

**THE ROLE OF ENGLISH – ENGINEERING SUBJECTS  
LINKS IN PROMOTION OF STUDENT MOTIVATION AND  
PREPARATION FOR SELF – EDUCATION**

**VÍNCULOS ENTRE IDIOMA INGÉS Y ASIGNATURAS DE INGENIERÍAS EN MOTIVACIÓN  
DE ESTUDIANTES PARA AUTOAPRENDIZAJE**

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**ABSTRACT**

Both the demand for specialists in agriculture and the requirements of graduates to meet this demand have changed since Latvia became independent. One of the requirements for getting a good job after graduation is competence in foreign languages, especially in English. We are facing the problem that we have social demand, motivated students, but they do not have the skills necessary for independent work and self - education. These skills are necessary for acquiring of all subjects as well as for successful learning after graduation. As students spend quite a lot of time at the University it is necessary to help them acquire not only theoretical knowledge and practical skills, but also develop their personal qualities which they will need in their professional life. It necessitates the organization of a process of studies that ensures that students acquire more knowledge and develop confidence, willingness and skills to enrich the existing knowledge and continue their education independently.

**Key words:** independent work, self-education, motivation, assessment, self-assessment, engineering.

**RESUMEN**

La demanda y los requisitos para especialistas en la agricultura han cambiado desde la independencia de Letonia. Uno de los requisitos para conseguir buen trabajo después de la graduación es la competencia en los idiomas extranjeros, especialmente inglés. El típico problema es que dentro de la demanda social y con los estudiantes motivados, los últimos no tienen las habilidades necesarias para el trabajo independiente y para autoaprendizaje. Estas habilidades son necesarias para todas las asignaturas así como para el aprendizaje exitoso después de la graduación. Es necesario ayudar a los estudiantes no sólo a adquirir conocimiento teórico y habilidades prácticas, sino también a desarrollar las calidades personales que necesitan en su vida profesional. La organización del proceso debe asegurar que los estudiantes adquieran más conocimiento y desarrollen confianza, buenos deseos y habilidades para enriquecer el conocimiento existente y continuar su educación independientemente.

**Palabras clave: trabajo independiente, autoaprendizaje, motivación, evaluación, ingeniería.**

## **INTRODUCCION**

Historically Latvia has always been an agricultural country and agriculture has not lost its importance today. We, the teaching staff of the Latvia University of Agriculture, are aware of the fact that further development of agriculture in our country greatly depends on the quality of the future specialists we are training now. Our University is the only higher educational establishment of agriculture in Latvia.

Since Latvia became independent we have had many changes in all spheres of life. The demand for specialists in agriculture and the requirements necessary to meet this demand have also changed to a great extent. Today's society requires specialists who are not only executors, but who can state the aims, carry out activities to implement the stated aims and assess the results obtained. Besides being able to meet professional requirements the future specialists must also be flexible, creative and independent in problem solving situations at their work. They must have also communication skills in order to cope with various tasks in their everyday professional life, such as attending conferences, giving presentations, participating at meetings, writing letters, telephoning, socialising etc. While the students spend four (undergraduate studies) or six (graduate studies) years at the University it is possible and necessary to help them acquire these skills. They must develop their personal qualities to organise their work in studies in an efficient and appropriate way to promote development of these skills and qualities. This must be included in our organisation of the study process at the University.

The flow of information necessary for a person to acquire is so abundant that in order to cope with this situation the person needs to work independently and be involved in self-education. The extension of the study programme or the time of study cannot ensure the necessary educational results. Thus the study process must be organised so that the students are prepared for continuous self-education and that they acquire the skills necessary for taking responsibility for their own learning. This implies that the students are *motivated* and *interested* in the knowledge the acquisition of which is organised by the teacher. The students must be offered choice and given responsibility during the process of studies and this provides satisfaction for the work carried out at the end. Such work requires careful preparation of the teachers as well as the students as definite skills are needed for successful independent work and self-education.

