

## Ways of rationality and effectivity in architectural education

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**ABSTRACT:** Mastering the art of *effectivity* is essential for the healthy functioning of an activity in every profession. Effectivity is understood as an economic category, which is connected mainly with the production sphere, but it also relevant to the area of education. Educational effectivity is also enriched by using of more methods in the trajectory of a project, problem education, using case studies, team work, etc. In this article, the authors compare effectivity in methods applied to different content categories of subjects in architectural education. The hypothesis was defined and answers were sought to questions of whether rationalisation and effectivity of the teaching process provides a kind of feedback, and whether it also has an impact on the quality of output and the competence of graduates. At the same time, a small study was used to evaluate the attitude of students to the change of methodology of teaching groups of technical-constructional subjects. Their realisation is demanding, because they are a part of architecture and, at the same time, they oscillate between technique and art.

### INTRODUCTION

Efficiency and good work management are interconnected. It is supported by a general opinion of economists that the more effective the management, the better the management [1]. If one perceives the opinion gradually through basic functions and factors of management, it is not common to achieve efficiency equally in terms of each function. Analogically, based on this, it can be supposed that the more effective is the educational process, the better the education. Of course, in accord with other conditions and targets, which have to be fulfilled regarding the teaching.

Efficiency in education logically takes inspiration from economics. Sensible management is the art of achieving a set target through other people [2]. *Well-managed* education and educational process do not depend on an individual, but on a range of specialists, pedagogues who try to achieve quality in an effective way in education, which reflects accreditation from the point of complexity. Efficiency of educational processes is mainly looking for a compromise between the *possible and objectively necessary*. A partial answer could be looking for new educational and organisational patterns of education in the Faculty of Architecture at Slovak University of Technology in Bratislava (STU), Bratislava, Slovakia.

### POSITIONS OF EFFICIENCY

The target of a pedagogue is to teach well and efficiently at the same time. A good pedagogue tries to give maximum knowledge in a given time interval. It is a mistake to think that it is possible to teach everything, mainly if one regards the university surroundings. Understanding this seemingly definite fact is not natural for many teachers and sometimes modern methods are applied to life only with difficulty. Efficiency in teaching is presented through different views from the pedagogues' and students' sides.

Teaching efficiency can be looked at from three perspectives:

1. School - from the view of opportunities and financial capacity;
2. Pedagogue - from the view of applying a suitable methodology and way of teaching;  
- from the view of organisation of the pedagogical process and rationality of the pedagogical time given;
3. Student - from the view of quality and quantity of learning (layering of knowledge received);  
- from the view of rationally used time.

### School

School efficiency must work on an interactive principle of *inputs and outputs*, so on the one hand *inputs* as some financial means as a basic economic indicator (need) of school potential. Following this, it is possible to apply rational

models of educational processes and research activities [3]. In other words, what can a school offer to students for a given amount of means? It must decide for a certain quantificational model of giving the knowledge for students, so how much and to what extent teaching *intensively*.

Efficiency can be understood as a problem of optimisation by using the minimax principle, which means approaching the maximum or optimal result with a minimum of negative effects or costs [4].

### Pedagogue

Setting the system and teaching methods in order to rationalise the education is first of all in hands of teachers who are motivated by school management. Teacher self-efficacy and the teacher teaching process show a strong association with learning satisfaction. The teacher teaching process and learning satisfaction all showed a strong association with learning outcomes [5]. From this relationship multiplied by the personal enthusiasm of teachers depends achieving a reasonable result and a level of efficiency and teaching rationality. The pedagogue gets to the inconspicuous level of a mediator as a mentor who motivates and activates students. No matter whether considering the spirit of teaching, course design, teaching methods, teaching materials and student assessment, today's teachers all need to be creative and to combine the application of information technology to innovative teaching methods and strategies [6].

In this context, the authors have presented in earlier publications, relevant teaching methods in PBL and PPBL, which are suitable in architectural education [7]. In the contribution, the stress is given to methods efficiency, which students experience learning. Van Vliet and Kolb express the view that ...*There are two goals in the experiential learning process. One is to learn the specifics of a particular subject, and the other is to learn about one's own learning process* [8].

Those are the methods, which help to develop the creating thinking and creative abilities of students, their cognitive motivation and independence, creative acquiring of knowledge and ways of activities.

