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TEACHING OF PSYCHOLOGY FOR STUDENTS WITH A TECHNICAL BACKGROUND

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Teaching of psychology for technically educated students has its specifics that must be respected by the university teacher. These specifics concern the study goals, extent and contents of the curriculum, methods of teaching and preparation of study textbooks. Author of the textbook must take into account the professional exactingness, consistency of explanation, its fluency and clarity, lingual style and technical user friendliness.

Key words: humanities, psychology, technical university student, university teacher

Introduction

In the following text we will try to define the psychology teaching specifics for students with a technical background. We consider the reflection of these specifics as crucial and relatively insufficiently developed up to now. On the respect of these specifics just depends the intellectual and emotional acceptance or refusal of the whole scientific field on the part of intellectuals with a technical background, formation of their attitudes to the psychology and readiness of technicians to extend, deepen and apply the psychology knowledge in the future. This reflection together with definition of the study goals should precede the choice of the curriculum contents and methods of teaching because the relations between the basic variables i.e. subject-goal-contents-methodology-

-knowledge appear to be interdependent. This applies both to the psychology and philosophy, pedagogy, sociology and another subjects that can form the contents of the curriculum of the future engineers.

A complex of findings, afforded by the psychology, forms a substantial part of the knowledge concerning the human being generally and the human factor in the different spheres of technical practice in particular. For the technical university students it implies to acquire the necessary psychology knowledge for the professional technical practice, managerial practice and generally advisory practice at solution of the respective vital problems.

Every individual has certain knowledge about the existence and mechanisms of the human psyche. He/she relies on the experience gained in contact with other people, cogitates about himself/herself and the people in about. Subjective opinions and experiences from the workaday life can be applied to the whole psychology and raise at the technician an impression that psychology is a field of study based on subjective opinions and vital truths, i.e. an insufficiently exact and unsatisfactorily quantifiable field of study. This tendency can be underpinned by a circumstance that the majority of us has a tendency (though not consciously) to skew the accepted information in order to bring it in accordance with the already created opinions and attitudes and to ignore or refuse such information that is inconsistent with our opinions and attitudes. These tendencies, in distinctive cases, are approaching the cognitive stereotype and rigidity.

The specifics of technical thinking consists beside other things in the fact that it navigates the technician to find his/her way in the world of information and accept decisions based on the quantitative or pseudo quantitative exactness that is numerically rather adequately expressed, however, in a certain situation it can work irrelevantly.

As an example can be mentioned the sphere of the oil extraction research. The problem of the pseudo quantitative exactness can be found here too.¹ Firms that explore the oilfields are struggling with the same problems as psychologists in psychological testing with the help of projective methods. Oil companies give preference to quantified information over the less quantified one despite of the fact that it proved to be more precise in the past.

Technicians similarly give preference to the hard facts and take this preference with themselves to the world of humanities that works with soft information. (The researcher in the field of psychology is sometimes afraid of the fact that the qualitative research will be evaluated much worse than the research based on sophisticated statistical procedures).

¹ R. Sternberg, *Úspěšná inteligence* [Successful intelligence], Praha 2001.

Study Goals of Psychology

The study goal of psychology is to render a basic orientation to technical university students in psychological sciences with a special emphasis on the common and social psychology complemented by selected topics from the industrial psychology and organization.

The basic goal can be concretized practically in the following items:

- acquirement of the basic psychological terminology and understanding of the basic methods that form an instrument of the psychological cognition
- understanding and acquirement of the respective relations between the basic psychological categories and building of the psychological thinking basics.

Explanation of The Psychology Curriculum

The introductory lecture of the psychology course is usually devoted to definition of the given field subject. The already used term “subject” can illustrate to the technicians the difference between the common Czech language and the psychological terminology. The technician in this context automatically creates connotations with the different concrete subjects of the real world, while the psychologist begins to explain that the subject of psychology is something in which the psychologist is engaged. The technician’s attention, based on the trivial example of this term, is for the first time drawn to the importance of the sense of the words, semantic nuances, similarities and differences in the common language and psychological terminology. Underestimation of the systematic teaching and education of technicians, focused on contemplation about the terms of different categories, results in the fact that the student might not perceive the context between the psychological processes and phenomena, learn the psychology knowledge mechanically and at the same time use terms the meaning of which has not crossed his/her mind.

