Course: Population Education-II (6574)
Semester: Autumn, 2021

ASSIGNMENT No. 2

Q.1 What are the different parameters of social systems unbalancing the population in different countries of South Asia?

Population cha The Alberta tar sands (or bituminous sands) in the northeast of the province have been recognized as an important petroleum resource since the 19th century when the first extensive surveys were made. They cover about 140,000 square kilometers of boreal forest and muskeg, largely in the Athabasca River basin. The petroleum is in the form of crude bitumen, which is a dense, tar-like substance mixed with sand and clay. Extracting bitumen and heavy oils from the tar sands requires pit mining or surface mining; processing the ore with water, steam, and caustic soda; and storing the toxic by-products in tailings ponds. In 1967, when Suncor began the first intensive commercial development of the tar sands, oil was just over $3 a barrel and the high cost of production limited the rate at which the resource was developed. In 1967, Suncor was producing 15,000 barrels/day. Today at prices that sometimes exceed $100 a barrel, production is projected to double from the present 1.9 million barrels/day to 3.8 million barrels/day by 2023. Industry projects that eventually 9 million barrels of bitumen will be produced per day.

The controversy over developing the tar sands sets two competing logics against one another: environmental sustainability versus capital accumulation. **Environmental sustainability** is the degree to which a human activity can be sustained without damaging or undermining basic ecological support systems. Environmental critics of the tar sands development note that the process of bitumen extraction requires vast amounts of energy, fresh water, and land, while producing significant environmental impacts in the form of greenhouse gases, reduction in air quality, destruction of peat bogs and wetlands, and accumulation of toxic waste in tailings ponds (Grant, Angen, and Dyer 2013). There are also health impacts: local aboriginal groups have experienced a 30 percent greater risk of cancer over expected cancer rates since 1998 (Droitsch and Simieritsch 2010). These are factors in addition to the basic problem of sustainability—they involve human reliance on fossil fuels in the face of potentially catastrophic climate change.

On the other hand, Canada has a capitalist economy based on private investment and **capital accumulation** (although both the federal and provincial governments have invested in tar sands development at various times). Capital accumulation refers to the reinvestment of profit in order to increase capital assets (rather than for any specific social use). Since 1996 when capital investment exceeded $1 billion per year for the first time, investment has continued to increase reaching $4.2 billion/year in 2000 and $16 billion/year between 2006 and 2008. Net profits for the industry increased from $3.1 billion to $37.8 billion between 1998 and 2008. Over the same period, the number of people directly employed in tar sands operations rose from 6,000 to 12,000, not including spin-off jobs in construction and maintenance of facilities and other services. Royalties and other land-related payments to the government of Alberta were $3.8 billion in 2008 (Gosselin et al. 2010).

During this period when the price of oil was high, the tar sands boomed economically. Industry representatives argued that building refineries in Alberta to refine the raw bitumen rather than piping it to distant refineries would "overheat" the economy (i.e., create too many jobs). Some pointed to the "Dutch disease" effect of this economic development (i.e., that the artificially high petro-dollar was responsible for undermining other important sectors of the economy, notably manufacturing in Ontario and Quebec) (Stanford 2012), and others pointed to the problem of foreign ownership of Canadian resources (two-thirds of tar sands production is owned by foreign corporations) (De Souza 2012). The overall argument from the point of view of capital accumulation is that the benefits to the Canadian economy outweigh the drawbacks. However, the precarious nature of the oil export economy was revealed when the collapse of oil prices in 2014, like in 1986, lead to a massive flight of capital investment out of Alberta (along with tens of thousands of layoffs and loss of tax royalties to the province). As oil is an export commodity whose price depends on the logic of market values, it is a fundamentally unstable source of capital accumulation.

nge often has weighty consequences throughout a society. As we think about population change, we usually think about and worry about population growth, but population decline is also a concern. Consider the experience of Michigan. Like several other northern states, Michigan has lost population during the past few decades. Its birth rate has declined by 21 percent from 1990, and elementary school populations dropped as a result. Several schools lost so many students that they had to close, and others are in danger of closing. In addition, many more people have been moving out of Michigan than moving in. Because many of those moving out are young, college-educated adults, they take with them hundreds of millions of dollars in paychecks away from Michigan's economy and tax revenue base. They also leave behind empty houses and apartments that help depress the state's real estate market. Because of the loss of younger residents from the declining birth rate and out-migration, Michigan's population has become older on the average. This shift means that there is now a greater percentage of residents in their older years who need state services.