### Student

There is a question of what the image of *effective learning* is from the student's perspective. What does the student use, creatively develop and apply in practice and, then, at the end, use in a successful profession? The level of a suitable range is not unambiguous. The personality of a teacher enters the process of who can influence it based on education targets, syllabi of subjects and personal experience. The space for influencing from the students' side is also based on the level of satisfying their expectations and results in the level of indirect pressure for updating of subject content. It is a teacher's *mirror*.

This contribution follows the efficiency of using the time in teaching. Time is an irreversible quantity; it cannot be put aside and stored. Nobody can be hurt non-violently more than by taking their time ...*Your life is as valuable as your time. Life is nothing else but a period of time. Without time there is no life* [9]. *If we want to get some time, we have to focus on doing the work we do more efficiently* [10].

Efficient use of time can be followed at school and outside of school. Out-of-school *management* of time is in the hands of a student and, in fact, it is not possible to be influenced. Responsible students try to know their own personalities and abilities to be able to choose a suitable method of learning.

What a pedagogue can influence is using time in a pedagogical process by a suitable method and educational system, which means modelling a timetable and semester organisation. A student at school is *under* the teaching organisation and that is why it is necessary for it to be organised efficiently for both sides: for the teacher, as well as for the student. *The more the school changes a student, the bigger the chance that the student influences the changes at school*. This situation is explained by Follet, where a student motivated by a school works more intensively and his/her performance grows. For achieving such an effect, the activity on both sides is necessary [11].

Time in pedagogy is most often talked about as *efficiently used*. A sign of efficient teaching is considered by a level of time given, quality of results and energy given for their achievement, for respecting individual personalities of a student [12]. Even at the beginning of experimental pedagogy, the authors thought about efficiency and rationality. According to Meumann (a founder of experimental pedagogy), economical learning is a process when a student reaches the target in the shortest time possible [13].

## EFFICIENCY IN THE TEACHING PROCESS AT FA-STU: ORGANISATIONAL MODEL OF TEACHING

The target of research was to confirm the authors' predictions with the intention of effective, rational and innovative teaching to integrate students in a teaching process. Their involvement, understanding the correct level of self-study, self-reflection of own abilities opens the way to a deeper knowledge and more progressive teaching.

At the Faculty of Architecture (FA-STU), a comparative study was undertaken of the potential for time efficiency of direct teaching in two timetable-organisational models.

The content of teaching architecture and urbanism according to the subjects has four areas:

1. basic subjects of the 1st year study (they create an interface between a secondary and university education);
2. subjects of general - theoretical and special preparation;
3. subjects of structural - technical character with overlap into subjects of a creative character;
4. subjects of a creative character (design studios).

*The first model* introduces traditional teaching organisation in which students are in seminars from subjects of the second and the third group, divided into groups of approximately 25. In subjects of the fourth group, students are in groups of five to seven.

*The second model* - a block one - introduces maximally integrated direct teaching in the second group of subjects in a continual time interconnection of lectures and seminars. The third group of subjects creates an *interface* between the second and the fourth groups and an organisational experiment in which a maximum of team work was introduced. The fourth group was unchanged.

Due to the relatively large numbers of students (in comparison with the 1980s) in combination with a lot of subjects mainly at the Bachelor's degree level and a lower number of employees, there is a call for a *block teaching*.

The group of creative subjects and groups of theoretical and constructional subjects make it possible to concentrate on separate teaching as these are related subjects in content and methodology. There are no clashes in the utilisation of rooms and pedagogues. For example, in the daily block of design studios, the pedagogue concentrates exclusively on the management of the design studios. A student has got a space for creation - design, discussion with classmates and he/she is not *disturbed* by having to leave for other subjects.

In the teaching organisation described, space is created for lectures out of the set syllabus, when there is the opportunity to invite external lecturers - pedagogues from other schools and renowned architects. This activity is exceptionally appreciated by students. *Knowledge is acquired not simply by thinking, but by making*, comes from the deep thoughts of Arendt [14]. It is logical, because the Faculty declares this way to be modern and open to external space and the most topical influences.

Another positive factor of block teaching is the option to organise one-day excursions and activities connected with design subjects without interrupting the syllabi of other subjects.

