

## Quality-Based Cooperative Technical Teacher Training

By László Kadocsa and Imre Koppány

Hungarian higher education is in transition from the stage of elite training to that of mass education. At the same time, according to monitoring surveys, the output efficiency level of secondary school students has decreased. These aspects, combined with the narrowing resource base due to the worsening demographic conditions, call for the renewal of global higher education and particularly technical teacher training. The authors are hoping for a breakthrough in the following items: quality-based approach in training and the organization, learning-centered philosophy instead of teacher-centered philosophy, new types of study materials and evaluation strategies, modular and credit-based curricula, and cooperative training.

### Cooperative Technical Teacher Training

Technical teacher education at polytechnics in Hungary has the specialty, and the advantage, of parallel engineering and teacher training at the same time. This type of dual course work aims at preparing students for two alternative professions: engineer or technical teacher at vocational secondary schools. About three quarters of the total training hours concern engineering subjects, and one quarter of those center on pedagogical subjects. At Dunaujvaros Polytechnic (DP) there is a possibility for students to learn some engineering and pedagogical subjects in English or in German as well. More than half of the graduates work for industrial companies as an engineer. Graduates who have studied professional subjects in

mechanical engineering or in information technology in foreign languages at DP are very popular, particularly at multinational firms in Hungary. Cooperative features of the training create a strong link between DP and industrial companies or other enterprises in the practical professional training of the students and between DP and vocational secondary schools in pilot teaching projects run by the students.

At the end of the sixth semester, every student spends a month at an industrial placement as an engineer assistant. In the seventh semester, there is a complex engineering project ended by a written final work and closing exam. This final work is related to the solution of a real industrial problem and is guided by an industrial expert and a supervisor of the academic staff.

Students complete a pilot teaching project in the eighth semester. The project consists of observation and trial teaching, one-month teaching practice in a vocational secondary school, and a teaching presentation. These activities are guided by a senior secondary school instructor and a supervisor of the academic staff. In the curriculum development of the technical teacher training program, theoretical and methodological aspects as follows were taken into account.

### **Challenge For Higher Education**

Global tendencies in higher education are:

- Changing from elite training to mass education.
- Establishing common features in the national higher education systems.
- Strengthening integration and organizational restructuring.
- Gaining a multilevel character or diversification of the training.
- Enforcing institutional autonomies: constraint of the requirement of cost efficiency, development of the interconnection of higher education and research with the industry, change of paradigm in the strategy and methods of teaching and learning, improvement in quality, development of quality assurance systems, etc.

Hungarian higher education needs to follow the international tendencies of development and

to adapt some of its important elements (Altbach, 1991). At the same time, in the course of changes, we cannot forget to take into account our national cultural heritage and features to preserve the actual values existing in our higher education.

As for quantitative development, Hungarian higher education has taken a considerable step towards catching up in the end of the 1990s, shown by the doubling of the number of students. Today, 40% of the generation aged between 18 and 23 years, or more than half of the youths leaving secondary school, will enter higher education.

Research studies have shown that the efficiency of students leaving secondary school decreased in our country—mostly in those fields that have an outstanding importance from the point of view of the success of studies in higher education. For instance, primary and secondary schools today prepare their students to a less extent for complex text interpretation exercises (diagrams, tables, instructions of use, etc.), and the output of youths in the field of mathematics and natural sciences is essentially worse than one or two decades before. There is a natural demand in public education to stop this decay of the output level of students and a call for its improvement. However, in itself, this cannot create a solution, as higher education must also enhance the smooth adaptation of students into higher level studies.

Increasing numbers of students combined with a narrowing resource base due to the worsening demographic conditions, the worsening output level of students in public education, and their uncertain career image, urge higher education that was previously arranged for elite training and that has been operating multiple selection mechanisms to undergo radical changes.

We are convinced that within the framework of mass-level higher education, for the sake of maintenance and even improving of quality, it is necessary to transform and renew the vertical structure of the training, as well as the whole technology of teaching and learning.

## Change Of Paradigm In The Methodology Of Technology Education

Undergoing rapid changes, there is a demanding need for a new view and paradigm in higher education, which should be student-centered, learner-centered. For this reason, higher education has to change its learning programs. The content, methods, and the practice and means of delivery (teaching and learning) of education should be based upon new partnerships between students and teachers. These new methods of teaching should go together with new types of teaching-learning materials. These new methods must also be connected with the new types of assessment and evaluation, which will enhance the development of not only the memory but also understanding and realizing capacity, as well as creativity and the capacity of doing practical work. The technology-based learning environment and the information and communication technologies as well as the application of open and distant education methods require the reformulation of the content, forms, and full practice of education. These new methods of teaching should go together with new types of teaching-learning materials.

