro teaching.

Keywords: Academic Staff College, Orientation Courses, Micro teaching.

INTRODUCTION

Teaching skills are specific instructional techniques and procedures that a teacher may use in the class room. They represent an analysis of the teaching process in to relatively discrete components that can be used in different combination in the continuous flow of the teacher's performance (Gage, 1968). Teaching is proved to be a complex skill which can be resolved in to a number of simple components which may be called as teacher's behaviors or a set of teaching skills, which are effective in bringing about desired behavioral changes in students. The refinement of teacher's behaviour to accomplish these skills is the basic requirement of teaching - learning situation. It helps to meet several challenging issues in the class room environment. More over it makes the teaching more interesting and permanent changes in students' behaviour.

Scientific studies and researchers expect to understand that the characteristics of an effective teacher are self-esteem, intelligence,

creativity, integrated personality, confidence, and competence in subject contents. A teacher becomes a better teacher only when he is equipped with all sorts of teaching skills. This makes him an effective and challenging teacher. Research studies have also revealed that the effective class room teacher has a wide range of personality styles and creative teaching approaches.

Teaching is not simply imparting knowledge or giving information. Teaching itself is an art as well as science. It is a unique style of each and every individual. The skills which facilitate effective teaching have to be developed. Hence the professional development of teachers requires skill based training. This sort of training programme is called micro teaching training.

CONCEPT OF MICRO TEACHING

Allen and Ryan (1969) have described micro teaching "as a scaled down teaching encounter, scaled down in terms of class size, lesson length and teaching complexity". Micro teaching is a teacher education technique which allows teachers to apply clearly defined teaching skills to carefully prepared lessons in a planned series of five to ten minutes encountered with a small group of real students, often with an opportunity to observe the results on an audio or video tape. (Buch, 1968), Micro teaching is a real teaching but the complexities of normal class room teaching are lessened and there is a focus on training for the accomplishment of specific task skills (Ryan, 1969). Young (1970) described "Micro teaching is a safe practice ground for student teachers, class room management problem can be minimised and focused upon separately as a component and skill". Micro teaching is a teacher training procedure which reduces the teaching situation to a simpler and more controlled encounter achieved by limiting the practice teaching to a specific skill and reducing the teaching time and class size and teaching unit (Clift, 1976). It is considered as a miniaturized class room teaching (Passi, 1977). Thus Micro teaching is a process of scaling down teaching process to miniature process facilitating the trainee teachers to learn a particular skill and integrate all the skills learnt to make one's teaching as an effective teaching.

Micro teaching is based on the promise that teaching can be analyzed in to various component behaviors called teaching skills which can be taught, practiced, controlled, evaluated and understood. Teaching constitutes a number of verbal and non-verbal acts. A set of related behaviors or teaching acts performed by the teacher with a specific intention to facilitate students' learning can be called a teaching skill. These teaching skills can be observed, measured and controlled by means of practice.

In micro teaching, the skills are practiced one at a time. The complexity in a teaching encounter is further reduced by having a small number of students mostly peer, short duration of time namely five minutes and the content being reduced to a single, simple concept. In India, many educationists have conceptualised twenty one skills which are essential for general teaching competence. Set induction, explaining, questioning, illustrating with examples, stimulus variation, use of blackboard, reinforcement, closure are some of the important skills quite often used in any teaching situation.

MICROTEACHING STRATEGY AT ASCs

The entire programme of practicing the core teaching skills is organised in to a well structured programme. The three formulated

training modules constitute 'Micro teaching session'. The following are the stages

(i) Planning session

(ii) Video recorded teaching session

(iii) Feedback session

This model has been successfully tried out in many ASCs and it is being used in all orientation courses to train teachers. In order to give the effective feed back the teaching sessions were video graphed.

(i) Planning Session

The student-teacher at this stage plans a micro lesson taking a single concept or the teaching point based on the components of a particular skill that is going to be practiced for 5 - 10 minutes taking guidance from the resource person. A teaching skill to be practiced is defined to students and sometimes a model is demonstrated. A micro lesson is carefully planned on the basis of the model.

(ii) Video Recorded Teaching Session

The student - teacher delivers the lesson which is planned earlier giving importance to the components of that skill. He tries to coincide with the modeled behaviour before a small class of 15 to 20 participants (peer group). His or her peers act as students. The lesson is observed by a resource person with the help of specially prepared observation schedule and the teaching of the lesson will be recorded on video tapes for effective feedback. Here importance is given to each component of a particular skill that is being practiced.

(iii) Feedback Session

After the teaching session the resource person gives the feedback based on his observation with the help of video recording. This is the most important stage as it replays the teaching of the student - teacher. The source of feed back will be the self, peer group teachers, LCD projected video play, and observation schedule.

COMPONENTS OF MICRO TEACHING SKILLS

(i) Skill of set induction

The skill is required to be exhibited by a teacher during the first phase of the class just to arouse the interest of students and create a sense of preparedness for the lesson. This can be done by checking the previous knowledge of the students through questions, narrating an experience of the teacher to arouse curiosity, performing a simple experiment, relating the topic to what has already been taught and so on.

(ii) Skill of Stimulus Variation

This skill is related to procedures by which the attention of the class can be secured. This involves deliberate changing of various attention compelling behaviors of the teacher in order to gain students attention. The behaviors corresponding to the skill can be stated as follows: Teacher movement, Gestures and body language, change in speech pattern, focusing, change in interaction style, oral-visual switching, and pause.

(iii) Questioning

The purpose of questioning, as one of the important teaching skills, is to establish cognitive and affective rapport with the learners; to discover what they already know; to maintain their interests and attentions: to encourage creative thinking on their part; to assist them to overcome their learning difficulties; and to determine the extent to which they have comprehended and assimilated the lesson taught.

Questioning has two aspects, i.e., fluency in questioning and probing questioning. Fluency in questioning refers to the rate of meaningful questions asked per unit of time (Passi, 1981) Components of this sub-skill are: (i) clarity, (ii) concise, (iii) relevancy, (iv) specificity, (v) pacing, (vi) pausing, (vii) coherence, and (viii) directing

(iv) Skill of Explaining

Explanation is a set of interrelated statements made by the teacher related to a phenomenon in order to increase understanding in students. In order to be a good explainer, the teacher has to develop certain desirable behaviors. They are: Beginning statement, explaining links, fluency, and concluding statement.

(v) Skill of using Chalkboard

Chalkboard is one of the most widely used visuals in a class room. It is a versatile teaching aid for the teachers in higher education. The components of the skill are: Writing legibly, neatness in the chalkboard work and appropriateness of written work in respect of meaning, brevity, simplicity, developing the necessary and proportionate diagrams using different colour chalks.

(vi) Achieving Closure

A smooth ending of a lesson is as important as a good introduction. It is the skill of the teacher which makes him recapitulate the teaching points covered in the class so that the students are reinforced and help them assimilate the parts in to a meaningful whole. A review, a quick summary, an assignment and similar activities from part of this skill.

(vii) Lecturing Skills

The lecture method has been the earliest known method of teaching and still continues to dominate the higher education system. Lectures are mostly delivered for conveying information, generating understanding and stimulating interest. An informal talk punctuated by suitable questions and made spicy by the use of visual aids providing a more vivid picture will be able to secure the attention of the students and will result in considerable amount of learning.

(viii) Skills associated with a Lecture

A good lecture involves two important aspects namely Preparation and Delivery. Selecting content, formulating the objectives, structuring the lecture, preparing teaching aids and preparing handouts would form part of preparation. Delivery aspect is concerned with effective communication and instructional strategies. This process involves the integration of many skills such as skill of set induction, explaining, questioning, stimulus variation, use of audio-visual aids, using chalkboard and achieving closure.

(ix) Video Recording of Micro teaching

Micro teaching has a number of advantages over the traditional teacher training programme. It is more effective in changing class room behaviour of the teacher. Micro teaching develops in teachers the ability to increase better pupil participation and interaction. It develops in the trainee teacher various skills needed for his effective teaching. It brings out general teaching competence in teachers. It helps to have maturity, purity, and sensitivity for class room teaching. It is a science of real and natural teaching for self discovery and for bringing out one's latent talents. It gives confidence and courage to face the class. It develops a new personality, styles in teaching, and creativity in teaching. It helps to gain confidence to handle new and difficult situations and problems in the class room environment. It helps to develop a better communication and interaction. It paves the

way for developing a positive attitude towards the teaching profession itself and towards the student and the subject. It gives an effective learning experience.

Objectives

The present study was undertaken with the following major objectives.

(i) To explore the impact of video recorded micro teaching for the professional development for the teachers in the orientation courses conducted by the Academic Staff Colleges.

(ii) To find out whether there is significant difference between various groups such as different ASCs, different orientation courses, gender, age, subject, experiences in teaching, place of working and the State in which they belong with regard video recorded micro teaching in the orientation courses.

Hypotheses

Based on the above objectives the following empirical hypotheses have been formulated, so it was hypothesized that

(i) Effectiveness of video recorded micro teaching for the professional developmental of the teachers in the orientation courses conducted by the Academic Staff Colleges is significantly high.

(ii) There is no significant difference between various groups such as different ASCs, different orientation courses, gender, age, subject, experience in teaching, place of working, and the State in which they belong with regard to video recorded micro teaching skills.

METHOD

Sample

The sample for the present investigation has been selected from the teachers who were under gone orientation courses in the Academic Staff Colleges of the Pondicherry University, Bharathiar University and Mysore University. In order to collect data from the teachers it was decided to administer the questionnaires to the teachers. The teachers (N=328) who have attended in the orientation courses during the year 2005-06 were included in the study.