Among other consequences, then, Michigan's population decline has affected its economy, educational system, and services for its older residents. While Michigan and other states are shrinking, states in the southern and western regions of the nation are growing, with their large cities becoming even larger. This population growth also has consequences. For example, schools become more crowded, pressuring communities to hire more teachers and either enlarge existing schools or build new ones. The population growth also strains hospitals, social services, and many other sectors of society.

A critical sociologist will note that disequilibrium in a society's relationship with the environment does not "just happen." There are vested interests that promote unrestricted exploitation of natural resources for short-term private profit. Capitalism is a system in which non-economic values—community life, ecological values, long-term sustainability, etc.—have no role in economic calculations of returns on investment. From the critical sociology point of view, changes in the human/nature relationship have to be examined as outcomes of relations of power and patterns of capital investment. Environmental issues are therefore not distributed equally around

the world. Changes in the global mode of production lead to the creation of unsustainable population increases, slum cities, and lax controls on toxic waste in some parts of the world, while in other parts of the world, people consume resources, throw away surplus, and contribute to the problem of global warming at rates that are equally unsustainable.

A symbolic interactionist interested in the day-to-day interaction of groups and individuals might research topics such as how attitudes toward the environment have changed, how individuals negotiate contradictory messages about industrial development and the environment, or how new practices in everyday life (e.g., recycling, smoking, bicycling, the "100-mile" diet, protest activities) emerge as a result of environmental concerns. One interesting question is how discredited theories that challenge research on global warming continue to circulate and produce doubt about the effects of greenhouse gases. Although the days are gone when a premier of Alberta can proclaim that climate science is a hoax, the divide between what is a publicly credible theory and what is not remains more a matter of symbolic interaction than pure science per se.

We recently hit a population milestone of 7 billion humans on Earth's surface. It took approximately 12 years to grow from 6 billion to 7 billion people (United Nations Population Fund 2011). In short, the planet is filling up. It is estimated we will we go from 7 billion to 8 billion by 2025. How will that population be distributed? Where is population the highest? Where is it slowing down? Where will people live? To explore these questions, we turn to **demography**, or the study of populations. Three of the most important components affecting the issues above are fertility, mortality, and migration.

The **fertility rate** of a society is a measure noting the number of children born. The fertility number is generally lower than the fecundity number, which measures the potential number of children that could be born to women of childbearing age. Sociologists measure fertility using the crude birthrate (the number of live births per 1,000 people per year); just as fertility measures childbearing, the **mortality rate** is a measure of the number of people who die. The crude death rate is a number derived from the number of deaths per 1,000 people per year. When analyzed together, fertility and mortality rates help researchers understand the overall growth occurring in a population.

Another key element in studying populations is the movement of people into and out of an area. This movement is called **migration**. Migration may take the form of immigration, which describes movement into an area to take up permanent residence, or emigration, which refers to movement out of an area to another place of permanent residence. Migration might be voluntary (as when university students study abroad), involuntary (as when Somalians left the drought and famine-stricken portion of their nation to stay in refugee camps), or forced (as when many First Nations were removed from the lands they had lived in for generations).

The **growth rate** of a population, or how much the population of defined area grows or shrinks in a specific time period, is therefore a function of the number of births and deaths as well as the number of people migrating to and from a country. It is calculated as the current population minus the initial population (at the beginning of the time period) divided by the initial population.

Q.2 What is an ecosystem? Analyze the impact of population phenomenon on the ecosystem in Pakistan with special reference to energy and chemical cycling.

The simplest definition of an ecosystem is that it is a community or group of living organisms that live in and interact with each other in a specific environment.

For instance, tropical forests are ecosystems made up of living beings such as trees, plants, animals, insects and micro-organisms that are in constant interaction between themselves and that are affected by other physical (sun, temperature) or chemical (oxygen or nutrients) components.

An ecosystem is **the basic unit** of the field of the scientific study of nature. According to this discipline, an ecosystem is a physically defined environment, made up of two inseparable components:

- **The biotope (abiotic):** a particular physical environment with specific physical characteristics such as the climate, temperature, humidity, concentration of nutrients or pH.
- **The biocenosis (biotic):** a set of living organisms such as animals, plants or micro-organisms, that are in constant interaction and are, therefore, in a situation of interdependence.

