Anjana *Editor*

Technology for Efficient Learner Support Services in Distance Education

Experiences from Developing Countries

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Concept of 'Developing Nations' in the Backdrop of an Ideal 'World Government'

An ideal situation for the planet earth could be that in which all territories are governed by a single political entity with all humanity as its citizen with equal right of social, political, and spiritual nature. This concept of 'world government' has been espoused by a number of thinkers, politicians, philosophers, and thought leaders. Such a world government can come to existence by violent means of military domination or through peaceful means of reconciliation.

Examples of such advocacy of world government may be found in Immanuel Kant (World Government 2017 'Immanuel Kant' para #1).

Immanuel Kant published an essay in 1795, on finding everlasting peace through what he called a philosophical sketch. Through this publication, he proposed three fundamental necessary conditions for structuring interactions among societies and nations so that any wars in present as well as in future could be completely done away with. This, he thought, would help in founding an age of perpetual harmony all across the globe. For this, he prescribed two steps in his proposed peace plan.

Accordingly, the first step would be in the form of 'preliminary articles' which would have to be taken immediately with fastest possible speed through deliberate steps. These *preliminary articles* should ensure that:

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- States do not enter into any secrete peace process which incorporate in it any seeds for a future war. Such treaties would not be accepted as valid by international communities.
- States (irrespective of their size in terms of population or area) are not be subjected to a dominion status to another state as a consequence of donation, inheritance, exchange, or purchase.
- States abolish all their standing armies in a timely manner.
- States do not indulge in such practices as hiring of assassins or poisoners, incitement of treason or breach of capitulation in the opposing states during wars as these steps would make the subsequent peace impossible.
- States do not interfere with the constitution or governance of other states.
- States do not indulge in practice of contracting national debts to other state with a view to cause external friction among states.

Once these have been established, the second step may be taken up. As a second step, he suggested three definitive articles to be institutionalized.

1. Each and every one of the states should have a republican constitution as principle of their civil laws.
2. The constitutions of such states should be based on a principle of union of free constituent states.
3. The conditions of universal hospitality would form the basis for the law of 'World Citizenship.'

These conditions should ensure not only stopping of enmity but also building lasting peace among states.

These principles had been loosely used as guiding principles when League of Nations (LoN) was established after the First World War (World Government 2017 'League of Nation' para #1).

The LoN was formally established as an intergovernmental organization subsequent to the Treaty of Versailles in 1919–1920. At its peak (September 28, 1934, to Feb 23, 1935), the membership stood at 58 states. The objectives of the LoN included upholding what was called 'Rights of Man' (including ladies, soldiers, and people other than white,) as well as averting wars by means of collective securities; disarmament; resolution of conflicts among nations using diplomacy and negotiations; and improving quality of life of all persons on the planet.

However, the LoN lacked many elements which were required to maintain lasting peace. The league had appointed 'Great Powers' the tasks of implementing its resolutions or enforcing economic embargoes against an earring state. This was because it did not have its own army. The Great Powers were reluctant to provide armies to the league when required, and thus the LoN was unable to prevent the Second World War. As Hitler wanted to take over the power of Europe, he made Germany withdraw from LoN. The other nations of the Axis Power soon followed him, and the league collapsed having failed in its primary objectives.

The League was made up of the three organs called the General Assembly, the Council, and the Secretariat. There were a number of constituent organs under

these. The representatives of the states used to discuss the matters in the Assembly. Each of the member states was allowed three delegates and one vote in the Assembly.

After the Second World War, the United Nations (UN) was established. The UN is very close to the concept of world government. However, its role is more of advisory in nature and not so much of executive, military, or judicial type.

Destruction unparalleled in the history of humankind was witnesses during the Second World War (1939–1945) with more than 60 million dead. Most of these were non-fighting citizens. The war also witnessed weapons of mass destructions being applied in scales unprecedented in the history. The heinous acts committed during the war of such magnitude that they were considered to be the act of crimes against humanity itself. This caused a great shock in the minds of sensitive thought leaders who called for a solution to permanent elimination of deadly international conflicts. At such a juncture, the UN was founded in 1945. It adopted 'Universal Declaration of Human Rights' immediately in 1948. The thought leaders like Albert Einstein, M. K. Gandhi, Bertrand Russel, and Winston Churchill voiced their concern and called upon governments to ensure that UN does not remain a forum for discussion and coordination but gradually becomes an effective and efficient federal world government.

The main role of the UN is to develop international law, means to ensure global safety, economies of the states, ensure human right, social progress, and ultimately global harmony where wars would be impossible. The major strength of UN is in its repetitiveness: Of 196 nations on earth, 193 are the members of UN. Almost all the nations are in UN. The UN meets regularly to resolve major problems. There are six official languages recognized by UN for its business: Arabic, Chinese, French, English, Russian, and Spanish. The finance to UN comes from some of the wealthiest countries. The flag of UN shows the map of the earth with all the populated continents (World Government 2017 'United Nation' para #1).

In the absence of such an ideal world government, with jurisdiction extended over the entire planet which holds the 'right of man' (including women and transgender) as supreme principle, we have differential systems of governances and inequalities, wars, and unfair trade practices among the states and nations. Some of the nations are socially, technically, and militarily more powerful than others. The idea of developing and developed nations and various ways to balance the divide are the subject matter of various debates at the global level.

Developing Nations

A developing nation or country is a nation or a sovereign state which has a comparatively less developed 'industrial base' and a low 'Human Development Index (HDI)' relative to other countries (O'Sullivan et al. 2003). It is debatable as to which countries fit into these two categories as also about what really should be the criteria for quantifying 'development' (United Nations 2017a, b). However, the per capita GDP is often taken as a measure of 'quality of life.' It may be noted that the

less general term 'less developed country' may cause some confusion as to mean the specific least developed country. The term 'developing' connotes that the country is not 'sufficiently developed' and does not necessarily mean that it has the 'tendency' of movement toward 'development.' Thus, a country in which the per capita GDP is showing retardation is also called a 'developing' country. Since the late 1990s, developing countries tended to demonstrate higher growth rates than the developed ones (Dr Gilbert Ahmar, Korotayev and Zinkina 2014).

The use of terms 'developing' and 'developed' countries has been objected to by various countries on various grounds. One such point of objection is that it connotes inferiority or backwardness on part of a country labeled as 'developing country' or 'undeveloped country' in comparison with another labeled as 'developed country.' This is not acceptable to many countries. Second dimension of disagreement shown by many critics is on criteria of industrialization or that of material development being given undue weight. Some countries like Bhutan and Cuba observe that there is traditional Western model of economic development taken as paradigm of development which may not be correct for many other contexts (Karma Ura 2017). Alternative measures of 'development' like that of a parameter called 'Gross National Happiness' have been suggested. There are some countries which are on the border between 'developed' and 'developing.' These are often termed as newly industrialized countries (Paweł Bożyk 2006; Waugh 2000; Mankiw 2007) or LMICs which is abbreviation for "Low and Middle Income Countries".

Thinkers like Walt Whitman Rostow Walt (Rostow 1971) put it this way that developing nations are in transition from conventional ways of life to the modern (industrial) lifestyle which is a hallmark of the Industrial Revolution in the eighteenth and nineteenth centuries.

The World Bank has taken a decision, which is implemented in the 2016 edition of the World Development Indicator published by it, according to which it does not differentiate between 'developed' and 'developing' nations (World Bank 2016).

A nation which may not be called as a 'developed' country is alternatively called as 'less economically developed nation' or 'less developed nation' and in the exceptional cases 'least developed nation' or 'least economically developed nation.'