In the introductory phase of psychology teaching of technicians, it is also useful to explain them how the different sciences are distinguished and categorized. In view of the different historical classifications, it is possible to choose for example the conception of Popper that is close to the technical way of thinking: Popper divides the sciences into the logical-mathematical (they can be tested from the contradiction point of view), empirical (observable, running and lasting processes or situations in the process of time) and philosophical (they are a thought presupposition for empirical theory creation as empirical theories are based on a philosophical premise, that what is going on in the world is somehow interrelated).

By way of this example of science division it is possible to explain to technicians that psychology belongs to the empiric sciences. Their attention can be drawn to the fact that the empiric data are divided into two groups: the data that belong to the outside world and the other ones that belong to the internal world. While our body belongs to the outside world, the empiric data that form a part of our mental life are assigned to the internal world. It is common to all the empiric data that they are beyond our will. And so, as we cannot prevent a stone to fall from the rock to the valley, owing to the Earth's gravity, we cannot prevent the psychological phenomena to come up in a certain form.

Technicians can be gradually introduced into the psychological terminology and acquainted with the psychological laws, complemented by a comparison with the physical laws. Teaching of technical subjects is for example illustrated by a phenomenon, where a small boy is able to move a heavy stone by a long iron bar and by way of this example enable us to explain the physical lever law. (If the quantity of torque moments, acting clockwise at the arm where the force acts, is equal to the quantity of torque moments acting anticlockwise at the arm with the burden, then the arm of the lever will not move. In case that the quantity of torque moments at the arm, where the force is acting, is higher than at the arm with the burden, the lever will move clockwise). *This explanation concerns only one selected partial aspect of the observed action.* It does not pose any question and does not for example explain, how it was possible that the boy got an idea to move the stone with a help of a long bar, i.e. a phenomenon that in psychology teaching should be pointed out in a different context.

In the course of psychology it is analogically proceeded with the explanation of another psychological phenomena and terms, which could be perhaps incorrectly understood with regard to another connotations in the technical fields. (The variable is a characteristic that can appear at different but at least at two degrees of expression. The term chair is not a variable but a variable is the weight of the chair. The term chair does not imply a quantity of values as it does not define, which feature forms a subject of the consideration – whether it is the colour, weight or height). University student will gradually learn about the independent and dependent variables in psychological research, about various methods and means that the psychology has at its disposal, and also about the possibilities of their application for example in the technical sphere.

The law in empiric sciences says how the events are interrelated. Physical laws are always in force, the laws of psychology are in force with a certain probability. The assertion that “there is not aggression without frustration” is valid with (a high) probability, however, the consequence of frustration could also be suppression, regression, rationalization, escape, etc.

A plenty of concrete examples, preferably from the sphere of technical subjects, is according to our experiences the best way how to convince the technicians about the fact, that it is *useful* to be acquainted with the basics of the common psychology which in its plain form is for technicians uninteresting. Insisting on an extensive historical introduction, with a long list of representatives of individual psychological specializations and schools, leads on the contrary to the fact that students will learn these facts by heart (for the examination) but they will forget them immediately, as they perceive them as superfluous. An important formative study goal of psychology, aimed to arouse interest in creation of a positive attitude to the psychological sciences, could not be achieved in this way.

Sometimes a part of students oppose to learn the theoretical psychological and other humanities phenomena (relations between the terms and phenomena, laws of the common psychology) with a justification that as technicians they are not able to acquire these phenomena. Behind this "revolt" is usually hid the cognitive rigidity, technocratic viewing of the world, minimal preceding experiences with psychology, but sometimes also reluctance and laziness, supported by an idea that university students can pass the examination without the respective theoretical knowledge. In these cases it is necessary to assess the situation individually. Repressive reactions of the teacher usually do not make it much better, more probably they can strengthen the negative attitude of students. There, where the reason consists in apprehension of a failure, a discreet encouragement has a positive influence. In case that it concerns decreased verbal abilities and skills, the teacher must redouble his efforts and repeatedly explain and exercise the problem parts of the curriculum. Should there exist a suspicion of indolence and laziness then the solidity and consistency of the teacher can ultimately drive the student to study the curriculum and subsequently to admit that the effort made was not in vain.