The traditional system of education does not supply the students with these skills. The teachers act as the authorities and are the ones who determine what to learn, how to learn and when. This makes the students passive and dependent on the teacher. In the work aimed at preparation for self-education the role of the teacher should change. Instead of being only the source of information the teacher should become the advisor in problem solving situations through cooperation with the students in the process of studies. The teacher cannot learn for the students but *can* help them learn by creating adequate conditions for it. The teacher can serve as an arranger of circumstances that will stimulate students to move in the desired direction. In summary, we conclude that not only giving students theoretical and practical knowledge in

different subject, but also development of high-qualified specialists as personalities is a very important task for the teaching staff of the University. The study process must serve to prepare the students for their professional life and career after graduation.

As international relations of our country improve, multilingual communication becomes more and more important. Thus, becoming competent in foreign languages is one of the prerequisites for a future specialist to find a good job after graduation from the University. In this context acquiring of foreign languages becomes necessary for students and they are now more interested in learning them. In addition, learning a foreign language has great potential to help in development of all the mentioned skills and qualities which the future specialists will need.

In order to organize the work of students at sessions successfully it is necessary to know the students' background experience, their needs and interests and what expectations they have from the course. We carried out an inquiry in the attitude of students towards foreign languages as a teaching subject at the University. The students had to fill in a form answering ten questions that helped us determine whether the students are interested in, and have a need to learn this subject, have medium interest or non interested attitude. The questions are as follows:

1. What was your interest in acquiring a foreign language at the beginning of studies?
2. What was your interest during acquiring it?
3. How did your interest change while studying a foreign language?
4. Is this subject necessary for your future speciality, work and professional life?
5. Is this subject necessary for you personally?
6. Would you like to study this subject deeper?
7. Do you think that the number of sessions per week is enough for acquiring a foreign language? etc.

The first experiment was carried out in 1990 at the Latvia University of Agriculture with 250 respondents. We found that 58% of 250 respondents of the Latvia University of Agriculture were interested in learning a foreign language and had a need to acquire it, 21% had medium interest, but 21% of students were not interested in learning this subject and had no need to acquire it.

The difference indicates variable student motivation. In our country when the first experiment was carried out there were few possibilities of using literature corresponding to the specialities of our students' future professions and other teaching aids in foreign languages. Additionally relations with foreign countries were not well developed. We found that many of our students wished to learn a foreign language, but they saw no real need for it and had little opportunities to use it.

Repeating the experiment in 1996 at the Latvia University of Agriculture with 100 respondents we found that the attitude of students towards a foreign language has become more interested: 69% of

respondents are interested, 19% have medium interest and only 12% still have no interest in learning a foreign language. This change can be explained by the new socio-economic situation in our country today. Students have become motivated to learn the subject, they understand that they will need foreign languages personally, as well as in their professional life.

Comparing the situation today with what it was ten years ago when the first experiment was made and four years ago when the experiment was repeated, we can observe considerable difference. From the results obtained in 1999 we found that all students (265 respondents) are sure that they need to know foreign languages and they wish to acquire them.