The concept of < **ecosystem** > is possible at several scales of magnitude. From multicellular organisms such as insects animals or plants to lakes, mountain ranges or forests to the planet Earth as a whole.

Together with freshwater ecosystems, marine ecosystems are also part of the broader category of aquatic ecosystems. Marine ecosystems cover more than **70%** of the Earth's surface and have a high salt content. **Some examples** of marine ecosystems are offshore systems like the ocean surface, the deep sea, pelagic oceans or the seafloor. But there are also nearshore systems like coral reefs, mangroves or seagrass meadows.

Marine ecosystems can too be **characterized following the abiotic and biotic dimensions** mentioned above. In this way, its biotic components are organisms and their species, predators, parasites, and competitors. On the contrary, the concentration of nutrients, the temperature, sunlight, turbulence, salinity and density are its abiotic components.

Natural ecosystems are "balanced" systems. This means the interactions between the different organisms that make up the ecosystem contribute to a certain stability. For example, in grassland ecosystems, herbivores consume grass, but also feed the **soil** with their droppings, which allows the grass to grow back and allows some sort of balance. Still, this doesn't mean an ecosystem, even a healthy one, is static. In reality, ecosystems are constantly evolving as they are based on dynamic processes that are constantly changing.

For instance, biocenosis are living organisms that interact with their environment and constantly transform it. How? Because animals compact the soil, plants create humidity or regulate the temperature and bacteria help in the microscopic world by protecting all sorts of animals from diseases and helping in their digestion process. As well, an ecosystem also evolves due to external or unforeseen events. A climatic or natural phenomenon, for example, can lead to transformations in the environment. In this way, biocenosis the ecosystem's living organisms to adapt to these new constraints, and change happens.

It's also curious that although an ecosystem is always looking for stability, the ecosystem never perfectly succeeds at it. The various natural imbalances tend to offset each other permanently. Some ecosystems evolve very slowly while others can transform very quickly. Sometimes, in extreme cases, they can even disappear.

According to the law of energy conservation, energy can neither be created nor destroyed. In fact, it can only be transformed or transferred from one form to another. But how does this work in an ecosystem? How does energy flow here? Let's watch this video to better understand this phenomenon.

Today, human activities have such an impact on ecosystems that we now speak of the **Anthropocene timeline**. This is a period that defines the significant human impact of human activities on the Earth's atmospheric, biospheric, geologic and hydrologic systems. This period in time also considers changes happening due to **climate change** events, which is also mainly caused by human activities. We can see all these changes everywhere. When **trees are taken down** in the Amazonian forest, the ecosystems change as species struggle to survive and the local humidity and the climate both change. As well, building a dam also changes the distribution of water and affects the species living along the river's course.

An example often used about how human activities affect ecosystems is the US Yellowstone National Park. Here, as in other national parks, the U.S. Biological Survey decided to kill wolfs and other species as a predator control measure. The problem was that the disappearance of the wolf population affected all the ecosystem in the long run, even changing the course of the local river. The wolf was later reintroduced in the Park, around 70 years later, in an attempt to restore the balance of the ecosystem. Check out the whole story on this video:

Like all other living beings, humans are dependant on natural ecosystem services to survive. We need it to get the food we eat, the water we drink and to transform raw materials into our everyday products. So in order to keep our living conditions, it's truly important that we preserve natural ecosystems.

For example, the agriculture that provides our food depends on the characteristics of a specific ecosystem. Cereals or vegetables grow only under certain conditions of temperature and humidity. They also need certain natural processes, such as pollination, to take place. If we change these characteristics too intensely, there is the risk that we aren't able to produce what we produce today, or at least not in the same way. That's why there are some agricultural techniques that understand and manage food production (such as **agroforestry**, **permaculture** or **regenerative agriculture)** that the wider impacts of using herbicides, pesticides, exhausting nearby water sources or betting on different types of trees that make ecosystems more **resilient**.

According to **FAO**, ecosystem services, worth USD $125 trillion, "make human life possible by, for instance, providing nutritious food and clean water, regulating disease and climate, supporting the pollination of crops and soil formation, and providing recreational, cultural and spiritual benefits."

For all these to be possible, Earth's ecosystems like forest ecosystems, grassland ecosystems, aquatic ecosystems or agroecosystems need to properly function. But the fact is that some ecosystem services are currently under threat.