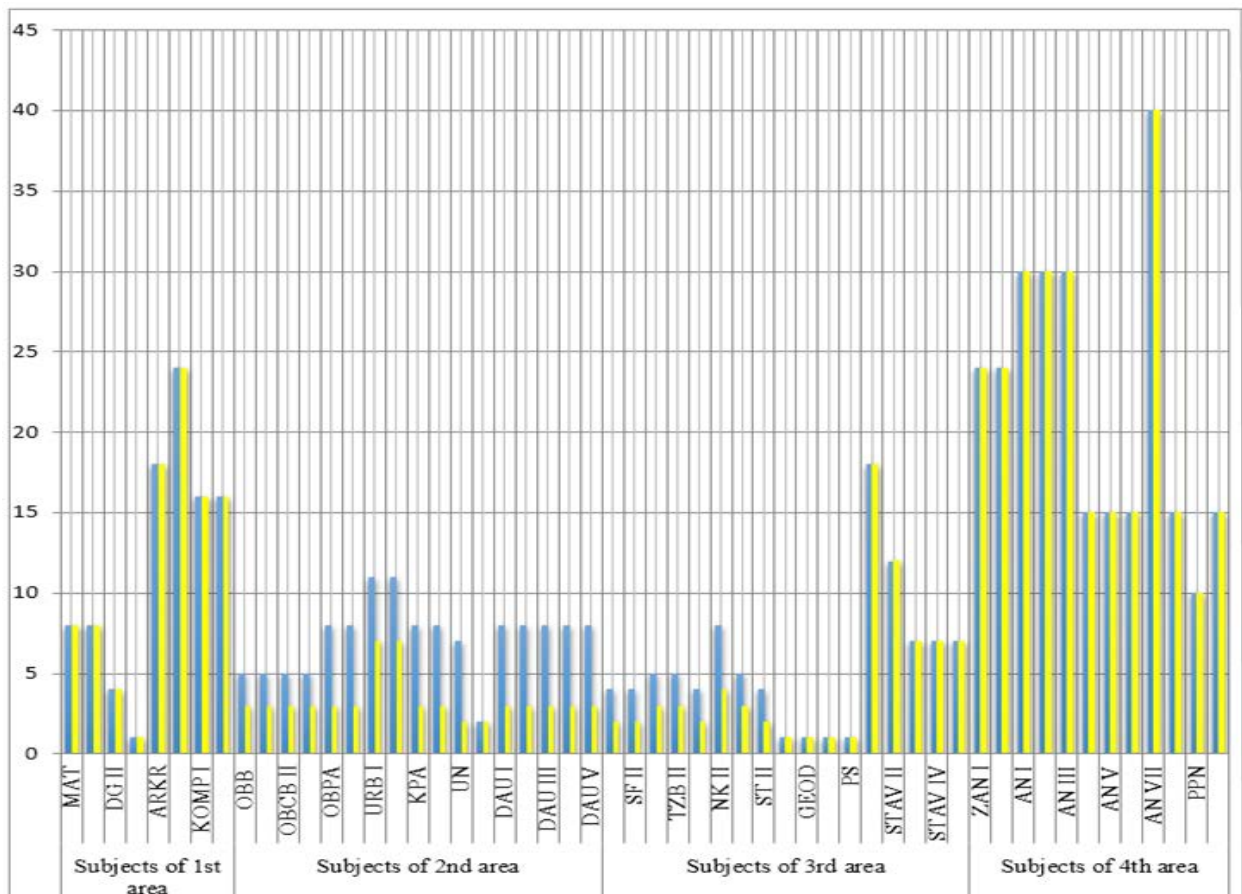


Figure 1: Comparison of timetable models in Bachelor's degree study (blue: original model; yellow: a new model).

## RESULT 1

The result of comparative study documents is that there is a time saving of about 8-10 % of classes of direct teaching of relatively integrated teaching of the second and third area of subjects in Bachelor's degrees, and about 4-5 % of Master's classes. This result also confirms the reality of growing the ratio of extent in the design studio teaching over the theoretical knowledge in Master's study. Teaching the design studios is similar in both organisational models, but with a different level of *individualisation* (number of students in a group) in Bachelor's and Master's levels of study. Results of the comparison are shown in Figures 1 and 2.

