CHAPTER –IV

THEORY AND PREPARATION OF SYNTHETIC MODEL

• Synthetic Model- A Theoretical Base
• Preparation of the Synthetic Model
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SYNTHETIC MODEL

Introduction

There exists almost unanimity in the opinion that Population Education should become an integral part of education at all levels, but it should not be treated as an additional subject in the curriculum. The concepts are to be “plugged into” the curricula of various subjects in the existing prescribed course at various levels of education. One of the major tasks envisaged in this connection is the preparation of instructional materials for the use of teachers in the class-rooms. The present study is one such attempt to develop a new model for covering some interdisciplinary areas of the curricula at the secondary stage. The proposed model Synthetic Model have been prepared by blending two innovative methods i.e. Computer Assisted Instruction model and Futures Wheel Method based on Blended Learning Strategy for teaching Population Education at the secondary school level. The present chapter is divided into two sections. SECTION–I deals with the theoretical background of the proposed Synthetic Model and SECTION–II explains the various steps involved in the preparation of Proposed Synthetic Model.

SECTION –I

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SECTION –II

4.2 Preparation of Synthetic Model
SECTION –I

4.1 Synthetic Model- A Theoretical Base

4.1.1 Blended Learning Strategy: A Recent Innovation in Educational Scenario

At present, the term “blended learning” is being used with increased frequency in all the academic circles. In 2003, the American Society for Training and Development identified blended learning as one of the top ten trends to emerge in the knowledge delivery industry (Rooney, 2003). Also predicted a dramatic increase in the number of blended courses in higher education, possible to include as many as 80-90% of all courses.

So what is this “blended learning” that everyone is talking about? This Section-I will provide a basic introduction to blended learning systems and share some trends and issues that are highly relevant for implementing such systems to develop the proposed Synthetic Model for teaching Population Education. To accomplish these goals, the chapter will address five important questions related to blend learning systems such as: What is blended learning? Why Blend? What current blended learning models exist? What issues and challenges are faced when blending? And what are the future directions of blended learning systems?

4.1.1.1 What is being blended?

One frequent question asked when one hears about blended learning (BL) is “what is being blended?” While there are a wide variety of responses to this question most of the definitions are just variations of a few common themes. The term ‘blended learning’ has gained considerable attention in recent years as a description of particular forms of teaching with technology. However, like so many terms within this field it remains ill-defined. Whitelock and Jelffs (2003) summarised the term ‘blended learning’ with three definitions.

- The integrated combination of traditional learning with computer assisted approaches (drawing on the work of Harrisons).
- The combination of media and tools employed in an e-learning environment , and
The combination of a number of pedagogic approaches, irrespective of learning technology use (drawing on the work of Driscoll).

Singh (2001) gives a more substantial description that elaborates on the bases of what he sees as a much richer set of learning strategies or dimensions that can be blended in ways such as; offline with online; self-paced with live, collaborative; structured with unstructured; custom content with off-the-shelf; and so on. However these three definitions are not the only ones that have been offered. Kerres and De Witt (2003), discuss blended learning as the mix of different methods and delivery formats, arguing that these two are depended. Driscoll identifies four different ‘concepts’ denoted by this term:

- Combining or mixing computer based technology to accomplish an educational goal;
- Combining pedagogical approaches (e.g. Constructivism, behaviourism, cognitivism) to produce an optimal learning outcome with or without instructional technology;
- Combining any form of instructional technology with face-to-face instructor-led training and
- Combining instructional technology with actual job tasks.

Driscoll summarizes by saying, ‘the point is that blended learning means different things to different people, which illustrates its widely untapped potential” (Driscoll, 2002). A similar but more precise explanation is offered by Hofmann (2001), who proposes that ‘the idea behind blended learning is that instructional designers review a learning program, chunk it into modules, and determine the best medium to deliver those modules to the learner’.

Another conceptualization is provided by Valiathan (2002), who describes blends in terms of the focus of learning, or ‘intended’ learning:

- Skill-driven learning, which combines self-paced learning with instructor or facilitator support to develop specific knowledge and skills.
- Attitude-driven learning, which mixes various events and delivery media to develop specific behaviours; and
Competency-driven learning, which blends performance support tools with knowledge management resources and mentoring to develop workplace competencies.

Here, Valiathan tries to link purposes (some kind of intended learning outcomes) with a mix of media and approaches to learning. In doing so, however, she combines resources, learning and pedagogy as if they were of the same type. The feature that all these examples and definitions share is that they are all described from the perspective of the teacher, the instructor or the course designer.

The three most commonly mentioned definitions documented by Graham, Allen and Ure (2003) are:

- ‘Blended learning’ is combining instructional modalities (or delivery methods) (Bersin & Associates, 2003; Orey, 2002a, 2002b; Singh & Reed, 2001; Thomson, 2002).
- ‘Blended learning’ is combining instructional methods (Driscoll, 2002; House, 2002; Rossett, 2002).
- ‘Blended learning’ is combining Technology Based Instruction and face-to-face instruction (Reay, 2001; Rooney, 2003; Sands, 2002; Ward & La Branche, 2003; young, 2002).

The first two positions above reflect the debate on the influences of various methods on learning (Clark, 1983; Kozma, 1991, 1994). Both of these positions suffer from the problem that they define Blended Learning Strategy so broadly that; there encompass virtually all learning systems. One would be hard pressed to find any learning system that did not involve multiple instructional methods and multiple delivery media. So defining Blended Learning Strategy in either of these two ways waters down the definition and really does not get at the essence of what blended learning is and why the concept of blended learning is exciting to so many people. The third position more accurately reflects the historical emergence of blended learning systems and is the foundation of the investigator’s working definition. According to Graham, Allen and Ure (2003) Blended learning systems combine face-to-face Instruction with Technology Based Instruction.

The working definition reflects the idea that Blended Learning Strategy is the combination of instruction from two historically separate
models of teaching and learning: traditional learning systems and distributed learning systems. Blended learning can be defined as an approach to learning and teaching process that utilizes acquisition and usage of the knowledge in an educational context by using primarily computer and communication technologies in collaboration. It also emphasizes the central role of computer-based technologies in blended learning.

This array of definitions is not, in itself, helpful. The breadth of interpretations means that almost anything can be seen as blended learning, and consequently that use of the term does not help us to understand what is being discussed. There also appear to be several category errors, where properties are attributed to things in inconsistent ways. In the next section, this array of conceptualizations will be analyzed to see whether a consistent, analytically useful concept of blended learning can be identified.

4.1.1.2 What is in a blend?

Options for blended learning go beyond the classroom. They are formal and informal, technology and people-based, independent and convivial, and directive and discovery oriented. The Table 4.1 below presents the possibilities of what can constitute a blended learning approach.

Table-4.1

The possibilities of Blended Learning Approach

<table>
<thead>
<tr>
<th>Live face-to-face (formal)</th>
<th>Live face-to-face (informal)</th>
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<tbody>
<tr>
<td>. Instructor-led classroom</td>
<td>. Collegial connections</td>
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<tr>
<td>. Workshops</td>
<td>. Work teams</td>
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<tr>
<td>. Coaching/mentoring</td>
<td>. Role modelling</td>
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<td>. On-the-job (OTJ) training</td>
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<tr>
<td>Virtual collaboration/synchronous</td>
<td>Virtual collaboration/asynchronous</td>
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<td>. Live e-learning classes</td>
<td>. Email</td>
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<td>. E-mentoring</td>
<td>. Online bulletin boards</td>
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<td></td>
<td>. Online communities</td>
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4.1.1.3 Past, Present and Future

Blended Learning Strategy is a part of the ongoing convergence of two archetypal learning environments. On the one hand, we have the traditional face to face learning environment that has been around for centuries. On the other hand, we have distributed learning environments that have begun to grow and expand in exponential ways as new technologies have expanded the possibilities for distributed communication and interaction.

In the past, these two archetypal learning environments have remained largely separate because they have used different media and method combinations and have addressed the needs of different audiences. For example, traditional face to face learning typically occurred in a teacher-directed environment. On the other hand, technology based learning systems emphasized self-paced learning and learning-materials interactions that typically occurred in an asynchronous, low fidelity environment. To a large degree, the media available placed constraints on the nature of the instructional methods that could be used in each environment. For example, it was not possible to have synchronous or high fidelity interactions in the distributed environment. Because of these constraints, distributed learning environments placed emphasis on learner-material interactions, while face to face learning environments tended to place priority on the human-human interaction.

The widespread adoption and availability of digital learning technologies has led to increased levels of integration of computer-mediated instructional elements into the traditional face to face learning experience.
From the distributed learning perspective, we see evidence of the convergence in residency requirements to face events. In addition, there is greater emphasis on person-to-person interaction and increasing use of synchronous and high fidelity technologies to mediate those interactions with the rapid growth of distributed learning environments and its convergence with face to face learning environments.

While it is impossible to see entirely what the future holds, we can be pretty certain that the trend towards blended learning systems will increase. It may even become so ubiquitous that we will eventually drop the word “blended” and just call it learning. But regardless of what we decide to call blended learning in the future, it is clear that the phenomenon of blended learning is here to stay. Therefore, it is imperative that we understand how to create effective blended learning experiences that incorporate both face to face and computer-mediated (CM) elements.

4.1.1.4 How to build a blend?

There’s no cookbook for blends. The topic calls out for empirical research. In the meantime, here are some guidelines for thinking about and constructing successful combinations. Derived from experience, observations of best practices, and the instructional design literature, these approaches highlight real constraints.

4.1.1.4.1 Mixing CAI with Traditional learning

From an activity based theoretic perspective (Kuutti, 1996), all activities involve a technology of some sort. Equally, there is no definition of ‘traditional’ learning. This is typically assumed to refer to face-to-face teaching, often in the form of lectures and or seminars; however, since forms a correspondence learning have existed for well over a century (Peters, 1998) there seems to be no reason for deeming some kinds of teaching as ‘traditional’ and others as not. Indeed, for lecturers who have begun their careers since the advent of the Internet, there is little reason to assume that web-based learning is not part of their ‘tradition’ of teaching.

The possibility of mixing media for pedagogic advantages is given relatively high profile within the research literature; Laurillard’s classic text (1993), for example, hinges upon this idea, providing tables that describe the characteristics of different media in terms of qualities that are mapped onto her conversational framework. The problem with this is that these tables ‘essentialise’ media; they present the media as types with fixed (essential)
qualities. The result is that Laurillard preserves the clarity of her argument by dealing in stereotype. This is in marked contrast to teachers’ experience of these ‘media’. For example, Laurillard portrays lectures as being primarily, or even exclusively, transmissive. A study that asked lectures to describe their lecturing activity (Oliver and Conole, 2002) revealed that what the term ‘lecture’ denoted to them varied according to the topic being taught, the size of the group, the year students were in, students’ expectations, what else was happening in the course, and so on. What this illustrates is that pedagogy is a form of practice – a socially constructed experience, rather than an inherent quality of media. For this reason alone the idea of mixing media becomes problematic.

However, in addition, there is the question of whether such a definition is useful. Within any course- indeed, in any learning situation of any duration, formal or otherwise – multiple ‘media’ will be used. These may be largely taken – for – granted media such as speech, print and pictures, but nonetheless their diversity is inevitable in the media. The term does not rule anything out; it has no discriminatory power. Consequently it is redundant and unnecessary.

4.1.1 Mixed Contexts

Implicit in some of the definitions is the idea that what may need to be blended are different contexts within which learning takes place. The primary contrast drawn in the definitions is between instruction and work as contexts.

The challenges to this position are essentially the same as the challenge to mixing media. The idea of a ‘context’ is hard to pin down, since it is in part psychological, reflecting individuals’ awareness of their situation. Even from an analytical perspective, problems arise, since the context in which someone learns (say, a classroom) is typically different from the context in which they might envisage applying what they have learnt (say, at home) or performing it (say, under exam conditions). The notion of imagination is important here, since even without access to another context learners are likely to envisage themselves using or performing what they learn in other situations (Wenger, 1998). And also, as before, in a case with any duration, it is unavoidable that the term once again become redundant.
4.1.1.4.3 Blending Theories of Learning

One suggestion in the definitions of blended learning is that the mix consists of ‘pedagogical approaches’ (Driscoll, 2002), which means ‘constructivism, behaviourism, cognitivism, etc. It is possible that the emphasis here is upon pedagogy, but on the face of it what is being proposed is a mix of theories of learning.

This possibility is relatively easy to dismiss, since many theoretical positions have arisen out of oppositions. Cognitivism, for example, was an attempt to challenge Skinner’s position – which forms a central tenet of behaviorism, that we do not need a theory of mind to explain learning (Skinner, 1950).

Since such theories can be thought of as tools or as positions, it would be possible to argue that several such positions could be held. However, although it might be possible for one person to switch positions, even swapping between them, this does not imply that they can ‘mix’ them. At this general level theories are irreconcilable and irreducible (De Freitas & Mayes, 2004); to take multiple position is not ‘mixing’ but simply being inconsistent.

4.1.1.4.4 Blending learning Objectives

Another position proposed by the definitions involves blending different kinds of intended learning outcome. Driscoll (2002), for example, mentions blending skill driven, attitude-driven and competency – driven learning.

This position maintains some consistency, but for design rather than learning. It is easily argues that what a teacher intends to be a learning outcome is distinct from what a student actually teaches (Barnett, 1994). The teacher may be primarily concerned with skills, for example, but the learner will not ‘turn off’ their learning of attitudes and competences (on this classification) simply because the teacher does not deem them to be relevant. This rules out the term ‘blended learning’, but might permit the modified term ‘blended learning design’. However, instructional design and learning design both already exist as terms, and both are used to describe situations for which different (or multiple) learning outcomes can be designed (Beetham, 2004). The idea of ‘blending’ adds nothing to these perspectives; it is, again, redundant.
4.1.1.4.5 Blending Pedagogic

The final blend that will be considered here concerns mixing pedagogic approaches. At a general level this, too, falls prey to the critique that cases of any duration will inevitably blend pedagogic approaches, leaving the term redundant. However, one position that is worth exploring more carefully is that advocated by Peters (1998). In his analysis of learning, he differentiates between physical distance and pedagogic distance. He refuses to classify distance learning as being all study where the tutor is geographically remote, since some pedagogies (such as lecturing) are similar whether the lecturer is present or being broadcast and others (such as a tutorial dialogue) can be recreated using technologies such as telephones. Instead, he distinguished between approaches where there is a ‘pedagogic distance’ between tutor and student. This position can be characterized as being about the intensity of interaction between the two roles. ‘Distance pedagogic’ is differentiated from other forms of pedagogy by the infrequency of interaction. On this account a stereotypical lecture consisting exclusively of presentation is a form of distance pedagogic whether students are present or not.

It might be possible to challenge the boundary between these ‘forms’ of pedagogic in terms of the cut-off level of intensity that marks an approaches as being of one type or the other. For example, even a book can be revised in response to readers’ comments. This possibility becomes important when considering whether a regularly updated course website is a form of distance pedagogic – how often does it have to be adapted in order to be classified as not distant? However, treating this as a continuum (rather than as a dichotomy) would preserve the distinction whilst avoiding this problem.

There are two consequences of this move, however. Firstly there is the question of why different intensities of approach should be blended. What is the purpose of seeking to incorporate low – intensity pedagogies? Is this to create space for reflection, or because they are cheaper.

Secondly, there is the matter of terminology. This blending is not about learning per se; it is thus misleading to call it ‘blended learning’. Instead, if a term must be used, this should be abandoned in favour of
‘blended pedagogic’ or even ‘blended teaching’, or (to maintain a student focus) ‘learning with blended pedagogies’.

4.1.2 Computer Assisted Instruction: In a Constructivists Perspective

Computer Assisted Instruction has a rich history and developed concurrently with the development of electronic computers (Daniel, 1999). CAI began in the mid-1950s as collaboration between Stanford University and IBM but grew slowly until the arrival of personal computers in the 1980s. Today there are few schools in the United States that do not have computers available for student use, and don’t use some form of CAI on those computers. However, today’s definition for CAI not involves just the presentation and delivery of the materials using the Computer, also it involves the learner who use the Internet to access learning material, interacts with the content, instructor and other learners. In addition it involves the learning process which should be obtained support for the learner in order to acquire and construct knowledge and to grow from the learning experience (Anderson & Elloumi, 2004; Dietinger, 2003; Wentling, Waht, Gallaher, Fleur, Wang & Kanfer, 2000). Nowadays, rapid developments on science and technology affect all fields and force to change and advancements of them. One of these fields is education is affected the respective advancements and obligated to continually renovate. Recently, in teaching-learning processes, a teacher’s role is not rather than make information transfer, according to the situation he or she become an advisor or a guide. In addition; learners try to construct knowledge by themselves in a learning environment, in short they learn to learning.

