ERGONOMIC PROBLEMS IN PRIMARY EDUCATION

Galip AKIN[1]

ABSTRACT

In Turkey, 8 years of uninterrupted compulsory education had became a law on 16th August 1997 and commenced to be implemented since 1997-1998 educational year. By means of the basic educational projects, it was aimed to convert primary schools expediently into primary education schools, which provide 8 years of uninterrupted education and bring educators, students, structures, hardware and environment of such schools to contemporary education level.

Dimensions of the machinery, tools, structures and equipment to be used by people must be in compliance with the body dimensions of the respective users by also taking into consideration to spaces where such equipment will be placed in, dimensions of the structural elements and tools as well as environmental conditions. Growth and development and the body structure of the children in primary education age who are at a rapid period of their physical, bodily and mental development, are formed by means of mutual interaction between the environment and their genetic structure. It is evident that anthropometric features of those individuals with different age, gender, environmental and genetic characteristics be different. For this reason, it is essential to determine unique characteristics and anthropometric dimensions of each age group, and to design and produce living environment, tools, structures and equipment according to them. Thus, their mental and bodily development shall have been protected, their motivation for education and training shall have been ensured, thereby a more informed, skilled, self confident, and creative individuals and consequently a society shall be raised.

Beginning from 1997 - 1998 educational year when 8 years of uninterrupted compulsory primary education has been started to be implemented, several projects have been developed for bringing the education - training process to a more contemporary and quality level.

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[1] Ankara Üniversitesi, Dil ve Tarih-Coğrafya Fakültesi, Antropoloji Bölümü, Fizik Antropoloji Anabilim Dalı, 06100- Sıhhiye Ankara, TÜRKİYE. akin@humanity.ankara.edu.tr

However, from the problems in the practice, the impression is obtained that the success expected from this process cannot be attained as it was prepared and put into practice without an adequate consideration of environmental and human factors aspects.

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İLKÖĞRETİMDE ERGONOMİK SORUNLAR

ÖZET

Ülkemizde 16 Ağustos 1997 tarihinde sekiz yıllık kesintisiz zorunlu eğitim kanunlaşarak, 1997-98 eğitim-öğretim yılından itibaren uygulanmaya başlanmıştır. Temel Eğitim Projeleri ile ilkokullar, ilköğretim okullarına hızla dönüştürülüp, eğitimciler, öğrenciler, yapı, donanım ve çevreleri çağdaş eğitim-öğretim düzeyine uygun hale getirilmesi planlanmıştır.

İnsanın kullandığı makine, alet, yapı ve donanımların boyutları, bu donanımın yerleşeceği mekanların, yapı elemanlarının, yapı gereçlerinin boyutları ve çevre koşulları da dikkate alınarak kullanıcı özelliklerine ve boyutlarına uygun olmalıdır. Fiziksel, bedensel ve ruhsal gelişmenin hızlı bir döneminde olan ilköğretim çağındaki çocukların, çevre ve genetik yapılarının birlikte karşılıklı etkileşimiyle, büyüme, gelişmeleri sağlanmakta ve vücut yapıları oluşmaktadır. Farklı yaş, cinsiyet, çevre ve genetik yapıya sahip bireylerin antropometrik özellikleri de farklı olacaktır. Bu nedenle, her yaş grubunun kendine has özellikleri ve antropometrik boyutlarının titizlikle saptanarak, yaşadığı çevre, kullandıkları her türlü alet, yapı ve donanımların buna göre tasarımlanarak üretilmesi gerekmektedir. Böylece, ruhsal ve bedensel sağlıkları korunacak, eğitim, öğretimleri için motivasyonları sağlanacak, daha bilgili, becerikli, kendine güvenen, yaratıcı bireylerin dolayısıyla toplumun yetişmesi gerçekleşecektir.