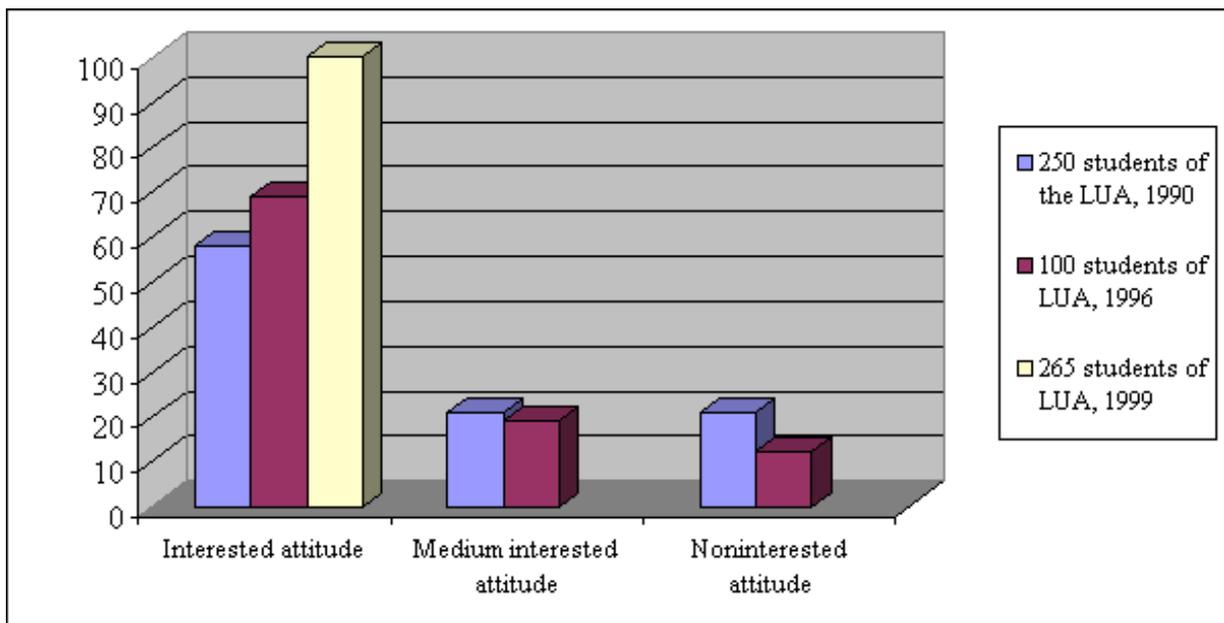


Fig. 1. Attitude of students towards a foreign language

In 1996 and 1999 we carried out SWOT (strengths, weaknesses, opportunities, threats) analysis in groups of the 1<sup>st</sup> and 2<sup>nd</sup> year master degree students of the Faculty of Engineering at the Latvia University of Agriculture to see what the students' needs are in respect to acquiring foreign languages. This analysis was organised in the form of discussions. All the master degree students who took part in these discussions consider that knowing foreign languages is important for finding a job after graduation in the real labour market. They stress also the necessity of knowing foreign languages as it is essential when working with foreign companies. This is so characteristic in our country today. All students also believe that they all will need some knowledge in foreign languages in their everyday life for different activities like socialising, meeting foreigners, reading books and other printed material, watching films etc.

The students can work efficiently if they understand how and why the activity is carried out. Without this understanding, learning becomes a dull routine according to requirements of the teacher. Thus it is necessary to model the course process in ways which interest students and leads them to see the need for the knowledge they are learning. If the students are motivated to learn, their activities are directed towards the attainments of their goals and the satisfaction of their needs. The teacher should encourage the participation of the students in studies by offering them encouragement and advice which contribute to their goals. If these are effective they must necessarily be based on the needs of each individual. The teacher's understanding of their needs helps communication with each student. The effective teacher must be able to identify such needs as they are expressed in individual behaviour and take action to help the students satisfy them in socially acceptable ways. Being educated in the authoritarian system of education has promoted only the concern to pass the exams, but not developed the interest in the process of studies that is personally important to a student. However, since students often reject any innovation in their process of study, so change is complicated. We were facing these difficulties trying to encourage students to work independently. Whilst solving these problems we analysed the character of work and its aims and, at the same time, encouraged students to discover their abilities, exercise and develop their study and assessment skills and helped them take responsibility for their own learning.

Every group of students is of mixed ability to some extent. Every student has a definite educational background and experience, which should be taken into account. The experience shows that the knowledge of the students in foreign languages greatly differs. Many of the students have had an opportunity to have practical experience abroad, which has influenced their knowledge of a foreign language. At the same time the students have different needs and expectations from their course of studies. It requires an individualised approach from the teachers in the organisation of the study process.

To model the process of studies which develops the skills of the students necessary for self-education we considered it to be necessary to determine the actual level of student autonomy at the University as autonomy of students indicates the degree of efficiency and quality of the study process. We used the following criteria to estimate the level of student autonomy:

- conformity of the aims, the means and the results of the activity,
- productivity of acquisition of knowledge and skills,
- research character of studies,

- approaching of self – assessment and teacher assessment,
- rational organisation of cognitive activities.

The choice of the criteria is based on the structure of independent work of students including such components as:

- the aim,
- the means for reaching the aim,
- application of the means,
- the result and new aims for future activities.