While educational effectiveness and implementation issues have been common, CAI has remained popular among educators who maintain a belief that it is a useful supplement to classroom activities. A number of studies have reported that it can be successful in raising exam scores, improving student attitudes, and reducing the time needed to master course materials (Canham and Dickie, 1986; Collis, Obserg, and Sherra, 1988-89; Nipp and Straub, 1986). It also has been shown that students like the mode of presentation (Anderson-Harper, Mason, and Popovich, 1988; Brown, 1995), that it is viewed as a positive experience (Deardoff, 1986), and that it is suitable for individual learning needs (Dobson, 1995). However, Kulik and Kulik (1989) concluded that more well-designed research is needed before any real conclusions about the effectiveness of CAI can be drawn. Bork (1991) suggests that much of what is available is of little use. Cherry (1991) found that there was no significant difference between CAI and lectures as
an effective teaching technique and Garrett (1995) reported mixed results when comparing CAI and lectures. Thus, while educational effectiveness may exist for specific applications, it is difficult to conclude that such effectiveness is common across a large range of disciplines.

Criticism about software design and implementation is well expressed by Walbert (1989), who stated that the majority of CAI applications are naïve and mundane. Blecha (1991) list common design problems with CAI software: tedious keystrokes, unnecessarily repetitive operations, software that is difficult to use, and minimal pedagogical value of programs that hide the inner workings of models. Harrington (1989) concludes that CAI programs lack any advantages over printed materials and do not take advantage of the feedback potential of computers.

To address many of the shortcomings perceived about CAI, Walbert (1989) offers specific suggestions for enhancing CAI:

- Include menu-driven open-model simulations, database spreadsheets, and an electronic sketchpad.
- Engage the student in Socratic dialogues with interactive questions and answers leading to the learning objective.
- Allow freedom of navigation so that the student can return to previous explanations or skip a particular troublesome problem.
- Provide an electronic sketchpad using the mouse to point to, draw, and modify graphs in response to questions.
- Give immediate feedback to correct and incorrect answers.
- Include a help facility to answer student questions or provide a reference to the text.
- Allow students to change the parameters in the spreadsheets.
- Vary level of difficulty of problems so that some require only recollection of facts and arguments from the text, others require the student to analyze a problem, and still others require the student to synthesize the techniques.
- Include high-quality graphics, animation, and sound.
• Provide spreadsheets with graphical capabilities.
• Write software for a specific textbook and do not try to replace the text.
• Provide a manual or on-line help.

Currently available CAI programs appear to address many of the past criticisms and appear to incorporate many of the suggestions made by both Walbert and Daniel. The programs reported on in this study are shown to be pedagogically effective within the two separate disciplines and have been successfully implemented and integrated into the student’s in-class experience.

4.1.2.1 Implementing CAI in Classrooms

As is the case with quantitative courses, practice and repetition are considered key factors for student success. The focus is on the development of tools and methodologies, which students are expected to use in solving a variety of problems. Many students find this very challenging, because the ability to apply methodologies requires a deeper level of understanding than simply the ability to repeat lecture and text material. This often requires different study habits than those students may have previously used. To maximize their learning, students are encouraged to read text material before coming to class and to actively work on the concepts and principles covered in class by completing problems and testing themselves on the main topics being discussed in class.

The need for students to be actively engaged in the learning process can create a pedagogical dilemma. Instructors recognize that completing chapter readings and homework assignments significantly increases the student’s ability to retain what is being taught, recognize alternative situations to which the concepts can be applied, and see the connection between topics throughout the course. Yet many students may not understand the amount of effort required to learn the subject matter at this cognitive level and may not have the time management skills needed to achieve the disciplined study required by more rigorous courses. To address this dilemma and to ensure that students are actively engaged in the learning process, teachers have typically given written homework assignments and or frequent quizzes. Such methods are not necessarily optimal, for either teachers or students, because developing, distributing, and grading
assignments and quizzes is often very time intensive, particularly for large classes. This implies an information lag between the learning process and a teachers’ knowledge of what students are learning. One option for motivating students and reducing this information lag is to incorporate computer assisted instruction in teaching.

The visual and simulation capabilities of computer aided teaching materials and inherent flexibility in their use have forced educators to develop computer assisted instructions to assist in teaching learning process. At present there are two groups of educators, one who feel that computers can replace classroom teachers and the other who feels that computer cannot give real life learning experience to students and hence oppose it. The educational benefits of CAI are unlimited.

- In reality availability of computing resources can result in dramatic improvement in learning experience of students if integrated properly with existing teaching methods.
- It is well known that there are three domains of learning namely, cognitive, psychomotor and affective domain
- In developing learning packages, those domains are covered as knowledge and understanding outcomes as well as skills outcomes. The effectiveness of any teaching and learning activity in lecture class depends on whether the activity is helping in attainment of learning objectives. As per the behaviourist's theory, the learning can be quantified in terms of behaviour change and a change in behaviour of learners takes place because of three domains of learning.

In education, cognitive domain learning is very important as it deals with imparting didactic information about knowledge and facts. The learning results in understanding learning objectives at a simple level to a more complex level. The knowledge transfer starts at a very low level, which requires memorization and recall. In education for a typical analytical module this can be a simple equation describing a physical phenomenon. In the next level, comes the comprehension, where students learn to interpret the information and understand the meaning behind the information. Other levels of learning within the cognitive domain, which must be employed clearly are, application (application of information to real life situation), analysis (analysis of the system from whole to part), synthesis (combining the analysis results to model a new or existing system), and evaluation (being able to optimize the systems). There is a lot work available on use of

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computer technology on teaching-learning effectiveness but most of this work is focused on use of cognitive domain.

4.1.2.2 CAI and Learner control

The notion of learner control was first introduced in relation to CAI and refers to students taking control over some aspects of their computer-mediated learning environment. It may imply control over the pace of information presented, the order or sequence of information presented, the timing of information presented or the quantity of information present (Becker & Dwyer, 1994). It also may refer to control over difficulty levels, content, contexts, and the method of presentation (Stemler, 1997). Traditional research on learner control has focused on how much or what type of control is best and findings have been mixed (Williams, 1996). Learner control of the content and sequencing in a program can encourage self-management of learning, although some students may not expose to all of the instruction (Kinzie, Foss & Powers, 1993). Some form of structural guidance was found to be a key when students were given control over the sequence and pacing of a computer program incorporating interactive video (Arnone & Grabowski, 1991). This latter study found that learner control students, who also received some guidance, performed better than other students and also developed higher levels of curiosity. Importantly, students with low ability lacked the learning strategies to deal with any extra learner-control (Dillon & Gabbard, 1998; Stemler, 1997; Williams, 1996). Constructivist perspective of educational technology are associated with a high degree of learner control of software: “The more learner controlled the instructional systems are, the more generative they are; that is they require learners to generate or construct their own knowledge” (Williams, 1996). However, Williams suggests that constructivists should be considering issues beyond which type of control is better or other traditional issues such as comparing learner control to program control. Instead they should be considering questions such as ‘how can learner-control are made more effective?’ For example, Harper and Hedberg (1997) emphasised the use of cognitive support tools to help learners who become daunted by the high degree of creative freedom and choice of direction in constructivist CAI programs. Becker and Dwyer (1994) looked at the impact of increased learner control on levels of intrinsic motivation. Previous studies had established strong links between enjoyment and intrinsic motivation and learner control over the goals, pacing and difficulty level of activities (Lepper, 1985). The Becker and Dwyer (1994) study investigated
a CAI setting and found that it may increase self-determination and intrinsic motivation depending on the perceived learner control of the task. Students were motivated by feeling in control of their own learning, and being aware of this control. Despite criticisms by Clarke (1983), who dismissed any motivational effects associated with computers as a novelty effect, findings linking learner control with motivation continue to be a powerful reason for using CAI in the classroom (Roblyer & Edwards, 2000)

4.1.3 Futures Wheel Method: A Futuristic Learning Strategy

Everybody is acquainted with the term ‘Future”. The meaning of future is linked with the concept of time. A layman understands very well from his experiences that the events witnessed by him yesterday has gone to the storage of the past and the vents with which he confronts currently is accounted to present day experiences. Beyond this he looks for something else; searches for something which he does not possess at present; aspires to be something which he is no at present. Such perceptions are linked with ‘future’ or the time, yet to come. No doubt every person is concerned with individualistic concept of future. In other words a person may be concerned with far fetched goals of his life, achievement points and the efforts engineered towards reaching at the achievement points. From a collective point of view future is not only connected with private or personal concerns of life but also with social and cultural life as a whole. It will not be an exaggeration to say that man’s seriousness about his involvement in cultural evolutions and knowledge generation processes has brought him more closure towards the concept of ‘social Futures’. Several concerns like what should be the nature of society, what should be its ideals and goals, how should man control and direct its ways of actions of society are nothing but the concern of ‘social futures’. Philosophers and social reformers like Aristotle, Karl Marx, Shri Aurobindo and Gandiji were visionaries of futures of men and societies. While the process of futuristic enquires has its root in advanced cultures, such process has been accelerated in this century. Of late, the process of knowing the futures has been gaining momentum the context of futures of social life, national development, international understanding, the planet and the universe.

The term ‘Futurology’ is identified with the terms Futures Studies, ‘futuristic’, ‘Futurism’ and ‘Futuring’. While above terms are popular in English countries, the French calls it ‘Futuribles’ and the Russians use the term ‘prognestics’. People have maintained their queries about the futures throughout the age. Man made adjustments environment and used improved
technology to control environmental effects with a futuristic look. But the present days’ concept of ‘Futurology’ is not identified with such preliminary ideas of man’s old ideas about futures. The present concept is concerned with the dynamics of a system rather than a simple problem solving activity. Unlike a lay man who thinks one solution to one problem a futurist thinks in terms of a whole complex of problems, and the solution to one problem taking into account the wholeness of situations, (Thompson, 1979).

Futurology is more identified with the process of futuristic enquiries than a separate body of knowledge. While History gives interpretation to the events either in realistic or controlled situations help us to make predictions about physical and social phenomenon in building theories. Unlike these enquires, futures studies are of exploratory type rather than of explanatory type. Futures studies intend to explore the probabilities of occurrences of events in futures. Neither like a historian a futurist restricts his enquires to the facts which do not exist a present nor like a scientist he deals with only hard data. No doubt, futures studies revolve around social realities; but with futuristic looks at the changes which are yet to occur.

4.1.3.1 Definition of Futurology

Even though it is very complex to define ‘futurology’ with a common agreement, one can get a comprehensive picture of futurology in the following definition given by Robert E Baker (1989). Robert E. Baker perceived that futurology, “constitute an interdisciplinary, methodological system and critical analysis of human nature, experience and knowledge, with the primary purpose of understanding and developing, humanity’s actual and potential abilities to forecast and influence the emergence of alternative futures”. It is clear from this definition that futures studies is a more comprehensive body of knowledge accommodating all kinds of probabilistic occurrences of future events; identifying approaches ways and means of achievement of social goals; and directing the change processes to occur according to the preferences of mankind.

4.1.3.2 Why Studying the Future and Change is Important?

Change is happening at an ever faster rate today; driven partly by technological changes leading to changes in all other areas of our lives, and by the increasing interdependence between countries and peoples today, as well as the decentralization of societies and institutions within countries. The issues such as sustainable development and preservation of the
environment have gained greater ascendancy. This has made it necessary for governments, organizations, and people to better understand change and the future, since we will all be living and working in a future world that promises to be different from today in significant ways. When people better understand change, they also often see more opportunities for their lives and ways to better positively influence the future that is being created. While there have always been futurists, in the sense of people who looked to the future and who tried to understand change, the field of Future Studies itself which tends to be very interdisciplinary.

4.1.3 .3 Range of Futurist Views and Perspectives

Within the Futures field, there have always been a wide range of views and perspectives from people who have come from a very wide range of different disciplines and backgrounds and interests. Futurists run a whole gamut of views between the following two poles and everything in-between:

- "Doom and Gloom" Futurists: So-called because they tend to focus on current real world problems, without easy solutions (such as the nuclear danger during the War, or the continuing population explosion, world hunger, depletion of fossil fuels and other on-renewable resources, and environmental preservation and pollution) and project these trends into the future, showing that "if current trends continue, then the future will be much worse than the present." It is important to note that even "Doom and Gloom" Futurists are not totally pessimistic, however. Indeed, no futurist would dedicate their whole life to studying change and the future if they were totally pessimistic. The major reason for pointing out negative trends and scenarios for the future is to alert people to the potential problems ahead, so that we humans can be informed and change our current policies so that a more desirable future can be created.

- Futurists who create different scenarios of the future: From negative, "doom and gloom" views, to most probable or likely views, to positive, visionary views. (In between perspective, that acknowledges all these possibilities for the world future, and which points out that our actions and policies now will help to determine which of these scenarios actually transpires in the future).
- **Positive, Visionary, and Evolutionary Futurists**: They focus more on positively imaging the more desirable futures that we would like to create; articulating the positive values that we would like a future world to be based on; focusing on technological, societal, and human potentials; tracking groups that are actually trying to create such preferable futures in the world today; and generally empowering people to see that we always have choices (in what we think & feel, and in how we behave in the world), and that we do have the power to create a more desirable future world by committing in the present to change what we are doing now.

### 4.1.3.4 Time Periods for Studying the Future

There are various time periods for studying the future, which were outlined by Earl Joseph. These periods are:

- **Near Term Future**: up to one year from now.
- **Short Range Future**: one to five years from now.
- **Middle Range Future**: five to twenty years from now.
- **Long Range Future**: twenty to fifty years from now.
- **Far Future**: fifty plus years from now.

### 4.1.3.5 Key Subject Areas Studied by Futurists

While futurists can study the future of anything and everything, and while people who call themselves futurists often have a holistic, systems approach that looks at connections and relationships between changes in one area of life as these relate to changes in other areas of life, there are nonetheless certain key subjects that futurists tend to study a lot. These include:

- The global mega crisis issue, including the relationships between:
  - Global Population Growth;
  - Food and World Hunger;
  - Energy Sources (Traditional, Non-renewable Fossil Fuels & Alternative, Renewable Energy Sources);
  - Environmental Pollution;
• Sustainable Development; and
• Global Climate Change (including Global Warming); and Other Global Catastrophes.

☐ Global peace, conflict, and war;

☐ North-South relations and the increasing gap (both between and within countries) between rich and poor.

☐ The emergence of larger regional economic blocs, including the Asia/Pacific Region; the European Community (EC); the North American Free Trade Association (NAFTA); and now other regional blocs, including blocs of countries in the South. In the 1980s, talk that the 21st Century would be the century of the Pacific Rim.

☐ Global economic trends, including the emergence of a global economy, as well as larger regional economic blocs, and privatization of economies within countries, as well as reactions to privatization.

☐ Global Political Trends, including democratization, and reactions to that.
☐ Societal Fragmentation
☐ Societal Restructuring and Environmental Impacts of New Technologies, including:

A) High Technologies, such as:

• Computers, Telecommunications, Robotics, the First Stage of the Information Revolution;
• The new Interactive, Multimedia, Internet, World Wide Web, Virtual Reality;
• Technology Stage of the Information Revolution;
• Genetic Engineering, Recombinant DNA, and Gene Splicing;
• Space Exploration, Industrialization, and Settlement; and
• Nanotechnology.

• Workplace Trends, including: new management styles; employment or job trends, technology and jobs; diversity and women working.
• Educational or Learning Trends;
• New Scientific Paradigms (or overarching worldviews);
• Changing Cultural Paradigms;
• Global Spiritual or Religious Consciousness, Traditions and Trends.

4.1.3.6 Characteristics of a Futurist Perspective

While Futurists themselves represent a wide range of backgrounds, interests, and perspectives there are nonetheless certain characteristics of a futurist perspective that most futurists would agree upon, and which distinguish Future Studies as a field from many others disciplines and fields of study. These characteristics include:

• Seeing change as the norm and it’s speeding up.
• Seeing events as interrelated (within a whole systems context), not separate and unconnected.
• Taking a holistic or whole systems perspective in looking at change.
• Accepting as a premise that there are many alternative futures.
• Distinguishing between Possible, Probable, & Preferable Futures:

  a) **Possible Futures:** Anything (good or bad, probable or improbable) that could happen in the future.
  b) **Probable Futures:** what is most likely or probable to happen in the future (based on extending past trends or developments into the future in some way).
  c) **Preferable Futures:** what is most desirable or preferable to happen in the future.

• The Goal is to make preferable or desirable futures more probable, by visualizing clearly what we want to create (including the values that we want a future world to be based on), and then committing energy, resources, time, and our lives to creating that future world.
• Another Goal is to note possible futures, that though they might not be probable or likely, if they did occur, would have a great impact on people's lives. We should thus be aware of such possibilities.
- Helping people realize that there are always consequences to what we do (or don’t do), and "if we always do what we've always done, then we'll always get what we’ve always gotten." The importance of ideas, values, and positive visions in creating a better world future.

- Empowering people to choose and act responsibly and consciously in the present, because those actions will help in creating the future: helping people to realize that we are all creating the future that we will be living and working in by what we think and do every day of our lives, and that we thus always have choices in what we do. In short, we can all make a difference, and we need to all become conscious of this fact and then make a commitment to do something no matter how small it may seem—that we feel could help to make this world a better place. Accepting the importance of short, medium, and long-range planning: in short, not leaving the future to chance, but proactively trying to create the future that we would like to be living in for ourselves and our posterity.

Most individual people, only look ahead as much as four to five years in their planning. It is important to look further ahead, however, in a world undergoing such rapid change today. Joseph stresses that we are creating the world that we will be living in five to twenty years from now (the Middle Range Future) by what we are doing right now. Thus almost anything can be created if we have a vision of what we want to create and are also committed personally to that vision; in five to twenty years from now. It is also important to remember that while past-present-future are all somehow interconnected, the only place from which to change the future is in the present day. The power for change resides in the present moment, for that is the only place from which our thoughts or actions can actually be changed.

