

Education on Aging

A Societal Need

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Aging is a fact of life. Not only are more people surviving into old age, but they are living longer. People over 65 years of age comprise a large part of our population. Approximately 10 percent of all Americans are now over 65 years of age, and today the fastest growing segment of our population is the over-75 group. It is our contention that education on aging should be a part of the school curriculum. It can provide young people with a sense of the past and a view to the future. Furthermore, with realistic views of age and aging, young people will be able to shed stereotypical viewpoints commonly held about "old" folks.

Aging is a complex process that cannot be discussed purely in biological terms. Human aging is a composite of biological, social, psychological and economic changes that occur with the passage of time. An inherent difficulty in discussing aging is agreeing on a definition. A widely accepted definition is, "Old age is not an illness; it is a continuation of life with decreasing capabilities for adaptation" (Vander, Sherman & Luciano 1985). Since this definition and other related ones are couched in negative terms, it is not surprising that by the time they are 12 or 13 years old, children look on aging very negatively (Lorge, Tuckman & Abrams 1954). There is overwhelming evidence that in America bias against the elderly and a revulsion to growing old begins early (Butler 1969; Hickey, Kickey & Kalish 1968; Thomas & Yamumoto 1975; Iversen & King 1977).

Aging is a natural part of the biological, developmental process. It is something we all do constantly, whether we wish to or not. Since aging is inevitable, it does not mean that we ignore it. If we can learn to understand the signs and the symptoms, as well as the causes and effects of aging, then we can: (1) adapt more positively to it; (2) cope with it better for ourselves; and (3) cope with it better in others. Education on aging, particularly if it reflects a lifespan developmental approach, may help young people understand some of the puzzling and disturbing

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aspects of this period of physical and psychosocial change.

This article is directed at teachers who want to incorporate the subject of aging into their courses; however, teachers and/or school systems will have to determine what their major objectives are in offering students a program on aging. Hopefully, this article can increase teachers' knowledge base and assist in the development of insights and skills which will enable them to deal with age-related changes affecting human beings.

Aging in Perspective

Biologists think of life as having three stages: embryological development; growth and maturation; and, finally, senescence. The first stage begins at the moment of fertilization and lasts until birth (or hatching). The second encompasses continued development from birth through adulthood. The third and final stage is a period during which the degenerative processes cause an organism to break down. When people think or talk about aging, they usually are referring to this last stage of growing old. In the developmental scheme of things, aging actually begins at fertilization and is the sum of all changes that occur with the passage of time. Therefore, we can say that aging is a progression of changes that occur to all individuals if they live long enough. On the other hand, disease is a pathological state which may occur at any age, but it is more likely to be seen in the elderly because their resistance is decreased. One difficulty of studying aging is that it is often hard to separate the changes associated with aging from disease-related changes.

Aging involves all aspects of the body. Changes in one system will have ramifications for another. Since the organism is integrated at many levels, the conse-

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quences of aging may range from cellular changes, to altered structure and function of body tissues, to the interrelationships of the organism both to its physical and its social environment.

Physiological Changes in Aging

Persons who live to old age are biologically elite. Their genetic makeup, in addition to environmental influences, combine to contribute to their long-term survival. A true understanding of the characteristics that result in an early death or contribute to survival will be possible only when we have data from longitudinal studies that trace the same individuals from an early age through the entire aging process. However, some common characteristics of aging populations have been identified by cross-sectional and semi-longitudinal studies. The following paragraphs cover key age-related changes in human physiological systems. Body systems will be classified for ease of presentation, but the changes are interrelated and interdependent.

Nervous System:

The nervous system coordinates the activities of all the other systems of the body. It is through these integrative functions of the nervous system that the body compensates for changes and regulates itself in order to ensure survival. Loss of nervous system functioning is probably (to many people) one of the most frightening aspects of the aging process. There is controversial evidence supporting a decrease in the number of brain cells, but there *is* a decrease in the functional capacity for neurons. Response to stimuli is slowed. This may be due to less efficient synaptic connections, alterations in function as a result of decreased available neurotransmitters, accumulation of age pigments within the cell, or damage from free radicals.

