

Scientific questions of demand-oriented vocational education for modern structures of production and service - Implications for teacher education

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If we discuss about characteristics of an appropriate system of vocational education and training, we use such terms as „demand-oriented” or “meet the requirements”. But what mean this terms in the science of vocational education. From which influence factors this requirements result and on whom this requirements are make.

In my presentation I would like to use these considerations as starting point for explication of scientific questions of demand-oriented vocational education for modern structures of production and service with implications for education of technical teachers.

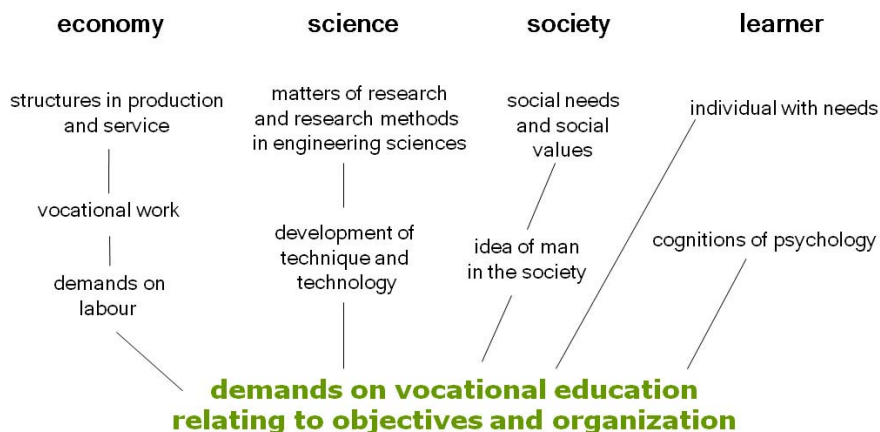
According to the Framework Agreement on Vocational Schools in Germany, vocational education aims at

- “[imparting] **employability**, which combines technical expertise with the general capabilities of human and social nature
- [developing] **professional flexibility** to cope with changing requirements in work and society, including the perspective of Europe’s coalescence
- [awaking] readiness for vocational **further and continuing education**
- [assisting] the ability and willingness for **responsible action** in the individual life and in public life”

(Standing Staff of Conference of the Ministries of Culture Affairs: General Agreement on Vocational Schools. 1991)

Which demands these formulations of general aims of vocational education show and what are the consequences for the teacher education?

Influence factors of vocational education



Economy as influence factor of vocational education

The main function of vocational education is to qualify employees to be able to meet the demands of production and service. These demands are determined by different economic factors.

The first factor is the labour market. The labour market of a region has a strong relationship with the structure of economy. Concerning this, the relation between industry, agriculture and service has the same importance than the development of different sectors in industry, trade and service. These factors determine decisively the demand for qualified personnel and the characteristic of their qualifications. Therefore, the following question has crucial importance for a demand-oriented vocational education:

What fields of professional activities are in demand from the current structure of economy and how this demand will develop in future?

To answer this question the following connections are to investigate:

- development of various sectors in production and services
- development of the technological structure and organization of labour
- demand for skilled labour on labour market

The specific demands on the employees concerning their required qualifications, abilities, skills, knowledge and experiences are determined by the character of professional work in the structures of production and service. The character of professional work in Tayloristic production structures differs decisively from such in structures of lean management.

Therefore the investigation of influence of economy on vocational education is to extend by the following question:

What is the character of work in the respective areas of professional activity and what requirements result out of it on the employees?

The finding out of the specific demands on the employees requires a detailed task analyses in the respective areas of professional activity.

The increasing adoption of lean management structures in industrial production and the growing importance of the factor "knowledge and information" for the economic success have changed professional requirements over the past 30 years significantly. Work activities in the production have become more complex and problem-oriented, individual work in TAYLORistic structures has been replaced by teamwork, and the personal responsibility for work organization and quality control has increased noticeably. In a study of modern production structures in the automotive industry, FRIELING found out the following components which are relevant for vocational education:

- Process-chain-oriented company organization instead of functional hierarchies
- Customer-orientation instead of product-orientation
- Responsibility for the project/venture and budget instead of hierarchically structured task management
- Working in teams or groups instead of working alone

- Complete operations instead of individual/single acts
- Self-regulation instead of standardized input/guidelines
- Involvement instead of heteronomy
- Continuous improvement instead of hope for innovation.

(cp. Frieling 1993, p.32)

For successful employment in such production structures vocational education has to prepare the personnel.

Furthermore the formulations of general aims of vocational education in Germany makes clear, that employability in the today's production and service processes is not the single aim of an appropriate system of vocational education. The demands on employees in production and service change continuously, because the industrial engineering, production technology and the employment system develop constantly. Therefore, another central task of vocational education is to empower employees to cope with these processes of change in their professional work.

In this connection an important aspect is the growing importance of knowledge and innovation of products and production processes. Terms such as "knowledge management" or "learning companies" emerged in approaches of business management and involve ongoing training needs. Therefore, human resource development as an independent element of work design has become increasingly important. This requires the ability for individual acquisition of knowledge and designing self-directed learning.