Table 1 Distribution of sample based on the orientation courses conducted by the ASCs (N=328).

Sl No	Name of College	No of Teacher participated	%
1.	ASC, Mysore	73	22.3
2.	ASC, Coimbatore	122	37.2
3.	ASC, Pondicherry	133	40.5
	Total	328	100.0

Instruments

To measure the effectiveness of video recorded micro teaching skills training in the orientation courses for the teachers of colleges and Universities, a self-administered response schedule developed by the researcher was used to collect data from the participant teachers to measure the effectiveness of micro teaching skills training in the orientation courses for the teachers of colleges and Universities. The instrument is having 5 point scale as follows:

Strongly agreed - 5

Agreed - 4

Undecided - 3

Disagreed - 2

Strongly disagreed - 1

A self-report assessment tool is usually considered to be a more accurate form of instrument for measuring effectiveness of the micro teaching organised by the ASC of Pondicherry University. The teacher participants were asked to indicate how they felt about making decision by ticking the response which was most applicable to them. All the responses were counted for individual score. The maximum score for an individual is 100 and the minimum is 20. The subject was asked to indicate how he/she felt about making decision by ticking the response which was most applicable to him. All the responses were counted for individual score.

Procedure

In all orientation programmes, usually ten sessions are devoted to workshop on micro teaching, which include sessions on lecturing skills and teaching techniques. The resource person will highlight the major skills and demonstrate how to practice during the micro teaching session. Major teaching skills to be practiced were explained to the participant teachers and all the chosen seven major skills were demonstrated. Micro lessons were carefully planned on the basis of the model. Each of the participants taught for five minutes to a small class of 10-15 students (peer group teacher participants). Each lesson was observed by the resource person and other teacher participants using a specially developed observation schedule. The micro teaching was video taped with a skilled videographer.

Before starting the micro teaching session, the participants were divided in to three groups of about equal in numbers such as teacher group, student group and observer group. During the first phase of micro teaching session, teacher group of participants presented their prepared micro teaching skills for five minutes as per their micro lesson. Student group of participants acted as students and observer group of participants observed the micro teaching with the help of observation schedule. In the second phase second group presented their micro teaching skills, third group acted as students and first group observed and in the third phase third group presented their micro teaching skills, first group acted as students and second group observed. Immediately after the video recording was over qualitative and quantitative feedback was given for the three groups one by one with the help of consolidated observation schedule and video play through LCD projector by the resource person and the researcher. They were assured that their responses would be kept in strict confidence and used only for the research. The filled-in schedules were collected from them and used in the present study.

RESULTS AND DISCUSSION

The main purpose of the study was to ascertain the effectiveness of the application of video recorded micro teaching arranged in the orientation courses conducted by the UGC-Academic Staff Colleges On analysing and interpreting the data collected the following results are obtained.

Table 2 indicates that 75.3% of the teachers strongly agreed and 24.4% of the teachers agreed that micro teaching helps to develop teaching skills, 73.2% of the teachers strongly agreed and 25.9% of the teachers agreed that micro teaching is a relevant teacher training technique, 34.8% of the teachers strongly agreed and 52.8% of the teachers agreed that teachers are better prepared through micro teaching, 35.1% of the teachers strongly agreed and 62.2% agreed that micro teaching provides necessary training to teach in normal class-room, 35.1% of the teachers

Table 2 Frequency and percentage of teacher's opinion towards various components of Microteaching (N=328)

Sl No	Components	Opinion	Frequency	Percent-age
1	Micro teaching helps to develop teaching skills of teaching	Strongly agreed	247	75.3
		Agreed	80	24.4
		Undecided	1	.3
2	Micro teaching is a relevant teacher training technique	Strongly agreed	240	73.2
		Agreed	85	25.9
		Undecided	3	.9
3	Teachers are better prepared through micro teaching	Strongly agreed	114	34.8
		Agreed	171	52.8
		Undecided	41	.3
4	Micro teaching is providing necessary training to teach in normal class room	Strongly agreed	115	35.1
		Agreed	204	62.2
		Undecided	9	.3
5	Micro teaching provides opportunities to practise teaching skills at a time	Strongly agreed	115	35.1
		Agreed	204	62.2
		Undecided	9	.3
6	Feedback given by the expert helps to easily modify the teaching behaviours	Strongly agreed	196	59.8
		Agreed	126	38.4
		Undecided	6	.9
7	Development of critical awareness is possible through micro teaching	Strongly agreed	74	22.6
		Agreed	214	65.2
		Undecided	40	.3
8	Micro teaching helps to learn each demonstrated skill well	Strongly agreed	10920	33.2
		Agreed	9	63.7
		Undecided	10	3.1
9	Planning a lesson for micro teaching helps me to prepare a lesson for actual class room teaching	Strongly agreed	125	38.1
		Agreed	183	55.8
		Undecided	20	6.1
10	Video based recording helps alertness in teaching the skills	Strongly agreed	119	36.3
		Agreed	104	31.7
		Undecided	105	32
11	Students' attention is drawn while teaching	Strongly agreed	48	14.6
		Agreed	17810	54.33
		Undecided	1	0.1
12	Use of information and communication technologies helps to build confidence in micro teaching	Strongly agreed	223	68
		Agreed	92	28
		Undecided	13	3.9

Sl No	Components	Opinion	Frequency	Percent-age
13	Applying electronic media in micro teaching helps in improving teaching	Strongly agreed	168	51.2
		Agreed	131	39.9
		Undecided	29	8.9
14	During micro teaching sessions students controlled behaviour helps in improving teaching skills	Strongly agreed	80	24.4
		Agreed	135	41.2
		Undecided	113	34.4
15	Micro lesson planning helps in micro teaching effectively than that of the traditional lessons	Strongly agreed	79	24.1
		Agreed	202	61.6
		Undecided	47	14.4
16	Duration of teach session is sufficient to practice teaching skills	Strongly Agreed	91	27.7
		Agreed	190	57.9
		Undecided	47	14.4
17	Micro teaching helps teachers to practise many teaching skills in the given time	Strongly agreed	102	31.1
		Agreed	167	50.9
		Undecided	59	18
18	Video based feedback immediately after the micro teaching helps in improving perfor-mances	Strongly agreed	124	37.8
		Agreed	168	51.2
		Undecided	36	11
19	Feedback given by the peers helps to improve the teaching behaviours	Strongly agreed	184	56.1
		Agreed	137	41.8
		Undecided	7	2.1
20	Self evaluation of teaching is possible through micro teaching	Strongly agreed	205	62.5
		Agreed	120	36.5
		Undecided	3	1

strongly agreed and 62.2% agreed that micro teaching provides opportunities to practise teaching skills at a time, 59.8% of the teachers strongly agreed and 38.4% agreed that feedback given by the experts helps to easily modify the teaching behaviours, 22.6% of the teachers strongly agreed and 65.2% agreed that development agreed that development of critical awareness is possible through micro teaching, 33.2% of the teachers strongly agreed and 63.7% agreed that micro teaching helps to learn each demonstrated skill well, 38.1% of the teachers strongly agreed and 55.8% agreed that planning a lesson for micro teaching helps me to prepare a lesson for actual class room teaching, 36.3% of the teachers strongly agreed and 31.7% agreed that video based recording helps alertness in teaching the skills, 14.6% of the teachers strongly agreed and 54.3% agreed that students' attention is drawn while teaching, 68% of the teachers strongly agreed and 28% agreed that use of information and communication technologies helps to build confidence in micro teaching, 51.2% of the teachers strongly agreed and 39.9% agreed that applying electronic media in micro teaching helps in improving teaching, 24.4% of the teachers strongly agreed and 41.2% agreed that during micro teaching sessions students controlled behaviour helps in improving teaching skills, 24.1% of the teachers strongly

agreed and 61.6% agreed that micro lesson planning helps in micro teaching effectively than that of the traditional lessons, 27.7% of the teachers strongly agreed and 57.9% agreed that duration of teach session is sufficient to practice teaching skills, 31.1% of the teachers strongly agreed and 50.9% agreed that micro teaching helps teachers to practise many teaching skills in the given time, 37.8% of the teachers strongly agreed and 51.2% agreed that video based feedback immediately after the micro teaching helps in improving perfor-mances, 56.1% of the teachers strongly agreed and 41.8% agreed that feedback given by the peers helps me to improve my teaching behaviours, 62.5% of the teachers strongly agreed and 36.6% agreed that self evaluation of teaching is possible through micro teaching.

In general the participant teachers expressed most favourable opinion about the conduct of micro teaching sessions and feed back given by the resource persons in all Academic Staff Colleges. It can be seen from the analysis of data that the effectiveness of micro teaching in the orientation courses depend upon the teachers who under go the programmes. The teachers attended the programmes with different kinds of expectations to fulfill the requirements for career advancement, to understand the recent developments in the field of education, to update their teaching skills and teaching techniques. The results were obtained based on the hypotheses formulated to verify the effectiveness of micro teaching conducted during the orientation courses organised by different ASCs.

The result of the study indicate that there is no significant difference among the ASCs with regard to conduct of micro teaching sessions in the orientation courses. Hence, it is concluded that there is no significant difference among the teachers who had participated orientation courses in different ASCs in respect of their effectiveness of micro teaching. All the colleges are equally disposed towards micro teaching for the professional development of teachers in higher education.

Difference among orientation courses

The results of the study indicate that there is no significant difference among different orientation courses conducted by the ASCs with regard to conduct of micro teaching sessions in the orientation courses. Hence, it is concluded that there is no significant difference among the teacher participants of different orientation courses in different ASCs in respect of their effectiveness of micro teaching. All the orientation courses are equally disposed towards conduct of micro teaching for the professional development of teachers in higher education.