Conformity of the aims, the means and the results of the activity are expressed in the skill to realise and state the aim of the cognitive activity, to choose the rational variant to reach the aim independently and to assess the process and the result of the activity objectively.

Productivity of acquisition of knowledge and skills is characterised by the skill to find new solutions for achieving the aim, to apply the acquired knowledge in new situations using multiform kinds of activities.

Research character of studies manifests itself in the ability of students to evaluate the problematic character of the situation, to compare the means for solving it and to select the optimal one as well as to self – assess the activity and its result.

If self – assessment of students and teacher assessment approaches, it indicates that the students have the skill to evaluate their work objectively.

Rational organisation of cognitive activities is characterised by the skill to plan and carry out activities purposefully and to co – ordinate the subjective and social aims of the activity.

We applied these criteria to estimate the level of student autonomy. It helps discover the drawbacks and contradictions in the process of studies and determine which aspects of traditional process of studies must be changed.

The process of application of the criteria in the experiment is described in detail in the Doctor dissertation of the author (Maĭinovska, 1997).

The first results were obtained in 1989. We stated that 15% of the students taking part at the experiment have high level of autonomy, 35% of students have medium, but 50% - low level of autonomy.

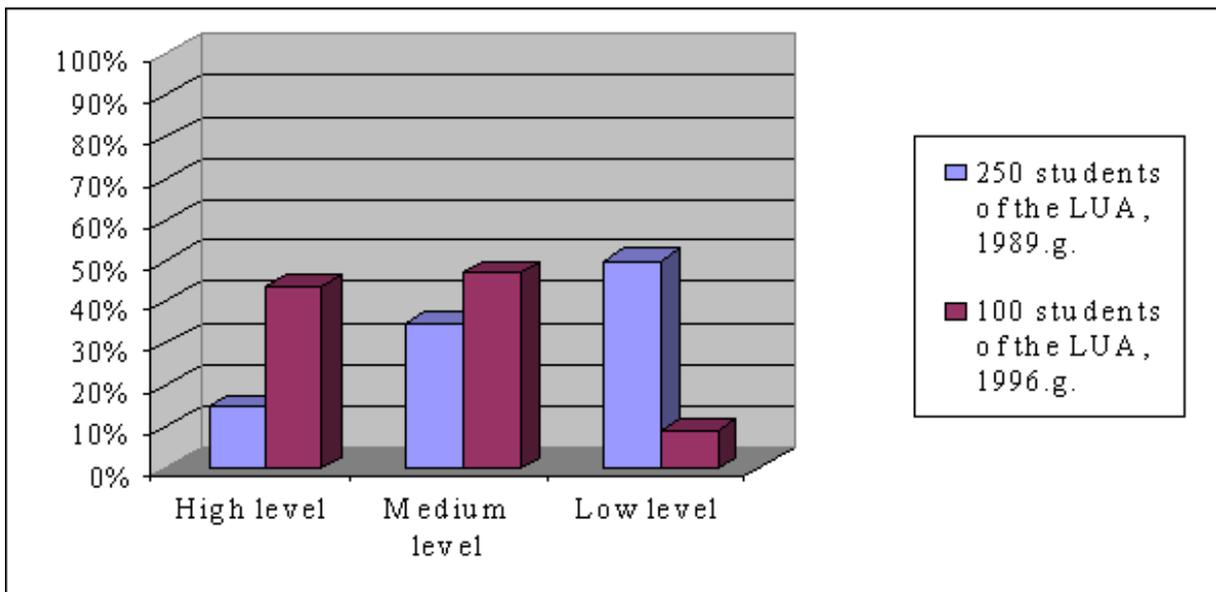


Fig. 2. Level of student autonomy in the process of studies

Changing the organisation of the process of studies, students and teachers joined in new ways of teaching and learning. We proved that the autonomy of students develops most efficiently if the teachers and students are co - operating on equal terms based on the teacher's skilfully organised readiness of students for independent learning.

We repeated the experiment in 1996 and found that the level of student autonomy had risen considerably. 44% of the respondents have high level of autonomy, 47% of students have medium, but only 9% - low level of autonomy.