If we see it from such perspective, the criteria for calling a nation 'non-developed' nation may be derived by using the opposite of the criteria for calling a country 'developed' one. Thus, a nation which cannot be termed as a developed one would have:

- Citizen has shorter life reflected in lower life expectancy.
- Citizen has academically inferior status reflected in low literacy rate and inferior quality of education.
- Citizens have lesser financial resources as reflected in less money (income).
- Women are subject to more pregnancy experiences as reflected in higher fertility rate and pregnancy.

A measure of the 'developmental stage of a nation' has thus been developed and called Human Development Index (HDI) ('Human Development Index' (n.d.).). This index is a single number which is dependent on other indicators like life expectancy, per capita income, education, and literacy. This index is applied in ranking nations into four types of human development. Thus, nations with higher scores of HDI are those for whom the citizens have higher life spans, higher academic accomplishments and have financially sound status. Amartya Sen, eminent Indian economist, and Mahbub Al Haq, another economist of great eminence from Pakistan, played pivotal role in the development of theoretical background which was adopted by UNDP in devising HDI (UNDP 2010).

A country may score very high on the basis of a very small part of population which is extremely well placed in terms of life expectancy, education, and income. Such country where high score coexists with extremely biased distribution of wealth, education, and health parameters should not be seen as an ideal society. This leads to adjustments against 'inequality.' The Human Development Report published in 2010 incorporated these aspects when it formulated a parameter called 'Inequality-adjusted Human Development Index' (IHDI). Even though the plain HDI is still a relevant statistic, experts now believe that the IHDI denotes a *corrected* level of development of the citizenry (after adjusting for inequality). Alternatively, the HDI can be seen as an indicator of 'potential' human development as it is the maximum IHDI that could be achieved if there were no inequality.

The HDI has in its foundation the 'human development approach,' proposed by Mahbub Ul Haq, and is further reinforced with the work of Amatrya Sen in the area of human capabilities. It asks philosophical questions terms of whether members of a society are able to 'do' pleasing things in their life at the same time as they are reaping the benefits of development. These theories focus on 'beings' (characterizing the status of the members of society) and 'doing' (indicating the actions the members engage into). In a society with desirable human development having been achieved, the members have the status of being well-fed, sheltered, healthy, and they carry such activities as practicing their occupations, voting their governments, participating in community experiences. The theory further recognizes the importance of freedom of choice. In a country where citizen chooses to be hungry (for health or religious reasons) cannot be compared with another where citizens are forced to be hungry due to unavailability of food (UNDP 2017). The Fig. 1 shows the world map with territories of the various countries color coded according to the values of their HDI ranking.

In this connection, we may invoke former Secretary General of the United Nations Kofi Annan. He described a developed nation as a nation that permits all its people to enjoy a liberal and healthy life in a secure surrounding. It may, however, be noted that United Nations Statistics Division does not distinguish between developing or developed nations. 'There is no established convention for the designation of "developed" and "developing" countries or areas in the United Nations system' (United Nations 2017a, b).

It further states that the designations 'developed' and 'developing' are used for statistical convenience and as such do not necessarily denote a judgment about the

status reached by a particular nation or territory in the process of development (United Nations 2017a, b).

The UN also notes that it is a common practice to treat nations like Japan, Canada, the USA, Australia, and New Zealand and nations in the Western Europe as 'developed' nations or regions. Another source of information comes from international trade statistics. According to it, Israel is considered to be a 'developed' nation and the Southern African Customs Union is considered as a 'developed region.' The nations which came into being due to disintegration of erstwhile Yugoslavia are commonly labeled as 'developing nations,' and countries of Central Europe and of the Commonwealth of Independent States in Europe are not considered under either 'developing' or 'developed' (United Nations 2017a, b).

Let us now see how International Monetary Fund (IMF) classifies the countries. The situation before April 2004 was like this: Nations of Central and Eastern Europe (together with central European countries that still belong to the 'Eastern Europe Group' in the UN organs) and the countries which resulted due to disintegration of erstwhile Soviet Union (USSR) in the central Asia (like Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan, and Kyrgyzstan) and Mongolia were considered as 'nations in transition,' thus avoiding being labeled either as ''developing' or 'developed' regions. This is despite the fact that they are otherwise generally regarded (as per various international reports) as 'developing' nations or regions.

The IMF utilizes a system of classification, which is flexible. It takes into account (1) per capita income level as a measure of richness of citizens, (2) diversification of export as a measure of soundness of nation's economy, and (3) how much does the nation participate in international trade. This ensures that oil-exporting regions which have high per capita GDP would not be labeled as the 'advanced' because around 70% of its exports are oil and thus fail the criteria of diversification (International Monetary Fund 2011).

Let us now see how the World Bank considers this aspect. It categorizes nations into four income groups (World Bank 2016). These are set each year on July 1. Economies were sorted according to 2016 GNI (Gross National Income) per capita with the following ranges of income:

- Low-income nations were those which had GNI per capita of US$1,025 or less.
- Lower middle nations were those which had per capita GNI in the range US $1,026 to US$4,035.
- Upper middle-income nations were those which had per capita GNI in the range of US$4,036 to US$12,236.
- High-income nations are those which have per capita GNI more than US $12,237.

After 2016, the World Bank has given away practice of categorizing countries into categories of 'developing' and 'developed' criteria as it treats such terminology and concepts as being outdated.

The World Bank puts the following indicators in the form of 17 Sustainable Development Goals (SDGs) (World Bank 2016).

SDG 1 Elimination of poverty.
SDG 2 Eradication of hunger (people may be hungry by choice but not due to compulsion).
SDG 3 Citizens are physically, mentally, emotionally, and spiritually healthy and maintain general wellness.
SDG 4 Proliferation and ubiquity of high-quality education.
SDG 5 Citizens are treated fairly irrespective of their gender.
SDG 6 Proliferation and easy availability of clean water and sanitation.
SDG 7 Clean energy is available at affordable price and abundantly.
SDG 8 Citizens are productively employed and contribute to economic growth.
SDG 9 Nations have ample infrastructure to pump its industry and trade, and they use innovative techniques to overcome their challenges.
SDG 10 Reduction in inequality among its members.
SDG 11 Cities and communities progress in a sustainable manner.
SDG 12 Nations harness the natural resources and produce value in the process in a responsible manner.
SDG 13 Nations take actions on maintaining climate and ecology.
SDG 14 Life below water is sustained at a healthy level.
SDG 15 Life on land survives to minimize number of endangered species.
SDG 16 There is an overall ambience of peace; justice is done and seen to be done, and strong institutions flourish to ensure continuity of goodness.
SDG 17 Nations work for partnership for global development

In addition to the present status of achievement, nations may be categorized in terms of how significantly a SDG indicator has improved during a pre-decided period of time (UNCTAD 2012). It may be represented in terms of absolute numbers or country rankings.

Needs of Developing Nations

In order to make 'progress' to achieve the Sustainable Development Goals (SDGs) as advocated by the World Bank, the developing nations face a number of challenges, which may be summarized under various heads as given below:

Challenges associated with health hazards in developing countries

- Problems of getting safe water to citizens,
- Problems of avoiding indoor smoke,
- Challenges regarding tropical and infectious diseases,
- How to tackle air pollution,
- Unpredictability due to climate change,

- How to minimize road traffic accidents,
- Challenges of unintentional poisoning (World Health Organization 2016).