Sensory Systems:

Information about the environment is coded by specialized sensory neurons. There are documented changes in several senses with advancing age. Obviously a decrease in the function of these systems will result in a lack in valuable information about the environment.

The decrease in visual acuity is caused by many factors, including cataracts, glaucoma and presbyopia.

Hearing sensitivity decreases and the prevalence of some degree of deafness increases with advancing age. Complaints of tinnitus, a "biological noise" generated from within the auditory system characterized by ringing in the ears, increases in persons over 65 years of age.

The ability to taste is said to decline with age, but this is based on scanty evidence. Loss of taste sensitivity could be attributable to a decrease in the number of taste buds, lower secretion of saliva, or both. Likewise, there is limited data on how the ability to perceive odors (olfaction) changes with age. In general, it is related to a loss of the number of olfactory fibers in the nasal epithelium.

The sensitivity to touch decreases throughout the sixth decade. This is probably due to a decrease in the number of receptors in the skin. But, in the seventh and eighth decades, this is reversed and sensitivity appears to increase, perhaps because of thinness of the skin.

Data on pain sensitivity are contradictory, perhaps because of the wide variety of painful stimuli we can encounter. But, empirically it has been shown that there is an age-related decrease in sensitivity to stimuli, such as a pin prick. This is probably related to changes in numbers of sensory receptors, as mentioned earlier.

Cardiovascular System:

Age-related decreases in the function of the heart and blood vessels has been documented since early times. The Greeks and Egyptians both described changes in blood vessels with atherosclerosis. Cardiovascular diseases are the major causes of death in most developed countries. Heart rate and cardiac output decrease with age. Atherosclerotic decline in blood vessel elasticity is possibly related to changes in collagen. Elevation of blood pressure with age is another finding commonly reported. In several studies, no consistent changes with age in blood volume, hemoglobin concentration, hematocrit and white blood cell count have been observed.

Respiratory System:

The maximal breathing capacity has been reported to decrease as much as 40-60 percent with age. Also, airway resistance increases. But, in the case of the respiratory system, it is difficult to distinguish between pathological changes caused by disease and "true" biological aging. This is especially difficult in that the respiratory system suffers a variety of assaults, i.e., air pollution, smoking and respiratory infections.

Renal System:

It has been well documented that renal function

deteriorates with age. There is a decrease in the number of functioning nephrons which results in overall diminished kidney function.

Gastrointestinal System:

The function of the digestive system is essential to health because it digests nutrients for the body. Progressive loss of teeth can cause chewing difficulties. This, in turn, may result in unbalanced diet and, consequently, malnutrition and vitamin and mineral deficiencies. The parietal cells of the gut lose their ability to secrete hydrochloric acid, and this may be related to the greater prevalence of vitamin B-12 deficiency in the elderly. Also, there is some evidence that the lower secretion of necessary enzymes makes protein digestion less efficient. Finally, the absorption of calcium is reported to decrease.

Skeletal System:

The density of bones decreases with a loss of calcium from the bone, a condition that is greater in women than in men. Also, a decrease in stature may be related to modification in the skeleton.

Muscular System:

A decrease in muscle strength has been documented, but whether this is a result of hormonal or neural factors or of changes in muscle structure is not clear. However, underlying changes in strength and motor ability are well-documented, age-related changes.

Endocrine System:

Like the nervous system, the endocrine system is involved in the body's responses to its environment. Normal age-related changes are difficult to distinguish from pathological changes. Thyroid hormone production decreases after age 35. A gradual decrease in testosterone secretion has been reported in males. Menopause in females results in a decrease in the levels of estrogen and progesterone.