The activities always correspond to the motivation of students for these activities. The motivation carries out the organisational and the directing functions of the activity and it expresses itself in the readiness of the students to carry out a corresponding activity. Motives also express the inner stimulus for the work and the students' needs and interests.

The Latvian educator Professor G.Rudzītis has divided the motives of self – education in four groups. He has summarised the results of an inquiry in motivation of 287 graduates (Rudzītis, 1999).

<b>Groups of motivations to self - education</b>	<b>% of students in which these motivations dominate</b>
<b>Group 1</b>	
socially significant motives, wish to earn money, make career, study in the Master degree course, post – graduate course, improve qualification	41,5
<b>Group 2</b>	
related to cognitive interest in a teaching subject, definite field of science, engineering and art	37,6
<b>Group 3</b>	
combines motives related to extension of general outlook and self – development	10,8
<b>Group 4</b>	
wish to keep pace with peers, spouse as well as the necessity to educate their children	10,1

Table 1. Motives of further education and self – education.

The educators H. Stanton from the University of Tasmania (Stanton, 1981) and T. Hutchinson from the University of Cambridge (Hutchinson, 1994) consider that the essential factor for independent work of students is to ensure the opportunity for each student to learn material included in the teaching course. Especially that, which is personally important to him.

Students today are positively motivated to learn foreign languages, as they understand that they will need this knowledge in their professional and everyday life. This helps the implementation of this requirement.

Many students wish to learn independently but they lack confidence that they will be able to organise their work correctly. Their self-esteem is not adequate, the teachers should encourage such students.

If students have a need to achieve a particular goal they must be free to choose the means for it. The British educator M.Cornwall stresses the importance of definite freedom of choice for the students (Cornwall, 1981). It means the freedom to evaluate their own strengths and weaknesses in order to choose the most appropriate means and methods for reaching their aims. The more versions they are offered the more responsibility lies upon them in the process of choosing the most appropriate ones.

In order to be able to choose correctly the students need to have a definite experience of independent cognitive activities. They must experience different ways and means of learning for themselves and need to make explicit the knowledge and skills required.

So that they are ready to supplement their knowledge after graduation through self-education, the students must first acquire the necessary skills for it at the University. These can only be achieved by active participation in the learning process. By the skills we understand knowledge in action. The skills are characterised by their generality, which makes it possible for them to be implemented by the student in different situations.

Knowledge becomes the means of achieving the aim when the student understands its purpose and takes personal responsibility for it.

Professor G.Rudzītis stresses the necessity to develop specific intellectual working skills. He has analysed methodical recommendations for studying foreign languages and for self – education developed by the teacher of foreign languages J.Zolotorevsky who knew approximately 30 languages (Rudzītis, 2000). We consider that it is very important for the students to know these recommendations and we present them to our students in the first year of studies. During the course of studies the students get acquainted also with other books by professor Rudzītis: “How to Work with a Book”, “The System of Preparing Students for Self – Education” etc.

Cognitive methods are also very important in self-education. Knowledge of the general cognitive methods and the skill to apply them in independent work promote the activity of the students and at the same time develop their autonomy in this process. It is achieved by purposeful usage of various stimuli such as positive assessment, praise etc. Development of the skills in the students of independent work is the aim, successful achievement of which will help to prepare students for continuing self-education after graduation.

We use the project method widely in the English sessions. The students develop projects on various engineering themes related to their future specialities. The students develop individual projects as well as group projects. The themes are as follows: Agricultural Machinery, Alternative Fuels, Car Service, Alternative Energy, Ground Power Vehicles, Milking Equipment etc. The best projects are presented at scientific conferences or exhibitions.

For the student the main object of the course is self – education rather than the content to be taught. The efficiency of this process depends on the cognitive activity of the students to a great extent. At the

same time stimuli and motivation play important roles in this. Every kind of work is more successful if it is interesting and necessary for the individual. If the motives initiating the work are socially significant and if it corresponds to the subjective aims of the students they work much harder to achieve their aims. In order to train highly qualified future specialists it is necessary to develop a positive attitude towards studies and the wish to extend the knowledge through self-education.