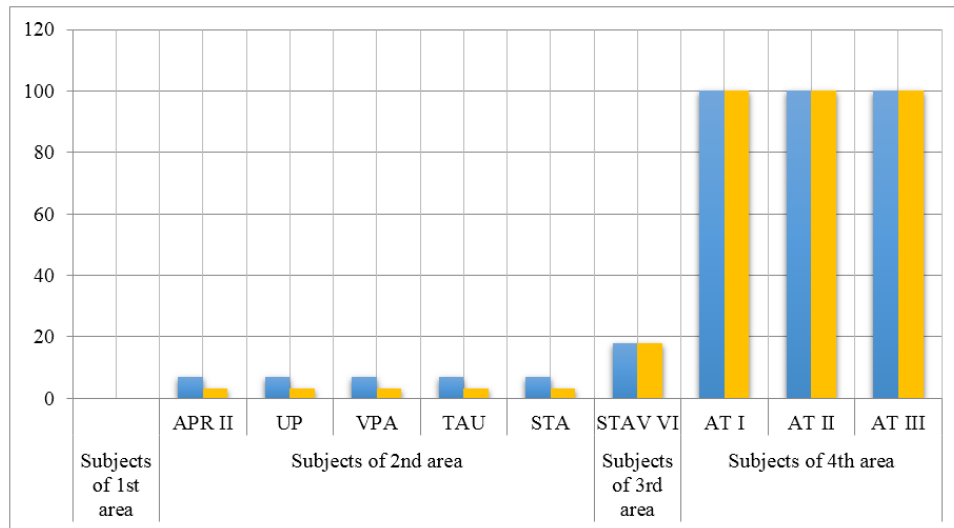


Figure 2: Comparison of timetable models in Master's study (blue: original model, yellow: a new model).

## EFFICIENCY IN MODELS OF TEACHING CONSTRUCTIONAL - TECHNICAL SUBJECTS

A small analogy of block teaching as a whole is group teaching technical subjects, which interlope into the subjects of a creative matter. The authors do not focus on the contribution to the group system of teaching regarding the design studio subjects, which is already common in the Faculty for wider assignments.

An organisational model of teaching based on *mini team work* has been created, with two to three students. When creating the *mini teams*, there is also an opportunity that students will be attracted to each other personally based on different abilities and so there is a chance they will create interactive and effective work teams with a bigger potential for a quality result. The authors worked with a combination of active project and problem education. A help to the methodology were Kolb's four cycles of learning from the 1970s of (in short: 1) experience; 2) observation - reflection; 3) own solution; and 4) experiment) [15]. Transformation to the new conditions and a new methodology of teaching structural-technical subjects means going through four phases:

- setting the task and *diagnosing* the level of a student in the given time;
- observing and analysing the example which comes out of it;
- looking for schemes how it works;
- creating one's own new concept and verifying the solutions [8].

Kolb's cycle comes out of a supposition that 80% of human cognition comes from one's own experience and also presented experience of what is logical for education in the area of architecture, regarding its visualisation. Constant improving and achieving the quality is also in the plan-do-check-act (PDCA) cycle - Deming cycle (which was inspired by other scientists from the area of statistics from 1930). Kolb's cycle started as its younger version.

If efficiency is being sought, quality and innovation in education, it is necessary to work with analysis, discussions and controversies. The benefit is discussion of a problem not only between a pedagogue and a student, but also their mutual discussions and exchanges of opinion. What was an individual matter until now - one's own task, one's own *worrying* about a problem and what was a common task for the second area of subjects, opens a space in this methodology for activity and creativity. It really forces out passive acceptance of knowledge and mechanical memorising of data.

At the same time, the authors tried to apply procedures, which lean on different typologies of student personalities from the view of their learning, and to create the most universal method. The schema is shown in Figure 3. Interest in individual differences has recently been widened into engineering education [16]. Interaction between effective ways of teaching and effective learning influences the creation of methods of teaching and it looks for inspiration in the theory of personalities. Of course, the methodology cannot work in detail with all of the 16 personalities types listed in the literature, but it deals with four basic types [17]. The authors next present the procedures of learning, which have been

connected with the methodology of teaching, so that they are suitable for different types of students (pragmatic - rational, analytic - creative, funny - enthusiastic and kind - idealistic):

- to influence the speed and gradual learning way of remembering - choice of a suitable structure and amount of study;
- visualisation of the problem - not only an explanation in words, but also illustrative examples, analysis;
- practising and multiple learning - supporting of creativity, creation of one's own alternatives (ideas) to the given problem;
- relative learning (extra information) - explanation of the context;
- application and usage of knowledge - practice, link to practice, real impact.