4.1.3.7 Methodologies for Studying Change and the Future

Since the future has not yet happened, futurists have had to develop a number of different methodologies for studying the future and change that are different from traditional scientific methodologies for studying the present and the past on which data already exists or can be generated. These methodologies range from quantitative, left brain methods to visionary, creative, intuitive right brain methods, and various combinations in between. It is important to remember here that futurists believe in many alternative futures including probable, possible, and preferable futures. Futurists are
thus not only interested in looking at probable futures (based on extending past trends and developments into the future), but also at designing preferable alternative futures, and showing how one can plan to get from the present state to this more desirable future. A wide range of methodologies must thus be employed to cover these very diverse different views of the future. Some of the more prominent futures methodologies include the following:

a) **Trend Extrapolation** Projects past trends into the future, for some given period of time assumes that the future will in some way be an extension of past trends.

b) **Dynamic Systems Analysis and Computer Modelling** shows how various variables indifferent areas interact with each other, within a whole systems context, over time.

c) **Simulations and Games** attempt to take certain variables from "reality" in some area and create a computer model or game situation in which one can see how those variables might interact with each other over time. Computers or humans (as role-players) or both can be involved. With computers, humans can play "what if" games, where by making certain choices, they can then, see the consequences (in terms of policy) that follow from those choices.

d) **Cross Impact Analysis** shows how choices concerning one variable interact with choices concerning another variable, providing a table of all possible combinations of choices for each variable, and showing which combinations are viable and which not.

e) **Technological Forecasting** attempt to forecast what technological breakthroughs and developments are most likely to occur in future and when they are likely to occur. In an age in which technology is a major driving force for change, such as today, keeping on top of the latest developments in technology is essential--especially if one works in the high technology area today.

f) **Technological Impact Assessment** looks at how new technologies are likely to impact on society or the environment.
g) **Environmental Impact Assessment** looks at how new developments in some area will impact on the environment. Often required today, before new building plans can be approved.

h) **Social Impact Assessment** looks at how new developments in some area will impact on society or on some community.

i) **Delphi Polls of Experts** analyses on either probable or preferable futures in some area on what events they think are most probable (or preferable) and when they are most likely to occur; also the reasons for their answers. Summarize results; give to experts; ask them to take poll again. If they think other people's reasons for their answers are better, they 'can' change their answer the second time; or the third time they take the poll.

j) **Futures Wheel** is a group brainstorming technique to quickly determine what some of the first, second, and third order consequences might be, 'if' some event were to occur in the future either for the first time, or if something were to either decrease or increase in value in future. Everything follows from this event put in the centre of the futures wheel.

k) **Scenarios:** A possible sequence of events that 'could' happen in the future, based on certain initial conditions or assumptions and what could follow from that. Futurists often construct at least two or three different scenarios about the future in some area, believing that different alternative futures are possible. Examples include: best case, worst case, most probable case, and other type scenarios.

l) **Science Fiction:** A possible story of what could happen in some future social or world situation. Based on a scenario of some kind (i.e., a possible sequence of events that 'could' happen in the future) to which characters (with their own personalities, even representing different alien species in some cases) interact with that sequence of events over time. Science Fiction has replaced cowboy movies as an important genre of films today. Both dystopian and utopian science fiction stories are possible. Science fiction does not claim to predict the future, but sometimes good scientists (who know their topic well) intuitively write about something in science fiction that later becomes a reality. The most famous case is Arthur C. Clark and the
communications satellite, which first appeared in a science fiction story.

m) **Intuition and Intuitive Forecasting:** A right brain 'a ha' experience, in which you suddenly 'know' something to be true, or you suddenly see patterns and relationships between things that you didn't see before. Intuition is another way of knowing, a "sixth sense, “beyond our five senses. Intuition is important in future studies because in a world in which change is occurring so fast, and one does not always have time to get all the information that one would like before one must make a decision about what to do, one must often rely on one's intuition to fill in the missing pieces and make a decision. Intuition is also the source of creativity and new ideas in whatever type of work one is in. Good artists, scientists, corporate executives, and leaders in any area all tend to be intuitive. Our Western culture has not always valued intuition, but its importance to creativity is increasingly recognized, and training programs seek to develop this skill in many people today.

n) **Experiments in Alternative Lifestyles:** One of the best ways to find out if alternative values can work is to try them out in practice. Those new "fads" or alternative lifestyle that work, and respond to some social need, often see themselves becoming more mainstream with time.

o) **Social Action to Change the Future:** People willing to join together with others to educate people on some issue and to work for meaningful change often find that their efforts 'can' effect and help to change the future.

p) **Short, Medium, and Long Range Planning:** Futurists look at planning in short, medium, and long range terms.

q) **Relevance Trees:** A way to map out the sequence of events, and in what order, that are necessary to get from where you are now to where you want to be as your end goal by some future date.

r) **CERT/CPM Analysis:** A method for doing complex planning of great numbers of people and subcontractors working on some large project, such as the space program.
Since futurology consists of enquiries about the probability of future occurrences, the methods employed for studying causal relationships of present events or facts have their limitations in future studies. Future studies has its own methods and approaches like trend extrapolation, Delphi method, Futures Wheel Method, Brain – storming, Panel Approach, Cross impact Analysis, Simulation and Games, Systems Approach, Scenarios Writing, Morphological Analysis, Relevance Trees and Mission Flow Diagrams.

In general, futurology has adopted several methods and techniques from the disciplines of mathematics, statistics and operations research. The models and techniques like Regression Analysis, Time series analysis, Sales-force composite, Box-leaking approach, Econometric Models, Input models, Simulation models, Life cycle Analysis and Stochastic models have been in vogue in future studies. Other quantitative forecasting methods like Mean forecasts, Moving averages, Exponential Trend Analysis, Auto- regressive moving Averages, Multiple Regression, Multi-variant, Auto Regressive and Moving Averages have been borrowed from other fields for futures studies.

From the various methods for the present study the investigator selected Futures Wheel Method for developing Synthetic Model by blending with CAI model.

4.1.3.8 The Futures Wheel Method

The Futures Wheel, a method of identifying and packaging secondary and tertiary consequences of trends and events, was invented in 1971 by Jerome C. Glenn, then a student at the Antioch Graduate School of Education. It was spread by workshops on futuristic curriculum development conducted by the University of Massachusetts during the early 1970s, and shortly thereafter, by futurist trainers and consultants as a method for policy analysis and forecasting.

The method first entered the literature in spring 1972. Subsequent variations of the Futures Wheel have been called the Implementation Wheel, Impact Wheel, Free Wheel, Mind mapping, and Webbing. These variations have been used by futurists in a wide variety of situations. Although the Futures Wheel is a simple technique, requiring only blank paper, a pen, and one or more fertile minds, it is also an extremely powerful method of
exploring the future. The Futures Wheel is currently used by planners and
public policymakers throughout the world to identify potential problems and
opportunities, technology related social problems, population issues, new
markets, products, and services and to assess alternative tactics and
strategies.

The Futures Wheel is a way of organizing thinking and questioning
about the future a kind of structured brainstorming. The name of a trend or
event is written in the middle of a piece of paper, and then small spokes are
drawn wheel-like from the centre. Primary impacts or consequences are
written at the end of each spoke. Next, the secondary impacts of each
primary impact form a second ring of the wheel. This ripple effect continues
until a useful picture of the implications of the event or trend is clear.

4.1.3.9 Characteristics of Futures Wheel Method

First, Futures Wheel Method reveals the nature of events which shall
occur in future. It makes probabilities statements about the future events.
While nearby futures may be visible with more clarity the distant futures
may be appearing with more haziness.

Secondly, one may say that future is not certain. But portrayals of
future scenarios through Futures Wheel Method do not lead us to total
uncertainty. Futures Wheel Method explores plausible futures of the man
and the society.

Third, Futures Wheel Method is action oriented. Since past is gone
nothing can be done regarding the dead events. On the other hand it helps us
to identify the goals and opportunities. It helps us to take decisions about
present activities. Moreover it acts as signal points, especially in the context
of giving cautions to avoid future crisis.

Fourth, future is change prone. The past does not repeat itself. The
present does not remain static. Not only the exploration of the nature and
possibilities of change is important, but also the exploration of the direction
of change is important for development oriented society. Futures Wheel
Method aims at identification of directions of change.

Fifth, Futures Wheel Method makes it possible to know the unknown.
Since future events have not occurred so far, they remain unknown. It helps
to expand our vision about those unknown events.
Sixth, Futures Wheel Method link past and present experiences with futuristic vision and thus is more comprehensive in nature. While futures may be of very different nature, there exists continuity in the process of change. Such process may be linear as well as non linear in nature. Futures studies trace out the paths of such change processes and establish links between future, present and past.

Seventh, Futures Wheel Method are problem oriented. Since the problems of futures society are of more complex nature, understanding such complexities and identifying appropriate means of solutions to such problems are the major concerns of Futures Wheel Method. The Consequence or Futures Wheel is most commonly used to:

- Develop multi-concepts
- Think through possible impacts of current trends or potential future events.
- Organise thoughts about future events trends
- Identify potential consequences of a strategy
- Show complex interrelationships

4.1.3.10 Futures Wheel Method and Creativity

Creativity is one of the essential pre-requisite of search for future life. Moreover, Futures Wheel Method insists on creativity oriented tasks to identify ways and means for changed life. A lay man perceives creativity as production of a new piece of literature or giving a novel design, or inventing new ideas or theories. The term creativity is identified with creation, newness or novelty. More scientifically, creativity has been identified with abilities of divergent production and transformation. Divergent production abilities pertain to generation of new ideas highlighting fluency, flexibility, originality and elaboration. Transformation abilities pertain to man’s potentials to revise what he experiences or know thereby production new forms or new patterns. Abilities to reorganize and reinterpret the ideas form essential element of creativity. Futures Wheel exercises become meaningful in the presence of creative deliberations of ideas. Whether it is the case of identification of goals of a system or identification of ways and means for attainment of goals of a system by understanding the complexities of a given system creativity is presumed to be an essential element of Futures Wheel studies. The futuristic problems are of such types that they invite multiple and multi-level solutions. Abilities to perceive or interpret the problems in various ways and exploring number of alternatives to tackle the problems
must be encouraged keeping in view better scope of future studies. Environmental stimulations must be provided at school level for development of creative potentials. Of course, it should not contest with the process of development of convergent abilities, which, also, contribute to futuristic processes.

4.1.3.11 Futures Wheel Method and Anticipatory Management of population

The complex socio economic and political network emphasizes the need for modern concept of ‘population management’. In education, management is not only a production oriented concept but also a process oriented concept. It aims at achievement of desired goals for a learner. The goals may be quantifiable or not. But this is not a major question for a teacher. Major question before a teacher stands in terms of identification of goals of Population Education in the context of social, economic, technological and political environment; specification of the best alternatives to achieve the objectives and evolving a conductive process of putting ideas into practice. In this context, a teacher in the school does not restrict his or her activities to the present activities only. With a view to grow further, he constantly asks questions what next? The past experiences or trend may help him to tackle certain present problems, but unless he looks forward and identify the opportunities and challenges, he cannot gear up the young generation towards their future survival as well as their success. A development oriented teacher looks for consequences of his action and take active steps on how to identify new ways and means for achievement of future population goals. Future studies help the management in terms of supplying systematic and organized images of future development. So that the ‘survival’ and ‘growth’ of the society are possible with a long term perspective.

Futures Wheel Method acts as a tool for life management. Consistent observation of the future can help the modern man for identifying the direction of change, evolving suitable strategies to overcome future crisis, to avail the future as today. In other words Futures Wheel Method facilitates present day’s decision making activities about population behaviour with development orientation.

In the present study, for teaching Population Education the investigator selected Futures Wheel Method and Computer Assisted Instruction Model for developing the proposed Synthetic Model based on blended learning strategy.
SECTION II

4.2 Preparation of the Synthetic Model for Teaching Population Education

Population is a value–laden subject because the subject matter is controversial issue. This process will enable the students to make responsible decisions regarding their reproductive behaviour in the future. In this context the method used to teach Population Education must be appropriate enough to shape students knowledge and attitudes so that they will make population related decisions based on scientific information. The teaching of Population Education requires subject competency and mastery of non-traditional teaching methods. So, the investigator intends to develop a new teaching model appropriate to create proper knowledge and awareness regarding population related aspects among the secondary level students. In this technology based global scenario, the very nature of Population Education is in futuristic angle. It focuses on problem oriented and value laden strategies (Taylor and Hamal, 1974). There are a number of teaching methodologies, strategies and models of teaching which have been used to teach population education. They range from traditional expository method to modern computer based instruction strategies.

Before developing the model, investigator went through all the available teaching methods, strategies and models which have been used to teach Population Education and analyzed its strength and weaknesses. The detailed analysis of the various teaching methods strategies and models with careful study of literature published clearly reveals that most of the learning strategies having its own inherent strengths and weaknesses. The inherent demerits existing in learning modalities demands a constant revision in various learning approaches. Blended Learning Strategy is solution for this problem. The idea of blended learning is to synthesis a number of approaches in order to create high impact on learning. Blended Learning Strategy offers lots of choices in front of a teacher to develop a learning model. Blended learning uses a variety of different delivery methods such as combining technology with more conventional teacher led methods. Through a detailed analysis the strengths and weakness of these methods, a prospective teacher can use the most effective components from each approach to create another solution.
Blended learning is mixing different kinds of approaches and resources in order to achieve an optimum learning solution. In addition, learners try to construct knowledge by themselves in a learning environment in short they learn to learn. Blended instruction can include a great deal of computer assisted instruction content, permitting teachers to use classroom time more effectively. The methods can increase student interaction in the classroom, while providing students with a range of learning choices (Osguthorpe and Graham, 2003). An additional advantage of blended learning is its ability to address differing learning styles with a variation of instructional methods (Wiffin, 2002).

In the present study, the investigator focuses to develop Synthetic Model by combining two learning approaches i.e., Computer Assisted Instruction and Futures Wheel Method for Teaching Population Education at the secondary level.

4.2.1 Lesson Designs based on Computer Assisted Instruction Model

For developing Synthetic Model investigator blended two learning strategies i.e. Computer Assisted Instruction Model and Futures Wheel Method. Before developing the Synthetic Model the investigator examined the effectiveness of computer assisted instruction model for teaching Population Education.

Computer Assisted Instruction (CAI) encompasses a broad range of computer technologies that supplement the classroom learning environment and can dramatically increase a student’s access to information. While differences were generally in the expected direction, it could not be shown that CAI had a direct impact on student evaluations of either the course or the instructor. For student grades, final exam grades were compared before and after the adoption of CAI. It is shown that the use of CAI significantly increased student final exam grades. Criticism of CAI generally focuses on two issues: it lacks an adequate foundation in educational theory and the software is difficult to implement and use. CAI programs, which can include directed drills, practice exercises, and communication between students and teachers, can adapt to the abilities and preferences of individual students and increase the amount of personalized instruction a student receives. Students also benefit from the immediate feedback provided by computers and most of them appreciate the self-paced learning environment.
At its best, CAI engages student interest, motivates them to learn, and increases their personal responsibility for learning.

While preparing the computer assisted learning material for teaching Population Education at the secondary level, the investigator made use of UNESCO guidelines for preparing CAI based Lesson Designs. The UNESCO guidelines for preparing a CAI based learning material are given below.

- Title

- Introduction: The introduction is an idea about the target population for whom the package is prepared.

- Overview: The overview presents the main theme of the package

- Instruction to the learners: Instruction to the learners as how to proceed and what he has to do.

- Objectives: The expected learning outcomes in terms of behavioural objective are presented under this part.

- Learning activities: The learning activities are provided in a planned and sequential manner on the basis of the entry behaviour and needs of the learners.

- Formative tests: At the end of each sub units evaluation questions were provided for self check.

Daniel (1999) gives a similar, but somewhat different set of criteria for preparing Lesson Designs based on CAI model. They are: The software should be as easy to use as a blackboard or notebook but provide additional capability including mathematical accuracy, animations, manipulation, and rapid calculation. The software should span the learning stages from initial exposure to an idea to understanding and application. Theoretical modelling, empirical estimation, and policy experimentation should be integrated to minimize student effort required to apply the theory. The software should present a multiplicity of integrated approaches: verbal explanations, textual presentation, mathematical equations, graphical modelling, animations, and
exercises. It should be able to accommodate different learning styles. The instructional tools should be flexible and adaptable enough to extend to new problems and topics as they arise. The courseware should be adaptable to different levels of instruction: principles, intermediate, and advanced. The courseware should not merely supplement a textbook but should be part of an integrated courseware system including presentation materials, textbook, study guide, workbook, and testing materials that make use of the same set of interactive computer tools.