Difference between male and female teachers

The results of the study indicate that there is no difference between male and female teachers with regard to effectiveness of micro teaching sessions in the orientation courses. Hence, it is concluded that there is no significant difference between male and female teachers in respect of their effectiveness of micro teaching. Invariably all teachers are equally disposed towards effectiveness of micro teaching for the professional development of teachers in higher education.

Difference among Age Groups

The results of the study indicate that there is difference among the three different age groups with regard to conduct of micro teaching sessions in the orientation courses. Hence, it is concluded that there is significant difference between teachers of 31 to 35 years

and above 35 years in respect of their effectiveness of micro teaching.

Difference among States

The results of the study indicates that there is no difference among teachers of different States with regard to conduct of micro teaching sessions in the orientation courses. Hence, it is concluded that there is no significant difference among the teacher participants of different States in respect of their effectiveness of micro teaching. Teachers from all States are equally disposed towards conduct of micro teaching for the professional development of teachers in higher education.

Difference among Experience in Teaching

The results of the study indicate that there is difference among teachers with different experience in teaching with regard to micro teaching sessions in the orientation courses. It reveals that the teachers having more than five years of experience used many teaching skills in an integrated way during micro teaching sessions.

Difference among Subjects of Teaching

The results of the study indicate that there is no significant difference among different orientation courses conducted by the ASCs with regard to conduct of micro teaching sessions in the orientation courses. Hence, it is concluded that there is no significant differences among the teacher participants of different orientation courses in different ASCs in respect of their effectiveness of micro teaching. All the orientation courses are equally disposed towards conduct of micro teaching for the professional development of teachers in higher education.

Difference between urban and rural teachers

The results of the study indicate that there is no difference between rural and urban teachers with regard to effectiveness of micro teaching sessions in the orientation courses. Hence, it is concluded that there is no significant difference between rural and urban teachers in respect of their effectiveness of micro teaching. Invariably all teachers are equally disposed towards conduct of micro teaching for the professional development of teachers in higher education.

Some of the noteworthy improvements in the participants are summarized below:

- By means of applying different skills acquired and by showing different attitudes the students are attracted towards learning their lessons more enthusiastically than it was in the years of past.
- Video recorded micro teaching skills are planned well in advance and made effective through the use of LCD projector.
- Observation of teaching skills and evaluation methods learnt during the program helps to improve the performance of students.
- The orientation programme gives enough awareness and understanding to learn many teaching skills relating to the teaching of the subject.
- Learnt as how to present ideas in a skill based technique.
- Definitely there is improvement in the methods of video recording of micro teaching, which helps to make the students more attentive and participating.

CONCLUSION

The results and findings of the study based on the analysis and interpretation of data reveal that the micro teaching sessions conducted in the orientation courses are very effective. It can be seen from the results of the study that the facilities related to conduct micro teaching have to be improved with the addition of video recording so as to fulfill the requirements of the practicing the micro teaching skills for the teacher participants. In general the results are positive and encouraging to the Academic Staff Colleges who are practicing the micro teaching sessions in the orientation courses.

In the classroom, teacher and students should interact with each other. The lecture should not be a monologue. As a good teacher, one should create a desired level of response among students. Interest created in the subject should drive them to refer and learn more and more. Teaching is an art involving creativity, involvement, motivation, personality and attitudinal changes. Teaching is also a science in so far as the identification of skills and practising them are concerned. In micro teaching sessions, the teachers are exposed to a wide range of skills and situations. Teaching is a skill which has a cluster of many sub skills. A good teacher who wants to be effective teacher must acquire many teaching skills and apply in their regular teaching sessions to inspire the students.

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Eklavya Technology

C.R. NAGENDRA RAO

ABSTRACT

Realizing the power and potential of Computers in Education. the Government of India started. Eklavya a 24 hour. a new Technology Channel named after one of the finest characters from the great Hindu mythology. Mahabharata. The character is a representation of endless practice and perseverance. The success of Computers Aided instruction also chiefly depends on the learners' active participation. The instructions need to be accordingly designed ensuring Learners' active participation to achieve the instruction objectives. The present paper discusses the role of computers in CAI. the essentials of Effective Instructional design. It further outlines various methods of designing the programmes of instruction. The paper finally stresses the significance of the role of Human Contact in Eklavya Technology/CAL. Based on the principles of design of an effective instruction a brief account of essential dimensions to augment the efficiency of CAL is also discussed.

INTRODUCTION

Eklavya. is one of the finest characters from the great Hindu mythology. Mahabharata. Eklavya. a young tribal boy requested Acharya Drona. one of the finest teachers of archery to accept him as a pupil. Drona refused. saying that he taught only the princes. Disappointed Eklavya went back to forest made an approximate statue of Drona out of mud. He accepted the statue of Drona as his guru. Deriving the inspiration from the statue he taught himself archery and acquired exceptional skills. Thus Eklavya symbolizes the power of teaching oneself and discovering one's potential. Also the character is a representation of endless practice and perseverance.

In the today's context of empowerment with digital technology the Eklavya's style of learning has a great role in education. However. the idea of use of computer in learning is not a new one. Even during decade 1975 - 1985. people in education circles thought that "Computer assisted learning is the medium of the future & and it always will be". That future now seems to have arrived in one form or another; may be you call it a Computer Assisted Learning (CAL) or Computer Based Training (CBT) or Computer Aided Instruction (CAI); computer has been around for some time in teaching.

Availability of reasonably cheap computing power coupled with the Internet's high potential to store. analyze. communicate information. and facilitate communication anytime and anywhere at negligible cost and high speed. the Computer Assisted Learning (CAL) had undergone metamorphosis from an expensive to an affordable technology.

Government of India has also realized the power and potential of this technology. Consequently, Eklavya a 24 hour, a new Technology Channel was started on 26th January 2003. This is a joint venture of IIT's and IGNOU and was catalyzed by Ministry of Human Resource Development, Government of India. Eklavya shall bring to students the actual IIT class rooms virtually at their door steps. This Eklavya technology, employs the Computer Assisted learning environment.

Role of Computers in Computer Assisted Learning (CAL)

Learning in Computer Assisted Learning (CAL), would largely become an out come of learners active participation navigating in the learning environment singly, or in community of other learners explore together, and/or support each other, as they use information resources and tools to pursue their learning objectives.

So what should be the instruction like? and what can computers do for self-instruction?

Ideally, a powerful computer should be rather proficient as an instructor. It can therefore:

- Store considerable amounts of information;
- Select from it at great speed;
- Present the learner with print and animated diagrams;
- Respond to contributions typed in by the teacher;
- Give immediate feedback to the individual learner'; and
- Deal differently with different learners.

Essentials of Effective Instructional Design

CAL needs to focus on teaching effectively rather than simply presenting huge information. As Instructional Designers, we need to develop strategies to make it possible for learners to learn by thinking about what the learners need to learn and what we know about helping them to learn. Knowledge of Principles of instructional design, conditions of learning and categories of learning outcomes would be of great help in designing effective programme for CAL. The work of Robert Gagne and others is worth mentioning in this context.

Conditions of Learning

The eight different conditions of Learning, as distinguished by Gagne's in his 1985 book, in which learner learns with the assumption that different capabilities required different conditions, are;

1. Signal Learning — The individual learns to make a general response to a signal similar to the classical conditioned response of Pavlov.
2. Stimulus-Response Learning — The learner acquires a precise response to a discriminated stimulus.
3. Chaining — A chain of two or more stimulus-response connections is required.
4. Verbal Association — The learning of chains those are verbal.
5. Discrimination Learning — The individual learns to make different identifying response to many different stimuli, which may resemble each other in physical appearance.
6. Concept Learning — The learner acquires a capability of making a common response to a class of stimuli.

7. Rule Learning — A rule is a chain of two or more concepts.
8. Problem Solving — A kind of learning that requires thinking.

Categories of Learning

Gagne suggests the objectives of learning consists of five categories of learning outcomes:

1. Intellectual skills.
2. Cognitive strategies.
3. Verbal information.
4. Psychomotor skills
5. Attitudes.

Instructional Events

Gagne. with these various types of learning outcome and conditions of learning. believed that there must be nine general instructional events to facilitate maximum learning and to support the internal process of learning.

1. Gaining and maintaining attention

➢ To direct learner's activity toward a given objective.

➢ To motivate the learner and thus make learning more meaningful and relevant to learner needs.

2. Informing the learner of objectives

➢ To define expectations.

➢ To activate a plan for classification and organization of new material in to long-term memory.

3. Stimulating recall of prior knowledge

➢ To promote transfer of knowledge.

➢ To activate the leaner's scheme which enables him/her to assimilate new information and place it in long term memory.

4. Presenting the stimulus material

➢ To allow for introduction. explanation. and clarification of material to be learned and applied.

5. Providing learner guidance

➢ To provide the learner the opportunity to master the learning objective in a friendly environment where the learner can test out his/her comprehension of the material.

6. Eliciting performance

➢ To enable the learner to demonstrate what's/he has learned after interacting with the material.

➢ To monitor learner progress.

7. Providing feedback on performance

➢ To inform learner whether his/her performance was successful.

8. Assessing performance

➢ To assess successful accomplishment of objective after completion of learning and instruction for the terminal objective.

9. Enhancing Retention and transfer

➢ To promote transfer of knowledge to real life situation.

Methods of Designing the Programmes of Instruction

There is no such thing as 'the Best' way of designing programme. The best is the one that is very effective for a given learners. However some of the generally followed ways of designing the programmes of instruction as outlined by Derek Rowntree (1990) are discussed in the following sections.