Trends and issues in forthcoming periods

- How to manage increasing population (in some poor countries).
- Rapid development may be leading to environmental and health disasters.
- Development without meticulous planning may lead to traffic fatalities and air pollution.
- Rapid urbanization may lead to unmanageable spread of communicable diseases.
- Rise in neo-rich may lead a lifestyle of physical inactivity leading to obesity and health issues.
- Countries are indulging into blind industrialization and intensified agricultural production without consideration to the environmental issues like air, water, and soil pollution.
- Unplanned industrialization may lead to unsustainable use of energy resources.
- Countries may take dangerously bold steps to enrich their economy through industrial growth and implement techniques for increasing agricultural production, which may endanger the delicate ecosystem and disturb the biodiversity, thereby creating climate changes and health hazards.
- In some countries, the dependence on natural resources for basic livelihood may lead to exploitation of the nature and deplete the resources beyond repairs.
- High degree of industrialization may lead to decrease in access to clean water.

Factors stimulating growth

- Nations and societies which recognize the citizens as their asset, including their habits, knowledge, social and personal attributes (Human Capital (Schultz 1961)) grow much better than those which do not.
- Open and fair trade policies stimulate growth in comparison with restrictive and unfair trade policies (Harrison 1996).
- Nations which have citizens who invest and have good sense of use of their economic resources tend to have a positive effect on growth (Edwards 1991).
- Societies where the strata of its members have minimal knowledge gap (Edwards 1991) tend to have a positive outcome in terms of growth.

Growth may be hindered due to factors like

- Diseases like tuberculosis, malaria, AIDS lead to decreased productivity in labor force, and nation's resources get diverted to management and control of epidemic, thereby impairing attention to trade and industry (Russel 2004).

- The developmental potential of more than 200 million children in the 'developing' countries is not achieved due to malnutrition or underdevelopment of the body and brain (Grantham-McGregor and Sally 2007).
- Knowledge gap (Edwards 1991) (which may be due to unequal distribution of 'knowledge' in various strata of the society) among the sections of society leads to impairment of process of growth.
- Political instability (Edwards 1991) leads to fear of investment in the foreign investors, and the uncertainty leads to policy paralysis affecting growth decisively.
- Political corruption (Williams 2007) leads to a servile and inert citizenry which further deteriorates the growth of the nation.
- Child marriage tends to have negative impact on growth of countries.

Role of Education in Addressing the Challenges Faced by the Developing Nations

It may be easily seen from the list of the challenges faced by the developing nations that institutionalization of quality education system would form a backbone of solutions to sort out most of the challenges faced by the developing nations.

We listed in under the heading 'health risks,' the factors like non-availability of safe water; proliferation of fume and smoke inside the households, management of epidemics of infectious diseases; pollution of air, soil, and water; changes in climate; problems of traffic mishaps on road and issues of curbing food poisoning which may happen unintentionally due to ignorance. A quality education system would help develop the developing nation a qualified workforce in medicine and management of hygiene. A course which may be common to all the streams of knowledge and disciplines on environmental awareness may help the citizens to understand the importance of water pollution, indoor smoke, infectious diseases, air and soil pollution, ecological changes, and accidental poisoning. The general courses on value education would help people to understand important precautions to undertake in order to avoid road accidents.

The general courses also help spread awareness to curb various superstitions, irrelevant traditions and practices which lead to growth of population in poor countries. For example, in many societies it is believed that children are gifts from gods which must not be refused. Introduction to advancements of science makes the citizens to be aware of scientific understanding of process of conception, birth control, and family planning.

Similarly, the awareness of importance of clean water may help the communities to undertake conservation activities leading to optimum utilization of the drinkable water.

The developing nations also face challenges covered under the 'factors stimulating growth' heading in the preceding section. The importance of 'human capital'

needs to be properly appreciated by the representatives of the people and people involved in public planning. Education can play an important role in assuring such appreciation. Human capital is a term popularized by Gary Becker, an economist from the University of Chicago, and Jacob Mincer that refers to the stock of knowledge, habits, social and personality attributes, including creativity, embodied in the ability to perform labor so as to produce economic value (Human Capital 2017). Similar problems and issues emerge in study and practice of macroeconomics and in business administration.

The implementation of appropriate educational intervention also helps in bridging the 'knowledge gap.' The hypothesis of 'knowledge gap' states that knowledge is a type or form of wealth. Hence, similar to other types of wealth, knowledge is many times distributed across the social strata in a differential manner. The theory further notes that as a consequence of availability of mass media technologies the percolation of information into a social system has increased. The inequality in the purchasing power of the various socioeconomic strata of the society leads to situation where the section of society with higher socioeconomic status tends to access and consume this information more effectively and efficiently in comparison with their lower status counterparts. Thus, the gulf or gap in knowledge as an asset between these sections has a tendency of widening rather than narrowing. The knowledge gap hypothesis was first proposed in 1970 by three University of Minnesota researchers (Phillip J. Tichenor, who was then Associate Professor of Journalism and Mass Communication along with George A. Donohue, Professor of Sociology, and Clarice N. Olien, Instructor).

Importance of Distance Education for Developing Nations

Distance Education Defined

Distance education (DE) can be defined as

> Institution-based, formal education where the learning group is separated, and where interactive telecommunications systems are used to connect learners, resources, and instructors (AECT 2017).

This definition envisages four main ingredients, namely institution-based, separation of teacher and pupil in space and time, interactive telecommunications, and sharing of learning experiences.

First ingredient of distance education requires it to be institutionally based. This factor is required in order to make a distinction between distance education and self-study. Even though the term 'institution' may generally mean the educational institutions like school or university, we are having non-traditional institutions like business organizations, companies corporations offering distance education programs. There is a trend of favorable outlook for distance education programs and

institutions which offer credible, good-quality education rather than acting as diploma-churning machines.

The second ingredient of the definition of distance education is the requirement of a distance or separation of the teacher and the pupil in space and/or time. Generally, separation is considered in geographic terms (physical distance): That is, teacher and learner are in different locations (as against that in a classroom).

There is a provision of separation of teachers and students in time also in the definition of distance education. For example, the teacher teaching through a recorded video means that teacher and pupil are engaged in learning at different instances. 'Asynchronous mode of distance education' is a term coined to represent situation where the instructions offered to the learners are accessed by the learners at the time of their convenience, with the time of generation of instruction not coinciding with that of access or retrieval of instruction. The concept of asymmetry in the intellectual level of the teacher and the taught is also important. The teacher is expected to have the expertise, cognitive skills, and a deeper level of understanding of the domain knowledge in comparison with the learners. With this in mind, the minimization of 'intellectual distance or gap' becomes one of the goals of the distance education system.

The third component in the definition is the application of interactive telecommunications. Here, the interaction can be synchronous or asynchronous. That is, the interaction may happen instantly (the time gap between information of instruction or feedback from the sender and reception of information by receiver is negligible) or at a significant time gap.

Interaction plays a very important role in distance education. However, care should be taken that it does not affect the delivery of content. It is important that the students should interact among themselves and exchange ideas, thoughts, doubts, difficulties, suggestions, solutions, and visions with their peers. Such exchange may also take place between pupil and instructional material like e-resources. The learners should also be able to interact with their teacher. Even though ability to interaction may not be the primary characteristic of instruction, it should be available, ubiquitous, and relevant.

Even though the words 'telecommunications systems' are generally used in the context of electronic media, such as the Internet, telephone, and television, non-electronic media may also serve the purpose. We may define 'telecommunications' as 'communicating at a distance.' Then, the term 'telecommunication' will also include communication using the post (as correspondence study and other non-electronic methods of communication of older era used to practice). Of course, the electronic telecommunications systems are improving and become more cost-effective, commonplace, and pervasive; they will be the principal modes of communication for future distance education systems. The older methods, however, may continue to exist for various reasons.