Currently available CAI programs appear to address many of the past criticisms and appear to incorporate many of the suggestions made by both Walbert and Daniel. The programs reported in this study are shown to be pedagogically effective within the two separate disciplines and have been successfully implemented and integrated into the student’s in-class experience. In the present study, the investigator prepared CAI based lesson designs for teaching Population Education at the secondary level. The CAI based lesson designs has been uniquely planned and designed to empower secondary level students with knowledge, attitudes and skills of issues in relation with population problems. As Population Education is interdisciplinary in nature, the topic selected for the preparation of CAI based lesson designs includes areas from various subjects. The topic “Overpopulation in India” was selected for experimental teaching in Population Education. While preparing lesson designs, the investigator selected content from Social Science, Chemistry, and Biology The lesson designs based on the topic “Overpopulation in India” is divided into four sub units. They are:

**Sub unit1: Population situation in India**

**Sub unit2: Effect of Overpopulation on Environment.**

**Sub unit 3: Food Problem in India**

**Sub unit 4: Overpopulation and Poverty**

**Sub unit 5: Unemployment problem in India**

**Sub unit 6: Relationship between Overpopulation and Social Problems**

**Sub unit 7: Overpopulation and Economic Development**

**Sub unit 8: Population Growth and Standard of Living**
The sample lesson designs are given in Appendix-VII.

4.2.2 Lesson Designs based on Futures Wheel Method

Population Education focuses on the quality of life by recognizing the past and present experiences and plans for the future. In teaching Population Education, the Futures Wheel used as a method to create forecasts about the issues in relation with population explosion within alternative scenarios. Futures Wheel is an important method of generation of likely consequences of a trend. The trend can be identified as overpopulation, population growth, unemployment, poverty, pollution etc. Futures Wheels can be used individually, in small groups, or on a larger collective group with a scribe or facilitator documenting the wheel on a whiteboard as participants yell out ideas. The exercise is given on a specific format to seek response of participants in terms of stepwise consequences of a major trend. The respondents are asked to write down consequences of trend. The consequence generation process almost follows a linear path. The consequences generation activity continues and repeated till minimum level of three or four round exercises on a futures wheel. It is a must to observe unanimity in response to consequence analysis. Therefore every participant should agree that the likely consequences filled in the final Futures Wheel should include the group’s agreement rather than its disagreement. The outcome of the exercise is used in building different scenarios of the future.

Stages of Futures Wheel Exercise

I Identification of concepts, trends or issues related to the problem.

Teacher introduces the problem. The problems can be of any nature like social, political, economic, health, education, transportation, energy, food environment etc. The trends can be of positive or negative types. For instance eradication of illiteracy is a declining trend whereas increasing rate of population is an upward trend.

II Advanced Discussion.

Teacher divides the students into groups. The students are explained about their role in the Futures Wheel exercise. The students engage in group discussion at this stage. The parameters or trends related to the problem are explored at this stage. The students are requested to express free and unbiased responses about the consequences. On the basis of group discussion such trends can be identified and listed out. After the discussion,
each group express their ideas about the trend or issue through the futures wheel exercise.

III Futures Wheel Exercise and Writing Consequences.

Teacher supplies a chart paper to each group. Depending upon the topic there may have 3 or 4 stages in a Futures Wheel.

STAGE: 1 Writing the event or trend.

STAGE: 2 Primary impact or consequence analysis of the event/trend

STAGE: 3 Second round analysis of each consequences or impacts.

STAGE: 4 Consequences of IIIrd round consequences are explored.

In the central place the trend is to be written. At least 3 consequences of this trend or issue are to be filled in by the respondents. This is the 1st round consequence analysis. In the IIInd round analysis each consequence must be followed by its further consequences. In the III round the consequences of II round consequences are explored. In the IVth round respective consequences of III round consequences are to be written on the wheels.

For convenience it has been highlighted that each consequence can be followed by its consequences. Such number can be more than two. The consequences can be of positive or negative in nature. One consequence may be repeated in the wheel. In this sense all the wheels may not have consequences respectively. Overlapping of consequences does not hinder the exercise. The timing for such exercise can be either controlled or uncontrolled depending on the criticality of a trend. Futures Wheel exercise can be done in group as well as individualised manner. Individual respondent takes three times more than the group respondents while filling up the wheels. To save the time, the individualised Futures Wheel can be given as home assignment. In the present study investigator selected group futures wheel exercise in a controlled timing to cope up with the overall time table of the school.
The example for a Futures Wheel is given in Fig. 4.1

**STAGE-1**

**TREND OR EVENT**

**STAGE-2**

Trend/Event

Primary Impact

Primary Impact

Primary Impact

Primary Impact

Primary Impact
V Analysis of Futures Wheel and writing of Scenario.

Content analysis of a number of filled-in Futures Wheel charts are to be done qualitatively. Here, the emphasis is given to agreements rather than disagreements. Once, the content analysis is done, a final wheel can be developed on the basis of such analysis. This paves the way for
writing scenarios about future events or impacts of existing trend. Futures Wheel supplies ideas in a more logical form for developing scenarios. Such scenarios can be developed either as an individual effort or as a group effort. While preparing the lesson designs based on the Futures Wheel Method for teaching Population Education, the investigator followed the above explained steps of Futures Wheel Method suggested by Gerome C. Glenn.

The same topic “Overpopulation in India” selected for teaching Population Education. While preparing the lesson designs, the investigator selected content from Social Science, Chemistry, and Biology. Before planning the lesson designs, the investigator made a thorough analysis of topic selected. The sample lesson designs based on the topic “Overpopulation in India” is divided into 8 sub units.

They are given below:

Sub unit1: Population situation in India
Sub unit2: Effect of Overpopulation on Environment.
Sub unit 3: Food Problem in India
Sub unit 4: Overpopulation and Poverty
Sub unit 5: Unemployment problem in India
Sub unit 6: Relationship between Overpopulation and Social Problems
Sub unit 7: Overpopulation and Economic Development
Sub unit 8: Population Growth and Standard of Living

The sample lesson designs for teaching Population Education based on Futures Wheel Method with fact sheet are given in Appendix-VIII.
MAHATMA GANDHI UNIVERSITY
SCHOOL OF PEDAGOGICAL SCIENCES
KOTTAYAM, KERALA

DEVELOPMENT
OF
SYNTHETIC MODEL

FOR TEACHING
POPULATION EDUCATION

Prepared by
REGI P MATHEW and Dr A SUDHARMA
4.2.3 Development of Synthetic Model

Behaviourism was the dominant learning theory in teaching Population Education for the last few decades and is deeply embedded in an objectivist epistemology, with a focus on students replicating certain behaviours. The teacher provides a set of stimuli and reinforcements that are likely to ensure that students give appropriate responses. This traditional way of teaching is characterised by teachers adopting a transmission of learning: what the teacher says is what the learner hears and therefore knows (Gunstone, 1990) and is reflected in the old age: ‘tell them what you are going to tell, then tell them, then tell them what you told them’. Such approaches in Population Education have resulted in frequent rote learning and recall of concepts with limited understanding (Mc Robbie and Tobin, 1997). The constructivist movement marked a significant move away from the dominance by behavioural psychology, with a new emphasis on the role of concepts and conceptual frameworks in human learning (Novak, 1988). Constructivist pioneers in education such as Driver and Easley (1978) and Novak (1977) initiated a movement which also branched away from earlier cognitive science efforts such as Piaget’s stage theory to focus on the actual substance and context of students’ explanations.

4.2.3.1 Pre-preparation of the Synthetic Model

The pre-preparation stage of the Synthetic Model involved consultations with experts in the field of secondary education, higher education, population education, and secondary level teachers for framing the proposed model for teaching Population Education.

4.2.3.2 Analysis of the Present Method for Teaching and Learning

At first the investigator had done a thorough analysis of the present methods and models for teaching Population Education, to prepare the new model. This helped her a lot in framing the learning sequences of the Synthetic Model. In order to identify the population education potential of our secondary education curriculum, the investigator analysed the Population Education curriculum, secondary level text books, hand books, resource books, related to content and method of teaching etc. were analysed
4.2.3.3 Steps for Developing Synthetic Model

Blended learning strategy is a promising model for supporting teacher’s professional development that combines the advantage of traditional face-to-face interaction with technology. For blending, teacher has complete freedom for selection of combinations. Any method or model or strategy can be selected for blending. Various principles, theories, philosophies are also can be blended.

In the present study, the investigator focused to develop Synthetic Model by blending two learning approaches i.e., Computer Assisted Instruction Model and Futures Wheel Method for teaching Population Education at the secondary school level. While blending the two approaches, the investigator followed the steps suggested by Graham for a perfect blending. The details regarding the steps involved in the development of proposed Synthetic Model are given below.

- Needs analysis for blending
- Selection of the methods or models for blending.
- Comparison of instructional methods
- Analyses of the strengths and weaknesses of the selected models
- Blending the new model
- Critical evaluation of blended model by experts
- Modifications based on critical evaluation
- Try out of the new model
- Modifications based on the results of the try out
- Preparation of the final model
- Final approval by experts.
- Experimentation stage of the Synthetic Model

The details regarding the development of Synthetic Model are summarized in the fig.4. 2.
Figure 4.2  Schematic Design used to develop the Synthetic Model
4.2.3.3.1 Needs analysis for blending.

Before blending, create a task analysis that will help the investigator to identify the type of learning strategy required, i.e., the knowledge, skills or attitudes those learners will need in order to learn new information. Based on the need analysis, in the present study, investigator identified learning outcomes or objectives and determined how much interactivity is required for each one. In the present study, the investigator examined the prevailing practices exist in teaching Population Education by administering ‘Population Education Prevailing Practices Questionnaire’ for collecting data from secondary level teachers. To examine teacher’s awareness about Blended Learning Strategy, investigator administered Blended Learning Strategy Awareness Inventory. Based on the analysis of the results of needs analysis, investigator identified the need for developing a technology based model with futuristic vision is the urgent need for teaching Population Education at the secondary level. Before selecting the learning strategies, the investigator analyzed the syllabus prescribed for secondary schools in Kerala. Text Books, Hand Books, Resource Books, Supplementary Reading Materials, Reference Books related to content and method of teaching, Models of teaching and pedagogical principles were also analyzed.

4.2.3.3.2 Selection of the methods or models for blending.

Before developing the model, investigator went through all the teaching methods, strategies and models which have been used to teach Population Education and analyzed it. After reviewing the literature related to various learning modalities and detailed comparison of the strengths and weaknesses of the models, investigator selected two instructional methods for blending. Based on the results of needs analysis and detailed search of the available literature, the investigator selected Computer Assisted Instruction Model and Futures Wheel Method as the base models for blending the new model.

4.2.3.3.3 Comparison of instructional methods

After selecting the base models for blending, the investigator compared the characteristic features of the Computer Assisted Instruction Model and Futures Wheel Method. Computer Assisted Instruction Model (CAI) encompasses a broad range of computer technologies that supplement the classroom learning environment and can dramatically increase a student’s access to information. CAI programs, which can include directed drills, practice exercises, and communication between students and teachers,
can adapt to the abilities and preferences of individual students and increase the amount of personalized instruction a student receives. The use of CAI is pedagogically effective and that currently available applications are easy to integrate into the student’s in-class experience. Futures Wheel Method is one of the futuristic learning strategies. The Futures Wheel is a structured brainstorming method used to organize thinking about future events, issues, trends, and strategy. It is also called as Consequence Wheels. Futures Wheel is an important method of generation of likely consequences of a trend. In other words this is understood as a method of study of future consequences of certain existing trends.

4.2.3.3.4 Analyses of the strengths and weaknesses of the selected models

The careful study of literature clearly reveals that, most of the learning strategies having its own inherent strengths and weaknesses. After the detailed analysis of the selected base models i.e. Computer Assisted Instruction Model and Futures Wheel Method the investigator analyzed its strengths and weaknesses for effective blending. Combining the strengths of each of the methods and eliminating their weakness can lead to the development of a powerful and effective instructional system. The comparison of the base models are given below.

- **Comparison of the Strengths of CAI and FWM**

  CAI is an effective learning tool that can greatly help the students and teachers. It offers great scope for teachers and students to work in an innovative and interesting ways.

  In a CAI based classroom students do not get bored and learning is a joyful experience. Students are challenged to discover more because the CAI process resembles the exploratory and discovery approaches of teaching. Motivation is carried all throughout the Population Education program and students’ interest is maintained. CAI enables students to learn at home in cases that they cannot attend classes due to health problems or any unavoidable circumstances that hinder their going to school. It also provides a chance for students to learn lessons missed due to absences as they attend to official endeavours outside the school campus like conferences and seminars, contests and other forms of activities related to learning. CAI allows the students to learn through drill and practice. The CAI lessons can be a good learning material for distance education program of the government. Younger children, disadvantaged children and especially, learning disabled students tend to respond positively to CAI. For teachers,
CAI lessons could reduce lecture time of the teacher. Since the CAI lessons are content-oriented and artistically presented the teacher’s role shift from didactically transmitter of knowledge to a facilitator in the student’s assimilation of knowledge. A Furthermore, the teachers could make use of the class time more effectively and attend to the needs of students whom they have not been able to meet. Provided computers are available, CAI lessons offer solution to issues or problems related to large classes.

Advantages of Futures Wheel Method are identified with experience based exploration of consequences of certain trends or events as well as application side of a theory. Since these consequences are identified on logical manner the content available for scenario writing are easily classified under several headings. The scenarios can be developed on both negative and positive groups of consequences. It can be used at any point in the process of futures research to further understand events and trends. One futurist said that whenever he gets stuck in a strategic planning exercise, he does a Futures Wheel with the group and "everything starts flowing again." It does not require advanced education or training and is easily transferred and adapted to a variety of situations. It is an easy means of diagnosing any group’s collective thinking about the future. The Futures Wheel can also yield contradictory impacts. The ability to reveal contradiction is the strength of the method.

(a) Futures Wheel Method cover a large range of possibilities of future population states, thus encourages divergent thinking and lateral thinking.
(b) Futures Wheel Method forces the analysis to examine the dynamics of population situation, thus being more problem conscious.
(c) They can help one to understand the implications of certain principles and issues which would have been neglected in the present context.
(d) Futures Wheel Method helps to think about the alternative possible outputs of certain real past and present events in retrospect.
(e) They are used as powerful tools for transforming goals of Population Education into actual state of affair.
(f) They help the students to suggest action plans to accelerate desirable consequences and to check undesirable consequences.

(g) Scenario developed on the trends of different parameters of a given problem can be treated as the basis of identifying the rate of changing in different directions along with its consequences.
The CAI model and FWM are very suitable for blending. The inherent strengths of the two learning strategies make the blend between the two strategies perfect and will sound excellent learning outcome. Students do not get bored in a CAI based classroom. Rather, they are challenged to discover more because the CAI process resembles the exploratory and discovery approaches of teaching. Motivation is carried all throughout the program and students’ interest is maintained if not strengthened through the program’s artistic presentation. For teachers, CAI lessons could reduce lecture time of the teacher. Since the CAI lessons are content-oriented and artistically presented the teacher’s role shift from didactically transmitter of knowledge to a facilitator in the student’s assimilation of knowledge. Furthermore, the teachers could make use of the class time more effectively and attend to the needs of students whom they have not been able to meet. Provided computers are available, CAI lessons offer solution to issues or problems related to large classes.

The Futures Wheel is easy and enjoyable to use and no hard work is necessary. It gets people thinking about the future quickly and easily. The Futures Wheel can help identify positive and negative feedback loops. The higher-order consequences occasionally cycle back to the original item. This sequential is a natural way to tie the Futures Wheel into the development of a formal systems model. The Futures Wheel also helps move the mind from linear, hierarchical, and simplistic thinking to more network-oriented, organic, and complex thinking.

The blend between FWM and CAI can greatly help the students and teachers. It gives a relatively clear, visual map of the potential complexity of interactions. As a result, it helps develop one's prospective attitude towards things, events, and people. It stimulates complex yet systematic thinking about a new development by emphasizing that the consequences do not happen all at once but are often linked over time in an evolutionary, interactive sequence.

- **Comparison of the Weakness of CAI and FWM**

Criticism of CAI generally focuses on two issues. First, it is argued that much of the available software lacks an adequate foundation in educational theory. Second, it is argued that the software is difficult to implement and use. Most CAI studies focus either on educational effectiveness for a particular subject or the student’s experience in using the software. Extant studies do not show a clear pattern of support for either of
those issues. In spite of these weaknesses, another defect identified is, CAI lack empathetic skills and always failed to fulfil the psychological needs of the students.

The Futures Wheel can make a group or individual think they understand causal relations between the items that emerge, when it's more likely that they've only identified correlations. The Futures Wheel can be too simplistic at times, blurring the distinctions on the timing of one identified impact relative to other impacts or consequences. One mistake is to see the possible impacts or consequences as truly representing what will happen. One might be tempted into believing that a single triggering fact is sufficient to generate an avalanche of impacts. Although such events do occur (such as attractors in chaos theory, which give rise to “butterfly effects" or how a very seemingly in significant event like a butterfly passing by can catch one’s attention changing the previously expected flow of events) the Futures Wheel can help to identify them. However, one must guard against making dangerously premature judgments. The output of a Futures Wheel should be used as a basis for further thinking, for more systematic exploration, and for the application of other techniques for probing the future. Put simply, the Futures Wheel is a creative tool that generates input to futures thinking. If one is not disciplined in using the Futures Wheel, one can end up with some messy "intellectual spaghetti" that makes the implications of the trend or event more difficult to see clearly. The use of primary, secondary, etc. rings is one way to help prevent the problem; another is the use of the single, double, etc., lines to organize the linkages among the impacts. As the rings of associations and implications increase, the complexity of the overview can become overwhelming unless patterns emerge. One strength of the method is its ability to reveal such patterns, but the process may become too complex before pattern recognition occurs.