1. Tuition

Here the program requires the computer to act as a patient. personal tutor. It leads the learners through a sequence of material which they are expected to master. There could be some mechanism to diagnosis leaner's difficulties — then provide for remedial measures. may be appropriate examples and exercises — and test the learners at each step to check how well they have understood.

Differences in learning pace may be taken care by presenting different learners with different examples and test exercises. according to their earlier responses. And the program may "branch" different learners in to different kinds of material according to the particular difficulties or interests they reveal.

2. Simulation

Simulating a particular situation or system with which the learner can interact is the second form of programming. Thus the learner will be able to "experiment in total safety with. let's say. a nuclear reactor. an ailing hospital patient. the processes of mountain building.

Learners can call up the information that will enable them to run the reactor. treat the patient. and so on. as they think fit. trying out their interpretation of the underlying principles. The computer will tell them what effects their decisions are having — especially if the reactor is about to go critical or the patient expires.

3. Data-crunching

Here the computer is used as a means of searching large amounts of data and / or of manipulating it at high speed. Thus the learner might ask the computer to select for certain figures or patterns in hundreds of census returns or to produce complex charts and graphs.

In seconds or minutes. the computer may be able to provide learners with data that might otherwise have taken hours or days to work out. Relieved of this drudgery and delay. learners can get on with the more important task for making sense of the data.

Human contact in CAL

The human contact in a CAL may sound odd. but it augments the effectiveness of programme. Then what are the roles for the human contact in a CAL?

Roles for Human Contact

Derek Rowntree (1990) identified a number of roles for human encounters in and around a self-instructional course like CAL. These roles are summerised in the following sessions.

Encouragement and support

The self-instructional learners may be prone to anxieties. Their worry may be about

1. Appropriateness of their approach of learning;
2. Level (Standard) of achievement.
3. Worthiness study their career or other aspirations. and so on.

The necessary encouragement and support can best be provided through "live" contact with another human being. A more experienced colleague (or mentor) / Trained counsellors can help learners talk through their problems.

Remedial tuition

Notwithstanding the meticulous design of instruction and materials. some learners do have difficulties with them. For such learners

need some arrangement to discuss such difficulties with a tutor.

Inspirational teaching

Occasional face-to-face encounters ensure refresh the learner's spirits. Before each new stage of the course. learners might be brought together for a session of which the tutor sums up the course so far and sets the scene for what is to follow. Learners might there by feel gratified of having converted so much ground already and heartened for the work that still lies ahead.

It is generally easier to stimulate learners' motivation face-to-face than it is in print. or even on audiotapes. One way video and 2 way audio may be thought of.

Practical teaching

Learning some subjects. need face-to-face demonstrations. under the guidance of an expert who can give them immediate feedback while observing their performance.

Advice on options

Access to a tutor would largely benefit the learners as the tutor can help them not only in choosing topics but also with organizing their personal researchers.

Marking and commenting

Derek feels that marking and commenting upon learners' performance is an essential feature in a self-instructional programme. Without personal feedback on what they have accomplished. they might just as well be reading teach-yourself books.

Learners as supporters

Learners can get help from one another. They may support one another through times of self-doubt. And they will help one another sniff out the limbs of the system. identifying what the "hidden curriculum" really requires of them. and what's in it for them.

Mentors

Mentors are more experienced colleagues. perhaps even the learner's line manager or a specialist else where in his or her organization.

Mentors provide strong support as a "resource" for learners to draw on and to come out with their ideas. They may also take on a more tutorial role — demonstrating practical work and assessing and commenting on tests and assignments. and even giving informal coaching.

ESSENTIAL DIMENSIONS TO AUGMENT THE EFFICIENCY OF CAL.

From the above discussion the following parameters are identified as essential dimensions to augment the efficiency of CAL.

- ➢ Voice-annotated Class-room Lectures to make seeing more interesting.
- ➢ Educational Games essential for participatory event for entire class
- ➢ Internet to encourage collaboration. peer group discussion. sharing of information & resources etc
- ➢ Video and Audio based video Class room to anchor Courses
- ➢ Distant anchoring by "Mentor"

Amiya Baran Sha et. al.. proposed a framework for CAL as depicted in figure 1. This frame work to a large extent takes care of the aspects discussed above. The model essentially comprises of three faces each being complimentary to other. However for any model or framework, preparation of a powerful and effective multimedia courseware is as equally important as scientific design of

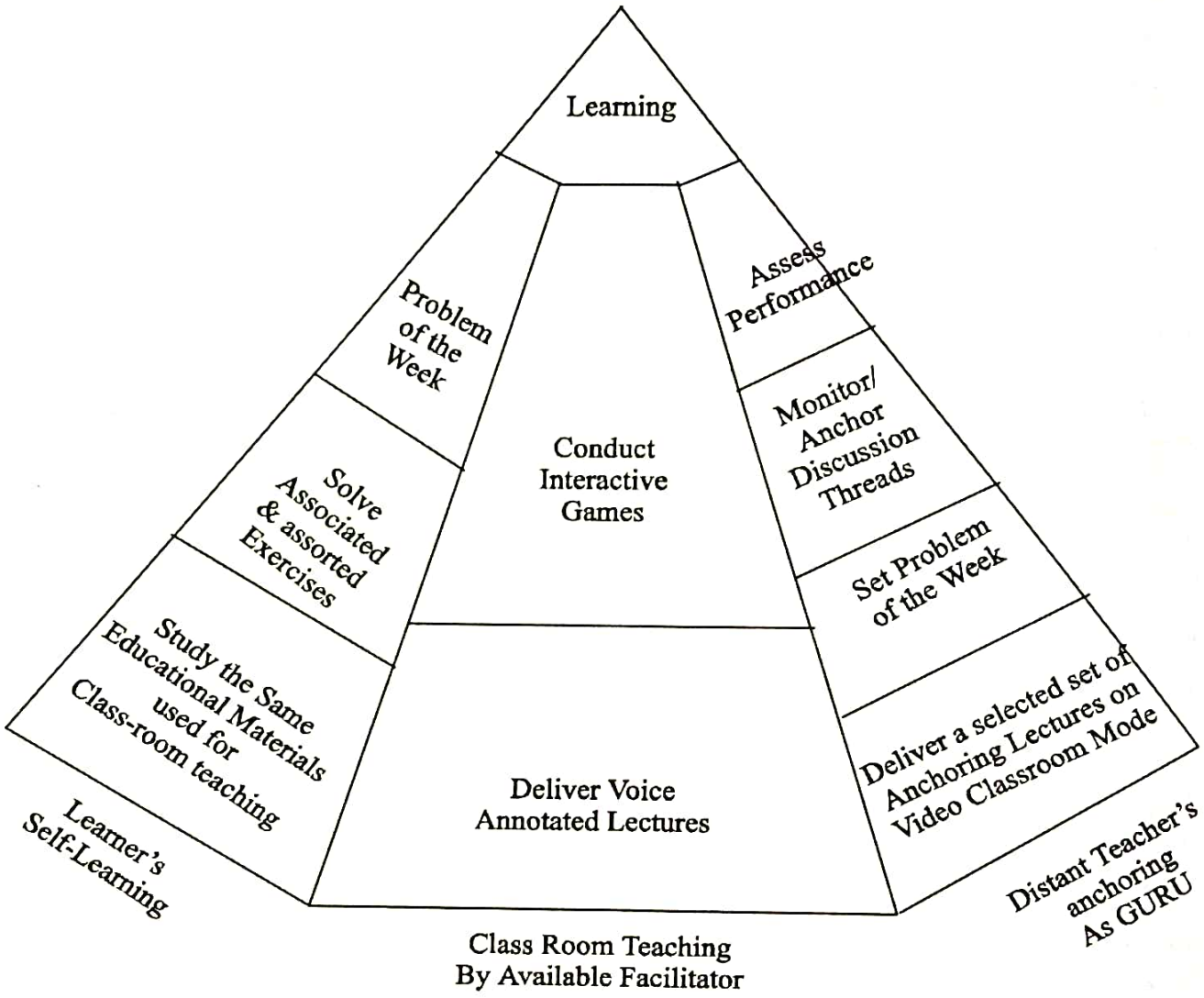

Figure 1. Framework for Computed Assisted Learning (Amiya Baran Saha et al.. Amiya.saha@erdcical.org. ER & DCI. Calcutta)

instruction. May be these skills are hired in case the content experts lack these skills.

CONCLUSION

The key to success for any learning environment is the effectiveness of the instruction. Thus. the use of instructional programmes based on instructional design theories as well as learning theories would facilitate designers with a dynamic and flexible guideline to ensure the development of effective and efficient instruction. The Eklavya technology. a technology employing the Computer Assisted Learning environment need to be structured on these lines. Knowledge of instructional design theories as well as learning theories coupled with the creative skills for development of multimedia courseware would greatly enhance the effectiveness of Eklavya Technology programmes.

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Video Conferencing for Tele Education and Training

G. KULANTHAIVEL

INTRODUCTION

e-Learning is a combination of learning services and technology to provide high value integrated learning; anytime, anyplace. It is being resented in the marketplace as the next evolution of the training and the education industry and the next phase in the digital revolution. e-Learning is one of the thrust areas identified by the Ministry. The main thrust of the e-Learning programme is to effectively integrate e-Learning methodology and approach with the conventional classroom system to maximize the benefits flowing from the traditional education system, increase its reach to more and more learners and spread e-Learning from teaching of IT related subjects to other subjects in the college curricula. Information Technology or popularly known as IT is the technology that organizes, stores and disseminate information where the physical distances is immaterial for end user. Development of IT in the past years has been drastic. Higher Education has evolved in an admirable way in India in the five decades since independence is now at the crossroads. Information and Communication Technologies (ICT) throughout the world has been the creation of a vast new generation of IT users. Never before, the next generation has been entrusted with such responsibility and challenge.