A suitable approach to empower employees to cope with these processes of change in their professional work is the concept of key-qualifications by MERTENS. MERTENS pointed out significant shortcomings concerning the predictability of future work requirements and came to the conclusion that vocational education should focus stronger on the adaptability against unpredictable work requirements. Prerequisites of such adaptability are so-called key qualifications. Key qualifications comprise knowledge, skills and abilities, which do not have an immediate relation to certain professional work activities. Rather, they allow

- the suitability for a large number of positions and functions in the work process
- the suitability for coping with changes in requirements over life.

MERTENS distinguished four categories of key qualifications:

Basic qualifications are mental abilities which enable the transfer of existing experience to new situations, for example, logical thinking, analytical thinking and constructive thinking.

Horizontal qualifications are abilities that enable quick access to knowledge stored somewhere else, i. e. abilities for gaining, understanding and processing information.

General elements are such knowledge abilities and skills which occur as requirements in many workplaces within a field of occupation or field of professional activity (e.g. knowledge of measurement technology or of occupational safety).

Vintage factors are abilities to compensate generation-specific educational differences through individual learning.

These considerations lead to the conclusion that modern production and service structures need professionals who

- are able to cope with the work processes
- possess a high degree of autonomy and personal responsibility
- are adaptable to changing work demands
- can behave in a social-communicative way
- have the abilities and willingness to take part in vocational further training.

What criteria do they imply for the teachers in vocational education?

The design of teaching and learning processes in a demand-oriented vocational education requires teachers who have extensive experience in professional practice.

This includes:

- Knowledge of current developments of the structures of production and service
- Knowledge about the nature of professional work in their respective professional fields
- Experience in dealing with the respective production facilities
- Experience in planning, execution and monitoring of professional work activities
- Ability to design work process related teaching and learning
- Mastery of methods to develop key qualifications

Science as influence factor of vocational education

Production processes and professional labour are influenced by development of technique and technology and thus by development of related sciences. Therefore, for vocational education and training in technical professions the related engineering sciences play a decisive role. However it is not meaningful to transmit the subject-matters of engineering sciences to vocational education and training. In this connection is to ask for the importance of the scientific subject-matters for the professional work. This consideration leads us to the following question:

Which subject-matters of engineering sciences are useful as appropriate matters of acquisition for the respective professions?

Engineering education is not the same than vocational education. The analysis of the functions of subject-matters of engineering sciences for the professional work is the basis of didactic simplification. The results of this process are the matters of acquisition for vocational education and training. These matters of acquisition have a descriptive, regulative or normative character.

Descriptive matters of acquisition are systems of scientific statements of engineering sciences with professional relation (theories, laws, hypotheses ...).

Regulative matters of acquisition are systems of professional scientific act regulatives (principles, methods, rules, procedures).

Normative matters of acquisition are systems of professional scientific act standards (directives, standards).

These considerations lead to the following criteria for teacher training:

- comprehensive knowledge of engineering sciences (in relation to the professional field)
- Insight into the importance of subject-matters of engineering sciences for the professional activities
- Competence in suitable didactic simplification of scientific subject-matters

Society as influence factor of vocational education

Vocational education is part of a social and political system. In so far, vocational education has to meet the demands of the society. These demands are determined by political systems, ideologies, religions and concluding from it, by values, norms, views and attitudes.

The term "demand-orientation" contains accordingly also the social demands.

The individual development of social adjusted values, norms, views and attitudes is the socialization mission of vocational education. The scientific question, resulting from it, is:

Which personality traits should have an ideal personality for the society?

In Germany the idea of man in the society is the responsible (mature) citizen, with

- general capabilities of human and social nature
- autonomy in activity
- responsibility in the individual life and in public life
- participation in democratic processes
- capabilities for autonomous lifelong learning.

These considerations lead us to requirements for vocational teachers, which are described in the standards of teacher education in Germany by the competency area of "Socialization".

This includes:

- Awareness of the connection between professional education and socialization
- Knowledge about the relationship of school and professional socialization
- Ability to design target-oriented socialization processes

Learning individual as influence factor of vocational education

The last but not least influence factor of vocational education is the learning individual. The design of teaching and learning processes in vocational education and training has to correspond with the individual personality characteristics of the learners. Therefore the

answer of the following question is an important condition for the success of learning processes in vocational education:

What individual personality characteristics of learners are to taken into account in the planning of learning processes in vocational education?

In this connection are to investigate

- the pre-conditions of the learners
- age-specific psychological characteristics
- individual values, norms, attitudes
- the needs of learners,

for designing target-group oriented learning processes.

This result in following implications for criteria of teachers of vocational education:

- Ability to psychological performance and personality diagnostics
- Ability for individual support and advice to students.

Only the consideration of the complex system of influence factors of vocational education and training ensure the demand-orientation of vocational education for modern structures of production and service. Accordingly, the demands on teachers of vocational education are very complex. A suitable teacher training is thus a key to successful vocational education.

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