Reproductive System:

Aging of the reproductive system is of concern from a biological as well as an emotional/psychological standpoint. Fertility in women begins to decrease during premenopause and terminates at menopause; i.e., the number of eggs produced declines. The risk of breast cancer increases with age, and in males there is a slow decline in the number of sperm produced.

Skin:

The skin is the most readily accessible to the study of age changes, but it is difficult to differentiate be-

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tween normal aging and cumulative environmental effects such as wind, sun and abrasion. Aging skin is characterized by increased wrinkling; it may be dry or sagging and thinner with very advanced age. The hair becomes thin and turns gray.

Psychosocial/Biological Interactions

In the following section, we will deal briefly with the psychological ramifications of aging as a supplement to the discussion of the strictly biological effects. But one must keep in mind that biological changes nearly always underlie the observable changes witnessed in behavior.

Sensory and Psychomotor Processes:

Failing motor ability may result in ever-decreasing mobility and, secondarily, may result in isolation. Inability to move about may limit one's ability to shop and to prepare meals. Malnutrition is common in the aged for both economic and psychological reasons.

Poorer muscular coordination and failing vision are responsible for ever-increasing incidence of falls in older persons. Age-related bone loss makes fractures more likely. Furthermore, repeated occurrence of accidents makes older persons lose confidence and tend to become homebound. In addition, failing vision may lessen the enjoyment of reading, watching television, or other forms of entertainment. This may cause the older person to become even more isolated from society. This limitation of activities may trigger depression or other psychiatric disorders. Not only the older person, but the rest of us need to be aware of ways to compensate for these changes. Hopefully, society—all of us—will make the environment a safer place in which to live.

Age-related changes in hearing resemble those for vision. Hearing impairments in those over 65 are much more common than visual impairments. Defective hearing, if left uncorrected, can result in serious behavioral aberrations. Hearing loss may isolate the older person to such a degree that mild paranoia can result.

Loss of taste sensibility can be one of several causes of loss of appetite, which can result in malnutrition. Likewise, the sense of smell contributes to the attractiveness (or lack of attractiveness) of food. In addition, loss of olfactory sensitivity may result in the inability to detect the odor of dangerous gases and smoke from fires.

Age-related changes in the respiratory system result in decreased oxygen being available to the body.

With decreased breathing capacity, any activity that is greater than normal may result in extreme respiratory distress and related biological and psychological stress.

Cardiovascular disease does not always result in death. People who do survive heart attacks or strokes may suffer severe physical, economic, social and psychological effects. Furthermore, the loss in neurological capabilities following a stroke may never be restored completely. This affects mobility and communication.

Aging of the gastrointestinal tract results in diminished digestive capability. This is often complicated by a loss of appetite, which usually has a psychological or emotional basis. Taken together, this results in poor nutrition for the elderly. Urinary dysfunction is especially common in persons suffering from senile dementia or organic brain syndrome caused by a stroke.

Cognitive Capabilities:

The psychological changes of aging are closely interwoven with the physiology of the aging process. The mind and body are inextricably woven together into a unitary functioning whole. Events that affect the body will invariably impact on cognition and emotions. Accompanying age-related changes in the nervous system, some facets of intelligence and learning and memory are altered.

Defining intelligence is, at best, problematical. Studies on intelligence reveal certain patterns of change. Mental testing has shown that there is no decline in intelligence with age, but the speed of reaction is slowed; i.e., verbal ability declines much less than psychomotor performance.

In general, age-related changes in learning ability appear to be minor. When an impairment is seen, it usually is related to an underlying debilitating change, and it should not be assumed that dulling of learning is a typical condition of normal aging.

It is impossible to separate learning from memory. With advancing age, some individuals experience mental confusion or loss of memory. These usually are minor and are a source of annoyance. However, in the case of senile dementia (organic brain syndrome), memory loss is severe and the person may require constant care to prevent tragic events.