The evolution of IT and Systems play a vital role in the research in higher Education. The network based information services can be provided through LAN or Internet to the user community. Campus networking of Institute will provide such services through LAN with IT application. Internet has emerged as the most modern revolutionary phenomenon. The worldwide network of computers has changed the world into a Global village and made any information under the sun, available at your fingertips. Establishing an organization identity on the Web is becoming more popular with each passing day.

A flexible delivery system is one that is set up to cater for the need of learners and so is one of the more effective ways of setting up a delivery system for open learning. ICT in higher and technical education is considered crucial for teaching online and is seen as a tool for overcoming the constraints of adequate infrastructure across the country. The government too has been keen on the ICT project. The third channel in the bouquet of Gyan Darshan channels, Eklavya brings quality education to the students pursuing engineering education throughout the country. EDUSAT helps us in learning from the Institute by using satellite technology. Web based conferencing / Video conferencing, offer a viable alternative interactive mode of education to the existing education system.

THE SUCCESSFUL USE OF IT IN EDUCATION

Net can engage students in the learning process, offer them to a vast universe of

previously unavailable information, and teach them virtual navigation and information-processing skills that are increasingly important to success in the workplace. Net has the potential to change the way student learns. Technology is enormously powerful in terms of changing what the children believe they can do. To get this technology out to more students and to give training to teachers is very essential.

It is accepted that IT can prove a potential contribution to Engineering Education. To use IT more effectively in education, a systematic planning is required. There should be direct access of IT equipment by students and teachers, so that they feel comfortable in using these latest technology. Sufficient time and opportunities should be given to teachers to become trained and comfortable in the use of these technologies. Planning, access to equipment, teacher training and the role of Government are some of the issues involved in the use IT in education. There are positive and negative features of using Internet in education. Teachers also have benefits and shortcomings.

VIDEO CONFERENCING

Videoconferencing is the combination of dedicated audio, video, and communications networking technology for real-time interaction, and is often used by groups of people who gather in specific setting (often a conference room) to communicate with other groups of people. Video conferencing allows student, faculty, and staff to communicate with one another while staying close to their home campus.

Video conferencing technology is all the rage among corporations. Recently educational facilities have begun taking advantage of video conferencing technology to support learning and education. Video conferencing equipment can help facilitate instruction and provide distant learners with a host of resources and access to content providers, teachers, librarians and more. More and more teachers are adopting video conferencing as a method of enhanced communication and instruction. Many Institutions are using video conferencing to connect with one another and produce networks carrying large volumes of video and text data to educational facilities, teachers and students. Other people that benefit from video conferencing technology include librarians who can use video conferencing to develop strategies, provide resources and improve the quality of their service and delivery.

Video conferencing facilitates learning by allowing remote or distant learners to meet regardless of their location. Students can take classes at multiple universities. In essence classes that are not available at one location may be available at another through video conferencing. Video conferencing can also benefit non traditional students who are not able to attend classes during normal hours.

Video Conferencing equipment would be used to conduct classes at different locations. With Video conferencing system using sound and vision as well as integrated electronic whiteboard, e-Laboratories and online chat, one can interactively conduct classes and lectures with the help of drawings and sketches using the electronic whiteboard. The Video conferencing system may be used to share applications and for high-speed file transfers between the different locations where the classes are being conducted. The technologies used to deliver videoconferences currently have a dramatic effect on the quality of the communication achievable. The issues are those of:

- bandwidth
- video compression

- delivery method
- standards

GROUP VIDEOCONFERENCING

These systems allow at least 6-7 people to sit in each studio, which is well equipped with various functions. These systems can operate at transmission speed from 128Kbps up to 1920 Kbps using ISDN/satellite network and it can provide near TV quality resolution at higher speeds. Nowadays, video conferencing can be carried out using IP connectivity also.

Types of Videoconferences

* Point-to-Point Videoconference (One-to-One)
* One-to-Many Videoconferencing
* Multi-Point Videoconference

Equipments in a Videoconferencing system

* CODEC(Coder-DECoder)
* Television Monitor/Plasma Screen
* Main Camera and Microphones
* Document Camera
* Personal Computer
* VCRs/DVD Recorders

Fig. Video conferencing session in NITTTR, Chennai

Fig. Video conferencing session between NITTTR, Chennai and extension centres - Hyderabad (Andhra Pradesh), Kalamassery (Kerala) and Bangalore (Karnataka)

Group video conferencing facility is used for tele-education/training between NITTTR, Chennai and its Extension centres at Bangalore (Karnataka), Hyderabad (Andhra Pradesh) and Kalamassery (Kerala) using ISDN connectivity. Expert lectures can be delivered from different higher learning Institutes and Industries for the technical teachers who are attending the Quality Improvement Programmes at NITTTR, Chennai and at extension centres. The connectivity can be utilized by each center for conducting their state course also. The Video conferencing system would be bridging the distances and executed in real-time. The participants are exposed to other state resource persons also in the regular courses. The travelling time and money are saved by this technique.

CONCLUSION

Digital library technologies will dominate the Internet of the 21st century. Resource material searching, Job searching, e-mail, chatting and other communication facilities of Internet will change our way of life. Technology changes the patterns of control and power that conventional education takes for granted in designing, delivering, and evaluating teaching and learning. The idea of a self contained classroom in which teachers, to a large extent, control and structure information and communication is made redundant through the possibilities of electronically mediated learning. Information Technology is replacing this picture of order, sequence, structure, self-containment and providing control with flexible learning. Video

conferencing can also be used as a career or employee training tool. Many colleges are now collaborating with local businesses to offer students certification and business training. Expert subject matter delivered from individuals in the field is easily delivered to students using this new technology. Students can also take advantage of mentoring services offered by companies in distant locations using video conferencing technology. The possibilities are virtually endless. Setting up a video conferencing facility in selected Institutes will benefit the students and staff members to have live interactions with higher learning Institutes and Industries in India and around the world by using the latest communication technologies.

Acknowledgements

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The authour wishes to acknowledge the various Internet sources and materials in compiling this background paper.

A Novel Partial Discharge Analysis In The Stator Winding of 60MW/11kV Alternator Using Neural Network

K.SATHIYASEKAR, K.THYAGARAJAH, A.KRISHNAN AND V.GANESHAN

ABSTRACT

Stator winding in generators fails when it is exposed to voltage surges. Measurements on generators show that these surges can create partial discharges and these discharges eventually destroy the turn-to-turn and phase-to-phase insulation resulting in generator failure. It is very difficult to separate the partial discharges from the Surges. Partial discharges are measured using conventional discharge detector. Neural network as tool used in this work, recognizes fairly well the partial discharge patterns of those insulation defects for which it is trained.

Key words: Back Propogation Algorithm, Semi Linear Activation Function, and Partial Discharge (PD)

I Introduction

High-voltage (HV) generator failures due to insulation breakdown may cause catastrophic damages to the equipment and expensive losses. Stator winding insulation of generators is prone to partial discharge (PD) activity as a result of voids within insulation and air gaps adjacent to insulation under high voltage stress. Partial discharges are "sparks" involving the flow of electrons and ions when a small volume of gas breaks down. The term partial is used since there is a solid insulation, such as epoxy-mica, in series with the void, which prevents a complete breakdown. Depending on the size of the void, the dielectric constant, and the temperature, the stress on the gas within the void may become high enough for breakdown to occur. In most cases, the electric field will not be uniform and this will tend to lower the breakdown voltage. Partial discharges are often the result of damage caused by other thermal, mechanical, electromagnetic and chemical stresses acting on the stator winding. These discharges also contribute to the ageing of the machine's dielectric system by eroding away or deteriorating the insulation system. Therefore, partial discharge activity is a good indication of insulation deterioration. Partial discharge testing can assess the condition of stator winding insulation and thereafter help to establish a condition-based maintenance program. Condition monitoring and predictive maintenance of stator insulation brings users benefits of reliable operation, optimal number of maintenance outages and maximal lifetime of their generators.

Non-destructive methods like loss factor measurements, insulation resistance, leakage current or charging / discharging current measurements are typical off-line tests that give' integral' information on the insulation condition [2]. Consequently, in order to get reliable information on the performance of the entire stator winding insulation, due to the complexity of rotating machines, it is highly

recommended to apply a combination of PD measurements and additional, well - defined diagnostic tests and inspections at regular intervals.

II Measurement of Partial Discharges

The measurement of PD on rotating machines can be performed either through on-line or off-line testing. With each of these methods there are several advantages and disadvantages that must be considered when performing diagnostic testing and especially when analyzing PD measurement results [3].

1 Off-line PD testing

The generator under test is rated at 60 MW, 11 kV and has class F epoxy-mica stator insulation. The stator winding is energized with an external power source while the machine is out of service. When performing off-line measurements the interference level resulting from external noise sources is usually quite low and due to the voltage variability, a detailed analysis of the PD behavior of each phase can be carried out.

When PD diagnosis is performed off-line, it is essential to examine PD results obtained at regular intervals from one machine for trends over time in order to detect progressive ageing and to determine whether or not additional diagnostic or even maintenance activities are needed. The main benefits of applying PD diagnosis as a tool for condition assessment to generators in key functions are, Early detection of deteriorating insulation components, Planning of preventive maintenance, Optimized reinvestment planning and Optimized availability and reliability for operational effectiveness

Thus, the overall life-cycle costs can be significantly reduced. Even though these benefits are quite promising, PD diagnosis has some inherent limitations that have to be considered.