The comparison between the weaknesses of CAI and FWM revealed that the inherent weaknesses of CAI are eliminated by the strengths of FWM and wise versa. Population is a value-laden subject. CAI programs, which can include directed drills, practice exercises, and communication between students and teachers, can adapt to the abilities and preferences of individual students and increase the amount of personalized instruction a student receives. Because the subject matter is controversial, choices should not be imposed, the teacher must help the students to make responsible decisions arrived at from a rational study of alternatives. The combination of CAI and FWM is a promising one in this connection.
4.2.3.3.5 Blending the proposed Synthetic Model

By eliminating the weaknesses and combining the positive elements of base models i.e. Computer Assisted Instruction Model and Futures Wheel Method, the investigator blended the strengths of both and developed the draft Synthetic Model for teaching Population Education among the secondary level students. While preparing the draft Synthetic Model, the investigator consulted with eminent experts in the field of education and teachers who are teaching at the secondary level. According to Osguthorpe and Graham (2003), a truly blended solution “involves the strengths of each type of learning environment and none of the weakness”.

The following figure 4.3 shows the process of blending the strengths of Computer Assisted Instruction Model and Futures Wheel Method.

![Blending Process of the Proposed Synthetic Model](image)

**Fig.4.3 Blending Process of the Proposed Synthetic Model**

4.2.3.3.6 Critical evaluation of blended model by experts

Evaluating a blended approach to learning is not so different from evaluating traditional training. The blend is only means to an end; the end is what we evaluate. In the developmental stage, investigator outlined success criteria and evaluation strategies, now they must be put into play. The first
section should be an evaluation of the delivery methods; the second an evaluation of the learning.

4.2.3.3.7 Modifications based on critical evaluation

The investigator prepared a fact sheet containing all the relevant information related to the Synthetic Model and attached to each of the lesson transcript so as to assist the teachers during the evaluation phase of the model. The draft lesson designs were given to two experts in the field of Population Education and two teachers from secondary level. Necessary corrections were made according to their feedbacks. In the developmental process of a new model, feedback plays a crucial role. Feedback given by experts at the various stages provides a usable, stepwise procedure containing guideline to develop a new model in an excellent way with maximum quality.

4.2.3.3.8 Tryout of the Proposed Synthetic Model

After preparing the draft lesson designs based on Synthetic Model, the investigator conducted a preliminary experimental tryout. Accordingly the draft test was administered on a sample of 46 students, studying ninth standard. In selecting the sample care was taken to give due representation to gender. A sincere effort was made to get correct evaluation about the Synthetic Model. The investigator herself administered the test. The preliminary experimental tryout was observed by two teachers. Investigator collected the valuable feedback from secondary level students as well as teachers.

4.2.3.3.9 Modifications based on the results of the try out

The preliminary experimental tryout was followed by rapid feedback from teachers as well as from the secondary level students. The investigator analyzed the feedback and considered their valuable suggestions. They gave some modifications in the steps of the Synthetic Model for betterment. Some problems identified by the investigator during the preliminary experimental tryout were also considered for rectification.

4.2.3.3.10 Preparation of the final model

Based on the feedback of the preliminary experimental tryout, the investigator modified the phases and various aspects of Synthetic Model and prepared the final lesson designs based on the synthetic model. In blending a
new model feedback gives stimulating or corrective information about the various aspects and phases involved in the new model.

4.2.3.3.11 Final approval by experts.

The modified Synthetic Model prepared by blending Computer Assisted Instruction Model and Futures Wheel Method based on blended learning strategy thus submitted to educational experts for final approval. The overall quality of the model was perceived as sufficient, although experts recommended a few revisions before the Synthetic Model could actually be used in final experimental study. The feedbacks given by educational experts help to steer the phases of the new model based on a diagnostic angle.

4.2.3.3.12 Experimentation stage of the Synthetic Model

After receiving the final approval by the experts, the Synthetic Model is ready for final experimental study. For the experimentation, investigator prepared lesson designs. Before planning the lesson designs, the investigator made a thorough analysis of topic selected and considered content area from Social Science, Chemistry, and Biology. The lesson designs based on the topic “Overpopulation in India” is divided into 8 sub units. They are:

**Sub unit1:** Population situation in India
**Sub unit2:** Effect of Overpopulation on Environment.
**Sub unit 3:** Food Problem in India
**Sub unit 4:** Overpopulation and Poverty
**Sub unit 5:** Unemployment problem in India
**Sub unit 6:** Relationship between Overpopulation and Social Problems
**Sub unit 7:** Overpopulation and Economic Development
**Sub unit 8:** Population Growth and Standard of Living.

For experimenting Synthetic Model the investigator used the same computer assisted learning material prepared for teaching through Computer Assisted Instruction Model. CAI based learning material is given in APPENDIX-VII.
AN OVERVIEW OF
SYNTHETIC MODEL FOR
TEACHING POPULATION EDUCATION

Prepared by
REGI P MATHEW and Dr A SUDHARMA
4.3. An Overview of the Synthetic Model

4.3.1 Introduction to the Synthetic Model

Population education is focussing on influencing the younger generation’s attitudes and behaviour in relation to population decisions over time, until they become parents. It is taken for granted that the subject matter is controversial. These two considerations necessitate developing in a student, the skills for making responsible decisions about the controversial issue of future decisions regarding life. Only through a thorough analysis of the pros and cons and exploration of alternative actions can the student arrive at a responsible decision regarding the future. It is observed that the teaching method appropriate to Population Education cannot be one in which the teacher dictatorially tells students that this behaviour is the right one and all the others are wrong. The ideal teaching method should present and evaluate plausible alternative in terms of futuristic angle. Teaching Models are really models of learning. In population education class room teachers help students to acquire information, ideas, skills, values, way of thinking, and means of expressing themselves. In fact the most important long –term outcome of population education may be reflected in the size and quality of a nation’s population. The Synthetic Model is focusing on teaching Population Education in a futuristic perspective. In this section the investigator describes the scenario of the Synthetic Model, goals and assumptions. Next, the investigator gives the four concepts: syntax, principle of reaction, and support system.

4.3.2 Scenario of the Synthetic Model

In teaching Population Education, Direct instruction based on behaviourism and information-processing theories have proven to be deficient in some areas (Roblyer & Edwards, 2000). For example, Population Education activities are often not motivating or relevant and students receive limited opportunities for developing future oriented problem-solving skills cooperatively. There is often little scope to deal with learner’s differences, especially students’ existing ideas and views, and life-long skills such as metacognition are ignored (Phillips, 1997). Adopting a transmissive approach to learning in Population Education, computers have traditionally been used to present information, ask questions and judge answers, all of which humans do better, at the same time, students have been required to receive, store and retrieve information, all of which computers do better (Jonassen et al. 1999). Learners have been viewed as passive
recipients of instruction, with an emphasis on memorizing facts and isolated skills related to Population Education.

One trend in schools through the 20th century has been their reluctance to accept educational technology innovations and developments. Consequently, only rather simple ‘modern’ educational technologies such as overhead projectors are widely accepted and used by teachers in schools (Fiske, 1998). So far computers have not provided a panacea for education, similar to radio, television and film before them! A transmissive view of instruction has dominated the use and development of educational software since the introduction of computers into schools during the 1980s. This view has been strongly influenced by behaviourism and also information-processing theories. Early research in the field comprised mostly of quantitative, media studies, although qualitative methodologies have now emerged as a viable and often desirable alternative. These traditional didactic approaches have focused on learning from technology; using computers to transmit information to the learner in the hope that they will be more efficient than teachers. “In much of the computer education community we are still building and selling Skinner’s teaching machines” (Wiburg, 1995). Computer Assisted Instruction can support the personal and social meaning making during the knowledge construction process. Students can learn with computers rather than from computers (Jonassen & Reeves, 1996) in a constructivist learning environment, reflecting on and discussing their views and solving problems in realistic contexts. For example, CAI programs can provide real-world scenarios for students to consider, helping them to link information to their own experiences. Studies from the CAI movement focus on technology-mediated peer learning and provide excellent examples of these new types of educational technology research. In particular, the use of CAI can expose students to learn scientific phenomena normally inaccessible in the classroom and provide students with rich observation experiences. Peer learning environments provide students with an opportunity to use elements of these computer displays as a focus for consensual meaning-making. Over the past decade, the field of education has endorsed constructivism as a suitable referent for the development and meaningful use of education in a futuristic angle. Population Education should make learners confident to forecast today’s problems in a future perspective. Futures Wheel Method offers learning as an inherently social process, using peer discussions as an opportunity to share alternative viewpoints, to challenge other’s ideas and help develop alternative points of view. The Futures Wheel Method was developed by
Jerome C. Glenn in 1971. It has been widely used since then on any number of real world social applications (Glenn and Gordon 1999). In the present study, the investigator focused to develop Synthetic Model by blending two learning approaches i.e., Computer Assisted Instruction Model and Futures Wheel Method for teaching Population Education at the secondary school level. The details regarding the proposed Synthetic Model are given below.

### 4.3.3 Orientation to the Synthetic Model

Any account of teaching and learning Population Education needs to consider the nature of the knowledge to the taught (Driver et al., 1994). From a constructivist perspective, Population Education offers a way for us to interpret events of nature and to cope up with the world. Indeed, scientific knowledge about population related aspects is essential in order to make sense of observations, which are open to individual interpretations (Mathews, 1992). However, this body of knowledge is not separate from knower but represents socially constructed and validated knowledge based on experiences in the world. Constructivism is a belief system based on relativist ontology, assuming that reality is known only in a personal and subjective way by the knower: “Reality exists only in the context of a mental framework (construct) for thinking about it” (Guba, 1990). A common criticism of constructivism is that anyone’s construction of the world is as viable as another and therefore the world only exists as constructed in the mind of the knower—a view known as solipsism (Duit, 1995). However, knowledge must not only be viable personally but also in the social contexts in which actions are to occur (Tobin & Tippins, 1993). Knowledge is constructed within these social contexts epistemologically; constructivism is based on a subjectivist position (Guba & Lincoln, 1989). The metaphor of construction aptly summarises the position that knowledge is built in the minds of learners through their own personal backgrounds, experiences and aptitudes: “Knowledge is constructed and adapted as a result of successive experiences and reflections” (Tobin, 1990).

The epistemological commitments of students can be an important influence in their learning, (Novak, 1988). Learners come to the classroom with their own views of knowledge, their own conceptions about life and perceptions about future. These views must be addressed before constructivist strategies can be effective, as learners are responsible for recognizing and evaluating their own beliefs and deciding whether to reconstruct them: “If the learner’s ideas and beliefs about the processes of learning and teaching are in conflict with recognizing, evaluating,
reconstructing their existing knowledge and beliefs, then little progress is possible” (Gunstone, 1990).

From the constructivist perspective, in teaching population education, learning is an active process in which, learners construct their own understanding and knowledge of the world through action and reflection. Three important concepts emerge from this:

- Knowledge is constructed from experience.
- Knowledge is socially constructed
- Learning is an active process. Students learn by doing rather than by passively absorbing information

In this technology based global scenario, the very nature of Population Education is in futuristic angle. It focuses on problem oriented and value laden strategies (Taylor and Hamal, 1974). There are a number of teaching methodologies, strategies and models of teaching which have been used to teach population education. They range from traditional expository method to modern computed based instruction strategies. According to Graham, Allen and Ure (2003) Blended learning systems combine face-to-face Instruction with Technology Based Instruction. The working definition reflects the idea that Blended Learning Strategy is the combination of instruction from two historically separate models of teaching and learning: traditional learning systems and distributed learning systems. Blended learning can be defined as an approach to learning and teaching process that utilizes acquisition and usage of the knowledge in an educational context by using primarily Computer and communication technologies in collaboration. It also emphasizes the central role of computer-based technologies in blended learning. From a pedagogical standpoint, the designers of blended learning systems should be seeking out best practices for how to combine instructional strategies in face to face and computer mediated environments that take advantage of the strengths of each environment and avoid their weaknesses (Osguthorpe & Graham, 2003; Martin, 2003).

Actual blended learning would involve students learning through experiencing various aspects of what it is that they are studying (their object of study). So, in looking at relations between learning theories and blended learning, we must start from the position that many students may not experience the learning environment as one that is blended in ways similar to the way intended by the ‘instructional designer’. Studies of the use of blended learning claim that they are associated with improvements in
aspects of learning. This suggests that some students are experiencing something that is different to contexts without blended learning. Some of these improvements have been attributed to an increase in choice, and there is sufficient research evidence from the student approaches to learning perspective, especially the work of Ramsden (Entwistle and Ramsden, 1983; Ramsden, 1991) to support this view. Some of the improvements may also be due to a novelty factor or Hawthorn effect. Research conducted in contexts where blended learning has been in the mainstream for several years is indeed to address the effects of the latter.

4.3.4 Population Forecasting through Synthetic Model

The age of science and technology has empowered man to influence the cycles of population growth. Especially modern technology has made the movement of life faster. No doubt, technological outputs have brought satisfaction of several immediate needs. It does not mean that every technological intervention with natural environment would lead to long term benefits of mankind. During past few decades we have been facing population problems and effecting large changes in a short space of time. While doing so we have not bothered about forecasting long-term effects of such changes. Because of technological outburst the age old social life style has been taking new forms very fast. Decay of several social value systems and emergence of disequilibrium in social system have posed threat to the quality of life in developed countries. Therefore, social consciousness has been emerging in developed and developing countries with regard to the positive and negative consequences of overpopulation and utilization of such information in the decision making machinery. The Synthetic Model is a structured brainstorming method used to organize thinking about future population events, issues, trends, and strategy in a systematic way with the help of computer assisted learning materials.

4.3.5 Syntax of the Synthetic Model

The syntax or phases of the Synthetic Model described as the model in action. It involves the description of the model in terms of sequence of activities. It is the plan of action a teacher has to follow while using Synthetic Model in the class room. Syntax is the operational heart of the Synthetic Model. It tells what activities should occur and, when appropriate, in what sequence. The Synthetic Model consists of seven phases arranged in an integrated and sequential manner. These phases are sequenced in the order given below:
Phase I: Identification of Concepts, Trends, Events or Issues Related to the Problem.

Phase II: State the Navigation Question.

Phase III: Presentation of the Computes Assisted Learning Material Related to the Topic.

Phase IV: Idea Generation through Group Discussion.

Phase V: Writing the Futures Wheel Chart.

Phase VI: Analysis of Futures Wheel and presentation of scenario

Phase VII: Evaluation.

Phase I: Identification of Concepts Trends, Events or Issues Related To The Problem.

During the first phase teacher sets the stage for learning. This is accomplished by stating the purpose of the lesson. The first phase is also a means of getting the students attention and focus. By using attention-grabbing demonstration the teacher creates ways to hook the students into learning and generate interest and curiosity, which sets the stage for exploring and analyzing about a particular phenomenon, issue, or problem. From a construction perspective, the first phase provides an opportunity for the teacher to activate learning, assess prior knowledge, and have students share their prior experiences about the topic. Often, the teacher introduces the topic of the lesson and status the explaining what the students should know and be able to do by the end of the lesson or unit the first phase is also a means of getting the students attention and focus. Knowledge is not ‘transplanted to a person’s mind as if the mind were a blank slate waiting to be written on (Cobern, 1993). Alternatively, learners make sense of the world by interpreting information in terms of what is already known. In this sense, constructivist teachers act as a ‘tour guide’ mediating between children’s everyday world and future world. We will see that when teacher plan lessons and units around the seven stage of the Synthetic Model, students move from concrete experiences, to the development of understanding to the application of principles994).
**Phase II: State the Navigation Question**

In synthetic model, students are cycled back into the processes and pathways of the concept, trend or event by generating a question to be answered. Synthetic Model built around the art and spirit of imagination. It is the scientific process of active exploration by which the students use critical, logical and creative lateral thinking skills to raise and engage in questions of far reaching future implications. Driven by genuine curiosity and exploration, Synthetic Model involves generating a navigation question about the trend or event to identify the impacts or consequences. To analyze the impacts or consequences of the trend or event, ask the navigation questions in the following manner:

a) If this happens, then what happens next? or
b) What goes with this event a trend? Or

Through generating navigating question, the problem is presented in a suitable form so that a range of different ideas concerning the problem can be obtained the navigation question stimulate the thinking processes of each student. Teacher encourages students to think around the navigation questions.