The final concept is that of sharing or connecting learners, resources, and instructors. Thus, the learners share their learning experiences with the world including the fellow learners, teachers, and society at large. Similarly, the teacher not only may share his instructions with learners but also may assign such tasks

which need learners to complete, construct, and cooperate with system or society. Resources should undergo instructional design processes, so that they are well organized and facilitate learning experiences which should enhance learning and should include such tools in them which can be observed (like video), felt (like samples of texture of fabric), heard (like audio), or may be completed (e.g., an assignment).

Thus, these four components define 'distance education.' If any one or more of such components are missing, what you will have is not the same (though it may be similar to DE) as distance education. When we talk about distance education, we are also talking about distance learning and distance teaching. Distance teaching incorporates planning, designing, developing, managing, and evaluation of systematic learning plans leading to pupil achieving specific learning objectives (Seels and Richey 1994). Distance learning means to use these resources in the learning experiences to accomplish learning. It may be noted that by virtue of the very definition of distance education, distance learning is not possible if distance teaching does not take place.

We have presented an analysis of a definition and explain what is required for an education system to be termed as 'distance education' system. However, it may be noted that this definition is not acceptable to all and there are many more interpretations of what constitutes distance education and accordingly a large number of 'definitions' have been offered based on different perspectives and paradigms. To give an example, Rudolf Manfred Delling (1987) defined DE as a planned and systematic activity comprising of the choice, instructional preparation including presenting the instructional media and supervision and support of a learner's learning experience. We can say that the instruction ensures that the physical and psychological gap is bridged. This is expected to happen through use of appropriate instructional and communication media.

Another attempt to define DE goes to Perraton (1988) who pointed out that DE is a process of education where somebody who is separated in physical space and time does the major job of teaching. This description is close to one of the requirements of the definition of DE discussed (from AECT) in detail by us earlier in the beginning of this section.

For the Office of Educational Research and Improvement, under US Department of Education, DE is the use of ICT devices to enable learners to get instructions which emanates from a distance location and a possibility of interaction with program and instructor directly on periodic basis. Again, this definition is a subset of our earlier AECT definition, incorporating criteria of 'distance' 'use of telecommunication technology' and 'sharing of learning experience' to a certain extent.

Another definition due to Rumble (1989) envisages four components for DE process, namely a teacher, one or more students, a curriculum (which the teacher would teach and learners would try to learn), and a contract (which may be formal or informal) between student and teaching institution (or teacher) which recognizes the roles of teacher and learner. He further mentions that DE is a methodology of instruction in which there is a separation in physical sense between learner and

teacher or the teaching institution. The DE methodology may be used as a stand-alone strategy for instruction or may be clubbed with other methods like face-to-face interaction. The teaching contract should incorporate the teaching, assessment, guidance, preparation for examinations which may or may not be conducted by the teaching institution. There should be a two-way communication to achieve these tasks. The learning may be in a group or in isolation from no instructor physically present.

Keegan (1986) combined the following four approaches in order to get an essence of the concept of DE:

1. First, the paradigm of the French government may be considered to identify the concept of DE. They had, through a law enacted in 1971, identified DE as a form of education where the teacher is physically present for only a select type of task or not physically present at all.
2. The second approach due to Börje Holmberg has been selected by Desmond Keegan. In it, distance education encompasses a number of methods of study at various such that continuous and immediate type of supervision by instructors on the learning experiences is not required. There is, nevertheless, provision of a supporting organization for planning, teaching, and guidance.
3. The third paradigm proposed by Otto Peters has been identified by Keegan for inclusion in the definition of DE. It emphasizes the role of technology and says that distance teaching/education (Fernunterricht) is a way of developing knowledge, skills, and attitudes such that this development benefits from the application of principles of 'division of labor' and managerial principles as well as by the widespread use of automation and technology in the form of instructional and learning management software. This leverages in multi-copying of high-quality teaching material (employing principle of econ- omy of scale) making possible teaching of a large number of learners (batch processing) simultaneously at their respective places of residence or work. This paradigm draws parallel with the business industry and recognizes DE as an industrial form of instruction.
4. Keegan further collected work of Michael Moore in an attempt to identify the defining ingredients of DE. In this approach, the related concept of 'distance teaching' is seen as family of instructional technology such that teaching tasks are carried out independently of the learning tasks, in contrast to the traditional method in which 'teaching' and 'learning' take place simultaneously and at the same place and cannot be independent of one another. This independence of 'teaching' and 'learning' in DE requires use of such technologies and methods as communication through print (self-instructional books), electronic (Web-based learning, interactive TV, etc.), and other media.

Keegan (1986) collected and recognized five main elements from these four approaches and used them to arrive at a comprehensive definition of DE. The five major elements are:

1. 'Distance.' It is a quasi-permanent separation of instructor and pupil during the learning activity (this criterion is essential to distinguish DE from traditional mode of learning).
2. 'Institution.' An educational organization is required for designing, planning, and development of educational resources (this criterion is essential to distinguish between DE and DIY Teach Yourself courses).
3. 'Technology.' As the physical presence of the teacher is missing, instruction needs to be carried out using technical media—print, audio, video, or computer.
4. 'Communication.' A two-way communication between teacher and learner and also among the peer enables initialization of a dialog for clarification of difficulties in learning and to generate self-validating feedback (this distinguishes it from other uses of technology in education).
5. The quasi-permanent absence of the learning group throughout the length of the learning process so that people are usually taught as individuals and not in groups. Included is the possibility of occasional meetings for both didactic and socialization purposes.

Garrison and Shale (1987) point out that Keegan's definition is not adoptive enough to account for advancement in technology and does not foresee future developments. For example, the possibility of peer interaction using social media technology may make a sea change in the way DE is delivered which would be in contrast to the element (at serial number 5) recognized by Keegan as a defining attribute. Even though they do not give a definition of DE, they prescribe the following three criteria as essential for characterizing the DE process:

1. Distance education implies that the majority of educational communication between (among) teacher and student(s) occurs non-contiguously.
2. Distance education must involve two-way communication between (among) teacher and student(s) for the purpose of facilitating and supporting the educational process.
3. Distance education uses technology to mediate the necessary two-way communication.

What are central to all the definitions of distance education are the concepts of 'distance' and 'education.' The broadest definition would include these concepts and leave corrections to the 'description' of DE to the practitioners as per the technical advancements. Accordingly, one may talk about different 'generations' of DE: from correspondence courses to satellite-mediated massive online open courses (MOOCs) accounting for the technological evolution witnessed by mankind.

Relevance of Distance Education in Solutions to the Problems of Developing Nations

We have seen in section 'Needs of Developing Nations' how education plays pivotal role in attaining the Sustainable Development Goals and challenges faced by developing nations.

As we saw in the preceding section, distance education has four principal ingredients, namely institution-based, separation of teacher and pupil in space and time, interactive telecommunications, and sharing of learning experiences. Proper integration of these components makes learning through distance education mode not only highly effective and appropriate to the learning situation but also most cost-effective.

The advancements in the technologies particularly that of information and communication technology (ICT) are making unit cost of distance education to go down at a remarkable pace. Thus, the cost of maintaining a student in the distance education mode is becoming more affordable than ever.

The activities in the distance education mode, at most of the universities, include program design and development, enrollment of learners, collection of registration fees, providing learning experiences through classroom-like didactic or through scenario-based learning, administration of assignments for formative evaluation purposes, collection of learner evaluation fees, administration of end examination (summative evaluation), maintain question banks, setting evaluation question papers, maintaining record of students performance, analysis of performance of learners, program evaluation and revision of program design and curricula.

