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Packaging Materials in General Technoeducation

Introduction

The study points to the unused possibility of including the theme of packaging materials in the educational process of general technoeducation. It defines the concept of packaging materials in the broad and narrow sense. It also characterizes the range of packaging materials used, their advantages and disadvantages. In particular, it focuses on the specific aspects of packaging materials, in particular the aspect of economic, health and hygiene, safety, aesthetic and ecological. It also addresses the issue of the impact of external factors on the properties of packaging materials.

Concept and terminology of packaging materials

The concept of packaging materials in practice interpreted in the narrow and broad sense. Packaging materials in the narrow sense are materials used to make packages (covers). The concept of packaging materials in the broad sense includes in addition, packages and containers. The main function of packaging is to protect the product against external influences and damage. In some cases, the package predetermines the shape and form of the product. There are also cases in which dominates the aesthetic function of package (gifts wrapping). Currently, the packages are often carriers of important information about the product.

As equivalents of the term packaging material also other terms are used in some cases such as *packing material* and *wrapping material*. In special cases of vernacular speech also names cover, cassette, sleeve, jacket, file, wrap, wrapper, and other. In many cases have packaging materials a special name. Generally, the packaging material can be directly part of the product as its outer part or is mechanically separated. In many cases serve packaging materials as containers, especially for non-solid materials and products.

In this article, we deal mostly with materials with which the educatee (we use the international term for all subjects of education) can come into direct contact in every day life.

Requirements for the properties of packaging materials

The spectrum of requirements for properties of packaging materials is broader than it seems at first glance. These properties can be divided into essential (mandatory) and complementary (moreover desirable).

Among the **essential requirements** include:

- material itself must not adversely affect the quality of the product;
- material must be harmless in terms of safety and hygiene;
- material does not negatively affect the environment;
- material must reliably protect the product for the intended life;

Among the **additional desirable requirements** include:

- material is recyclable;
- material is available for other purposes secondarily;
- the colour of the material can be specifically changed, wherein aesthetic colour, or at least non-irritating colour is desired;
- material is printable and writable;
- material waste is biodegradable;
- material is not expensive;
- material is easy to shape and storable.

Variety of packaging materials

Assortment of packaging materials is relatively narrow. Gaseous and liquid materials are used very rarely. Preferred are materials in solid form with good mechanical properties. Paper and paper-based materials (e.g. carton, cardboard, cartonnage, corrugated cardboard), fabrics of natural fibres, and metal foils, and the oldest plastic celluloid are used traditionally. As container materials are traditionally used wood, steel, glass and ceramics, newer aluminium. In recent decades has significantly advanced other plastics, plastic films and plastic granulates, compositions (impregnated paper), layer foil composites (paper + metallic foil, paper + plastic foil, paper layers + binding material), particle composites (e.g. foam polystyrene). In paper composites with metals dominates aluminium foil (milk containers), in that ones with plastics polyethylene foil (dual-layer packaging paper for meat products, bubble wraps, e.g. polyethylene film with air bubbles).

Special aspects of packaging materials

Packaging materials have some special aspects in comparison with other materials. They are:

- many packagings are designed for single use;
- in many cases packaging materials can be used secondarily;
- many materials are used also for another, often more important applications;
- packages are extremely important in terms of environmental protection;
- teaching packaging materials is demanding terminology. Many materials have trade names (alobal for Al foil, celluloid for nitrocellulose foil, microt(h)ene for polyethylene foil, staniol for tin foil) in addition to system names;

- searching for information on suitable literature about packaging materials is complicated by information smog. At the time of writing this article the search engine Google had registered 550,000 links. Amidst the prevailing commercial links are difficult to search for information about sources usable in technoeducation, for example (5) to (13);
- packaging materials are classified as cross-cutting materials, that is those which are used in many fields and spheres of the human activities;
- packaging materials have often to meet higher demands in terms of aesthetics reflecting slogan „packaging sells”.

Advantages and disadvantages of packaging materials in general technoeducation

There are some benefits of integrating packaging materials in general technoeducation. As the most important we consider:

- an extremely low, often zero financial costs;
- an extremely good availability;
- great scope for applying creativity of educatees in exploring the possibilities of reuse;
- the possibility of educatee self production from material waste;
- the possibility of using a cross-curricular with another school subjects;
- the possibility of obtaining or fixing skills for technological operations with the bodies from packaging materials, for example: division, joining, surface treatment;
- some packaging materials can serve as epistemological object.

Paper – an excellent epistemological object in materials science education

Paper as most widespread packaging material represents an excellent epistemological object in materials curriculum. It allows demonstrate many links to materials science and many of its particularities, for example:

- it allows control its properties, for example absorbency, colour, density, electrical conductivity, permeability, thickness;
- paper is used only in foil form, but allows produce thicker materials by combining multiple layers (cartons);
- paper has porous structure, which can be considered as an advantage (tea bags, impregnated paper, filtration paper, paper for aquarelle technique in art), but also as a disadvantage (absorption of moisture degrades its mechanical properties);
- paper is still very important information carrier (polygraphy, ICT);
- there exist papers with unique use (cable paper for high voltage cables, condenser paper, xerographic paper, decorative paper, paper for the purposes of Fine Arts);

- paper allows demonstrate the impact (influence) of external factors on its properties (e.g. depolymerization by light accompanied by a colour change, loss of mechanical strength after soaking water or multiple flexure);
- paper is flammable and has an extremely low mechanical strength;
- even in the home may educatees meet with various modifications of packaging paper (paper packages of various products, tea bags, paper boxes, envelopes, etc.) as well as non-packaging paper (paper bags and books, newspapers, magazines, calendars, toilet paper, paper tissues, paper towels, wallpaper, paper tape, etc.).

Some problem questions for demonstrations in a class or for further study

Which strip of paper is easier to tear: dry or saturated by water? Why?

If we put on a window sill sheet of ordinary newspaper and cover a part of it, will be over time the colour of covered part other than that one of uncovered? Why?

Why a drop of water on a polyethylene film keeps its shape and is absorbed into the paper sheet?

Why are books and other products from chalk paper heavier than equal products from ordinary paper?

If you pour water into a glass of waxed paper it keeps in it until it evaporates or not? Why?

Is paper material of polymeric nature? Why?

Why can not be used foil paper thinner than the order of ten microns?

Has paper in all directions the same characteristics? Why?

Conclusions and recommendations

Packaging materials have good epistemological potential and significant advantages for including them into content of general technoeducation. Therefore we recommend elaborate a methodical aid for general technoeducation teachers and publish experience gained from teaching.

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Abstract

The study points to the unused possibility of including the theme of packaging materials in the educational process of general technoeducation. It defines the concept of packaging materials in the narrow and broad sense. It also characterizes the range of packaging materials used, their advantages and disadvantages. Also it points to specific aspects of packaging materials, in particular to the aspect of economic, health and hygiene, safety, aesthetic and environmental. It also addresses the issue of the impact of external factors on the properties of packaging materials. Epistemological value of packaging materials is illustrated in the case of paper as the most widely used packaging material. On the topic of the paper also some problematic questions are presented.

Keywords: general technoeducation, packaging materials, packaging materials in general technoeducation, properties of packaging materials.