**Phase III: Presentation of the CAI learning package related to the topic.**

Presentation of the computer assisted learning material related to the topic enables students to build on a common experience as they go about their investigation. This common experience is essential because students will enter the classroom with different levels of experience and knowledge about the topic being studied. This presentation stage enables all students to experience hands on learning and help to get a common idea in a culturally diverse classroom. The computer in itself does not necessarily promote learning; it is the teacher and the students whose collaborative grasp of the tool constitutes effective learning. From a constructivist perspective, the aim of Population Education is to make sense of a universe of phenomena in terms of knowledge that is viable (or making sense of our sense impressions). Many educators believe that specific knowledge will be as important to tomorrow’s citizens as the ability to learn and make sense of new information.
Hence, the presentation of the computer assisted learning material related to the topic considered as learning new ways of making sense of the world and constructing viable models to fit current understandings and experiences (Tobin, 1990). In fact, if we look at the various dimensions, distributed learning environments are increasingly encroaching on instructional territory that was once only possible in face to face environments. For example, in the time and fidelity dimensions, communication technologies now allow us to have synchronous distributed interactions that occur in real-time with close to the same levels of fidelity as in the face to face environment. In the humanness dimension, there is an increasing focus on facilitating human interaction in the form of group discussion after the presentation of CAI materials. Additionally, there is ongoing research investigating how to make machines and computer interfaces more social and human. Even in the space dimension, there are some interesting things happening with mixed reality environments that simultaneously facilitate both distributed and face to face interactions. Hence, Synthetic Model can take place with CAI. If the teacher adopts a constructivist epistemology, collaborative discussions, negotiations and reflections need to be encouraged by the teacher to develop higher order problem solving skills associated with constructivist learning. CAI may help this process but ultimately it is the teacher’s beliefs and actions which determine the ultimate success of these lessons based on synthetic model. Teachers’ epistemologies continue to perform a central role in mediating the quality of student learning. The key elements of Computer Assisted Instruction learning package are given below:

- Introduction to the topic.
- Instructional objectives of the CAI learning package.
- The concept is explained with necessary pictures.
- Origin of important term and the definitions are given wherever necessary.
- Various facts, word meanings etc. related to the topic are given in each sub unit under the title “Do you know”?
- Important points are given under the title “things to remember” at the end of each sub unit.
- At the end of each sub unit there is a provision for students to respond to each question in the learning package and self checking is possible.
In Synthetic Model the investigator used the same computer assisted learning material prepared for teaching Population Education through computer assisted instruction model [APPENDIX-VII].

**Phase IV: Idea generation through group discussion**

Once the problem is presented through computer assisted learning material, the idea generation exercise is scratched on through advanced group discussion. The core view of constructivist learning suggests that learners actively construct (rather than acquire) their own knowledge, strongly influenced by what they already know. The learners are divided into small groups with 4 to 6 members. Each group led by a chairperson, and allows each group to discuss the problem under study. Crisp statements can be made by the leader without projecting his own ideas. The navigation question can be placed before the group with a view to maintain the tempo for generating more novel and unique ideas. At this stage, all care is to be made by the leader to be flexible enough and highly interactive with the group members so that free flow of ideas is produced. The group members are encouraged to express as many ideas as possible. From a constructivist perspective, the group discussion phase also provides an opportunity for the teacher to activate learning, assess prior knowledge, and have students share their prior experiences about the topic. Hence, teachers need to be attentive to student’s pre-instructional ideas and elicit these views prior. “Prior knowledge is used to make sense of experience and as a consequence, teachers should give close attention to the prior knowledge of each student in the class” (Tobin, 1990) Fundamentally, constructivism asserts that pupil learn through a continual process of constructing, interpreting, and modifying their own ideas based on experiences with reality (Janssen, 1994). Indeed, students may hold alternative conceptions owing to their varied prior experiences and existing knowledge. Thus the role of the teacher is to recognize these strongly held conceptions that children bring to the classroom and provide experiences that will help them build on their current knowledge of the world. During the group discussion stage, the teacher can note possible naïve conception stated by the students. These misconceptions can be addressed while the students have an opportunity to work through the Analysis of futures wheel stages. Students in the group open the door for opportunities to integrate higher order thinking skill across the curriculum. During the discussion pores students are usually involved in sharing their commonly held theories comparing and contracting their ideas and understanding, justifying their positions and theories analyzing relevant information, choosing avenues of action and explaining alternative solution.
Wang & Woo (2007) researched the effectiveness of class discussion in face-to-face and online settings have focused on how both settings have context-specific advantages. Face-to-face discussions tend to have greater efficiency, immediacy of feedback, no technological issues, greater perceived interactivity and import verbal and non-verbal communication cues present.

**Phase V: Writing the Futures Wheel Chart**

This stage is an excellent time to engage students in inquiry. During this stage, students examine the causes or impact or solutions for navigating questions; and work without direct instruction from the teacher. They analyses the evidence and data, recording and organizing information, sharing observations, and working in cooperative groups. The futures wheel exercise is a way of organizing thinking and questioning about the future—a kind of structured brainstorming on the risks that a society will face. The following example on the topic, ‘Causes of over population in India’ gives a brief picture about the various steps involved in the cause analysis through a futures wheel exercise.

In the first step of Futures Wheel Exercise, each group is supplied with a piece of chart paper. As seen in the figure 4.4, each group brainstorm about the problem, trend, idea, future event, or value and write the name of the problem, trend or event in the middle of the paper. [The Futures Wheel Exercise can be written in any writing material flip chart, black board, or on an overhead projector transparency.]

![Fig.4.4 Basic Futures Wheel –Step 1](http://example.com/f4_4.jpg)

Next, the leader of the brainstorming session draws an oval around the item and asks the group to say what necessarily goes with this item. In the central place the problem or trend is to be written. At least 3 causes/consequences/ trend of this problem are to be filled in by the respondents. This is the first round analysis. Primary causes or impacts or consequences or trend are identified based on group member’s feedback. As the causes or impacts or consequences offered by the group members, the
leader draws short wheel-like spokes from the central oval and writes these causes or impacts at the end of each spoke.

Next, in the IIInd round analysis; each causes or consequence or trend must be followed by its further causes or consequences or trend, two each. The secondary causes or consequences or trend are identified for each primary causes or consequence or trend in order to form a secondary ring of the wheel.

![Diagram](image)

**Fig. 4.5 Example of primary causes of the problem -Step 2**

The leader asks the group to give the most likely causes or impacts for each of the primary causes of the first ring of primary causes. As these secondary causes are offered by the group, the leader draws two or three short spokes out from each of the ovals around the primary causes to form a second ring and writes the name of these secondary causes at the end of each spoke and draws ovals around them.

In the III round, the consequences of II round causes are explored. In the IVth round, respective consequences of III round causes are to be written on the wheels. For convenience it has been highlighted that each cause or
impact can be followed by two of its causes or impacts. Such number can be more than two. The causes or impacts can be of positive or negative in nature. One cause or impact may be repeated in the case of more than a wheel. In this sense all the 45 wheels may not have 45 causes or impacts respectively. Overlapping of causes or impacts does not hinder the exercise. There is no time limit for such exercise. This depends on the criticality of a problem or trend. Of course, individual respondent takes three times more than the group respondents while filling up the wheels.

This visualization of the ripple effect is useful in understanding complex social interrelationships of critical aspects of the trend or event under consideration. The diverse ideas of the group members help to insure that the process represents different social aspects of the threats. The Futures Wheel process provides a useful picture of the implications of the event or trend in a clear, concise and visual manner. The futures wheel exercise is one of the most commonly used methods among futurists, because it is an effective way to engage thinking about alternative future events. Used correctly, it is easy to use the wheel to think through the implications of, and organize thoughts about, possible future social events or trends.

The Fig. 4.6 gives the example of primary and secondary causes of the problem.
Fig.4. 6

Example of Primary and Secondary Causes of A problem -Step 3

At first, this process goes quickly, with participants listing second, third, and fourth order consequences with little or no evaluation. After the group feels its thinking is represented on the wheel, they can evaluate and edit the wheel to be more "realistic." This step is similar to the clarification part in other brainstorming processes. Alternatively, the impacts of an event or trend can be processed more slowly and deliberately by accepting criticism prior to entering anything on the wheel. In this approach, the group discusses the plausibility of every impact. If an impact is judged plausible by all, then it is entered; otherwise, not. Peter Paschal refers to this as the "rule of unanimity." He argues that making sure everyone agrees is one way of ensuring that the impacts are reasonable: "The Futures Wheel process leads rapidly to unexpected consequences and, thus, requires a restriction on the group to prevent them from arriving at conclusions that are so speculative as to be of little worth in assessing alternative futures."

Sometimes people may want to pursue sequential chains of impacts radiating out in a linear fashion from the initial trend or event. This variation is
referred to as *Mind Mapping*. The Futures Wheel, in contrast, completes each ring in concentric circles. Mind Mapping is good for exploring one’s thoughts, but does not necessarily make distinctions between primary, secondary, and tertiary impacts relative to other impacts radiating out in time.

**Phase VI – Analysis of futures wheel chart and presentation of scenario**

Content analysis of a number of filled-in futures wheel charts are to be done qualitatively. Here, the emphasis is given to agreements rather than disagreements. Once, the content analysis is done, a final wheel can be developed on the basis of such analysis. This paves the way for writing scenarios about future events or impacts of existing trend. Futures Wheel supplies ideas in a more logical form for developing scenarios. Such scenarios can be developed either as an individual effort or as a group effort. During this phase students put their collective reasoning skills into action by implementing a possible solution to the problem by presenting the scenarios. The final step in the Synthetic Model is the presentation of scenario in terms of the evaluation of terminal behaviour of the learners. Presentation of scenario in turn implies the feedback of the entire learning activity.

**Phase VII– Evaluation**

Students evaluate their observation, analyze their scenarios and communicate their scenarios to others during the evaluation stage. The teacher brings the closure to the unit by encouraging the students to summarize their scenarios developed through futures wheel exercise about the concepts or trends or events. This model is flexible enough for use in advanced situations as well as in elementary applications. In short, it can be used by everyday classroom activities. Combining the best qualities of the futures wheel method and computer assisted instruction model, Synthetic Model is focusing on forecasting the future in a better way.

Synthetic Model act as a composite of attitudes, knowledge and skills which includes an ability to recognize the existence of problems and acceptance of general need for evidence in support of what is asserted to be true knowledge of the nature of valid inferences, abstractions and generalizations in which the weight age or accuracy of different kinds of evidence are logically determined and skills in employing and applying the above attitudes and knowledge. Synthetic Model calls for a persistent effort to examine any belief or supposed form of knowledge in the light of the
evidence that supports it and the further conclusions to which it lends. It also generally requires ability to recognize problems, to find workable means for meeting those problems, to gather and marshal pertinent information, to recognize unstated assumptions and values, to comprehend and use language with accuracy, clarity and discrimination, to interpret data, to appraise evidence and evaluate arguments, to recognize the existence (or non-existence) of logical relationships between propositions, to draw warranted conclusions and generalizations, to reconstruct one’s pattern of beliefs on the basis of wider experience, and to render accurate judgments about specific things and qualities in everyday life.

4.3.6 Principles of Reaction

Principle of reaction tells the teacher how to regard the learner and how to respond to what the learner does. During the first phase, the teacher motivates the students to use their acquired data to explore a problem situation, event, or issue. Teacher facilitates the new information through computer assisted instruction strategy followed by a group discussion. Here the teacher is the designer of computer assisted instruction learning material and a facilitator. In the group discussion stage teacher provides opportunities for students with diverse experiences to share their different understandings and broaden the perspective of the entire class. During this stage, the teacher may choose to assign roles to the individual students working in a group or let students choose the role according to their strengths or interests. Students may assume the recorder, reader, or group manager role.

The task of the teacher in the second and third phase is to help the students to explore and analyze the problem through Futures Wheel exercise. Pupil is provided with lots of freedom to probe into the problem situation collectively and allow them to construct their own viewpoints regarding the problem. During the final phase students brings closure to the lesson by summarizing the generalizations and presenting the scenarios. The teacher encourages the students to for caste the future trend or consequence of the problem by making connections from prior understanding to new situations that encourage the application of concepts and problem solving skills with a future perspective through natural sense of curiosity and exploration.

4.3.7 Social System

A teacher using the Synthetic Model plays different roles, which ranges from planner, designer, facilitator and challenger to manager. The
social system is democratic and governed by decisions developed from or at least validated by the group within boundaries and in relation to puzzling through preparing Futures Wheel. The activities of the group emerge with a computer assisted learning atmosphere provided by teacher. Teacher planes the learning activities and according to these designs a computer assisted learning material on the subject matter. Teacher is a facilitator for group activity. Teacher distributes the activity equally between teacher and students by encouraging a great deal of social and intellectual independence. Students and teacher have equal status except for role differences.

In a changing social order, it is very much essential that, the younger generation should be aware of their future roles and responsibilities in nation building. In the synthetic model, the students are given the freedom to interact among themselves. Students assume the roles as, explorer, analyzer, evaluator, predictor, manager and forecaster of future. Students act as an explorer of the on developing scientific attitude among students through exploring the present situations and able to forecast the future events or trends. The students confronts with the problems which may have bearing on future world. The problem may fall under the area of any discipline or interdisciplinary, nature. They analyze the problem in group and logically arrange the data gathered and try to put forward suitable solutions.

The Synthetic Model has moderate structure and, rigorously co-operative intellectual atmosphere. The teacher and students participate as equals where the trends or events related to the problem under exploration are analyzed in a scientific way. The futures wheel activities provide the students to assert and evaluate their current beliefs, understandings and misconceptions of about the problem situation. Our class rooms are communities of students, brought together to explore the world around us and learn how to navigate it effectively educators need to be competent to meet the challenges raised by the society in front of the future generation in a futuristic perspective.

**4.3.8 Support system**

The main requirement of the synthetic model is computer assisted learning material related to the topic and chart paper for the preparation of futures wheel charts.
4.3.9 Instructional effects.

The Synthetic Model developed by blending of CAI with Futures Wheel Method is an art of analyzing and evaluating future with a view to improving it. The effect of a learning environment can be designed to come from the content and skills on which the activities are based or, effects can be implicit in the learning environment. Learning through Synthetic Model provides the combined effect of computer assisted instruction model and Futures Wheel methods. Most philosophers can agree that one aspect of Futures Wheel Method is the ability to analyze, understand and evaluate an issue, event or an argument. Through the Futures Wheel exercises, students actually improve their abilities to analyze the problem in an effective way. The rapid emergence of technological innovations particularly digital technologies over the last half century has had a huge impact on the possibilities for learning in the distributed environment. Synthetic Model encourages positive scientific attitudes by promoting curiosity, corporation among the group member’s confidence, responsibility, discourse, active participation, questioning, decision making, persistence, self reliance, independence and future forecasting skills in the class room.

The Synthetic Model effectively facilitates learner interactions within a computer assisted learning environment. When considering solutions to an urgent needy problem without time for a generous development cycle, more important; content is emergent and unstable, the Synthetic Model therefore, is suitable to provide teachers with access to emergent expertise to boost the knowledge and confidence of students for solving that problem. Will this learning outcomes last long term? A good effect to remember is that product information tends to be fickle, while such concepts as a perceived through futuristic learning base possess more staying power. In the information era with the changing life conditions in all aspects of life, Futuristic problem solving skills is not a luxury but a requirement that should not be neglected. One of the greatest experiences for students in the classroom is to have the opportunity to think freely and challenge ideas with their own. Aim of Synthetic Model is to teach and develop skills that are essential to lead a successful life in the future. Gough (1991) indicated the significance of teaching life skills as perhaps most importantly in today’s information age; skills are viewed as crucial for educated persons to cope with a rapidly changing world.
4.3.10 Nurturant effect

Encourage students to think around the questions engaging. Students in the group discussions open the door for opportunities to integrate higher order thinking skill across the curriculum. During the discussion phase students are usually involved in sharing their commonly held theories comparing and contrasting their ideas and understanding, justifying their positions and theories analyzing relevant information by choosing avenues of action and explaining alternative solution in forecasting perspective. During the futures wheel exercise, students put their collective reasoning skills into action by implementing a possible solution to the problem. Synthetic Model encourages positive scientific attitudes by promoting curiosity, corporation among the group members, confidence, responsibility, discourse, active, participation, questioning, decision making, persistence, self reliance, independence, future forecasting skills and an excitement in the class room.

- Think through possible impacts of current trends or potential future events
- Develop scientific future forecasting skills
- Organize thoughts about future events or trends;
- Promote curiosity and exploration among students
- Develop co-operative learning skills
- Develop confidence and responsibility,
- Create forecasts within alternative scenarios;
- Show complex interrelationships;
- Develop multi-concepts;
- Nurture a futures-conscious perspective; and
- Aid in group brainstorming.

The Synthetic Model developed by blending Futures Wheel and CAI is one of the most suitable methods for teaching Population Education, because it is an extremely easy way to engage people's thinking about the future. It is easy to use the Synthetic Model to think through the implications of, and organize their thoughts about possible future events or trends. As the least expensive technique to use, it’s also flexible for use in advanced situations as well as in primary school classrooms. After identifying trends or possible future events, students start thinking about, "If this event occurs, then what happens next?" Or they may ask, “What necessarily goes with this event or trend?" Or, "What are the impacts or consequences?" These impacts
compose a mental map of the future, acting as a feedback mechanism to stimulate new thinking among the pupils. In a definitive review of the method, Glenn (1994) proposes that the futures wheel is a structured brainstorming method for organizing opinions about the future. A common approach to operationalising the futures wheel involves identifying trends or possible future events. These trends are then presented to a respondent or a group of individuals. A facilitator is used to ask: ‘If this event occurs, then what happens next? ’, or ‘What are the impacts or consequences? ’. Responses are recorded as a set of sequential chains of impacts radiating out in a linear fashion from the initial trend. Philosophically, one cannot claim certainty of causality. One situation may appear to because by another situation, when in fact they may both be caused by a third situation not visible to the observer. This point in a futures context is well explained by Bertrand de Jouvenel in The Art of Conjecture. The philosopher David Hume in On Human Nature demonstrated that what we call causality is a habit of the mind formed by seeing one thing varies with another.