It can be easily seen that the processes for almost all these activities can be re-engineered to make them Web-based or Web-enabled. The use of Internet provides such advantages as communication almost at the speed of light, extremely low cost, ability to reach multiple users simultaneously, redundancy of information (so that if information is deleted by accident at one place, it can be recovered through another source), availability across the planet (and even in the space like International Space Station). With such process re-engineering, the unit cost of teaching the courses to the distant learner becomes highly affordable particularly the resource-starved population of the developing nations.

Such application of modern technology was hindered by the lack of technological backbone in the developing nations. As the satellite-launching expertise of developing nations like India became particularly refined, agencies like Indian Space Research Organization (ISRO) are helping other developing nations in their communication needs. India has evolved as a major space player achieving objectives for its space missions in an extremely cost-effective and time-efficient manner. The developing nations regard India as a dependable agent to harness the benefits from space technology. The scope of international cooperation has become wider and diverse, as ISRO has made tremendous progress in recent time (ISRO 2017a, b).

Prasad (1997) has discussed various other issues about applicability of distance education in developing nations.

He discusses the problems and issues which the developing countries have to encounter about the policy decisions they have to take regarding implementation of distance education. He discusses at length about globalization and neocolonialism.

The trade-off between 'invasion' and 'access' needs to be understood adequately by the policy makers in charge of distance education in developing countries and decided in the best interest of the community. In order to provide access to education to the larger and larger segment of population, the countries have to import technology from the developed countries. This poses the danger of 'invasion' by the corporate world from the developed countries, reminding of the era of colonization by the European counties of the rest of the world from Columbian era (fifteenth century) to twentieth century. This sentiment was echoed by Terry Evans too when he says that globalization makes nations face a dilemma: They access the world but the world invades them (Terry Evans 1995). The unevenness of development results in some countries dominating the scenario of education in the resource-depleted countries.

Another issue of relevance is that solutions to provide access are also driven by market demands, which may or may not be in line with the priorities and needs of the receiving countries but may depend on priorities and needs of the technology donors, who play the deciding role. When we couple this with the dynamics of market forces in the developing countries, we note that the access to the global programs which is supported by the costly technology offered by the technology donors would be restricted only to the affluent segments of society (who can afford the cost) in the developing countries. Thus, the knowledge gap among the sections of society would be widened and not narrowed down. The affluent sections of the society would continue to become richer in financial terms as well as in respect of knowledge, information, and managerial skills. Thus, the economic and educational inequalities within and among the countries become enhanced rather than mitigated.

There are some developed countries which use globalization only as a means for liberal access to the markets of developing countries. The phenomenon of 'big fish swallowing the small fish' may be observed in this context. The unequal competition among the technology providers could result in the survival of the fittest player. This 'fittest player' may not be providing solutions and contents in education which are in the long-term interests of the 'buying' nation but may be only catering to the commercial and existentialist goals of the player. While it is exciting to note the technological advancements leading to development of information superhighways, one should also note the limitations of use of such superhighways. The flow of 'satisfaction of interest' is such that donors of technology get satisfaction of their economic objectives fulfilled, while the receivers of the technology may not have addressed to fulfillment of many of its national priorities. The donor of the educational content and technology from the developed counties sells the readily available software, which the receiver may not need so urgently. On the other hand, the educational content and technology required to address the problems and issues in the developing (receiving) counties may be requiring efforts and

resources which the donor (developed) agency may not be willing to spend. Thus, the receiving society ends up feeding the technology provider without meeting its own objectives. Further, the institutions may lose their identities and initiatives.

Prasad concludes that the developing countries must build capacities to resolve their challenges on their own terms and not merely become vehicles of educations to serve someone else's interests. He cites Mahatma Gandhi's dictum that we should let all the windows open and let the wind blow from all directions but keep out feet rooted firmly in the ground. The developing countries should take assistance from all the quarters but keep the vision of development in their own perspective and peculiar circumstances in place.

The developing nations should thus not remain aloof from the technological development but have a systematic plan of developing their capacities. They would then have no need to fear 'invasion' from the foreign technology donors. There is also a need for a developing nation to understand the hidden agenda of the donor developed nation which may derail the very process of developmental needs of the receiving developing nation.

Various Specific Tools Used in Learner Support Services

Let us now discuss various tools used in automation of the distance education processes.

Learning Management System

A Learning Management System (LMS) (Learning Management System 2017) is a software solution which helps us in managing, tracking, reporting, archiving, and delivering the various aspects of the academic programs including training programs (Ellis 2009). These are used to assist the teachers in instruction; taking tests; maintaining records of attendance and academic progress; analyzing the learning curves; identifying issues faced by the learners and/or the class and finding solutions to the challenges; maintaining record of certifications; and similar other activities. LMS is developed keeping in mind the online learning method of delivery. They may, however, support other delivery methods also like blended learning, flipped classrooms. LMSs also keep record of students' profiles and achievements which may be subjected to various methods of analysis. These analyses may be used to identify the various issues and challenges in learning and also find solutions to the various challenges. For example, analyses of the assignments may point out that the learning curve for a student has reached a plateau even though the level of achievement is still not satisfactory. The instructor may go through a one-on-one session with the learner to find issues of academic, motivation, fatigues, or other origins and suggest remedies to overcome the same.

Purpose

An LMS may be an integrated package to help the institution in process of student registration including a payment gateway; online learning administration; assessment and end examination delivery and evaluation and reporting modules (Gilhooly 2001). Some LMSs may also manage progress toward the learning outcomes achieved. The LMSs may be commercially available or custom made by institutions for their internal requirements. The LMSs may be open source (e.g., Moodle, Canvas, ATutor, Chamilo), SAAS/cloud-based (e.g., Google Classroom, DoceboLMS, Cornerstone OnDemand Inc., CallidusCloud, EthosCE, WizIQ), and propriety (e.g., CERTPOINT Systems Inc., Blackboard Learning System, Desire2Learn, EduNxt, Engrade, JoomlaLMS, Kannu, and WizIQ).

The student registration module may incorporate the archiving of student's profile, his or her contact details, a formal contract between the learner and institution including details of course work, evaluation methodology, and responsibilities of institution and learners. This module may be supplemented by a payment receiving mechanism like integration with a payment gateway or Point of Sale (POS) hardware/software. The registration module may also be designed to work as 'alumni management software' for the learners who pass out, maintaining record of the placement service provided by the institution.

The delivery mechanism used by the LMS may include adaptive presentation of the learning units. The software keeps track of units or even part of the unit completed by the user. There are tests embedded in the learning units which serve to break monotony of instructions as well as reinforcing of content learned in addition to be used as evaluating tools. Serious evaluation of the content learned in the unit is, however, presented as 'End Question' at the end of units. Some training modules working on principle of 'programmed learning' require that a learner completes at least 80% of the end questions to around 80% of satisfactory levels to migrate to next unit.

The LMSs usually also keep track of the assignments completed within the stipulated time frame. The LMS does the management of assignments at both the learner's end and the tutor's end. The LMS may depict the progress made by a learner toward the learning objectives. Some LMS may also have performance management systems, which may include performance appraisal by employer. It may also include competency management in which the employer (or user) may set a learning objective to inculcate a specific skill set and chart progress in achieving the stated goals toward development of competencies in that skill set. LMSs may also perform skill gap analysis, indicating the difference between present and desired levels of a skill. They may also include succession planning and multi-rater assessments in the form of 360° reviews.