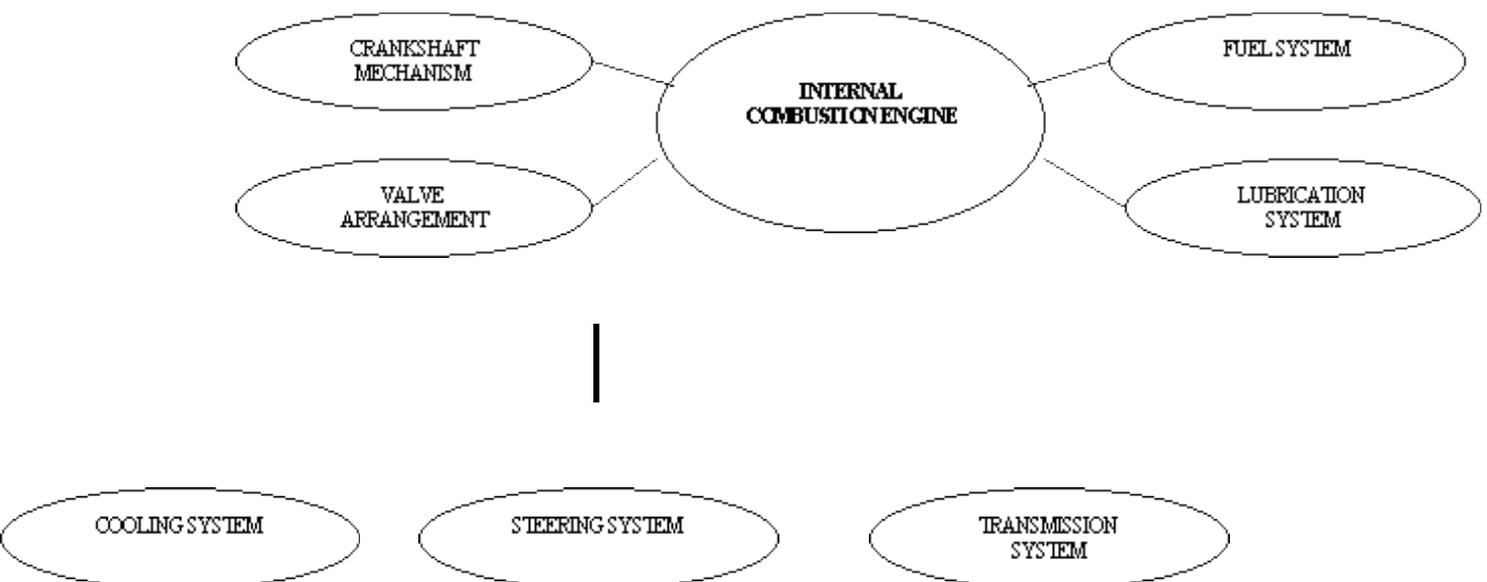
We are using specially designed engineering science texts in the English sessions for two purposes:

1) to arouse the students' interests to acquire the English language through reading texts related to their chosen speciality,

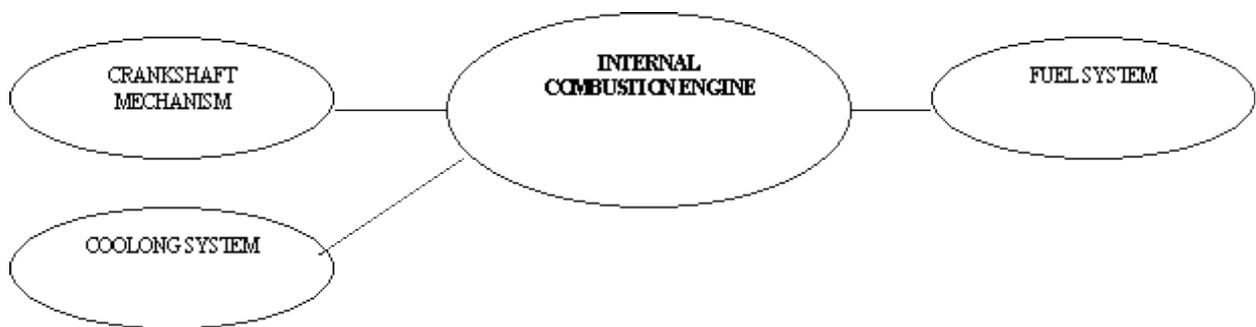
2) to supply the students with knowledge necessary to understand materials in English on various topics of engineering sciences.