Measurement of partial discharge for our paper is done using the Tan Delta test by applying different input voltage and noticing the Leakage current, capacitance and Tan value in the slots of the generators. We are

Table 2.2

Phase	Ground Terminals	Applied Voltage (KV)	Leakage Current (mA)	Capacitance (μF)	Tan δ Value %
R	Y and B Ground	2.20	232	0.174248	3.2406
		4.40	506	0.176000	3.3004
		6.60	784	0.176369	3.4630
		8.80	1059	0.176053	3.9308
		11.0	1347	0.176004	4.3920
Y	R and B Ground	2.20	236	0.165976	3.2548
		4.40	511	0.166867	3.3000
		6.60	786	0.168142	3.4136
		8.80	1084.	0.170141	3.8707
		11.0	1346	0.170922	4.3486
B	Y and R Ground	2.20	235	0.164922	3.1939
		4.40	510	0.165864	3.2488
		6.60	789	0.167309	3.4180
		8.80	1070	0.169119	3.8905
		11.0	1351	0.170603	4.3268
	R+Y+B to Ground	4.40	115	0.553923	2.3256
		11.0	298	0.570108	3.0104

making the measurement for thousands of minute changes in the input voltage and noticing the values to make a tabular column 2.2.We are just giving a sample from the numerous measurements we have taken.

III Artificial Neural Networks (ANN)

An Artificial Neural Network (ANN) is an information-processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurons) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a specific application, such as predetermination of Partial Discharge that we apply in our paper, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurons. This is true of ANNs as well [6].

Either humans or other computer techniques can use neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, to extract patterns and detect trends that are too complex to be noticed. A trained neural network can be thought of as an "expert" in the category of information it has been given to analyze. This expert can then be used to provide projections for given new situations of interest and answer "what if" questions.

Other advantages include:

1. Adaptive learning: An ability to learn how to do tasks based on the data given for training or initial experience.
2. Self-Organization: An ANN can create its own organization or representation of the information it receives during learning time.
3. Real Time Operation: ANN computations may be carried out in parallel, and special hardware devices are being designed and manufactured which take advantage of this capability.
4. Fault Tolerance via Redundant Information Coding: Partial destruction of a network leads to the corresponding degradation of performance. However, some network capabilities may be retained even with major network damage.

Neural networks process information in a similar way the human brain does. The network is composed of a large number of highly interconnected processing elements (neurons) working in parallel to solve a specific problem. Neural networks learn by example. They cannot be programmed to perform a specific task. The examples must be selected carefully; otherwise useful time is wasted or, even worse, the network might be functioning incorrectly. The disadvantage is that, because the network finds out how to solve the problem by itself, its operation can be unpredictable.

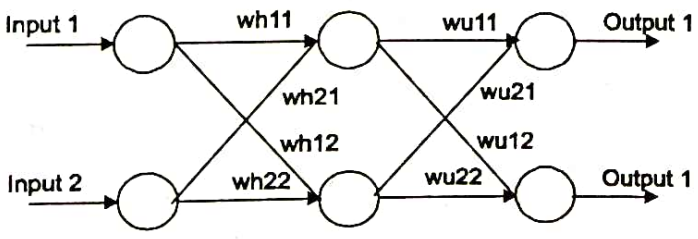
IV BPN Algorithm

When you present your network with data and find that the output is not as desired, what will you do? The answer is obvious: we will modify some connection weights. Since the network weights are initially random, it is likely that the initial output value will be very far from the desired output. We are implementing BPN algorithm with C programming. We wish to improve the behavior of the network. Our attempt is to find out which connection weights must be modified, and by how much, to achieve this objective. To put it in another way, how do

you know which connection is responsible for the greatest contribution to the error in the output? Clearly, we must use an algorithm, which efficiently modifies the different connection weights to minimize the errors at the output. This is a common problem in engineering; it is known as optimization. The famous LMS algorithm was developed to solve a similar problem, however the neural network is a more generic system and requires a more complex algorithm to adjust the many network parameters.

One algorithm, which has hugely contributed to neural network fame, is the back-propagation algorithm. Back propagation algorithm in our paper is used for training the network with the input and output in the Tan Delta test that we conducted manually. After training the network with thousands of data the network gets trained to predict any Tan value when we give the inputs like voltage and the leakage current value.

A neural network is useless if it only sees one example of a matching input/output pair. It cannot infer the characteristics of the input data for which you are looking for from only one example; rather, many examples are required. The best training procedure is to compile a wide range of examples (for more complex problems, more examples are required), which exhibit all the different characteristics you are interested in. It is important to select examples, which do not have major dominant features, which are of no interest to you, but are common to your input data anyway.



Designating (I_1, I_2), (H_1, H_2), and (O_1, O_2) as the inputs, hidden-layer outputs and output-layer outputs respectively, the outputs of Hidden Node1and 2 are given by

$$H_1 = sgm\left(\sum_{l=1}^{2} I_1 W_{l1}^{h}\right)$$

And

$$H_2 = sgm\left(\sum_{l=1}^{2} I_l W_{l2}^{h}\right)$$

Where

$$sgm\,(x) = \frac{1}{1+e^{-x}}$$

Which is the Semi Non-linear Activation called unipolar Sigmoid Function. The output-layer outputs are given by

$$O_1 = sgm\left(\sum_{m=1}^{2} H_m W_{m1}^{o}\right)$$

And

$$O_2 = sgm\left(\sum_{m=1}^{2} H_m W_{m2}^{o}\right)$$

Now we can calculate the output for a particular set of inputs. This allows us to calculate the Mean Squared Error (MSE) between the actual output and the desired output for the given input in this training example. Thus our error function can be formally written as

$$E = \sum_{n=1}^{2}\left(D_n - O_n\right)^2 n$$

Where D_k is the kth-desired output.

The gradient is fairly straightforward to calculate, due to the convenient fact that the derivative of the sigmoid function can be expressed in terms of the function itself:

$$\frac{d}{dx}\frac{1}{1+e^{x}}=\frac{e^{-x}}{\left(1+e^{-x}\right)^{2}}=(\,1-sgm\,(x)\,)\;sgm\,(x)$$

The gradient is defined as the vector of partial derivatives of the multivariate function with respect to each variable. Because the error is a function of the network outputs, we first need to calculate a set of partial derivatives for each output node with respect to each associated connection weight. This turns out to be trivial, since all other variables but the one of interest are held constant when we calculate the partial derivative. Thus, only one linear term is left in the calculation of the partial derivative of the output, and leaving the coefficient - which is just the corresponding input! So, we can write

$$\frac{\partial O_n}{\partial W^{o}_{mn}}=\frac{\partial}{\partial W^{o}_{mn}}\sum_{k=l}^{2}W^{o}_{kn}H_k=H_m$$

Now, the gradient of the error function can be

$$\frac{\partial E}{\partial W^{o}_{mn}}=\frac{\partial}{\partial W^{o}_{mn}}\sum_{n=1}^{2}\left(D_n-O_n\right)^{2}$$

$$=-2\,(D_n-O_n)\frac{\partial}{\partial S^{o}}sgm\left(S^{0}\right)\frac{\partial S^{o}}{\partial W^{o}_{mn}}$$

$$=-2\,(D_n-O_n)\left(\left(1-sgm\left(S^{o}\right)\right)sgm\left(S^{o}\right)\right)H_m$$

The expression

$$=-2\,(D_n-O_n)\left(\left(1-sgm\left(S^{o}\right)\right)sgm\left(S^{o}\right)\right)$$

is denoted δ^{0}.

The new values for the network weights are calculated by multiplying the negative gradient (remember, we want to go *down*!) with a step size parameter (called the learning rate) and adding the resultant vector to the vector of network weights attached to the current layer. This change does not take place, however, until after the middle-layer weights are updated as well, since this would corrupt the weight-update procedure for the middle layer.

Clearly, the error at the output will be affected by the weights at the middle layer, too. However, the relationship is more complicated. A new gradient is derived, but this time the output weights are treated as constants rather than the hidden-layer weights. Now, the actual output is a function of the weights attached to the middle layer only (and in a generic network there are LM of those, for L input nodes and M middle-layer nodes). Fortunately, it is still a relatively simple expression.

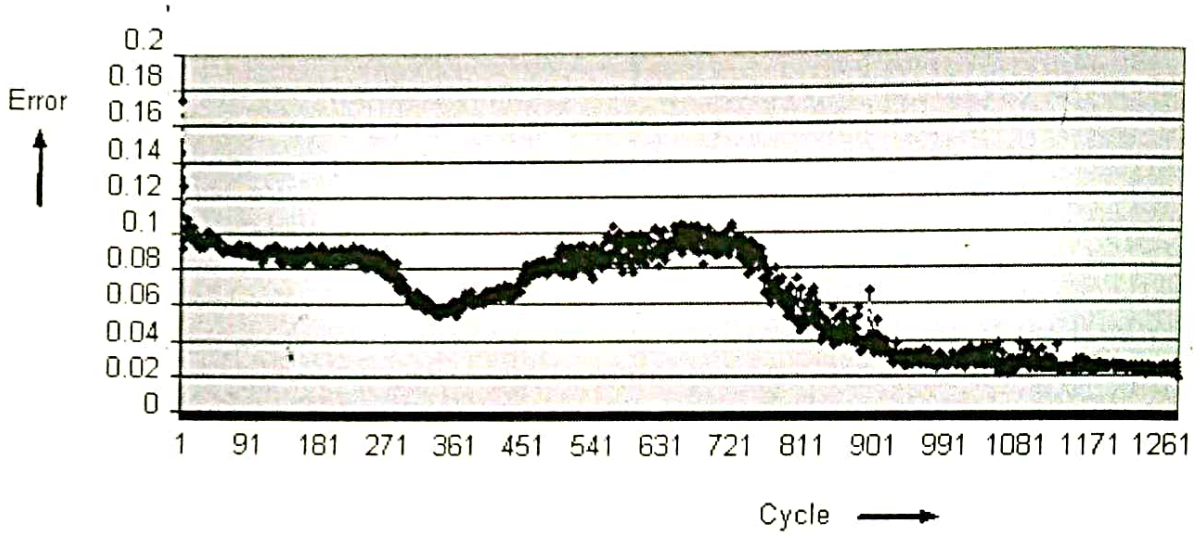
$$\frac{\partial E}{\partial W^{h}_{lm}}=\left(\left(1-sgm\left(S^{h}\right)\right)sgm\left(S^{h}\right)\right)\sum_{n=l}^{2}\delta^{o}_{n}W^{o}_{mn}I_l$$

The middleweights are updated using the same procedure used for the output layer, and the output layer weights are updated as well. This is a complete training cycle for one piece of training data [7] [8].