An alternative set of terms is used to describe various digital aids and techniques for education. Examples include course management system, virtual classrooms, managed learning platforms, computer-based learning environment. However, the term LMS has gained more currency and a widespread use.

Application to Distance Education

As the audio video communication got started being used for distance learning, the concept of 'e-learning' started to develop in the first part of twentieth century ('The History of LMS Software' (n.d.)). Thus in 1909, E.M. Forster authored story 'The Machine Stops' which narrated the benefits of audio communication in delivering lectures for pupil at remote locations (Forster 1909).

The first teaching machines were developed by Sidney L. Pressey in 1920. They offered a number of practical exercises and question formats. Professor M. E. Zerte of the University of Alberta extended this concept into a problem cylinder in 1929 which was able to compare problems and solutions (David (n.d.)a). The focus of research shifted to video communication. The University of Houston decided in 1953 to arrange telecast lectures for their students with 13–15 h of such time in a week. In 1956, a very adaptive teaching system called SAKI was released for the corporate world by Robert McKinnon Wood and Gordon Pask (David (n.d.)b). The University of Illinois experts were inspired by the idea of automating the teaching operations, and they developed a product called Programmed Logic for Automated Operations (PLATO), thereby enabling users to exchange the content irrespective of their locations. The period between 1970 and 1980 saw rapid developments in educational venues as idea of computerizing the courses was being rapidly evolving and first accredited online degree was offered by Western Behavior Science Institute from California.

Distributed Classrooms

The use of satellite communication technology makes it possible to deliver a lecture by an expert which may be viewed by learners sitting in classrooms with video projection facility across a wide territory (or even globally). The learners are able to see the visuals of the teacher along with presentation slides, video clips, simulation, or practical demonstration through video motion capture and listen to the accompanying audio. The 'Learning Management System' allows the learners from classrooms to 'raise hand' if they have a question to ask. The expert teacher can choose any one of the 'classrooms' from among the 'distributed classroom' locations, the learner from the chosen classroom goes live on air, and his visuals and audios get accessible to the expert teacher and the peer classroom learners.

Such arrangements need fairly small bandwidth to the tune of 2 megabits per second (MBPS) for transmission through satellite. The number of Student Interaction Termini (SITs) is limited only by the cost of establishing the hardware setups.

Developing nations like India have been making optimal use of such distributed classroom technology. The ISRO had launched a special satellite called GSAT-3, also known as EDUSAT for educational purposes. This satellite was launched on September 20, 2004, by ISRO and was the first Indian satellite with an exclusive focus on educational services. The main intension of the satellite was to meet the

perceived need for interactive distance education program using satellite communication to facilitate distributed classroom (ISRO 2017a, b).

There were five Ku band transponders which provided spot beams, while one Ku band transponder provided national beam and six transponders which operated at extended C band giving national coverage beams. The EDUSAT was decommissioned in September 2010 and was transferred to 'graveyard' orbit.

A typical setup using the satellite (like EDUSAT) for distributed classroom is shown in Fig. 2.

Such 'distributed classroom' or 'virtual classroom' setups are generalized to the concept of 'distributed learning.'

Distributed learning (2017) is a model of teaching and learning in which the teacher, the learners, and the learning resource may be situated at distinct non-centralized locations allowing the teaching and learning to take place independent of space and time. This method may be used in conjunction with the traditional mode of learning (which is also referred to as 'blended learning'), or the entire course may be delivered using distributed classrooms.

Distributed classroom method is a valuable option for various students of all age groups who wish to learn and obtain education. The salient features of this method include the following (2017):

- Provides opportunity of education to deprived section who cannot go to traditional classroom due to various reasons networking.
- Learner can choose his pace of learning.
- Learner may schedule his learning calendar avoiding overlaps with important business or vocational opportunities.

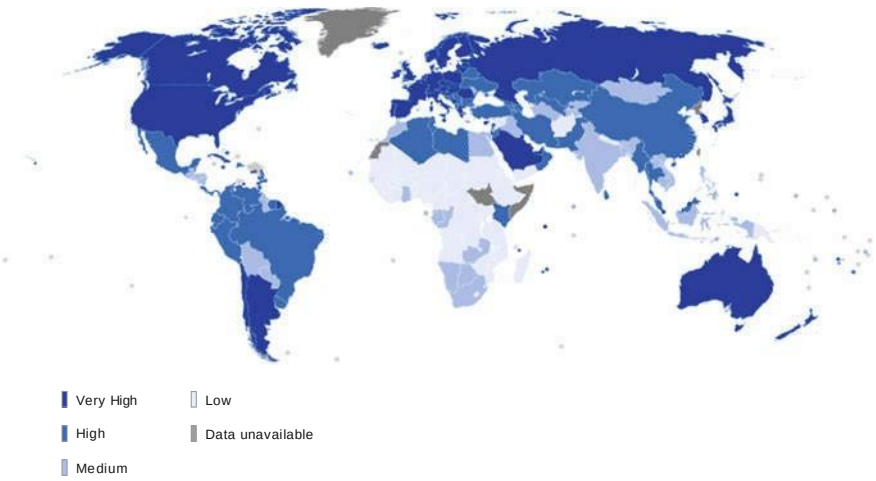

Fig. 1 United Nations Human Development Index (HDI) rankings for 2017 (*Source* Wikipedia, 'Developing Countries,' by BlankMap-World6,_compact.svg: Canuckguy et al., derivative work: Ricardomarins29 (talk), published under CC_BY_SA license)

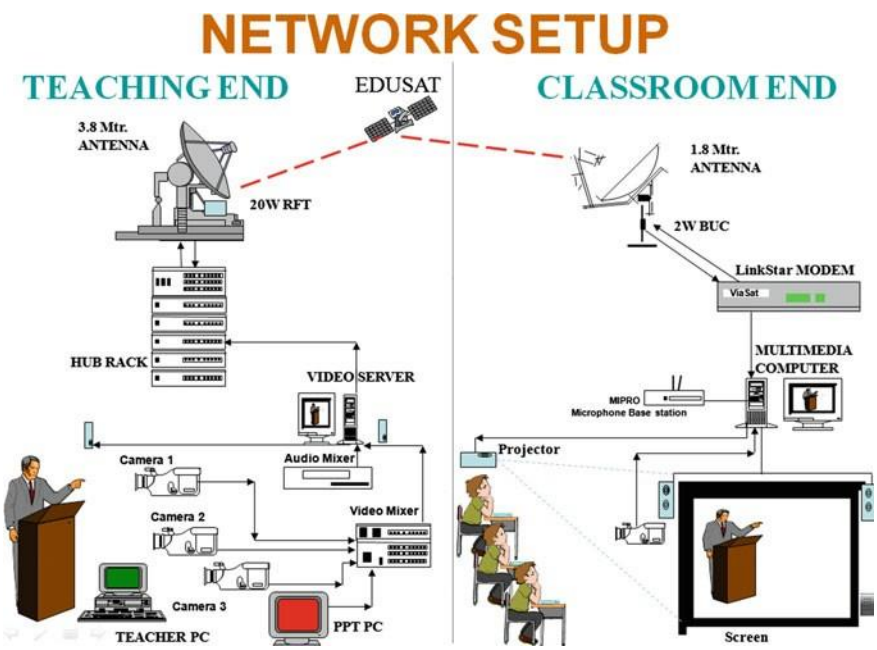

Fig. 2 Distributed classroom setup using satellites (like ISRO EDUSAT) is an example of developing nation's use of ICT

- Money of the learner may be saved as he does not have to sacrifice his business or vocational opportunities to meet learning cycles.
- Learner and teachers do not have to travel great distances to do teaching and learning.
- Since one teacher can deliver instructions to a large number of pupils, the very best of teachers may be selected for the purpose.
- The cost of satellite communication is independent of number of nodes or learning locations; hence, a larger number of learning stations may be used.
- The recording of the lecture is possible (by recording the satellite feed).
- Teaching may be very effective as the pupil may listen to recorded lectures any number of times and at any point of time stamp.
- It allows learning while working.
- It allows immense flexibility in place, place and time of learning.
- As the learning can be scaled to a very large population of pupil, the economy of scale renders this method very cost-effective.
- The method amenable to use of very advanced technology like satellite communication or Internet communication or communication at the smartphone of the learner (the method is not likely to be outdated because of advancements in technology).