4.3.11 Teacher’s roles and beliefs

Teachers of the 21st century face the challenge of adapting themselves to the latest needs that consists in using of the Information and Communication Technologies (ICTs), not only in the traditional face-to-face teaching, but also in teaching, application skills (Diaz and Entonado, 2005). Synthetic Model emphasizes on blending of computer assisted instructions with Futures Wheel Method to promote knowledge generation though group activity in a constructivist scenario. Constructivist learning theory marks a significant move away from the dominance of behaviourism in Population Education, emphasising that learners construct their own knowledge, strongly influenced by what they already know. Role of teacher in Synthetic Model is structuring the learning experience, guiding and facilitating; giving direct input on factual issues; supporting students in exploring and synthesizing their ideas (Pegrum and Sporing, 2003). Students should be encouraged by their teachers to construct their own knowledge with the assistance of peer learners by scaffolding the mental models. Many pre-set methods of instructions are static and limit the opportunities for interaction and knowledge construction (Lauzon, 1992; Garrison, 1993; Burge, 1988; Bullen, 1998). The CAI based learning presumes a high level of independence and motivation on the part of the learner, but in reaching most of the teacher’s energies may need to go into building and maintaining such independence and motivation even for students who have no other means of
participation (Ham and Davey, 2005). The use of computer technology act as presentation and storage tools and advance to the next level by using them as interactive tools. Keegan (1993) declared ‘Without a medium of communication the concept “education” would not be an educational process. Only a minimum of the capacity and the capability of technologies have been utilized to support learning. It is critical to take further steps to examine the issues of integrating CAI to encourage, stimulate and regenerate high quality interactions (Chih-Hsiung Tu, 2005). The more interaction and communication in teaching, the more desired adaptation will be (Bernat, and Fichten, 1999). Knowledge can better be defined as a dynamic process driven by each human being in a unique way. It should be realized that pure technology based teaching is not suitable to acquire all the necessary attitudes and skills required for many fields of knowledge (Trindade et al., 2000). Attrition rates and low participation levels in course activities are frequent teacher complaints about technology supported learning environments (Bonk and Dennen, 1999).

Motivating learner towards attaining social values is a key challenge facing teachers. Martin and Briggs (1986) state that “motivation is a hypothetical construct that broadly refers to those internal and external conditions that influence the arousal, direction and maintenance of value based behaviour” (Cornell and Martin, 1997). Key problem learners encounter include not knowing participation expectations. Sometimes, CAI often suffers from a lack of value motivational elements, because instructors are unsure of how to manipulate this instructional medium and in part because adequate instructor support is not yet available. The blend between CAI and Futures Wheel minimizes this problem and ensures necessary elements of teacher interaction. The efforts of teacher modelling of desired activities and peer participation can motivate the reluctant learner to become more active and value based (Dennen and Bonk, 2007). Feedback in the form of scenarios analysis motivates learners by letting them know how well their performance meets course expectations (Anderson, 2001; Dennen and Bonk, 2004). Feedback opportunities are typically built into Synthetic Model for students. The advanced discussion phase and the scenario presentation phase ensures high level feedback generation among the learners. This feedback helps them gauge their own performance and motivates them to either maintain or improve the quality of their learning episode. Brown (2002) indicates that threaded discussion forums also are highly effective in providing formative course feedback. Teachers provide necessary feedbacks
to the learners during their discussion participation and at the evaluation phase.

4.3.12 Summary of Synthetic Model

4.3.12.1 Syntax

Phase One: Identification of Concepts, Trends, Events or Issues Related to the Problem.

Teacher presents the topic and briefly explains the important ideas related to the topic.

Phase Two: State the Navigation Question.

Through stating the navigating question, the problem is presented in a suitable form so that a range of different ideas concerning the problem can be obtained. The navigation question stimulates the thinking processes of each student.

Phase Three: Presentation of the Computes Assisted Learning Material Related to the Topic.

Presentation of the computer assisted learning material related to the topic enable students to build on a common experience as they go about their investigation through the navigation question. This presentation stage helps to get a common idea in a culturally diverse classroom.

Phase Four: Idea Generation through Group Discussion.

The learners are divided into small groups with 4 to 6 members. Each group led by a chairperson, and allows each group to discuss the problem under study. The navigation question placed before the group with a view to maintain the tempo for generating more novel and unique ideas.

Phase Five: Writing the Futures Wheel Chart

During this stage, students write the Futures Wheel chart and work without direct instruction from the teacher. They analyses the evidence and data, recording and organizing information, sharing observations, and working in cooperative groups.
Phase Six: Analysis of Futures Wheel chart and presentation of the scenario.

Each group presents their futures wheel in front of the whole class and makes necessary modifications according to it. The whole class think through possible future social trends related to the topic. Based on the futures wheel analyses of all groups, the whole students prepare the scenario about the problem.

Phase Seven: Evaluation

Teacher evaluates the student’s behaviour and attitudes in new situation through a formative evaluation.

4.3.12.2 Social System

In Synthetic Model teacher plays different roles, which ranges from planner, designer, facilitator and challenger to manager. The social system is democratic and governed by decisions developed from or at least validated by the group within boundaries and in relation to puzzling through preparing Futures Wheel. The activities of the group emerge with a computer assisted learning atmosphere provided by teacher. Teacher facilitates the group activity. Students may assume the recorder, reader, or group manager’s role.

4.3.12.3 Principles of Reaction

During the first phase, the teacher motivates the students to explore a problem. Teacher facilitates the new information through computer assisted instruction strategy followed by a group discussion. Here the teacher is the designer of computer assisted instruction learning material and a facilitator. The task of the teacher is to help the students to explore and analyze the problem. Pupil is provided with lots of freedom to probe into the problem situation collectively and allow them to construct their own view points regarding the problem. During the final phase students brings closure to the lesson by summarizing the generalizations and presenting the scenarios.

4.3.12.4 Support system

The main requirement of the synthetic model is computer assisted learning material related to the topic and chart paper for the preparation of futures wheel charts.
4.3.12.5 Instructional and Nurturant effects.

The Synthetic Model developed by blending of CAI with Futures Wheel Method is an art of analyzing and evaluating future with a view to improving it. Learning through Synthetic Model provides the combined effect of computer assisted instruction model and Futures Wheel methods.

![Diagram of Synthetic Model](image)

- Encourages positive scientific attitude
- Promotes future decision making power
- Develops critical thinking skill
- Promotes problem solving skill
- Promote curiosity and exploration
- Develop co-operative learning skills
- Develops future forecasting skills
- Develops knowledge about concepts, issues, trends, or problems

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Instructional effects

Nurturant effects.

Figure 4.7 Instructional and Nurturant effects of Synthetic Model

The details of preparation of sample lesson designs based on Synthetic Model are given below. Computer Assisted Learning Material prepared for teaching each subunit is given in APPENDIX-VII.
MAHATMA GANDHI UNIVERSITY
SCHOOL OF PEDAGOGICAL SCIENCES
KOTTAYAM, KERALA

SAMPLE LESSON DESIGNS BASED ON
SYNTHETIC MODEL
FOR TEACHING
POPULATION EDUCATION

Prepared by
REGI P MATHEW and Dr A SUDHARMA
Sample Lesson Designs for Teaching Population Education

Based on Synthetic Model

Name of the Teacher : Standard: IX
Name of the School : Division : 
Subject : Geography Duration: 45minute
Topic : Overpopulation in India Date : 

Name of the Sub-Unit 1:  Population Situation in India

In this unit the students will learn about,

- Population bomb-a big threat to ecological balance.
- Causes of over population in India.
- Consequences of overpopulation in India.
- How to solve overpopulation in India?

Instructional effect

By the end of this sub-unit the students should be able to …

1. Create an awareness about population situation in India
2. Understand the problem of overpopulation in India and the strategies adopted to meet this critical situation.
3. Analyse the major causes of overpopulation.
4. Understand the consequences of overpopulation.
5. Develop a keen insight into the inter relationship between overpopulation and socio-economic welfare vis- a-vis the individual, the nation and the world.
6. Develop awareness about the difficulties faced by the country due to overpopulation in India.
7. Think through possible impacts of current population growth in India
8. Develop a healthy rational and scientific attitude towards the problem of overpopulation.

Nurturant effect

By the end of this sub-unit the students should be able to …

1. Organize thoughts about the relationship between overpopulation and socio-economic development of India.
2. Promote curiosity and exploration about the future changes in our country
3. Develop co-operative learning skills
4. Develop individual responsibility in nation building
5. Forecasts within alternative scenarios about future events.
6. Explores complex interrelationships between overpopulation and socio-economic development of India.
7. Develops scientific enquiry skills
8. Nurtures a future-conscious perspective; and
9. Realizes the importance of small family norm

**SYNTAX**

**Phase I: Identification of concepts, trends, or issues related to the problem**

Teacher introduces the topic **Population Situation in India** and promotes curiosity and exploration about the future population changes in our country.

Teacher highlights the demographic picture of India.

Teacher briefly explains the problems and consequences of overpopulation in India.

The pupils:

1. Identify the issue of overpopulation in India.
2. Analyses the problems and consequences of overpopulation in India.
3. Understand the problem of overpopulation in India and the strategies adopted to meet this critical situation.

**Phase II: State the Navigation Question**

Teacher states the Navigation Question "**What would happen in future if the present population growth continues in India?**"

The Pupils:

- Think through possible impacts of current population growth in India.
- Brainstorm about Navigation Question.
Phase III: Presentation of the Computer Assisted Learning Material

Teacher presents the Computer Assisted Learning Material on the topic ‘Population Situation in India’ for the students with adequate explanation. The Computer Assisted Learning Material is given in Appendix-VII.

Phase IV: Idea Generation through Group Discussion.

Teacher divides the class into discussion groups of 4 to 6 members with each group led by a chairperson. Teacher encourages each group to discuss the issue "What would happen if the present population growth continues in India?" students examine the solutions for navigating question and they work without direct instruction from the teacher.

The Pupils:
1. Explores complex interrelationships between overpopulation and socio-economic development of India through group discussion.
2. Develops scientific enquiry skills.

Phase V – Futures Wheel Exercise

During this stage, teacher supply chart paper to each group for doing Futures Wheel Exercise. Students collectively analyze the problems and consequences of overpopulation in India by sharing their observations, and organizing information in cooperative groups. They record their observations in the chart paper by doing Futures Wheel Exercise.

The pupils:
1. Develop co-operative learning skills.
2. Develop individual responsibility in nation building.
3. Forecast within alternative scenarios about future events.
FUTURES WHEEL DEPICT THE CONSEQUENCES OF OVERPOPULATION IN INDIA

- Loss of social welfare
- Poverty
- Increasing crime
- Social unrest
- Global warming
- Ozone whole
- Change in climate
- Low standard of living
- Unemployment
- Low per capita income
- Ecological imbalance
- Pollution
- Health problems
- Depletion of natural resources
- Acid rain
- Health problems
- Health problems
- Ecological imbalance
- Problem of shelter
- Deforestation
- Inequality
- Scarcity of oil
- Global inflation
- War between nations for oil monopoly
- Growth of slums
- Loss of social welfare
- Inflation
- Scarcity of food
- Low agricultural production
- Problem of shelter
- Deforestation
- Inequality
- Scarcity of oil
- Global inflation
- War between nations for oil monopoly
- Growth of slums
- Loss of social welfare
- Inflation
- Scarcity of food
- Low agricultural production
- Problem of shelter
- Deforestation
- Inequality
- Scarcity of oil
- Global inflation
- War between nations for oil monopoly
- Growth of slums
- Loss of social welfare
- Inflation
- Scarcity of food
- Low agricultural production
- Problem of shelter
- Deforestation
- Inequality
- Scarcity of oil
- Global inflation
- War between nations for oil monopoly
- Growth of slums
- Loss of social welfare
- Inflation
- Scarcity of food
- Low agricultural production
- Problem of shelter
- Deforestation
- Inequality
- Scarcity of oil
- Global inflation
- War between nations for oil monopoly
- Growth of slums
Phase VI : Analysis of futures wheel and presentation of the scenario.

After the Futures Wheel Exercise each group think through the implications of, and organize thoughts about possible future social events or trends related to the problem of environmental problems created by overpopulation. Each group suggest plans to accelerate desirable consequences and to check undesirable consequences each group presents their futures wheel analysis in front of the whole class. Based on the futures wheel presentation of all groups, students prepare the scenario about the problem of overpopulation in India.

In November 2011 the world population reached 7 billion i.e. 700 crore. Among the world nations, Indians are number two with 1,2,17,42,4708 people on 2011. India is the home of 17.5% of world’s population with only 2.42 per cent of the world’s land area. Today India ranked second in the world after China. If the current population trend continues, India will beat up China by 2025 A.D., making India the most populous nation in the world.

India is facing intense problem of population outburst. Our civilization is being squeezed between rising population densities. Many factors are directly or indirectly associated with causes of over population in India. They are illiteracy, poverty, rural backwardness, unemployment, superstitions, preference for sons, orthodox mentality, joint family system, religious restrictions regarding family planning, early marriage, polygamy, and lack of health consciousness, low death rate and high birth rate, and low status of women. If the population issue is ignored, it will have dangerous consequences. In large part of India, people have strong preference for sons which leads to population growth.

Population adversely affects the welfare of our nation. People often experience a shortage of employment opportunities, but they should understand that job opportunity is not related to population. Many young men and women do not get employment according to their education therefore they involve in criminal activities and become drug peddler. Overpopulation can cause many problems that people are not aware. They are: increasing unemployment, poverty, economic inequality, scarcity of food, inflation, depletion of natural resources, energy crisis, environmental pollution, ecological imbalance, scarcity of land and water, social unrest, crime, starvation, growth of slums, malnutrition, health and hygiene issues.
India should take better precaution to curb the increasing number of people. The government should therefore be strict with laws to limit over population without hurting the feeling of the general public. The government should implement effective awareness programs through media and education to reduce unplanned births and also they should try to provide assistance to people. Population control program is essential because of the growing problems related to social welfare and economic problems. Unless the size of population is brought under control, no progress can be attained by our country.

Phase VII : Evaluation

Teacher evaluates the student’s behaviour and attitudes in new situation through a formative evaluation.
Lesson Designs in Population Education
Based on Synthetic Model

Name of the teacher : Standard: IX
Name of the School : Division :
Subject : Chemistry Duration: 45 Minute
Name of the Sub- Unit 2 : Overpopulation and Date :
Its effect on environment

In this unit the pupils will learn about,

- Stress on environment due to population explosion
- Types of pollution
- Air pollution: causes
- Main effects of air pollution
- Green house effect, Global warming, Acid rain
- Remedial measures to solve air pollution

Instructional effect

By the end of this sub-unit the pupils should…

1. Understand the relationship between overpopulation and environmental pollution
2. Understand various types of pollution
3. Identify the causes and effects of air pollution
4. Realise the need and importance of protecting nature from pollution
5. Identify the remedial measures to protect nature from pollution

Nurturent effect

By the end of this sub-unit the pupils should…

1. Develop a positive attitude to save the nature
2. Think through possible impacts of current growing environmental pollution on potential future events.
3. Develop future forecasting skills related to ecological trends.
4. Organize thoughts about the relationship between overpopulation and environmental pollution.
5. Promote curiosity and exploration about the future changes in our environment.
6. Develop co-operative learning skills
7. Develop confidence and responsibility,
8. Develop scientific enquiry skills
9. Develop multi-concepts
10. Aid in group brainstorming

SYNTAX

Phase I: identification of concepts, trends, events or issues related to the problem

Teacher introduces the issue Overpopulation and its ill effect on our environment

Teacher encourages the students to elicit various types of pollution with examples and promote curiosity and exploration about the future changes in our environment

The pupils:
1. Identify the issue air pollution and analyze the sources of air pollution
2. Analyze the ill effects of air pollution
3. Develop a positive attitude to save the nature

Pupils classify various types of pollution with examples. They are smoke from vehicles and factories, burning of plastic etc.

Teacher defines the term pollution. When air is contaminated by unwanted substances which have a harmful effect on both the living and non–living, it is referred to as air pollution. The substances which contaminate the air are called air pollutants.
Phase II: State the Navigation Question.

Teacher states the Navigation Question "What would happen to the environment in future if pollution continues?"

Pupils brainstorm about the Navigation Question and think through possible impacts of current growing environmental pollution on potential future events.

Phase III: Presentation of the Computer Assisted Learning Material.

Teacher presents the Computer Assisted Learning Material on the topic ‘Overpopulation and its ill effect on environment’ for the students.

The pupils organize thoughts about the relationship between overpopulation and environmental pollution.

Phase IV: Idea Generation through Group Discussion.

Teacher divides the class into discussion groups of 4 to 6 members with each group led by a chairperson. Teacher encourages each group to discuss the issue "What would happen to the environment in future if pollution continues?"

Pupils discuss about possible impacts of current growing environmental pollution on potential future events collectively.