Without ecosystem services, life on Earth as we know it wouldn't exist. There are four main categories of ecosystem services:

Provisioning services refer to the products secured by ecosystems. These include:

• Water

• Food (including cattle and seafood)

• Pharmaceuticals, biochemicals, and industrial products

• Energy (sunlight, hydropower, biomass)

Regulating services are the ecosystem services that allow the regulation of ecosystem processes such as:

• Climate regulation (and carbon absorption and storage via the oceans, trees, soil)

• Waste decomposition (one of the most essential microbial process happening in soil)

• Crop pollination (performed by agents such as bees that contribute to the reproduction of flowering plants)

• Water and air purification and regulation

• Control of pests and diseases

Supporting and habitat services refer to the ability of ecosystems to give habitat for migratory species and to support the viability of gene-pools.This is possible thanks to:

• Primary reproduction

• Nutrient and seed dispersal

Cultural services are the benefits ecosystem services bring to humans. Examples of these are:

• Inspiration for intellectual (creativity), cultural (entertainment) and spiritual (why) purposes

– Remember how it feels good to seeing and hearing wild birds

– Animals, plants and even the funghi kingdom serve as inspiration in theaters, movies…

– Many people go to natural sites when they want to be alone or reflect about life

Q.3 Critically review the role of different catalytic agents. Do you think they can bring desired behavioral change in the society?

The other articles in this series on Change Management have listed the business imperatives for change as well as the various barriers to change that arise from internal and external resisters. In this article, we examine the other side of driving change and that is to do with the role of people who can act as catalysts in driving change.

Every organization has high performers and those who are steady as well as those who make up the bottom of the performance chart. Though it is not necessarily the case that the top performers are the ones who should drive change, more often than not, that is the case. However, there might be pearls waiting to be discovered as well.

The broader point that we are making is that management and the HR department must institute a program that would identify potential "change agents" who can act as catalysts for the change initiatives which the management might be planning.

Most organizations have lists of employees whom they consider “High Potentials” or “Fast Trackers” which indicate that the people in these lists are being marked for higher positions and they are groomed accordingly. In addition to that, the management along with the HR department can compile a list of people who take initiative in their roles and are not content with merely doing their assigned tasks but are proactive about trying on new ideas and concepts. These people are an asset to any organization and the management must identify such people and get them together to brainstorm about new initiatives and how to make the organization more successful.

The qualities that are needed in such change catalysts are impatience with the status quo, out of the box thinking, a different perspective than others about the strategies that the company is pursuing etc. When we mentioned that such people might not be necessarily the top performers, what we meant is that there might be employees at all levels who given the chance to change the existing paradigm may very well end up as the stars that the company needs. And when there is a need for change, such people turn out to assets that the company had undervalued all the while.

The point about the catalysts for change initiatives is that they have the personal attributes needed to motivate and inspire others to follow their lead. The key point here is that they would be people enablers and leaders as far as leading from the front are concerned. Plus, they would with their infectious attitude towards change be able to convince those who are skeptical about the change initiatives.

Hence, organizations need to rethink their system of rating the employees and include the change agent part of it and maybe, assign it more weight in determining the overall grade of the employee. Though this does not take anything away from the employees who are diligent and produce results, change initiatives can be driven only by a new way of thinking and hence non-linear thinking must be encouraged.

Research has shown that the best way to get the senior managers at all levels interested in the change initiatives is by engaging them and seeking their buy-in for the change management process. Studies have proved that the managers in the upper echelons buy into the change from a strategic perspective where the accent is on performance and hence radical or disruptive change is seen as part and parcel of an organizations development.

Managers at the middle level can be made to see the value inherent in change and hence they can be brought on board. The frontline managers’ views and inputs can be sought and thereby their cooperation and participation in the change obtained. These are the broad outlines and the following detailed sets of approaches can be pursued as well.

Make Them the Hero

By making the managers the change drivers and change initiators is often the best way of securing their buy-in. The point here is that by getting the managers to be the ones who are implementing change and by giving them centre stage, it is possible to secure their participation.

By definition, senior managers are highly capable, motivated and ambitious. By making them the stars of the change process, their innate abilities can be harnessed to the benefit of the organization. It is often better to have a close association with the senior managers to achieve the desired results.

Show them the potential of Change

By selling change and the value of such change to the organizations and themselves the senior managers can be persuaded to accept change. The point to note is that senior managers must be told what their role in the post change scenario would be and by making them see themselves in the future vision, they can be made to play a key part in the change management.