Some enhancements to the BP algorithm have been developed to get around this - for example one approach adds a momentum term, which essentially makes the marble heavier - so it can escape from small potholes. Other approaches may use alternatives to the Mean Squared Error as a measure of how well the network is performing.

V Results and Discussion

We developed the C program for making the network learn the Prediction process of the partial discharge in generators.



The procedure is applied to the data shown in Table 2.2 and error characteristics are shown in the above figure.

VI Conclusion

PD testing can establish a predictive maintenance program and the maintenance costs of generators can be reduced. If there are concerns of stator insulation conditions, off-line PD testing is to verify insulation problems and assess insulation conditions. This program can be used for any kind of generator. This may be useful for design of the Generators with different ratings, as the C program will predict the partial discharge for different inputs given to it.

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Role of Trade Unions on Education and Training

M. GOVINDAN

Introduction

Economic development requires harnessing of all resources of the community to achieve the desired results. Capital is more important, no doubt; but if the level of skill and knowledge of workers is not up to the mark, economic development will be retarded. Ignorance of workers is a strong barrier to the process and progress of industrialization. Both education and training is an instrument in increasing worker potential for economic growth.

Need for the study

Trade unions, as universally accepted, are the workers' instruments, protecting and promoting the interests of their members. One of the most important functions is to bargain with employers to raise wages and to improve the working conditions. In running of industries, the role of workmen is a significant one. It is an undisputed fact, today, that the survival of the industry largely depends on the constructive role of trade unions. Further, trade unions are generally regarded as the most potent agencies of education and training. It has been accepted all over the world that worker's education and training should be the responsibility of trade unions.

Objectives of the study

I. To measure the perception of managers, trade union office bearers and employees towards contribution of trade unions for increasing education and training of employees.

II. To find out the present role of trade unions towards education and training as opined by the managers, trade union office bearers and employees.

III. To find out the difference, if any, in the extent of contributions of trade union in education and training in relation to

1. male and female respondents
2. single and multi union industries
3. independent and affiliated union industries.
4. the three types of industries (Public, co-operative and private)
5. the five types of industries classified on the basis of production (food, textiles, chemicals, machinery and equipments and transport equipments).
6. the three types of union affiliation (central, state and regional)
7. the three types of respondents (managers, trade union office beaers and employees)
8. respondents of four types of age groups (20-30, 31-40, 41-50 and 51-60 years)
9. respondents at four levels of educational background (SSLC,

Diploma, Graduation and Post-Graduation)

10. respondents at five levels of occupational status (worker, clerical, technical, supervisor, and managerial)

Methodology

Normative survey method was adopted for the present study. For collecting data a questionnaire was constructed and administered to a random sample of 50 managers, 120 trade union office bearers and 330 employees in ten manufacturing industries located in Chennai and Chengalpet Districts of Tamil Nadu. The questionnaire was administered in Tamil Language.

Data Analysis

The statistics of mean and SD was calculated to find out the respondents perception about the trade unions role towards education and training. The analysis of 't' test was computed to differentiate the respondents opinion about the present role of trade unions towards education and training in single and multi union industries, Independent and affiliated union industries and the respondents sex. To find out the significance of difference among the various groups, the one way ANOVA was computed.

Results and discussions

Table-1: Mean and SD of the perception scores of respondents about the role of Trade unions toward Education and Training.

N	M	SD
500	91.3	10.2

The mean score 91.3 indicates that large number of respondents perceived that the trade union can perform the activities to increase education and training of their members.

However, few managers state that, the trade unions believe that increasing education and training of the employee is the task of management not the union and unions are not interested in establishing their own education and training centres for the employees. Trade union office bearers and employees state that there is no enough money and time to concentrate on developing education and training of the employees.

Table 2: Mean and SD for the responses regarding the current activities by the trade unions for Education and Training.

N	M	SD
500	86.2	10.3

It is observed from the table that, the mean is very high which means that the current activities of trade union for education and training is highly acknowledged by the managers, trade union office bearers and employees. Though the response from the sample are highly positive, an interview with the respondents while collecting data revealed some interesting reasons from certain respondents as "why the trade unions cannot effectively contribute for education and training".

The managers state that the trade unions are financially weak and they have no money to establish their own education and training centres. They also state that, the unions concentrate only on their day-to-day problems and issues, and they never think about the education and training of their members. The trade union office bearers and the employees state that, while preparing curriculum for education and training of the employees, the Govt does not invite the local unions and also

the management restricts the unions to collaborate with the CBWE, NPC, RLI etc. Further, they state that due to their financial constraints they are unable to establish their own education and training centers and provide monetary assistance to the employees for their further education and training.

Table 3: Difference between the male and female opinion about the trade unions role towards Education and Training.

Responden ts	N	M	SD	't'	Level of significance
Male	350	77.9	9.2	8.4	0.01
Female	150	85.3	9.0		

It could be observed from the table that the 't' value for education and training is significant at 0.01 level. It reveals that there is a significant difference between male and female respondents in their responses regarding the present role of trade unions in increasing education and training of the employees.

The mean of the female is greater than that of men indicating that the responses of female is more favorable than male towards the role of trade unions on education and training. This result could be due to the low representation of women in trade unions. Not many women become members of trade union, and when they become members, their immediate demands are satisfied by the leaders. Moreover, women get satisfied very easily.

Table 4: Difference between single and multi unions in their present role towards Education and Training.

Union type	N	M	SD	't'	Level of significance
Single union	130	86.6	10.1	8.6	0.01
Multi-union	370	77.4	10.2		

It could be seen from the table that the 't' value for education and training is significant at 0.01 level. It reveals that, the respondents differed significantly in their responses regarding the present role of trade unions towards, increasing education and training of the employees.

The means of the table indicate that in industries with single union, the role of trade unions towards Education and training is greater than in the industries with multi unions. The results may be due to the following reasons. In single union industries all members come under one umbrella. There is more cooperation among them. The union-management relation is very cordial. They are financially very strong. The members satisfaction is very high, therefore the productivity is also high. Therefore the single unions are able to contribute more for education and training.

Table-5: Difference between independent and affiliated union in their present role towards Education and Training.

Type of union	N	M	SD	't'	Level of significance
Independent	150	85.2	9.2	7.3	0.01
Affiliated	350	77.5	9.5		

As per the table the 't' value for education and training is significant at 0.01 level. It means that there is a significant difference between the respondents of the independent and affiliated union in their role towards increasing education and training of the employees.

The mean is highest for independent unions, compared with affiliated unions. It reveals that the respondents acknowledge that the independent union play more effective role for education and training. The reason may be follows: The independent unions do not depend on anybody and stand on their own. They have freedom to take any decision if they wish.

It could be observed from the above table, that the 'F' values for the three types of industries, the three types of union affiliation, the three types of the respondents,

Table 6: Table showing the ANOVA for Education and Training

Sl. No	Variables	Source of variation	DF	SS	MSS	F	Level of significance
1	Type of industries (public, co-operative and private)	Between groups Error Total	2 497 499	1032.1 49870.8 50902.9	516.1 100.3	5.1	0.01
2.	Type of industries classified on the basis of production (food, textiles, chemicals, machinery and equipment and transport equipment)	Between groups Error Total	4 495 499	984.6 51953.8 52938.4	246.2 104.9	2.2	Not significant
3.	Type of union affiliation (central, state and regional)	Between groups Error Total	2 497 499	1128.6 50911.3 51915.9	564.3 102.4	5.4	0.01
4.	Type of respondents (managers, trade union office bearers and employees)	Between groups Error Total	2 497 499	1010.6 49892.3 50902.9	505.3 100.3	5.0	0.01
5.	Age groups (20-30, 31-40, 41-50 and 51-60 years)	Between groups Error Total	3 496 499	747.6 50155.3 50902.9	249.2 100.9	2.5	Not significant
6.	Educational background (SSLC, Diploma, Graduation and Post Graduation)	Between groups Error Total	3 496 499	944.3 49958.6 50902.9	314.8 100.5	3.1	0.05
7.	Occupational status (Worker, clerical, technical, supervisory and managerial)	Between groups Error Total	4 495 499	2015.8 48887.1 50902.9	503.9 98.7	5.1	0.01

't' values between groups (type of Industry) for Education and Training

Type of industry	SD / Mean	Public	Co-operative	Private
		8.6	8.2	8.3
Public	73.2	–	3.8*	5.7*
Co –operative	75.6	–	–	3.9*
private	77.4	–	–	–