Phase V – Futures Wheel Exercise

During this stage, each group examines the solutions for navigating question; and they work without direct instruction from the teacher. They analyses the evidence and data, recording and organizing information, sharing observations, and working in cooperative groups.
ILL EFFECTS OF OVERPOPULATION ON ENVIRONMENT

- Depletion Of Natural Resources
- Deforestation
- Fragmentation of Agricultural Land
- War to Get Oil Monopoly
- Increases Food Prices
- Increases Oil Prices
- Changes Climate
- Reduces Food Production
- Problem of Waste
- Pollution
- Land Pollution
- Water Pollution
- Health Problems
- Radiation
- Ozone Whole
- Acid Rain
- Global Warming
- Air Pollution
- Water Pollution
- Land Pollution
- Health Problems
- Terrorism
- Unhealthy competition
- Poverty
- Scarcity of Food
- Energy Sources Depletion
- Inflation
- Spread Epidemic
- Destroys Land, Air, Water
- Increases Food Prices
- Changes Climate
- Agriculture Failure
- Water Shortage
- Drought
- Health Problems
- Inflation
- Scarcity of Food
- Depletion Increases Oil Prices
- Increases Food Prices
Phase VI  : Analysis of futures wheel and presentation of the scenario.

The Futures Wheel Exercise is an eco-friendly future-conscious perspective activity. Each group thinks through the implications of, and organizes thoughts about possible issues related to the problem of environmental problems created by over population. Each group presents their futures wheel analysis in front of the whole class. Based on the futures wheel presentation of all groups, students prepare the scenario about the problem of environmental pollution. The Futures Wheel Exercise helps to develop cooperative learning skills and scientific enquiry skills.

Most people are not aware of the fact that the environmental problem is associated with growing population. There is a strong link between the global population and climate change. Resources are limited in the environment and if people keep using them all, then there will be a crisis for future generation. Others believe that unmanaged population growth could lead to catastrophe because of the earth’s finite resources. Therefore, it can be said that majority of population is concerned about the impact of overpopulation on their lives, the earth and the future.

Pollution of the environment is one of the most horrible ecological crisis to which we are subjected today. Pollution refers to any undesirable change in the physical, chemical, or biological characteristics of our environment i.e. air, water, and soil which adversely affect humans or other species of our biosphere directly or indirectly. Various types of pollution are air pollution, water pollution, land pollution, noise pollution, visual pollution, odor pollution, indoor pollution, radiation pollution.

The WHO defines air pollution as the presence of materials in the air in such concentration which are harmful to man and his environment. Pollution is also related to overpopulation. As the population grows, the demand for the consumption of energy such as electricity, use of automobiles and other energy resources increases which in turn affects the nature. If population growth is controlled, people can control the ever increasing of burning energy that might hamper their future. Various sources of air pollution are burning fossil fuels, emissions from automobiles and industries, spraying
insecticides, explosives used in wars, and natural causes like gas emissions from volcanoes, marsh gas, spores of fungi and pollens etc.

The ill-effects of air pollution are ozone hole, global warming, and green house effect, and climate change, dust, smog and health problems. Many industries produce gaseous pollutants in the air. It contains sulphur dioxide and nitrogen dioxide. These gaseous pollutants react with the water vapor present in the atmosphere to form sulphuric acid and nitric acid. The acids drop down with rain, making the acid rain. The increase of atmospheric temperature due to the increase of carbon dioxide in the atmosphere is called Green House Effect. The average temperature of the earth and its atmosphere increases due to the green house effect. This is called Global Warming.

To control global warming, population must be controlled. Many countries in the world are global warming polluter, contributing greenhouse gas emissions primarily from transportation, industry and power plant sources. The other thing that people should be concerned about the infrastructure. Automobiles and factories release huge quantity of Carbon monoxide. Carbon monoxide reacts with the hemoglobin in blood and a compound Carboxyhaemoglobin is formed. Due to this, blood loses its ability to absorb oxygen and becomes harmful to health.

Air pollution is the big problem of the present society. It is the need of present day to make social as well as legislative measures to protect the environment. This can be done by following measures:

1. Regular testing, monitoring, controlling of pollution.
2. Popularize scientific waste management practices.
3. Use of biological indicators to monitor pollution.
4. Using of alternate non-conventional sources of energy.
5. Creating environmental awareness through various programmes.
6. Implementation of governmental laws to control pollution.
7. Population growth, which is the main cause of pollution, should be brought under control.
8. Active involvement of individuals, schools and voluntary organizations in environmental protection.
9. More trees should be planted to purify air.
10. Make sure vehicles are serviced properly and regularly
11. Keep environment free from garbage and waste.
Phase VII : Evaluation

Teacher evaluates the student’s behaviour and attitudes in new situation through a formative evaluation.
Sample Lesson Designs for Teaching Population Education
Based on Synthetic Model

Name of the teacher : Standard: IX
Name of the School : Division :
Subject : Biology Duration: 45 Minute
Name of the Sub- Unit 3 : Food Problem in India Date :

In this unit the student will learn about,

- Importance of balanced diet
- What is meant by under nutrition?
- Causes of under nourishment
- Ill effects of under nourishment
- Need for controlling overpopulation in India

Instructional effect

By the end of this sub-unit the students should…

1. Understand the importance of balanced diet
2. Understand the need and significance of proper nutrition
3. Identify the relationship between overpopulation and under nourishment
4. Realise the need for reducing population growth for the welfare of the society
5. Identify the causes and effects of under nourishment.
6. Realise under nourishment lead to bad health and deficiency diseases.

Nurturent effect

By the end of this sub-unit the students should…

1. Develop co-operative learning skills
2. Develop a sense of belongingness towards the basic needs of fellow human beings.
3. Forecast within alternative scenarios about future health status of India if present population growth continues.
4. Develop scientific enquiry skills.
5. Nurture a futures-conscious perspective about the various impact of under nourishment.
6. Aid in group brainstorming.

SYNTAX
Phase I: identification of concepts, trends, events or issues related to the problem

Teacher introduces the issue **Food Problem in India**

Teacher defines the term balanced diet. Balanced diet consists of Carbohydrates, protein, fats, minerals and vitamins in a fixed proportion. On an average, an Indian should get 2400 calories to be fully nourished. If the intake falls below 2400, it becomes a definite case of under nourishment.

The pupils:

1. Identify the issue of food problem in India
2. Analyze the causes of under nourishment.
3. Nurture a futures-conscious perspective about the various impact of under nourishment.

Teacher encourages the students to elicit various causes of under nourishment and helps to develop a sense of belongingness towards the basic needs of fellow human beings.

1. Pupils identify several causes of under nourishment. They are unemployment, inadequate food production, scarcity of food, inflation, poverty, starvation.
2. They explore complex interrelationships between overpopulation and under nourishment.
Phase II: State the Navigation Question.

Teacher states the Navigation Question “What are the causes of under nutrition?”

Pupils brainstorm about the Navigation Question. It provides a direction to the mental process for forecasting future events.

Phase III: Presentation of the Computer Assisted Learning Material.

Teacher presents the Computer Assisted Learning Material on the topic “What are the causes of under nutrition?”

Pupils identify the relationship between overpopulation and under nourishment and realise the need for reducing population growth for the welfare of the society.

Phase IV: Idea Generation through Group Discussion.

During this stage, the teacher assigns roles to the individual students working in a group or let students choose the role according to their strengths or interests. The teacher divides the class into discussion groups of 4 to 6 members with each group led by a chairperson. The teacher encourages each group to discuss cooperatively the issue what are the causes of under nutrition?

Phase V – Futures Wheel Exercise

Each group examines the solutions for navigating question; and they work without direct instruction from the teacher. They establish a chain of learning by linking the evidence and data, recording and organizing information, sharing observations, and working in cooperative groups. Each group thinks through the impact of the problem of under nutrition indirectly created by over population.
CAUSES OF UNDNRUTRITION

- Poverty
- Overpopulation
- Scarcity of Food
- Inflation
- Food Scarcity
- Unemployment
- Massive Death
- Low agricultural production
- Inadequate Food Production
- Starvation
- Frequent diseases
- Spread Epidemic
- Massive death
- Terrorism
- Inflation
- Scarcity of Food
- Social unrest
- Increase crime
- Increase Food Prices
- Social unrest
- Increase crime
Phase VI : Analysis of futures wheel and presentation of the scenario.

Pupils forecast within alternative scenarios about future health status of India if present population growth continues. Each group presents their futures wheel chart in front of the whole class. Based on the futures wheel presentation of all groups, students prepare the scenario about the problem of under nutrition.

Hunger is one of the most acute problems in India. As a nation we are ill fed and ill nourished. Millions of people simply do not get enough to eat, where they have enough to eat; many do not get enough of the right kind of food to eat. In other words many are under nourished. The uneven growth of population and inequitable distribution of food production creates many problems. Currently world population is growing over 80 million per year—that is by one billion (100 crores) people every 12 to 13 years. This rapid population growth in the world leads to serious constraint to increasing agricultural production.

One-third of the world population lack food security now. Thus better distribution of food is an essential component of any world strategy to improve food security. Majority of the population are poor and they are under nourished. Under nutrition is a condition, which occurs when the body does not get the proper kind of food in the amounts needed for maintaining health.

Children, especially, are very vulnerable to the ill effects of malnutrition which is the biggest contributor to child morality in our country. They may be under weight, frequent diseases sleepy and dull performance poor in daily life. The undernourished children are more prone to diseases than the nourished ones. To remain healthy you have to eat a balanced diet. Balanced diet consists of Carbohydrates, protein, fats, minerals and vitamins in a fixed proportion. We must eat a variety of food stuff like cereals, pulses, green vegetable, fruits, milk, egg, fish, and meat.

The major causes of under nutrition are overpopulation, unemployment, and inadequate food, supply, and scarcity of food, inflation, poverty, and starvation. To solve our food problem, two prolonged strategy is essential. On the one hand we have to produce more food and on the other we should control population progressively.
decreasing the rate of its multiplication. It is very difficult to increase our food capacity due to the scarcity of cultivable land. Thus the only solution for food problem is controlling ever increasing population.

**Phase VII : Evaluation**

Teacher evaluates the student’s behaviour and attitudes in new situation through a formative evaluation.
Lesson Designs in Population Education

Based on Synthetic Model

Name of the teacher : Standard: IX
Name of the School : Division :
Subject : Economics Duration: 45 minute
Topic : Overpopulation in India Date :

Name of the Sub-Unit IV: Overpopulation and Poverty

________________________________________________________________________

In this unit the students will learn about,

- Poverty - A Multi – Dimensional Problem
- Causes of Poverty In India
- Ill –Effects of Poverty
- Measuring Poverty in India
- What is Poverty Ratio?
- Relationship between Population Explosion and Poverty
- Major Poverty Eradication Programmes of the Indian Government

Instructional effect

By the end of this sub-unit the students should be able to …

1. Create awareness about relationship between poverty and overpopulation
2. Identify the multidimensional problems of poverty
3. Derive to measure poverty line and poverty ratio
4. Develop a sense of belongingness to the poor people
5. Develop an attitude to help the poor people
6. Sympathise toward the sufferings of poor people
7. Identify the relationship between overpopulation and poverty
8. Analyse the major causes of poverty
9. Understand the problem of poverty in India and the strategies adopted to meet this critical situation

Nurturant effect

By the end of this sub-unit the students should be able to …
1. Organize thoughts about the relationship between overpopulation and socio-economic development of India.
2. Construct future perspective in a critical way.
3. Develop co-operative learning skills
4. Develop confidence and responsibility in nation building,
5. Forecast within alternative scenarios about future.
6. Explore complex interrelationships between overpopulation and poverty
7. Develop scientific enquiry skills
8. Realize the importance of small family norm

**SYNTAX**

**Phase I: Identification of trends, events or issues related to the problem**

The pupils:

1. Identify and create awareness about relationship between poverty and overpopulation
2. Identify the multidimensional problems of poverty
3. Analyze the problems and consequences of poverty India.
4. Understand the problem of poverty in India and the strategies adopted to meet this critical situation.

Teacher introduces the topic **Relationship between Poverty and Overpopulation in India**

Teacher defines the term poverty and gives a brief description about the causes and effect of poverty in India.

Poverty means a situation where human being experience hunger, do not have enough clothes, do not have a house, do not have access to drinking water, do not have access to medical facilities, do not have access to education, are not able to get a job, are denied opportunities, are denied freedom.
Phase II: State the Navigation Question.

Teacher states the Navigation Question: "Is there any relationship between poverty and overpopulation in India?"

Pupil brainstorms about the relationship between poverty and overpopulation.

Phase III: Presentation of the Computer Assisted Instruction Material.

Teacher presents the Computer Assisted Instruction Material on the topic ‘Relationship between Poverty and Overpopulation’ for the students.

Phase IV: Idea Generation through Group Discussion.

Teacher divides the class into discussion groups of 4 to 6 members with each group led by a chairperson. Teacher encourages each group to discuss the issue "Is there any relationship between poverty and overpopulation in India?"

Phase V – Futures Wheel Exercise

During this stage, students examine the solutions for navigating question and they work without direct instruction from the teacher. They analyses the issue, by organizing information, sharing observations, and working in cooperative groups.
Phase VI : Analysis of futures wheel and presentation of the scenario.

The teacher encourages the students to forecast about the interrelationship between poverty and overpopulation by making connections from prior understanding to new situations that encourage the application of concepts and problem solving skills with a future perspective through natural sense of curiosity and exploration. Each group presents their futures wheel analysis in front of the whole class. Based on the futures wheel presentation of all groups, students prepare the scenario about the issue.

Presentation of the scenario about the problem

India is facing intense problem of population outburst. People are experiencing the crisis such as unemployment, poverty, shortage of food and also severe starvation that are all related to the ever-increasing population. Our civilization is being squeezed between rising population densities. It can be said that if such trends continue, there will be a severe shortage of employment opportunities. The eruption of population has affected the standard of living of the people. Village people started migrating to cities where they can get employment. Today, in some places, people have started fighting for food, water and place to live.

Many social and economic problems are directly or indirectly associated with over population. Some issues are relating to crime growth and also less of employment opportunities. Therefore, the only best thing to do in such a case is to better educate them with the merits of smaller family. The need to address the family planning scenario has become a very important concern and many countries have joined hand in taking up the matter to educate the general public about the consequences of having a large family. Therefore, government should impose the law that a family shall not have more than one or two kids so that they can curb the population growth and also save the
environment from the misuse of the energy by millions of people. People survive on food and water. If stern action is not taken from the government to regulate population control then the country will become unrecognizable slums filled with broken-down housing, bad transportation, and hungry and thirsty people living on the filthy edge of human survival. If better facilitates are not provided then many young people take up the path of crime just to sustain themselves and this also becomes a major concern of the government as the inmate population also increase and they have to build various other infrastructure to hold them. However, the major concern regarding over population is that of nature and shortage of food and water.

Developing country like India, should take better precaution to curb the increasing number of people as many would thing that they might find opportunities in these areas because they are still yet to be developed. The government should therefore be strict with laws to limit over population without hurting the feeling of the general public. Many of the goals and assumptions of national population control programs do not correspond exactly with local attitudes toward birth control. The government should implement program to reduce unplanned births and also they should try to provide assistance to people. Population control program is essential to meet the future population crisis. If this issue is ignored, it will have dangerous consequences.

**Phase VII : Evaluation**

Teacher evaluates the student’s behaviour and attitudes in new situation through a formative evaluation.
The sample lesson designs based on synthetic model consist of all the basic elements of teaching models. The social system, principles of reaction and support system are common to all the above lesson designs based on synthetic model. A brief explanation of the social system, principles of reaction and support system are given below:

**Social system**

Teacher plays different roles, which ranges from planner, designer, facilitator and challenger to manager. The social system is democratic and governed by decisions developed from or at least validated by the group within boundaries and in relation to puzzling through preparing Futures Wheel. Teacher distributes the activity equally between teacher and students by encouraging a great deal of social and intellectual interdependence. Students and teacher have equal status except for role differences.

**Principles of reaction**

During the first phase, the teacher motivates the students to use their acquired data to explore a problem situation, event, or issue. Teacher facilitates the new information through computer assisted instruction strategy followed by a group discussion. Here the teacher is the designer of computer assisted instruction learning material and a facilitator. In the group discussion stage teacher provides opportunities for students with diverse experiences to share their different understandings and broaden the perspective of the entire class.

Students may assume the role of futures wheel writer, scenario presenter, or group chairman role. The task of the teacher in the third and fourth phase is to help the students to explore and analyze the problem through Futures Wheel exercise. Pupil is provided with lots of freedom to probe into the problem situation collectively and allow them to construct their own viewpoints regarding the problem. During the final phase students brings closure to the lesson by summarizing the generalizations and presenting the scenarios.
Support system

The main requirement of the synthetic model is **Computer Assisted Instruction Material** related to the topic and **Chart Papers** to do Futures Wheel exercises.

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**Note:** Investigator developed the Synthetic Model Lesson Designs for teaching Population Education by blending Computer Assisted Instruction Model and Futures Wheel Method. While blending Synthetic Model lesson designs, investigator used the same Lesson Designs used for teaching Computer Assisted Instruction Model group and Futures Wheel Method group (given in Appendices VII & VIII).