As has been mentioned earlier, if the benefits of the change are explained and by persuading that the change does not involve downsizing or other reduction in roles and responsibilities, the senior managers can be expected to be partners rather than resisters in the change management process.

Painting the Alternatives

This is the stick part of the carrot and stick approach wherein senior managers are told of the urgent need for change and by indicating to them what the consequences for themselves and the organization would be if the change does not succeed. By painting harsh alternative scenarios like declining market share and repercussions of layoffs and downsizing if the change does not succeed would make the senior managers realize the flip side of resistance. In this way, they can be persuaded to accept the business realities behind the change process.

Involving Them in the Change

By adopting a "hands on" approach that would involve "all hands" and including all the stakeholders, senior managers can be brought on board. The point is that by adopting an inclusive approach and giving a sense of ownership to the senior managers and taking their inputs and feedback would ensure that the key aspect of "engagement" is achieved.

The key to senior manager participation in the change initiatives is through engagement and only by communicating clearly the benefits of change and by positing the alternatives would it be possible to engage with senior managers. A suitable narrative of the changes and the impact that they have on the senior managers must be communicated to all levels and there must be a process in place to bring on board as many managers as possible.

Personality clashes and power politics can be addressed by consensual approaches to decision making and by adopting a carrot and stick approach as described above.

Q.4 Discuss and analyzes the population polices of South Asia Countries in detail.

A human growth and development researcher was observing children at a preschool. She noticed that the girls in the class tended to be better at coloring inside the lines. Since the researcher found this an interesting observation, she began to research any existing information that might be related to what she had seen.

Based on her observation and research, she made a guess about what was occurring: Three-year-old girls have better fine motor skills than three-year-old boys. She tested this idea by collecting coloring samples from three-

year-old boys and girls at area preschools. Ten out of fifty three-year-old boys colored within the lines, and thirty out of fifty three-year-old girls colored within the lines. The researcher then wrote a report that outlined how the information she obtained supported her idea that three-year-old girls have better fine motor skills than three-year-old boys.

This is an example of the use of the scientific method in human growth and development research. **The scientific method** is a method of investigation used by researchers to identify a problem, observe associated variables, and collect data to reach conclusions about the problem.

Application in Human Development

The goal of human development researchers is to understand, describe, and predict changes that can occur throughout a person's lifespan. They must utilize the scientific method to conduct this research in order to validate the assumptions that are being made.

You have been hearing about the scientific method from as early as elementary school. However, most of your past experience with the process was probably not associated with the social sciences. Because of this, when you first heard the scientific method mentioned, you probably pictured a laboratory experiment involving chemicals or measuring the growth of plants in a controlled experiment. Is this the same process as in the social sciences?

The answer to this question is yes. The major elements of the scientific method are shared by both the social sciences and other types of science. The only major difference is that in the social sciences, such as the study of human growth and development, different methods of research are used more often. Assumptions and inferences must be allowed as well.

This is because people are much more difficult to understand, predict, and control than chemicals or laboratory conditions. There are also ethical concerns in the study of people. Because of the different methods of research used, results of the research in the field of human development can be a bit more complex, even though the basic scientific steps being applied are still the same.

The scientific method allows for human growth and development research to occur in an objective and systematic way. This means that the conclusions being reached will still be significant. In order to understand how researchers reach these conclusions, let's look more closely at the research process itself, as well as the basic steps that are used to conduct the research.

Steps of the Scientific Method

We are going to discuss five steps involved in the scientific method.

1. You will select an area that you want to research and learn more about it.

This may begin in a simple way, like making an observation. Then you have to learn what information already exists about the topic that you want to research. This is like the researcher in our previous example. She noticed that the girls in the class tended to be better at coloring in the lines. Then she began to research any existing information that might be related to what she had seen.

2. You will develop a hypothesis about what you want to investigate.

A **hypothesis** is a testable statement that is logically derived from theory or observation. Previous research is essential to helping you form this educated guess. In the previous example, our researcher guessed that three-year-old girls have better fine motor skills than three-year-old boys, based on her observation and research.

3. You will test your hypothesis.

"As a field biologist, my favorite part of the scientific method is being in the field collecting the data," Jaime Tanner, a professor of biology at Marlboro College, told Live Science. "But what really makes that fun is knowing that you are trying to answer an interesting question. So the first step in identifying questions and generating possible answers (hypotheses) is also very important and is a creative process. Then once you collect the data you analyze it to see if your hypothesis is supported or not."