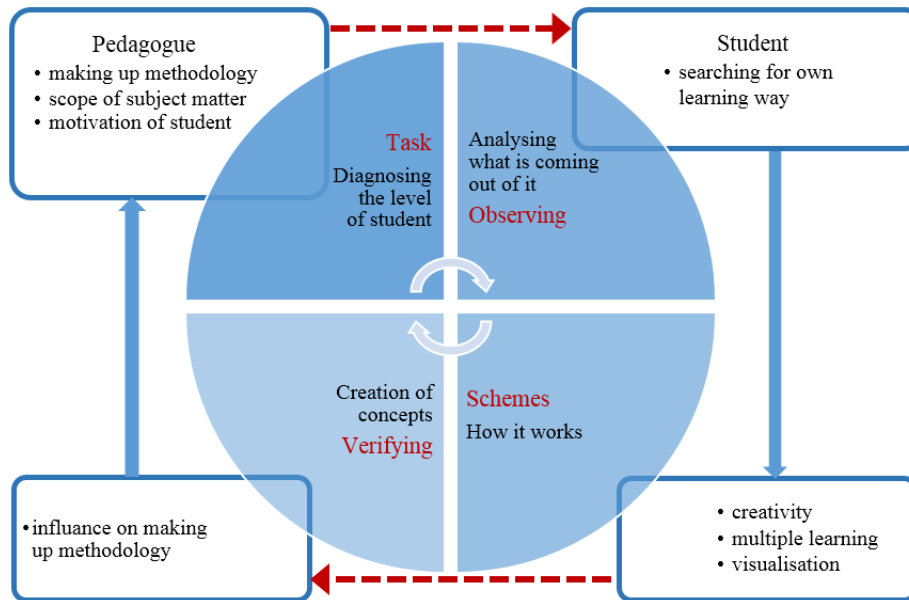
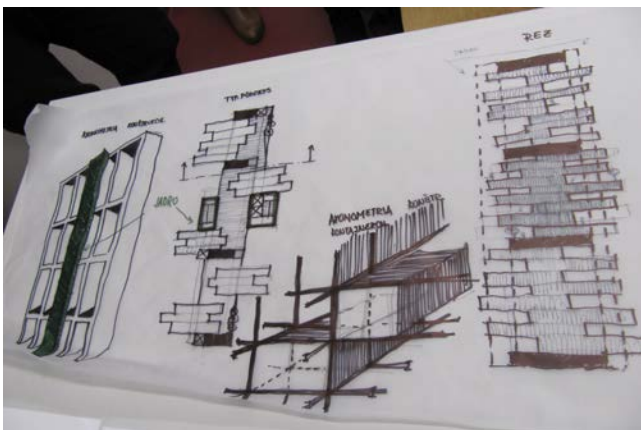


Figure 3: Trajectory of effectivity in architectural education, inspired by the PDCA cycle.

It is the creation of the teams that gives space for cooperation and balancing the different personality types - students which had a positive impact on the result. This model is similar to the form *studio as a melting pot*. Although it is not a design studio, this relation model is possible for application in constructional - technical subjects with an impact on architectonic creation, Figures 4 and 5.



Figures 4 and 5: Educational process with creativity and visualisation presentation of schemes how it works.

Similarly, students' motivation is not only about encouraging the learning itself, but it is also about creating a time space for studying, for economical - effective usage of time. Maximum usage cannot only be for those who have an ambition to be successful in science. It is presented in the thoughts of W.A. Mozart *...Day and time will not accommodate to you, it is you who has to find it*. Very inspiring are thoughts of a personality who dedicated his life to an exact science on a professional level. A great Einstein really appreciated the fantasy of what is declared in this thought: *...Imagination is more important than knowledge. Knowledge is limited, fantasy is never-ending*. Fantasy and creativity play an important part in effective teaching. Design studios, which enable intuition and reflection support deeper education. Strictness brought by certain methods of teaching (also in structural - technical subjects) as a part of the process of designing can lead to better project management together with more professional presentation of results [18].