This makes it possible to implement the English – Science inter - subjects links in the course. In the first year the students acquire technical terminology reading the book “Internal Combustion Engine” in English. The book describes the systems and mechanisms of the engine, like the crankshaft mechanism, valve arrangement, lubrication system, fuel system etc. This terminology is quite new for the students, as they have not come across these terms at school. We need to help the students to find the most appropriate means how to acquire the material most efficiently. For instance, we use the so – called spider diagram, which seems to be very exciting for the students. The body of the spider represents the central theme – the engine, the students have to add the legs representing all systems of the engine and strengthen the legs by adding the parts of the systems. This diagram is very suitable for testing the students' knowledge. The more information the students can remember, the bigger the spider they can develop.

A spider developed successfully looks like this:



A poor example includes only few systems and mechanisms:



In the second year the students go deeper in the specialities they have chosen. It is reflected also in the process of learning foreign languages. we are using authentic texts related to the five specialities which the students acquire at the Faculty of Engineering: Agricultural Mechanisation, Autotransport, Agricultural Energetics, Food Engineering and Entrepreneurship in Agroservice. So the students work on texts in agricultural machinery, milking machines, automobiles, fuels, car servicing, food processing equipment, ecological problems etc.

Students are able to choose the most suitable means of learning *for them* from the ones they are offered and gradually acquire appropriate skills for themselves. Such work shows a high level of student autonomy, which we aim to achieve in the process of studies.

Assessment of the student's work is another important factor in the development of the skills necessary for self-education. In this respect we would like to stress that not only the result, but also the process of the independent work of students should be assessed.

In the pedagogical literature of the dominant opinion that it is quite easy to assess the *product* of cognitive activities, but assessment of the *process* causes difficulties. After the using of the old model of testing and assessment it is difficult for the students to get involved in the process of assessment. They cannot evaluate their knowledge and the process of acquiring it adequately. To overcome these difficulties we suggest the cooperation of the teachers and students in the assessment. Through working *with* the teachers the students develop abilities to assess themselves using appropriate criteria. By active participation in the process of self-assessment, which is personally significant to them, the students develop the necessary skills and the habit to assess their own studies and the final result. This helps to achieve one of the most important objectives of the study process - the students take responsibility for their own learning, at the same time raising the level of their autonomy which is the crucial factor in preparation for self-education. The Swedish educator K.Taube describes the characteristics of efficient cognitive activities - planning, control and assessment (Taube, 1988). We consider that the students must take part in the agreeing of the aims of their work, selecting of the means to carry it out and in the process of self-assessment.

Self-assessment will only be adequate if the students feel satisfied with the process and the results of their work. The teachers, in turn, should ensure favourable conditions for the students to participate in the assessment and ensure that assessment and self-assessment become more balanced and valid. It means that teachers must value the work of the students when they have succeeded in learning, and help the less successful ones improve their performance. The teachers must help their students analyse the particular difficulties they face in learning, how to overcome them and what skills they need.

We also used different kinds of peer assessment. It helps to know the opinion of peers about each student, so the students can compare their views and do the self-assessment more precisely. In comparison to the methods of one-sided assessment, co-operative assessment can be more objective.

The use of self-assessment and peer assessment in the process of study helps students prepare for professional work after graduation because students practise the use of objective criteria and assess their work and own its results.

In the experiment we focused on assessment of the *process*, because it turned out to be more difficult for students than assessing the *product* of their work. We also encouraged students to take part in assessment, discussing, analysing and explaining the criteria of assessment. We asked students to argue about them, suggest their criteria or amendments. One problem was that students sometimes stubbornly tried to defend criteria, which seemed inadequate to us. We tried to solve this problem in two ways: (i) we tried to persuade students that the criteria chosen by them are not rational and objective by allowing them to use these criteria in assessment of their work. This allowed them see whether they *really believed* in the efficiency of *their* criteria and wanted to use them in the future; (ii) the teacher and the students used different criteria for assessment of students' work independently.