### Change Of Concept

The renewal of training should include concept and role changes, both from the part of teachers and students, as well as the renewal of contents and the creation of a study environment. This change of view from the side of teachers requires the creation of a learning, guiding, helping attitude, which can be recognized as the main managing force of the learning process. The active cognitive activity of the students should more and more be emphasized, which, at the same time, also requires the undertaking of a greater responsibility for their own learning activity.

During the renewal of the study material, a balance should be achieved between the wide basis that assures the convertibility of knowledge and the users' ("market") demands that are formulated more and more markedly. Within the transformation of the study environment, the expansion in space and time of the scenes of teaching and learning is well observable (van den Berg, 1996). The individual sites, or those that are suitable for small-group learning, play a

significant role in and outside of educational institutions: at media centers, resource centers, computer rooms, libraries, research places, homes, working placements, etc.

The main characteristics of the methodological, didactical changes are:

- The conveying of knowledge is transformed into a cognitive (knowledge-gaining) process.
- Learning to learn plays a decisive role in this process.
- The process has a student-centered character.
- The teacher loses his or her central role.
- The teacher assists the students in the organization of their learning activity.
- The teacher creates the conditions of learning, shows the direction, and gives counsel.
- The teacher explains to the student the essential interrelations, the methods of work, and the rules.
- The teacher evaluates the results.

These, altogether, can result in the achievement of a new type of relationship between teacher and student, the basic change of the structure and contents of training, and the character of teaching and learning.

### Development Of Higher Education Curricula

We identify the curriculum as a process plan, a program, that is a thoughtful system of teaching and learning goals, requirements, contents, organizational-methodological-instrumental solutions, evaluations, and conditions. The structure of the curriculum determines the priorities that, at the present date, show more and more a student-centered or learning-centered tendency. In the development of the university and college curricula, the following tendencies can be observed:

1. ***The credit system becomes general:***  
The credit serves for the measurement of the time for teaching, or for the measurement of the amount of the total student work necessary for the acquisition of the given subject or module. The great advantage of the credit system lies in its flexibility, which makes possible the satisfaction of the need for free

choice ("determining of the own way of life"), the permeability between the areas of study and the training stages, the reciprocal acknowledgment of the part-trainings and part-studies, the continuing of studies without time losses, the possibility of conferring an international status to the studies (European Commission, 1998).

2. **The dynamic development of the modular curriculum structure** (Badley & Marshall, 1995; Burkhart, 1996): The precondition of the optimal functioning of the credit system is modularization, which means the creation of study units, courses, and modules, as well as using them as elements in further building. The module, the unit element of the training (teaching and learning process) that is the basis of the planning and development of the curriculum, includes all the study work (lectures, practical classes, individual learning, assessment and evaluation, school practice, etc.) necessary for the processing and acquisition of a coherent part of the study material (subject or subjects). In fact, the modular curriculum system represents the basis of the credit system. The credit-based modular systems carry in themselves the joint advantages of the credit and modular systems.
3. **Flexibility:** The modules can elastically adapt to the many-faceted student community, to the rapid development of the sciences, and to the ever-changing needs of the labor market.
4. **Motivation:** The success assured by eligibility, the opportunity of forming an individual path of life, and the effective learning guidance can considerably increase the inner motivation of students, the appearance of a positive attitude, and responsibility towards learning.
5. **Wide availability:** With modularization it is possible, on one hand, for preparedness of candidates and the requirements of the study programs to meet. On the other hand, in the measure of the individualization of training and the elaboratedness of the learning guidance procedure and resource systems, it decreases the number of necessary contact hours and increases the ratio of individual learning.
6. **Adaptivity of curricula:** The module as a unit element (e.g., the standard module comprises a workload of 90 hours of total learning) can, in principle, be inserted anywhere in the curriculum, or can be changed, transformed, upgraded, etc.
7. **Enhancement of credit accumulation and transfer:** Modularized courses are characterized by the fact that the credit is allocated to the module, and the successful accomplishment of a certain module means the acquisition of the allocated credit points (e.g., if one module = 90 hours total learning workload and 1 credit = 30 hours total learning workload then 1 module = 3 credit points). Thus, the credit accumulation is achieved through the accomplishment of the modules, while possibility of the transfer (transferability, accountability) supposes modules with identical (to min. 75%) content among training programs, degree courses, and institutions.
8. **Cost efficiency:** As a result of wide availability, the cost efficiency is improving, but the elasticity has its own price. Cost efficiency can be improved if we apply "common" modules in different study programs.
9. **Promotion of the concept of lifelong learning:** The knowledge acquired in different training forms, places, and time, as well as the accountability of the practical placement, "requires" the modular and credit-based curricular form because this ensures the superposing of knowledge.
10. **Open or distant education:** Distant education is the "traditional" training

form built on modules in the shape of learning packages, which include most of the functions of learning guidance taken over from the teacher, with the assurance of consultation possibilities.