## SURVEY - RESEARCH ON THE METHODOLOGY OF TEACHING

An innovative and more effective method of teaching theoretical - structural subjects was completed with a survey with the aim to evaluate results, and then, to perform progressive methodological changes. The aim of the study was to confirm the prediction of effective, rational and innovative teaching by integrating students into the process. When evaluating the efficiency and quality of teaching, the authors were inspired by D. Kirkpatrick. He created his own four-level model of evaluation of the quality of company education in 1954 (first published in 1959). However, he did not deal with efficiency and the economic impact. Phillips later added the fifth level of evaluation by the method of recoverability (return on investment ROI) and this is when the Kirkpatrick/Phillips model was created (in 1996). The model presented here was appreciated mainly in companies, where they inevitably needed valuable results in evaluation of the educational process and usage of the knowledge gained by their employees [19]. Although the Kirkpatrick's model was created 50 years ago, it has been the basis for evaluation up to now. Evaluation of the reactions, learning, behaviour, results and recoverability were also the main issues for the authors when creating the survey.

The methodology of the survey was aimed at questions that need unambiguous answers - (*yes - no*) and they could also be used to evaluate the process more closely. The questions started out being based on a combination of models for efficiency in education and evaluation of education. The first and the second questions included reactions to the methodology - acceptance of teams and a methodology, which motivates, provokes analysis and deeper study of a problem. The third question more concerns the rational process of handing out and evaluation of work. The fourth one includes a reaction to the usage and applying what students learnt.

### RESULT 2

The character of answers comes from the fact of whether students accept the methodology and if they understood it correctly. The survey included 60 students. It can be stated that their answers to Questions 1, 3 and 4 were mostly positive, and in accordance with the authors' suppositions. They evaluated stress elimination positively and the possibility of gradual elaboration and back elaboration of the tasks, taking into consideration rationalising the number of deadlines. For the second question, two-thirds of the students had a positive evaluation (see graphs). The comments in the answers showed that a certain proportion of the students prefers a secondary overview methodology than deeper study of a problem. At the same time, precious are the attitudes of the students who understood the sense of an analytical study and its usage in other subjects, mainly in subjects on architectonic design. A graph of the survey is shown in Figure 6.

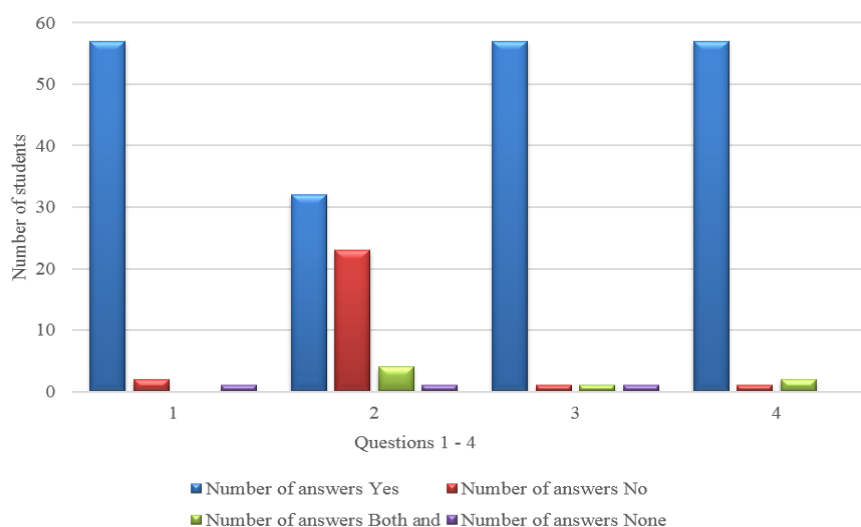


Figure 6: Evaluation of survey.

### CONCLUSIONS

A comparative study and survey confirmed the correctness of methodologies presented. The *teaching - learning* relationship is alive and ever-changing. It is determined by external influences, which are also outside the education area. It is also necessary to combine experiences from total quality management (TQM), scientific - research activities and a reflection of students' opinions to secure quality and efficiency in education. An indicator of *student involvement* shows students in an active position and not only as passive consumers of educational activities. This is the way to deeper knowledge, and from the side of the pedagogues, to models of effective teaching the aim of which is to produce competent graduates for strong competitive surroundings in practice both at home and abroad.

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