We found the second to be the best strategy to persuade students of appropriate criteria. It was a little risky, but very interesting at the same time. We consider that taking part in formulating the criteria of assessment promotes the development of student autonomy. Firstly, students become active, secondly, by comparing the criteria they have chosen to the ones chosen by the teacher students develop their skills to analyse, argue and defend their views.

## Conclusions.

In comparison to the former one-sided assessment when, what student has learned was assessed *only* by the teacher, cooperative assessment assesses *how* the student works during the *whole process of studies*. We found that self-assessment is influenced by the significance of work to the student. It is also important to the student how other persons, for example, teachers and peers, assess him.

The self-concept of students, objectivity of self-assessment, attitude towards their success and failures and comparison of them to the success of peers is very significant. We showed that students who have low self-concept could do the assignments at a low level maintaining some involvement in self-assessment of the quality of their learning. However students with high self-concept were working successfully and qualitatively.

Students having unsuccessful experience before have inadequate self-concept and they fear future failures. Students who are usually successful are confident and are not afraid of failure. In consequence students' self-concept develops with their success.

We found that learning and self-concept of students are closely related and influence each other. Low self-concept can function as a barrier in the process of learning. As each person tries to avoid inadequate self-concept unsuccessful students try to avoid complicated situations in the process of learning which can result in discomfort. Nevertheless the only way of becoming a successful student is to take part in the process of *learning actively*. It is necessary to help every student enjoy the feeling of success. This is complicated but teachers need to work with students taking into account their interests, skills, their individual differences and especially their background experiences, which can be very different.

Prerequisites for successful independent work of students are understanding and interest in the activities and tasks planned by the teacher, the negotiation with the student of purposes of the course and the means used for implementing, learning and assessing skills of the students.

Joy and satisfaction of success is the stimulus for further learning. The skills and autonomy of the students to choose the aim and methods in learning influence their self-esteem. In turn, this greatly influences their success in learning. So these factors are closely correlated with each other. An inadequate self-esteem leads to the avoidance of cognitive activities, as it is associated with failure and negative emotions.

The *only* way to become a successful learner is to be an active participant in cognitive activities, but avoidance of it prevents the further development of the skills. The duty of the teachers is to encourage the students. This can be achieved by creating a situation for every student to experience the feeling of satisfaction as the result of the work carried out. The teachers should try to find at least some positive moments in the work of every student. This requires getting to know the students better, considering their individual characteristics in order to help them overcome the difficulties and to make them believe in themselves and their abilities.

We recommend teachers not to force students to agree with their views and opinion but simply express them for students to consider and decide to accept them or reject. We must remember that a group of students is a team in which they train to be members of society after graduation, in this team habits of social contacts and communicability develop. This process can be successful only in a team where relations of good cooperation and favourable mood prevail.

The students need to acquire definite skills and have some experience in working independently; the teachers - to supervise this work. The teachers should learn to evaluate the situation - how much help the students need and when, and what the students can do on their own - depending on the readiness of the students for independent work. This statement is proved by the British educator D.Boud (1981). He also underlines the necessity for the teachers to have the knowledge and skills to determine the level of student autonomy and to organise the work of the students in a way that will raise this level. It is of utmost importance as independent work and self-education are closely correlated and self-education is not possible without the ability and motivation to work independently.

A person ready for self-education can be characterised as being an aware, self-confident person, being able to set objectives, to formulate standards for the work that realises these objectives. S/he can also assess the work done according to agreed standards and can modify the objectives and standards in the light of experience and action.

Overall, then, we believe that the traditional system of education should be replaced by the process of studies which promotes the development of student autonomy and preparation for self-education.

Without doubt, learning a foreign language can play an essential role in training future specialists to prepare them for their professional life after graduation from the University. For the teachers of foreign languages there are wide opportunities to make their investment in this important work. However, the enhancement of the roles of the students in justifying their curriculum and its assessment and the responsibility of students as learning is of significance in all aspects of University teaching are of the same importance.

These are high ideals, far from easy to achieve since they require a significant change in attitude towards learning on the part of both the learners and the teachers. Readers of these papers are encouraged to make their views and experiences known both to the authors and to the editor of the Journal.

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