Zorunlu sekiz yıllık temel ilköğretimin uygulanmaya başlandığı 1997-98 eğitim- öğretim yılından itibaren, eğitim öğretimin daha çağdaş, daha kaliteli hale getirilmesi amacıyla, çevre, eğitici, öğrenci, araç-gereç, yapı ve donanımlar için bir çok projeler geliştirilmiştir. Fakat uygulamadaki aksaklıklar, çevre, insan faktörleri yeterince araştırılmadan ve ergonomik koşullar gözetilmeden hazırlanmış ve uygulamaya koyulmuş projelerden beklenen başarı sağlanamamış izlenimi edinilmiştir.

Anahtar Kelimeler: Ergonomi, antropometri, ilköğretim.

INTRODUCTION

In the educational premises where the children who are the future of every society, it is necessary to create optimum physical settings, which shall ensure efficient fulfillment of the actions taken by those who use such premises. We have to understand that education is the process of bringing such workforce in the adequate quantity and quality necessary to realize social and economic development and increasing our life standards (Yertutan, 2002). One of the conditions for raising qualified individuals is to create a suitable setting. Mutual interaction of the environment and genetic heritage leads to formation of biological and mental structure of the individuals. All environmental factors under which the individual lives, have as much great importance as such individual's genetic heritage has, in physical development and growth such individual, formation of his /her bodily and mental structure. Growth and development, which are concurrently realized by the environment and genetic heritage, are very important in assessing physical and mental structure, determining extent of influence of the environment and genetic heritage and determining characteristics, health and status of the society. One of the techniques which is employed in assessing bodily structure of the individual is anthropometry. The studies performed previously indicated that each society has unique anthropometric values (Akın and Sağır, 1998; Çalışır, 2000; Kayış, 1988). It is very natural that the school children who are at the fastest period of their physical, bodily and mental development, have unique anthropometric values. Even such anthropometric values exhibit differences for each age group and gender. For this reason, the tools, structures and equipment used by those students with diverse anthropometric values, must have different dimensions (Mert et al., 1998; Turan and Turan, 1998).

Sustaining a healthy life by the children is closely related not only to quality of education, educational programs and methods and teachers are statically but also to the fact that the tools and furniture they use in the setting where they are in, is dynamically ergonomic. In addition, it is recognized that each tool, structure, equipment and setting which are well and properly designed to desired ergonomic characteristics, positively influence physical, biological and mental development of the children, promotes their cognitive development, plays educational roles thereby assisting them to develop positive behaviour, in short directly influence quality of the education - training process. On the other hand, the fact that each tool, structure, equipment and furniture used by the children have ergonomic characteristics, shall ensure that they attain some skills and talents in a timely fashion (Turan and Turan, 1998; Erbuğ and Demirkan,

1998). When compared with the entire life of an individual, 8 years is a time period, which can be deemed important within the life of an individual. Moreover, primary education period is the most important period, during which several habits and manners are acquired (Erbuğ and Demirkan, 1998). Education loyalties, which have suitable ambient and ergonomic features, shall ensure protection of our pupil's health, to attain good manners, and creation of a wiser, more self-confident, creative individuals resulting development of the society (Kayış, 1987-1988; Yertutan, 2002). In case these various tools, structures, equipment and settings are designed and manufactured without taking their anthropometric dimensions and biomechanical characteristics into consideration, we may face the possibility that there are various problems in their skeletal, muscular, respiratory, circulatory, thermoregulatory systems and their optical and auditory senses (Ercan 1998, Kayış 1988).