11. **Spreading of information and communication technologies:** They promote the re-thinking, re-formulation of the teaching materials and forms of delivery (teaching and learning) connected in most cases with distant education and/or modularization.
12. **Enhancement of pedagogical innovation:** Modularization, the development of learning guidance procedures and modern teaching materials, has represented the basis of the pedagogical renewal in higher education throughout the world, which can lead to the achievement of the change of concept and role (change of paradigm).

Active, independent student work is in the center of the process. From among the conditions of the effective achievement of the independent student learning activity, we can point out the following:

- Necessity of the development of learning abilities.
- Elaboration of a system of individual and group study problem solving (literature processing, exercises, projects, etc.).
- Decreasing to reasonable levels the fixed weekly number of hours ("contact hours").
- Working-out of a procedure and device systems for guided learning (learning guidance, additional learning materials, etc.).
- Upgrading of the assessment and self-assessment systems.
- Creation of a modern learning environment (computerized infrastructure, library, laboratories, tutorial system, etc.).

### Quality Thinking In Education

A focus of institutional strategic management in higher education includes the demands of the stakeholders: students, staff, employers of graduates, government, and society (Bonstingl,

1997). This new way of thinking of quality in Hungarian higher and public education is characterized by some new programs:

- Hungarian Accreditation Committee organizes the evaluation of training programs and institutions in higher education (started in the mid 1990s).
- COMENIUS 2000 Quality Improvement Program aims at the implementation of the principles and practice of TQM in public education (started in 2000).

Preparation for these tasks is built in the training of technical teachers at DP. The quality development process was supported, among others, by a three-year TEMPUS-JEP project (1996-99).

The project has essentially achieved its objectives:

- The introduction of quality thinking into strategic management.
- The addition of one or more quality subjects in all of the main study areas at DP.
- The development of a new special course, Quality Control, consisting of 12 quality modules in the 3.5 year Technical Manager degree program.
- The development of a quality system at DP as well; the project helped to establish the Quality Assurance Office at DP.

### Summary

The experiences of the modular and credit-based curriculum and cooperative training developed and introduced at DP have convincingly proved that, within the conditions of mass education, it is suitable for preserving the quality and, in the case of elaboration of learning guidance methodologies, for improving it. We believe that this pilot program of model value can offer useful experiences for the development of Hungarian higher education.

Meanwhile, the Dunaujvaros and international experiences have also called attention to the fact that the introduction of the modularization and of the credit system is not merely the question of decision, but it is a thoroughly prepared activity that requires a definitely controlled development work lasting many years.

The new type of study materials (learning

guide, course textbooks/workbooks, self-evaluation/assessment tests, exercises, electronical study materials, open and distant learning materials, etc.), the alternative approach to the effective teaching-learning methods, the upgrading of the assessment and evaluation strategies, and the learning-centered, student-centered thinking itself require from the teachers the development of new skills instead of the customary traditional teaching activity. This can-

not be efficient without a total quality improvement circle of the teaching-learning process.

*Dr. László Kadocsa is a Professor and Vice-Rector at the College of Dunaujváros, Hungary*

*Dr. Imre Koppány is an associate professor and head of the Institute of Mechanical Engineering at the College of Dunaujváros, Hungary*

## References

- Altbach, G. P. (1991, Spring). Patterns in higher education development: Towards the year 2000. *Review of Higher Education*, (14), 190-203.
- Badley, G., & Marshall, S. (1995). *53 questions and answers about modules and semesters*. Bristol, United Kingdom: Technical and Educational Services.
- Bonstingl, J. J. (1997). *Schools of quality: The application of total quality management at schools*. Nyíregyháza, Hungary: SCHOOL Bt.
- Burkhart, S. (1996). *Vocational training in Europe: Towards a modular form?* (Discussion paper). Thessaloniki, Greece: European Center for the Development of Vocational Training.
- European Commission. (1998, March 31). European credit transfer system: ECTS users's guide. Retrieved from <http://europa.eu.int/comm/education/socrates/guide.en.dor>
- van den Berg, M. (1996). *Working on a new learning environment*. Eindhoven, The Netherlands: Pedagogisch Technische Hogeschool Nederland.