- It allows the individual learner to raise his difficulty and concern through use of textual or audio or video mode.
- International networking is possible.

The policy makers of the education systems should therefore consider integrating distributed classroom and distributed learning into their system of education.

Simulation

'Simulation' is emerging as a very important and novel tool for education at various contexts.

Simulation (2017) is the imitation of the operation of a real-world process or system over time (Banks et al. 2001). In order to simulate anything, one has to first develop a model on understanding how the real-world phenomena work. For example, if a teacher is teaching how an object travels in space under the influence of gravity with effect of the viscosity of air and rotation of earth being neglected, he may invoke a model based on kinematic equations of physics to predict the position of the object at any desired time. For more complex system of an intercontinental projectile fired with known angle of fire and velocity at the time of launch, more complex mathematical model would be required which would account for variation in acceleration due to gravity, rotation of earth, viscosity of air at various altitudes, etc. Thus, the model represents the salient features of the real-world system itself and desired precision to which the behavior needs to be predicted and encompasses data as well as underlying principles of nature to predict the behavior. The simulation experience would generate an 'instance' of the behavior of real-world phenomenon, in terms of time evolution of the system. For example, a simulation experiment would predict the trajectory of the object in case of an intercontinental projectile if angle of launch is 15° and initial velocity of fire is 6 km/s. This is an instance of behavior of the system.

Simulation may be used for testing, training, education, testing the efficacy of a theory, optimization of performance, process engineering, and in developing video games. Thus, computer simulation software may be used to predict the behavior of a physical system under a controlled environment and the predicted parameters may be tested against the experimental values, thereby validating the theoretical model. The range of parameters within which the simulation values match within the acceptable tolerances gives the validity for the physical theory along with the computer algorithm in conjunction with the hardware. Such simulation may be obtained for domains of physical sciences as well as social sciences like economics (Smith 1998). Simulations can also be used in situation where it is not practical to engage the real system. For example, in training pilots to work on fighter planes, it is customary to use a trainer flight simulator rather than real planes in order to avoid risk to the life of the trainer and trainee as well as to save cost of damages to

hardware. Sometimes, the simulation is used because the real system is yet to be designed or built and may simply not exist (Sokolowski and Banks 2009).

The development of simulation software includes deciding theoretical model which maps the behavior of real system to that of the theoretical concepts. Such decisions may be based on the considerations like academic level of understanding of the target group, complexity of the problem, available time and financial resources, degree of precision or accuracy required the fidelity and validity of simulation outcome. The outcome of the simulation experiment depends on the soundness of the theory, versatility of the computer algorithm and code as well as the computational hardware being deployed. The study of procedures and protocols for verification and validation of models is a subject matter of academic disciplines and is being continually refined through research and development in the field of core domains as well as in the fields of mathematics and computer science.

Simulations can be used in distance education in a variety of ways. Some simulation models are available freely as Java-enabled applets. For example, the University of Colorado at Boulder makes available a number of simulations in the domain of physics, mathematics, chemistry, biology, and earth science using HTML 5 platform (University of Colorado 2017a). These simulations may be embedded in the Web-based teaching resources. Alternately, a teacher may ask the learners to download or use the simulation through online mode. The teacher may ask the learner to observe the behavior of the simulated system and to note and observe interesting features of the nature. For example, the quantum mechanical tunneling phenomena can be 'observed' by the learner using the Java-based applet (University of Colorado 2017b).

Recorded or Live Lectures

It has been observed that the teacher in a classroom does more than 'information transfer.' The teacher communicates a great deal of stimuli through verbal and nonverbal use of intonation, body and face gestures. The very act of writing on a blackboard is a gradual process and creates 'anticipation' in the mind of the learner which creates new neural pathways, thus strengthening the learning process.

Recorded and live lectures have been popular, and recent phenomena like emergence of Ted Talks and Khan Academy 'lectures' show the continued interest of people in the chalk and talk practice.

The recorded lectures may require an elaborate setup, particularly if there is audience participation. In such cases, more than one camera with 'online' editing (vision mixing) facility may be needed. If there is a 'PowerPoint' type of presentation also involved, then there may be a need to do off-line editing in which various slides need to be meticulously synchronized so that the learners can learn effectively. Incorrect editing may result in confusion rather than lucid learning.

Considering the paucity of funds and availability of expert editors in developing nations, a single camera setup which does not require elaborate vision mixing or

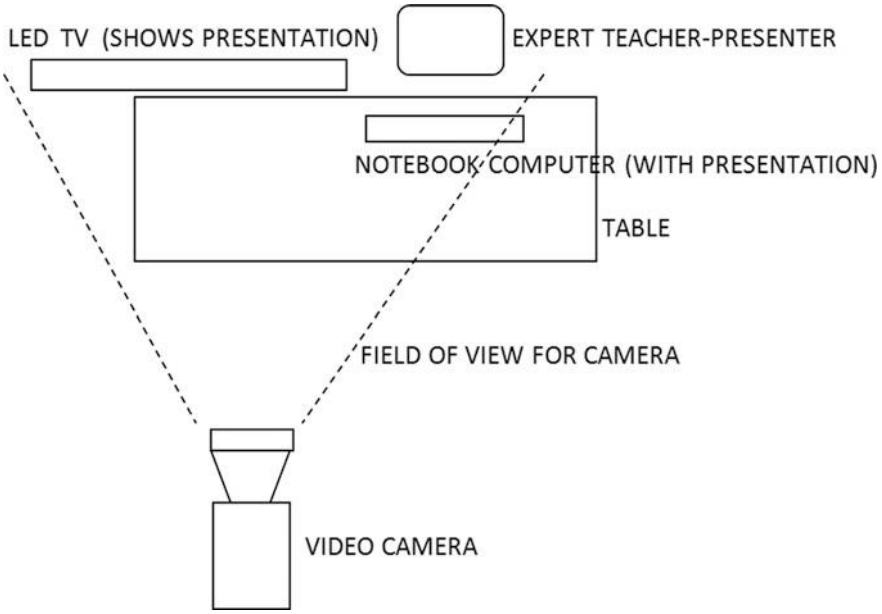

Fig. 3 A simple setup using a single camera which does not require vision mixing or video editing

video editing setup may also be devised. The block diagram of such setup is shown in Fig. 3.

A screenshot of such a video production is shown in Fig. 4. The author has used such a setup to produce a number of video lectures which are available on YouTube (Vadnere 2016).

Discussion Forum

The distance learners' community is likely to be a group of isolated individuals. As the methodology of distance learning does not envisage engagement of learners on regular basis at the study centers, the peer-to-peer interaction among the learners is likely to be very dilute. One of the important tools which makes it possible to institutionalize the learner interactions on peer-to-peer as well as on learner–tutor basis is 'discussion forum.' The discussion forums may be integrated with the 'Learning Management System.' The learners who are registered for a distance education course may become members either by default or by design. The discussion is in the form of textual string of interaction. This development has been inspired by the concepts of Internet forum and that of 'blog.'