In Turkey, eight years of uninterrupted compulsory education has been incepted during 1997 -98 educational year according to Law No 4306 dated 16th August 1997. By means of the basic educational projects, it was planned to convert primary schools expediently into primary education schools, which provide 8 years continuous education and bring teachers, structures, hardware and environment of such schools to contemporary education level. Eight years of uninterrupted education is the greatest reform experienced recently. Purpose of this law is to strengthen the education system, by increasing primary education level to 100 % in Turkey as it is an important achievement for bringing Turkey to the level of most developed countries to increase physical capacity in the schools to make pre-school and adult training widespread to increase the quality of education by creating an educational setting with contemporary technology and to use resources allocated for education more effectively and more efficiently (Bostancıoğlu, 1998). With Eight Years of Compulsory Primary Education Law, primary education has been undergoing a restructuring process with the help of a new primary education setting, structure and equipment, pedagogues and students in Turkey. In this paper, developments encountered in the education of the students and education staff; ergonomic criteria utilized in the preparation of the setting, structures of the buildings and equipment and the extent of utilization of advanced technologic possibilities as a result of the inception of Eight Years of Compulsory Primary Education Law as well as any other developments experienced from the inception of the law up to date will be discussed.

STUDENTS

The basic purpose of the education is to raise a generation consisting of people who are wise, skilled, creative, contemporary have a wider

point of view are capable of adapting to the technology, and content. In order to perform this, ergonomic characteristics must be taken into consideration in the design of educational spaces and the latest technological advancements and methods must be applied in education and training. The student must be capable of reaching such information s/he may desire in an easy, accurate fashion and in a desirable setting. For this reason, it is mandatory to increase the quality of educational spaces for raising physically, mentally and socially qualified students (Tokman and Yamaçlı, 1998; Şen and Tokay, 1998).

Since in the computer age we are living in, today's students who will become future society's notable individuals, must be capable of utilizing education related technological possibilities. One of those technological possibilities are computers. This will be put on the agenda in the computer aided education and teaching for the skills and information that students will receive. Utilization of the technology influences methods of teaching, redefines roles of teacher and students, leads to changes in curriculums in line with the expectations of the society as a result of such innovations, and reshapes setting and physical spaces of the school. All school structures, equipment and tools must be redesigned in accordance with the all age groups and users in primary education (Tokman and Yamaçlı, 1998; Turan and Turan, 1998).

In primary education, the computer must be used as an educational tool and the computers must be networked with each other and Internet. The Internet must be the goal in rising a generation leading a society with a broader point of view, productive, creative, technology compliant (E_siz et al., 1998). The student must not be a person who only listens to what is told, learns what is taught, does not filter logically what is told, simply implements what is told, silent and avoids to research, but a person who is ambitious, curious, proactive at every stage of the teaching, creative, observant and researching his /her environment, using his/her logic, adapting to the technology, humanitarian and environmentalist. The first step in ensuring the students to attain these features is only possible by ergonomic and technologic design of the educational spaces, which constitutes infrastructure of the education.

PEDAGOGUES

Scope of the primary education has become broader due to dynamics of the age of universal change and since it forces the people to learn such infoemation that is more complex than the past. The information provided in two dimensions on paper previously is not enough in enabling us to conceive what is going on in our environment. In this context, we face with the phenomenon of "universal education and teaching". This phenomenon and advanced technology, which attained position of an

effective educational tool, increases "importance of the teacher" unlike previously thought. In the new primary education law, it must be adopted that the teacher must be major player in the education and teaching (Tokman and Yamaçlı, 1998).

The fact that each teacher must prepare web sites to be able to instruct his/her courses over the internet, be able to prepare presentations containing audio, video, animation, images and graphics alone or with the help of technical advisor of the school and recognize well those software packages related to his/her courses and follow up the developments, has become a necessity. The teacher must assume current information and technology of this era, be aware that s/he is raising adults of the future and try to create a free thinking environment, assume the goal of raising such students that are ideologically, conscientiously free and creative and who seeks the right, good, beautiful, and assumes the sciences as their guide (Tokman and Yamaçlı 1998; Eşşiz et al., 1998).

Personnel training are the key to this. Given the current situation in the school of Turkey, it is necessary to keep the teachers informed, train them and follow careful strategies by giving consideration to the fact that several schools have no adequate computers or they have no adequate information regarding the matter (Tokman and Yamaçlı, 1998).