Death and Dying

Death and the process of dying are now looked upon as a part of the terminal phase of the life cycle, i.e., the final stage of development. If death becomes more familiar and is viewed as part of life, it may become less terrifying. However, there is much resistance to dealing with the subject of death and dying in schools or anywhere else. Kalish (1976) has con-

ducted in-depth studies on the reactions of older persons to death and he suggests two aspects with particular significance for the older person. First, it is an organizer of time. Secondly, it is a sense of loss. To the elderly, death is perceived as a constraining force on the future and may bring a reorganization of time and priorities. Kubler-Ross (1969) has given us the most explicit analysis of the psychological stages of dying. Both authors contend that the study of death and dying makes it easier for us to manage death and the dying process in a humane manner.

Death is a physiologically, psychologically and socially significant event. On an individual basis, death is an end of consciousness and sensibility. Death involves a loss of social identity and a disengagement from society. For the group, death may result in social disequilibrium and reduction of cohesiveness.

The acknowledgement of death and dying is part of the culture which all societies share. Concerns with death and dying serve several important functions. The mere mention of the subject itself produces anxiety, but dealing in a straight-forward manner with the subject can help decrease this anxiety. To some degree, preoccupation with death can also help to negate some of the socially disruptive impact of death.

Finally, one should consider bereavement, which refers to the process of getting over another person's death. Both physical reactions such as upset stomach, frequent sighing and a lack of muscular coordination, as well as emotional reactions which may include anger, guilt, anxiety or depression, can be a part of the multifaceted process of dealing with death. The loss reaction is shaped in part by societal norms and experiences. In most advanced societies, there are established rites and rituals that are of value to those doing the grieving. These rituals also help the participants to accept the relationship of this event to all the events of life and directs mourners to the pursuit of life (Kant 1981).

In summary, the meaning of death varies with respect to the culture and the individual. Many issues are involved in the subject of death and dying, but the study of aging is incomplete without, at the very least, acknowledgement and discussion of the subject.

Suggested Learning Activities

The following includes a set of suggested learning activities that might be incorporated into a unit on aging.

1. (a) Identify, document and discuss changes in a tree or flowering plant during different times of its life cycle.
(b) Set up a display or a bulletin board to show changes in an insect during its life cycle. Do

the same with any number of animals such as amphibians, birds and even humans.

These are good introductory activities and can be followed by a discussion of the morphological and physical changes associated with aging.

2. Collect a series of pictures of people of different ages (these can be from magazine ads). Have the students look at the pictures and write five words to describe each picture, then tally up the negative and positive words. This could lead to a discussion on the views of aging. Furthermore, students might be willing to speculate on why we seem to be such a youth-oriented society.
3. Another approach to the activity listed above might be to have students look at photo albums at home or to bring in a series of family pictures they might want to share. This activity makes the study more personal and something they can identify with. Ideally, it would involve parents or grandparents and reinforce these types of interactions.
4. Have a debate on society's role in the care of and obligations to older people. Use a recognized debate format (see: Madrago and Hounshell. "Debates: Verbal encounters in the science classroom." *School Science and Mathematics*, LXXIX(8), December, 1979) and assure that students prepare adequately for their respective topics.
5. Have students write about their feelings on aging: poems, short stories and songs.
6. Study the contributions of older people—now and in the past. What have been and are the ages of our political leaders, scientists, scholars, artists, musicians and others of society's leaders?
7. Prepare a "documentary" on "aging" using any audiovisual aids available. Videotaping is ideal but you can prepare an 8mm film, make film strips, or prepare multi-media slide shows. Use the "product" with other classes in the school, with parent/teacher groups, or with community civic groups.
8. Field trips: visit a funeral home, morgue and/or crematorium. Each of these will probably be traumatic, but we have seen school groups visit each and truly benefit. Skillfully handled, these experiences can lead to fantastic discussions of the "normal life cycle."