The steps of the scientific method go something like this:

1. Make an observation or observations.
2. Ask questions about the observations and gather information.
3. Form a hypothesis — a tentative description of what's been observed, and make predictions based on that hypothesis.
4. Test the hypothesis and predictions in an experiment that can be reproduced.
5. Analyze the data and draw conclusions; accept or reject the hypothesis or modify the hypothesis if necessary.
6. Reproduce the experiment until there are no discrepancies between observations and theory. "Replication of methods and results is my favorite step in the scientific method," Moshe Pritsker, a former post-doctoral researcher at Harvard Medical School and CEO of JoVE, told Live Science. "The reproducibility of published experiments is the foundation of science. No reproducibility – no science."

Some key underpinnings to the scientific method:

- The hypothesis must be testable and falsifiable, according to North Carolina State University. Falsifiable means that there must be a possible negative answer to the hypothesis.
- Research must involve deductive reasoning and inductive reasoning. Deductive reasoning is the process of using true premises to reach a logical true conclusion while inductive reasoning takes the opposite approach.
- An experiment should include a dependent variable (which does not change) and an independent variable (which does change).
- An experiment should include an experimental group and a control group. The control group is what the experimental group is compared against.

Q.5 What are the different steps involved in the process of research and the applied methodologies required in the population education?

Scientific research involves a systematic process that focuses on being objective and gathering a multitude of information for analysis so that the researcher can come to a conclusion. This process is used in all research and evaluation projects, regardless of the research method (scientific method of inquiry, evaluation research, or action research). The process focuses on testing hunches or ideas in a park and recreation setting through a systematic process. In this process, the study is documented in such a way that another individual can conduct the same study again. This is referred to as replicating the study. Any research done without documenting the study so that others can review the process and results is not an investigation using the scientific research process. The scientific research process is a multiple-step process where the steps are interlinked with the other steps in the process. If changes are made in one step of the process, the researcher must review all the other steps to ensure that the changes are reflected throughout the process. Parks and recreation professionals are often involved in conducting research or evaluation projects within the agency. These professionals need to understand the eight steps of the research process as they apply to conducting a study. Table 2.4 lists the steps of the research process and provides an example of each step for a sample research study.

Step 1: Identify the Problem

The first step in the process is to identify a problem or develop a research question. The research problem may be something the agency identifies as a problem, some knowledge or information that is needed by the agency, or the desire to identify a recreation trend nationally. In the example in table 2.4, the problem that the agency has identified is childhood obesity, which is a local problem and concern within the community. This serves as the focus of the study.

Step 2: Review the Literature

Now that the problem has been identified, the researcher must learn more about the topic under investigation. To do this, the researcher must review the literature related to the research problem. This step provides foundational knowledge about the problem area. The review of literature also educates the researcher about what studies have been conducted in the past, how these studies were conducted, and the conclusions in the problem area. In the obesity study, the review of literature enables the programmer to discover horrifying statistics related to the long-term effects of childhood obesity in terms of health issues, death rates, and projected medical costs. In addition, the programmer finds several articles and information from the Centers for Disease Control and Prevention that describe the benefits of walking 10,000 steps a day. The information discovered during this step helps the programmer fully understand the magnitude of the problem, recognize the future consequences of obesity, and identify a strategy to combat obesity (i.e., walking).

Step 3: Clarify the Problem

Many times the initial problem identified in the first step of the process is too large or broad in scope. In step 3 of the process, the researcher clarifies the problem and narrows the scope of the study. This can only be done after the literature has been reviewed. The knowledge gained through the review of literature guides the researcher in clarifying and narrowing the research project. In the example, the programmer has identified

childhood obesity as the problem and the purpose of the study. This topic is very broad and could be studied based on genetics, family environment, diet, exercise, self-confidence, leisure activities, or health issues. All of these areas cannot be investigated in a single study; therefore, the problem and purpose of the study must be more clearly defined. The programmer has decided that the purpose of the study is to determine if walking 10,000 steps a day for three days a week will improve the individual's health. This purpose is more narrowly focused and researchable than the original problem.