In the view of the new educational methods, the teachers must instruct their lessons by means of new techniques based on the visual expression. The teachers must make use of all possibilities of the technology (e.g. television, video, computer, etc.). In addition, providing the most necessary, beneficial and newest information to the students must be primary duty for the teacher. The teacher must guide the students with better, faster, and more qualified teaching methods. It must be kept in mind that to the extent of information and skills that the teacher has, s/he may guide his/her students better (Eşsiz et al., 1998; Cafaoğlu, 1996; Mert et al., 1998).

NEW TECHNOLOGIES

According to Catching New Age 2000 Project of the M.N.E., it was planned that all infrastructure regarding the computer networks must be completed till 1999 and all primary education schools must be interconnected with each other by network and with outer world by Internet. It was also contemplated that all primary education schools in Turkey must have been influenced by this change and has at least one computer laboratory, and capable of utilizing such educational technologies as audio-visual, video presentations, data shows etc. Since emphasis was made upon this practice since 1998, it brings serious responsibilities to the designers, architects, civil engineers and officials of

the Ministry of National Education in design of the new buildings and refurbishment of the existing buildings (Tokman and Yamaçlı, 1998; Şen and Tokay 1998; Çalışır, 2000).

Primary education schools must be developed to be an in-service educational center, which provides social, cultural, and sportive activities in an open setting. School buildings must not be confined to the school hours but also kept open outside the school hours and throughout the year. Thus, the most effective and efficient utilization of resources of the country shall be ensured. Since this model is contemplated for entire country, it shall be open for a sensitive, flexible and dynamic change and development which also takes into consideration of geographic, climatic and cultural properties of the various areas of the country (Tokman and Yamaçlı, 1998; Mert et al., 1998).

Computer facility provides an environment, which is suitable for the colorful and animate personality of the primary education students. Adoption of those designs in spatial organization, which are acceptable by the students, shall promote student's learning and creativeness in physical, mental and social aspects. Educational environment shall become more attractive than the classical system (Tokman and Yamaçlı, 1998; Mert et al., 1998).

By means of the developing technology and new teaching methods, all information regarding the primary education must be accessible by means of a single environment. In design problems, ensuring maintenance and safety of the high technology equipment is a challenge for the designer. For ensuring this, doors and passage ways must be established for ensuring protection of the equipment and some arrangements must be made in spatial organization to enable the school personnel examine the students and visitors easily (Erbuğ and Demirkan, 1998; Mert et al., 1998).

PRIMARY EDUCATION BUILDINGS AND EQUIPMENT

It is necessary to critically evaluate some design rules in the primary education buildings based on the changing and developing educational system. Thus, it must be ensured that the country resources are used in the most effective and efficient manner; "specific local architecture" must be sustained based on the local materials and local workmanship together with the analysis of the geographical, climatic and cultural characteristics of the area where the project shall be carried out. The school must also be capable of satisfying the environmental requirements, thus be integrated into the ambient environment. For all functions as required by the building, as well as such activities as educational, teaching, sportive, managerial, social and cultural activities, spaces must be planned by

giving due consideration to the relations between such spaces. The building and landscaping must be arranged such that it shall form a ground for interaction with the surroundings (MNE Publication, 1998). It is important for building and landscaping, to choose the correct materials, which are durable, require no or less maintenance and respond to the needs the best (Tokman and Yamaçlı, 1998; Ercan, 1998). It is controversial to say that the buildings, equipment and tools manufactured for the primary education have been designed according to anthropometric dimensions up to date (Akın and Sağır, 1998; Medd, 1993; Kayış, 1987; Akın and Koca, 2002).

Although it is challenging and controversial to form an idealistic functional model for the primary education buildings, the criteria for this must be clarified (Tokman and Yamaçlı, 1998; Çalışır, 2000).