Fig. 4 A screenshot of video production using a single camera setup shown in Fig. 3

An Internet forum, (2017) or message board, is an online discussion site where people can hold conversations in the form of posted messages (Bulletin Community Forum 2001). There is a difference between chat rooms and Internet forum. The messages in Internet discussion forum are usually longer than one line messages used in chats. The messages are at least archived temporarily in forum. Many forums require that the messages are approved by the moderator before being visible to all members.

Forums have a specific terminology or jargon associated with them. For example, we call a single conversation as a 'thread' or 'topic.' A discussion forum may be treelike (hierarchical). That means that a forum may contain a number of sub-forums and each of these sub-forums may have several threads or topics. Within a forum's 'topic,' whenever a new discussion started, it is called a thread. It may be replied to by any numbers of members.

Depending on the forum's settings, users can be anonymous or have to register with the forum and then subsequently log in in order to post messages. On most forums, users do not have to log in to read existing messages.

The discussion forums offer advantages that an intelligent question or a 'popular misconception' about a topic in a course can be answered by the expert and such 'question-and-answer' session may be treasured for the future batches. They may inspire the tutor to design multiple-choice questions where he may use the 'popular misconception' as a 'distracter.'

Discussion forum, however, suffers from the disadvantage that it requires the learners to be Internet savvy and well versed in use of keyboard for texting the questions and comments. These conditions may not be prevailing in many of the developing countries.

Massive Open Online Courses

According to Wikipedia (Massive Online Open Course 2017), a massive online open course (MOOC) is described as an online course which targets at large number of participating learners and provides open participation through Internet (Kaplan et al. 2016). The MOOCs may provide interactive forum for learners and tutors to facilitate learning through recorded lectures, e-books, problems sets, and interactions with peers and teachers. MOOCs made entry into the scene way back in 2006 and have become successful as promising methods of teaching–learning, thereby generating a remarkable interest in the research and development community working in distance education (Pappano 2012; Lewin 2013).

The initial MOOCs usually had open licensing of content and encouraged remixing and reuse of resources. Even though still called as 'MOOCs', many later variants did not use open licence but may have had 'free' access to student (zero cost). The word 'free' has two connotations: 'free' as zero financial burden and 'free' as freedom to use, alter, and distribute. Open license normally means the freedom to alter, use, and distribute (Wiley 2012; Adamopoulos 2013).

MOOCs offer following benefits (Massive Open Online Course 2017):

MOOCs improve access to higher education

MOOCs can be seen as significant devices to provide benefit of higher education (HE) for masses, thereby widening the access to HE. By educating a very large section of population particularly in the developing countries, MOOC may enhance the standard of life for them. MOOCs also serve as an agent which is transforming the scenario of HE by bringing in democratization at local as well as global scale. This is happening as MOOCs also content to be scripted by a large section of experts from various walks of life and representing diverse strata of society and also as the technology allows the content to reach the masses. The learners from the deprived sections of society are also able to enroll into various complete courses offered by institutions and universities of global repute. The availability of cost-effective technology is making MOOCs to be delivered by renowned institu- tions and teachers (Patru and Balaji 2016).

MOOCs can provide an inexpensive alternative to traditional system

One of the reasons for the higher education to be costly is that the institutions offering them have a tendency to offer too many services bundled with the education. The philosophy and methodology of MOOC allow some other players in public or private sector to cater to a few of the services which would have been rendered by the intuition. The operational philosophy of MOOC is aligned with having a large number of participants. These participating learners may access the content of the course at their pace and schedule from their places of convenience. These MOOCs are open to almost anyone without entry qualifications and give total course learning experience for free through online communication mode (Mulder and Jansen 2015; Patru and Balaji 2016).

MOOCs may help countries to achieve sustainable development goals

As the philosophy and methodology of MOOC have in their core the concept of mass education through use of technology which is affordable, MOOCs may play very significant role in transforming a developing country from a resource-starving to a healthy, clean, and rich knowledge society. We have seen that many of the evils of a developing country may be cured through application of appropriate education. It is also obvious that many of the SDGs can be achieved through interventions in which MOOCs can play crucial role.

India has accepted MOOC as a game changer for higher education. The MOOC model developed by India is called 'Study Webs of Active Learning for Young Aspiring Minds' (SWAYAM). The University Grants Commission has issued a Gazette Notification on July 19, 2016 (UGC 2016), which envisages MOOCs courses for learning in higher education programs. It is mandatory for the universities in India to give credit transfer to the candidates who successfully completed a MOOC under the SWAYAM platform by virtue of Sect. 6.2 of the notification. The Sect. 6.2 of notification (UGC 2016) states that "No university shall refuse any student for credit mobility for the courses earned through MOOCs."

The SWAYAM model can be summarized by the 'four-quadrant' approach elaborated in the 'Guidelines-for-online-courses-under-SWAYAM' document published by the Ministry of Human Resources Development (MHRD), Government of India (MHRD 2017).

The model of MOOC espoused by the Indian government envisages what they call as 'four-quadrant approach.' Thus, the e-learning through MOOCs is designed to have four components.

The first quadrant comprises of e-tutorial (with video and audio inputs in a well-planned format with utilization of animation, simulation, video recording showing demonstrations, virtual laboratories, and other similar inputs).

The second quadrant is called e-content and is expected to contain self-instructional e-books with ample illustrations, case studies, presentations, historical development of the subject matter, anecdotes which make subject interesting, etc. It should also make use of resources available on Internet to inculcate in the students the habit of referring to Web resources, open source content, links, and journals.

The third quadrant envisaged in the design of MOOC is the 'discussion forum.' This facilitates posing interesting problems by the tutor and/or learners in respect of the subject matter which would enable deeper understanding of the topics and also serve as a way to resolve difficulties and doubts regarding the subject matter. The course coordinator and his team are expected to resolve these issues in near real-time scale.

The fourth quadrant is regarding learner evaluation. It therefore contains assignments, problems, and their solutions. It may contain problems in the form of multiple-choice questions, matching questions, descriptive short and long answer questions, quizzes, fill-in-the-blank questions. It may also contain frequently asked questions and clarify the common misconceptions regarding a topic.

The SWAYAM MOOCs are uploaded by MHRD on a portal with URL https://swayam.gov.in. The students can register in SWAYAM MOOCs in various sectors of disciplines like:

(a) Postgraduate (PG) degree programs (excluding technology areas),
(b) Undergraduate (UG) degree programs (excluding technology areas),
(c) UG and PG degree programs in technical or engineering disciplines,
(d) Diplomas and certificates programs,
(e) Programs in school education for children in grade 9th to 12th grade,
(f) Management programs,
(g) Teacher training program (MHRD 2017).

Conclusion

In this chapter, we have seen the plight of the developing countries. We have glanced through the various challenges that the developing nations have to face to survive with grace. These include: problems of poverty, sustainable growth, health risks, population growth, making best use of human capital, trade policy, and knowledge gap. We observed that the educational interventions play pivotal role in addressing to the challenges which stare at the face of the developing nations. Distance education offers quality along with access and equity at the affordable cost of material and human resources to be invested. We have seen a number of academic tools which developing countries can deploy with the optimal resources at their disposals. The tools which we discussed included Learning Management System, distributed classrooms, simulations, recorded or live video lectures, discussion forum, and MOOCs. It is hoped that the discussion in this chapter should help the policy makers in the developing nations to take proactive steps in implementing the distance education programs with the use of various technologies available at affordable unit cost.

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