Step 4: Clearly Define Terms and Concepts

Terms and concepts are words or phrases used in the purpose statement of the study or the description of the study. These items need to be specifically defined as they apply to the study. Terms or concepts often have different definitions depending on who is reading the study. To minimize confusion about what the terms and phrases mean, the researcher must specifically define them for the study. In the obesity study, the concept of "individual's health" can be defined in hundreds of ways, such as physical, mental, emotional, or spiritual health. For this study, the individual's health is defined as physical health. The concept of physical health may also be defined and measured in many ways. In this case, the programmer decides to more narrowly define "individual health" to refer to the areas of weight, percentage of body fat, and cholesterol. By defining the terms or concepts more narrowly, the scope of the study is more manageable for the programmer, making it easier to collect the necessary data for the study. This also makes the concepts more understandable to the reader.

Step 5: Define the Population

Research projects can focus on a specific group of people, facilities, park development, employee evaluations, programs, financial status, marketing efforts, or the integration of technology into the operations. For example, if a researcher wants to examine a specific group of people in the community, the study could examine a specific age group, males or females, people living in a specific geographic area, or a specific ethnic group. Literally thousands of options are available to the researcher to specifically identify the group to study. The research problem and the purpose of the study assist the researcher in identifying the group to involve in the study. In research terms, the group to involve in the study is always called the population. Defining the population assists the researcher in several ways. First, it narrows the scope of the study from a very large population to one that is manageable. Second, the population identifies the group that the researcher's efforts will be focused on within the study. This helps ensure that the researcher stays on the right path during the study. Finally, by defining the population, the researcher identifies the group that the results will apply to at the conclusion of the study. In the example in table 2.4, the programmer has identified the population of the study as children ages 10 to 12 years. This narrower population makes the study more manageable in terms of time and resources.

Step 6: Develop the Instrumentation Plan

The plan for the study is referred to as the instrumentation plan. The instrumentation plan serves as the road map for the entire study, specifying who will participate in the study; how, when, and where data will be

collected; and the content of the program. This plan is composed of numerous decisions and considerations that are addressed in chapter 8 of this text. In the obesity study, the researcher has decided to have the children participate in a walking program for six months. The group of participants is called the sample, which is a smaller group selected from the population specified for the study. The study cannot possibly include every 10- to 12-year-old child in the community, so a smaller group is used to represent the population. The researcher develops the plan for the walking program, indicating what data will be collected, when and how the data will be collected, who will collect the data, and how the data will be analyzed. The instrumentation plan specifies all the steps that must be completed for the study. This ensures that the programmer has carefully thought through all these decisions and that she provides a step-by-step plan to be followed in the study.

Step 7: Collect Data

Once the instrumentation plan is completed, the actual study begins with the collection of data. The collection of data is a critical step in providing the information needed to answer the research question. Every study includes the collection of some type of data—whether it is from the literature or from subjects—to answer the research question. Data can be collected in the form of words on a survey, with a questionnaire, through observations, or from the literature. In the obesity study, the programmers will be collecting data on the defined variables: weight, percentage of body fat, cholesterol levels, and the number of days the person walked a total of 10,000 steps during the class.

The researcher collects these data at the first session and at the last session of the program. These two sets of data are necessary to determine the effect of the walking program on weight, body fat, and cholesterol level. Once the data are collected on the variables, the researcher is ready to move to the final step of the process, which is the data analysis.

Step 8: Analyze the Data

All the time, effort, and resources dedicated to steps 1 through 7 of the research process culminate in this final step. The researcher finally has data to analyze so that the research question can be answered. In the instrumentation plan, the researcher specified how the data will be analyzed. The researcher now analyzes the data according to the plan. The results of this analysis are then reviewed and summarized in a manner directly related to the research questions. In the obesity study, the researcher compares the measurements of weight, percentage of body fat, and cholesterol that were taken at the first meeting of the subjects to the measurements of the same variables at the final program session. These two sets of data will be analyzed to determine if there was a difference between the first measurement and the second measurement for each individual in the program. Then, the data will be analyzed to determine if the differences are statistically significant. If the differences are statistically significant, the study validates the theory that was the focus of the study. The results of the study also provide valuable information about one strategy to combat childhood obesity in the community.

As you have probably concluded, conducting studies using the eight steps of the scientific research process requires you to dedicate time and effort to the planning process. You cannot conduct a study using the scientific research process when time is limited or the study is done at the last minute. Researchers who do this conduct studies that result in either false conclusions or conclusions that are not of any value to the organization.