If we summarize the criteria that must be taken into consideration while establishing a functional model in design of the primary education buildings:

1. Selection of the locality where the primary education building shall be erected is important. It is a widespread reality we experience that decisions on the location of the building are generally random and based on the inadequate data and without any system (Akbulut and Özaydın, 1988; Çalışır, 2000). For this reason, decision must be made after receiving positive answers to such questions as how the students shall reach to such locality, number of students to make use of the building, inclination of the land, traffic problem, geological and geotechnical structure, etc. In addition, use of the rationalistic systems intended for best utilization of the resources shall not only lead to best utilization of the educational resources and increasing quality of the education but also to more efficient utilization of such other urban resources as transportation, infrastructure, environment, etc. (Çalışır, 2000). Chosen locality must functionally satisfy the educational model.

2- The students must be capable of identifying themselves with the space of the school. The school must be imposed as a social center where the society may meet and get acquainted with amongst them. This property of such a social center shall become stronger with addition of those spaces involving such activities as art centers, art workshops, multimedia and teaching centers, multimedia library etc (Tokman and Yamaçlı, 1998; Çalışır, 2000).

3- Dimensions of the spaces, colors used in the spaces and materials employed in construction must form a harmony and must be planned by taking into consideration those factor which shall increase and modify the interest in the activities performed and teaching in such places (Akgül and Yıldırım, 1995).

4- Just like with every design, design of the primary education school buildings and equipment, must be carried out based on the anthropometric dimensions of the students who are using the same. Since the primary education covers an 8 years period of time, and the students are at the stage of fast physical, mental and bodily growth, it must be remembered that anthropometric dimensions of each age group shall be determined and given the fact each society has specific anthropometric dimensions unique to them, design of the equipment must be performed accordingly (Akın and Sağır, 1998; Akgül and Yıldırım, 1995; Kayış, 1987).

5- Designs must be carried out by considering that different entries must be present for different age groups, entry halls must be wide enough, heights of the stories must not be less than 3 meters and there might be physically disabled students (Şen and Tokay, 1998; Çalışır, 2000).

6- Multistory buildings must be avoided and maximum 4 stories must be used. While performing story layouts, all wet spaces must be on the each other at different stories and the entire school must be designed by considering the necessary sound and heat insulation. Walls of the classrooms, corridors, canteen, etc. which are frequently used by the students must be washed with oil paint up to a height of 150 cm which oil paint is easy to clean, and hard to be soiled and deform (Çalışır, 2000).

7- The power supply, clean water and waste water quantities that the building may need, must be pre-calculated precisely and infrastructure must be performed accordingly (Çalışır, 2000).

8- The classrooms must be capable of being rearranged according to different contexts of courses by means of a flexible design, they must also satisfy the requirements for small and large group studies as well as different seat layout arrangements. Classroom layouts must be changed according to the position of the teacher and needs of the students (Şen and Tokay, 1998).

9- Benefits of all changes in the primary education buildings must be carried out by a pedagogue consultation (Tokman and Yamaçlı, 1998).

10- All advanced systems available in the primary education buildings, such as ventilation, air conditioning, illumination, electrification, plumbing, insulation etc. must allow for arranging more valid and long term educational facilities which can be adapted to the future developments and actually serve to the new age (Eşsiz et al., 1998). For this reason, in design and construction of the primary education schools, developing technology must be taken into consideration. Process of school buildings construction must be effected

in such a manner that researches are carried out in accordance with the main targets as determined by the relevant authorities and developing technology and that they can satisfy and continuously adapt themselves to these technologies (Eşsiz et al., 1998; Mert et al., 1998).

11- The contemporary educational programs involves introduction of the science and technology to the children from their early ages. For this reason, the classrooms must be designed such that the students may make use of advantages of the communication and digital technologies. Construction and structural systems of the school buildings must allow for ensuring such advantages. In addition, such systems as ventilation, air conditioning, heating, power, plumbing, etc. must be designed in such a manner that they shall support those areas which serve to educational programs best (Eşsiz et al., 1998).

12- With realization of the fact that computers, television broadcasts, educational satellite broadcasts, information processing systems, databanks, database based systems which evolve as a result of the recent developments in the science and technologies, increases the efficiency of education, it is a necessity for designing the school spaces to develop methods to make use of them in the teaching process, determine priority needs of the teachers and students, and in which fields such needs can be benefited from the technological possibilities (Mert et al., 1998).