't' values between groups (type of Affiliation) for Education and Training

Type of affiliation	SD / Mean	Central	State	Regional
		9.3	9.4	7.9
Central	82.6	–	5.4*	6.1*
State	80.6	–	–	5.8*
Regional	76.6	–	–	–

't' values between groups (type of Respondents) for Education and Training

Type of Respondents	SD / Mean	Managers	TUOB	Employees
		8.8	9.2	9.0
Managers	78.6	–	7.8*	4.4*
TUOB	85.1	–	–	4.6*
Employees	71.0	–	–	–

't' values between groups (Level of Education) for Education and Training

Level of Education	SD / Mean	SSLC	Diploma	Graduation	Post Graduation
		9.1	9.3	9.2	8.9
SSLC	82.6	–	3.1*	4.1*	4.7*
Diploma	81.6	–	–	3.3*	3.6*
Graduation	79.3	–	–	–	2.7*
Post Graduation	78.9	–	–	–	–

't' values between groups (Occupational status) for Education and Training

Occupational status	SD / Mean	Worker	Clerical	Technical	Supervisory	Managerial
		8.5	8.9	8.7	8.6	9.1
Worker	83.2	–	3.2*	3.3*	3.7*	3.6*
Clerical	82.6	–	–	2.9*	4.1*	3.2*
Technical	81.5	–	–	–	3.6*	3.2*
Supervisory	80.4	–	–	–	–	3.0*
Managerial	79.6	–	–	–	–	–

* significant at 0.01 level

the four levels of respondents educational backgrounds and the five types of respondents occupational status are significant at 0.05 level and 0.01 level. This reveals that the respondents of three types of industries (public, co-operative, private) the respondents of trade union with three levels of affiliation (central, state, regional), the three types of respondents (managers, trade union office bearers, employees) the respondents having four levels of educational background (SSLC, Diploma, Graduation, Post-graduation) and the respondents of five types of occupational status (worker, clerical, technical, supervisory, managerial) significantly differ in their responses regarding the present role of trade unions towards education and training of the employees.

But the 'F' values for the five types of industries classified on the basis of production and the respondents belonging to the four types of age groups are not significant. It denotes that there is no significant difference among the respondents of the five types of industries classified on the basis of production (food, textiles, chemicals, machinery, and equipment and transport equipment) and the respondents belonging to different age groups (20-30, 31-40, 41-50 and 51-60).

As the 'F' values are significant, further analysis is done using 't' tests to find out the significant mean differences among the groups.

The results of table shows that there is significant difference among the respondents of three types of industries, three types of Union affiliation, the three type of respondents, the four levels of respondent's educational background and five types of respondent's occupational status about the present role of trade unions for increasing Education and Training of the employees. Further, the mean values of the table denotes that

- trade union in private sector industries contribute more than the co-operative and public sector industries.
- trade unions in food industries function more for increasing education and training of the employees.
- unions having affiliation with central level organization contribute more than the union having affiliation with state and regional level organizations.
- trade union office bearers' response is more than the managers and employees.
- the response of the 51-60 age group is more favorable than the other age groups.
- the respondents having SSLC qualification are highly favored than the Diploma, Graduates and Post Graduates.
- workers' response is more favorable than the Clerical, Technical, Supervisory and Managerial personnel's.

Conclusion:

The respondent opined that the trade unions can contribute towards education and training of the employees and also agreed that the trade unions, at present function more for increasing education and training of the employees.

Although, few respondents urge their views with regard to trade union not able to do to the optimum level.

The managers state that the trade unions think that increasing education and training of the employees is the task of the management and the government only. Further they state that the union do not have enough money to establish their own education and training centres.

The trade union office bearers and employees state that they do not have enough resources to establish education and training centres for the employees. They also state while preparing curriculum for education and training of the employees, the government does not invite the local unions and the management restrict the union to collaborate with the Central Board for Workers Education, National Productivity Council and other bodies.

Recommendations

No new technique or modern productivity improvement scheme can be introduced and used efficiently without well-trained and educated workforce. A number of studies have revealed a significant correlation between education and productivity.

Education is concerned with developing person's faculties of reasoning and thinking, of increasing his general knowledge and understanding of the total environment.

Training as a function is concerned with increasing knowledge and skill in doing a particular job. Its concern is to increase operatives' competence in performing their tasks.

Both education and training are involved in the development of personnel to the desired level of skill, knowledge and attitude. Hence, trade unions should educate their members not only to read the word but the world. It is not enough if the workers are merely literate but should be scientifically literate. Scientific literacy is not merely the acquisition of basic knowledge but is an application of scientific method to social problems.

For increasing education and training of the employees, trade union

- may try to establish their own education and training centres and guidance and counseling centres for their members.
- may spend 25% of the unions income for the members education and training.
- may have close link with the Central Board for Workers Education, National Productivity Council, Local Productivity Council, Universities and Technical Institutes.

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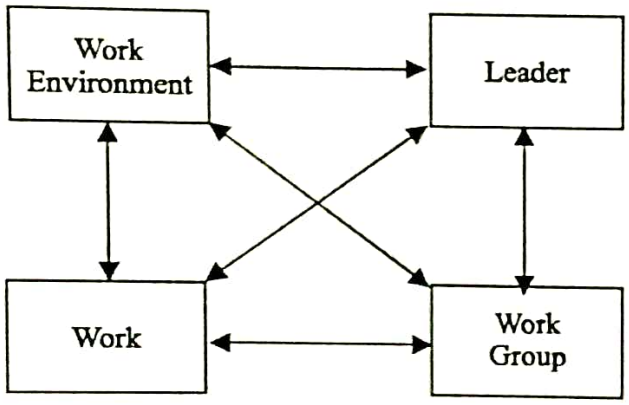
Polytechnic Teacher's Preparedness for Team Work — An Analysis

R. SRINIVASAN

1.0 THE SETTING

An institution's effectiveness could be measured through the personnel's preferences for group work. The key elements in Human Relations ad depicted by Gupta (2005) is shown below.



The implies not

(i) Common Interests and

(ii) Collective efforts are to be encouraged.

Teachers who are facilitating Human Resource Development (HRD) work in tandem with their immediate colleagues and as well with other colleagues. Evidences are practical examinations, organizing industrial visits and sharing teaching a subject which involves two or more teachers together. Team teaching which necessitates sharing and recognising personal talents is a well-established teaching strategy.

2.0 TOOL FOR DATA COLLECTION

An opinionnaire 'Preparedness for Team Work' having ten statements was circulated. The respondents had to tick one of the alternatives – True / False.

The individual scores are between 20 and 40 with arbitrary weights of 2 or 4 for their responses for each item.

3.0 INTERPRETATION OF TOOL

The respondent's opinions were analysed as per the scoring fixed in the instrument.

(i) Respondents who scored above 35 have good attitude to work as team members;

(ii) Those whose scores are between 25 and 35 also can do well as a team member; and

(iii) Those whose scores are < 25 does not have the attitude to cooperate in a team.

4.0 SAMPLE

The opinions of 12 Polytechnic teachers of Eastern Region who participated in a short Term Training Programme were gathered.

5.0 OBJECTIVES

The study aimed at

(i) Identifying their attitude for being a team player / member.

(ii) Involving them in discussions on common problems faced by them in classrooms.

6.0 DATA ANALYSIS AND FINDINGS

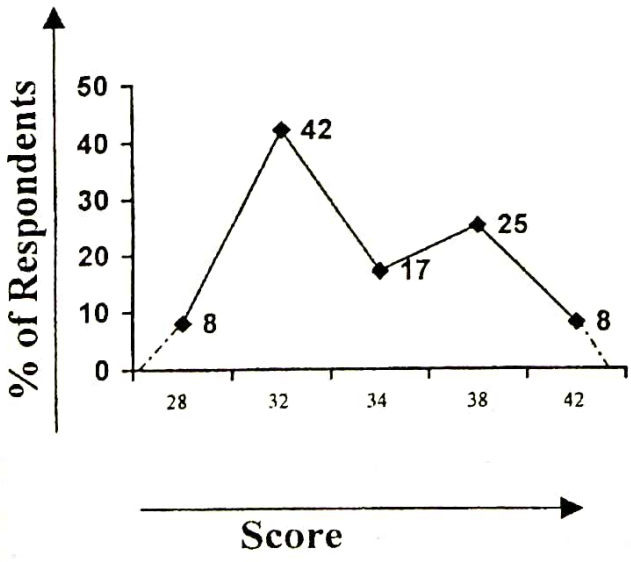
The analysis reveals the following:

(i) All respondents scores lie in the interval 28 to 40;

(ii) Only one (8%) has got the maximum possible score of 40;

(iii) The distribution of individuals is as follows.

Score	No. of Respondents	%
28	1	8
32	5	42
34	2	17
38	3	25
40	1	8
Total:	12	100



(iv) For two items viz. 2 and 4 all the responses are unanimous i.e., all the respondents score 4 for each statement.

(v) The mean score is 34.17 and only 4 of them (33%) have scores exceeding the mean.

(vi) The σ is 3.41 and coefficient of variation is 9.18.

(vii) The analysis indicates that all the respondents are favourable to the idea of cooperating as a team member. This shows that being teachers they have to work closely with their colleagues in their institutions.

7.0 INFERENCE

As HRD and Human Resource Management are complementary processes this piece of research is evident to show that teachers are well oriented to work in a group situation and prefer to work as a team member and as a team leader as per the needs of the activities supervised by them.

It may be noted that there is no I'm the word Team and individual ego is not an impediment for group decision-making. TEAM as an acronym could be described as Teachers Effectiveness Accelerates Meritoriously (TEAM).

TEAM is the mantra for obtaining Accreditation for which each and every teacher has to do their best collectively for their own professional and over all institutional development.

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