We recommend that teachers discuss these kinds of visits with school officials and possibly with groups of parents prior to making the decision to take the class.

9. Toward the end of the year, when students possess a basic understanding of the fundamentals of biology, they could work in groups to understand age-associated changes in organs and/or organ systems. This could be followed by class

presentations on their findings. Another approach could involve each group of "organs" having a debate on their contributions to the health of an individual.

10. Students could take part in a modified version of the training program of sensory loss in aging designed by Herbert Shore (1976):

Vision: Students wear glasses with paper on the sides to simulate decreased peripheral vision or have them wear lenses with grease smeared on them to simulate cataracts. Students will try to identify cereals, peas, etc. They may also experience a "blind walk" to see how this affects their sense of balance and movement.

Audition: Students listen to conversations and music with cotton in their ears, to simulate hearing deficits.

Taste: This can be simulated by camouflaging the texture of food by grinding, blending, etc., and feeding it to an individual who is blindfolded and wearing a nose clip.

Smell: The students can wear nose clips and eat. Taste and olfaction are closely linked sensory systems.

Touch: Many exercises can be used to simulate losses of sensation. Rubber cement or paraffin can be applied to fingers to deaden the sense of touch. Mittens can be used to approximate the loss of tactile ability following a stroke. Students can try to zip a zipper, buckle a belt, tie shoes, etc.

Kinesthesia: One way to convey difficulty in mobility is to use an ace bandage wrapped around the knee to simulate joint stiffness, or they can build up one shoe to simulate balance problems.

There are some potential problems and/or hazards with these exercises. First, it is important that the students do not start "horsing around" and, in the process, hurt themselves or other students. Next, the use of the blindfolds in the impaired sight simulation necessitates close supervision by the teacher. Finally, the use of paraffin to cover the fingers for the decreased sensation phase of the experiment involves working with flammable substances, plus burns could result if the wax is too hot.

11. Students could put on a skit in which they take on the roles of older persons, eg., an 80-year-old man driving a car, a 65-year-old person jogging, a 70-year-old woman shopping in a supermarket. Virginia Burggaff and Elizabeth Palestis (1983) report that this activity resulted in enthusiastic discussions from students who took part in an experimental curriculum on aging. You need to stress that this is a serious activity, not a comedy routine!
12. Based on findings of Demos (1981), Smith (1979) and Richman (1977), the use of greeting cards, cartoons or jokes dealing with attitudes towards

the elderly can be helpful in stimulating students to think about lifestyles and attitudes about the older person.

13. Students with a particular fondness for science fiction literature might enjoy reading *Reliquary for an Old Soul* by Sharon Webb, or *Like a Fine Man* by Ray Brown. Both raise questions as to how we might deal with aging in the future.
14. In order to show how environmental forces affect longevity and to deal with the concepts of morbidity and mortality, students could take a field trip to an old cemetery (preferably one with pre-Civil War markers as well as more recent ones). They could record the lifespans during the various decades of history represented. Back in the classroom, this might bring up topics such as early childhood diseases, accidents, war, etc., contributing to mortality. This exercise is not without psychological implications and these need to be explored beforehand. Also, some students may not want to participate but may not express their reluctance for fear of being labeled by their peers. Needless to say, a lot of preparation needs to go into this type of exercise but, especially with older students, it provides an excellent multidisciplinary approach to aging.
15. Students working in groups could prepare class presentations on different burial practices and beliefs of ancient or other present-day societies, eg., American Indians, Egyptian mummification and burial, the Greek myths, etc.
16. Older resource persons from the community could come to talk to the students or, if the situation warrants, students could take a field trip to visit a retired beekeeper, a carpenter, a potter or other older active citizen.
17. Finally, there is a wealth of films that are good for introducing certain age-related topics or for supplementing other activities. Cheren, Patchner & Cook (1983) has an interesting article on how films have the power to "create images in our minds" and thereby have considerable influence on our attitudes and behavior toward older persons.

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