13- By taking into consideration the technological developments and changing teaching methods, the educational facilities can be changed and it is very important to design them in such a fashion that its entire structure allows for development and upsizing (Eşsiz et al., 1998; Kanra, 1998).

14- Since in the design of the school, audio, visual and heating comforts of the buildings, classrooms, corridors, yards and equipment contains security measures, causes the students using the same to identify the school and environment with themselves and like them as well as increased motivation, they shall be important factors in making education and teaching easier, solving the problems of the same and increasing the quality (Kanra, 1988; Mert et al., 1998; Cafoğlu, 1996).

15- Since the measures to be taken with regard to health during the school age which the physical, bodily and mental development and growth is faster, shall act as a factor which can increase life standard during the next stages of the life, the educational spaces must be designed in such a fashion that they may be more easily cleaned. That's because cleanliness is a precondition for a healthy life. The cleanliness is important for the mood, comfort and performance of the student (Yertutan, 2002).

CONCLUSION

With the enactment of Eight Years of uninterrupted compulsory primary education on 16th August 1997 in Turkey and its inception during 1997 - 1998 educational year, typical project practice has been abandoned in primary educational projects. New primary educational projects are needed for the schools to be constructed within the scope of the primary education projects, development of the projects which are compliant with the land plot data and environmental conditions has to be made and it is planned that these projects must be realized at once (Mert et al, 1998). However it cannot be said that we are successful in this matter (Şen and Tokay, 1998). In order for the primary educational projects to be successful;

a- It is clear that the new technologies must be used in design and construction of the school buildings. In this period during which it is intended to initiate an attack in education by means of primary education projects, the fact that the students receives education in such settings with high level of comfort and all possibilities of high technologies, is important for our country to exhibit development in every field. For this reason, great duties are imposed on the pedagogues, designers, education staff, engineers and anthropologists in design and construction stages of the new schools, which is now on the agenda.

b- Turkish pedagogues must examine all educational methods implemented throughout the world and develop new educational methods suitable for the conditions prevalent in Turkey. In addition, designers must be led by developing suggestions as to in which stages of the education, to what extent the technology must be used (Eşsiz et al., 1998).

c- While selecting the sub-systems designed for the building, the necessity for achieving such comforts which do not lower efficiency in the education, and for design to allow for various arrangements and changes in line with the developing technology and educational methods (Eşsiz et al., 1998).

d- It is mandatory for all primary education related institutions and offices to work in a coordinated fashion.

e- In order to raise the pupils in accordance with the targets aimed in the primary education, not only quality of the educational programs, but also quality of the educational settings must be taken into consideration. Organization between the location and structure of the building as well as equipment and environment must be suitable for the determined targets (Ten and Tokay, 1998).

g- In design of the school buildings and equipment, scientific studies

performed on the children must be made use of, it must always be remembered how important human-machine-environment interaction is in educational buildings and equipment, it must be recognized that this is an investment for future, not a commercial enterprise (Çalışır, 2000).

h- Importance of arranging all ambient conditions in the schools in accordance with the ergonomic criteria which plays an important and effective role in making the eight years of compulsory uninterrupted education successful, attaining the desired quality and raising a healthy generation, cannot be denied. However, we are also of the opinion that making all necessary explanations and efforts is of great importance for adoption of the purposes of the primary education by and motivation of the students, education staff, managers, guardians, and any party concerned with the education.

i- We may say that success cannot be achieved in implementation of the Eight Years of Uninterrupted Compulsory Education Law with regard to such matters as design of the new primary education buildings, utilization of the new technologies, establishment of computer laboratories in every school, interconnecting the computers with each other means of computer networks and with the outer world by Internet, access by the teachers to the new technological developments, teaching lessons by means of new teaching methods, planning in multidiscipline fashion, ensuring hygiene and compatibility with the environment.

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