It is impossible to fail notice that some of the full-time students of ČVUT use various tactics how to pass an examination of the subject with a minimal effort. In view of the fact that participation at the lectures is not compulsory and the students have at their disposal electronic textbooks, some of them are coming right to an exam. Only after failure they begin to realize that they cannot get along with the accustomed stereotypes in self-study and are requested to present more than a passive receptive mastering of the curriculum. An impulse for a change of student's approach to his/her study can be a usual misunderstanding, when he/she identifies the phase of curriculum understanding and the final phase of mastering it.

Methods of Psychology Teaching

Should the students of the technical programme be able to make a choice, the teaching of psychology will consist in illustrations of the psychological testing and methods of social psychological exercise. However, if the defined goals of study should be achieved, the combined lessons prove to be most appropriate. It is therefore necessary to interchange the methods of teaching, ease the theoretical teaching units with short activation sequences (brainstorming, short tasks supporting the attention, breathing exercises, discussion entries, solution of case studies, training of communication skills, teaching video programmes and another things). The lectures can be continuously complemented by discussions of students moderated by the teacher.

Elements of the problem curriculum have also a good effect on attention, though a part of the students is remarkably resistant towards the effort of the teacher to induce them to an active participation. Good experiences brought the work with a video camera, when the students rehearse short scenes in front of the eyes of their colleagues. These are subsequently commented both by the actors themselves as well as by their schoolfellows and the teacher. These simulations of presentations in public cause ambivalent attitudes to students: rationally they are perceived as appropriate exercise means, however emotionally they cause unpleasant emotions, replaced by a relief after the end of the presentation.

Control of The Study and Examination Qualifications

University students can take advantage of consultations during the course of psychology. This possibility is frequently used after the end of the lecture. The questions of students (of full-time and combined forms) are for the most part associated with solutions of their study and personal problems. Less frequently they come with questions that concern the lecture itself and problems with its understanding. The students also process some short tasks throughout the course, (they learn to formulate some short abstracts from the magazine "Psychology today" in the given extent, so as to express well the substance of the topic), and a part of the students elaborates papers on the given topic and presents them before the course participants.

The subject of the course is concluded by evaluation of the course participants that comprises several parts: carried out control of the assigned tasks, and consideration of the active student's participation during the course. The focal point of this evaluation forms an overall written test from the whole curriculum. A part of the test items relates to the basic curriculum, however, the

other part requires a creative individual application of the acquired knowledge and its incorporation into another contexts. Right with this part have the university students a major problem as they are required to do something they are not used to. The teacher gets from the test results a relatively precise picture of the time that the student has devoted to studies for an exam and the level at which he/she is able to cogitate.

Creation of a Textbook

Preparation of psychology textbooks for students and graduates of the technical universities has its specifics that the author has to keep in mind. The basic requirements can be specified as follows:

- appropriate extent of the textbook
- appropriate professional exactingness
- consistency of the text
- fluency of the explanation
- clarity of the text and its total layout
- lingual style
- technical user friendliness

The requirements of a good quality communication at a general level were similarly formulated by T. Kollárik:

(...) should the communication be effective, the information itself must be precise, understandable, with a concise contents, sufficient, relevant and reliable. Otherwise the released information cannot achieve the required objective (...)².

An appropriate extent of the textbook used to be perceived considerably subjectively by the parties (authors and students). While the student forms his/her first impression according to the thickness of the textbook, and according to it he/she estimates the time necessary for exam preparations, the author on the contrary tends to repeatedly extend, amend and refine the text. Students of technical universities are used to study for technical subject examinations preferably from the textbooks of the faculty teachers that are regularly published in the innovated versions, in a classical or electronic form. Less frequently they study from monographs and another textbooks. The extent of textbooks is usually in proportion to the number of credits assigned to the given subject and ranges from 100 to 300 pages, where the upper limit concerns the major special subjects of the programme. The appropriate extent of the common psychology textbook, according to our point of view, ranges from 120 to 200 pages. A similar extent should have the follow-up textbooks

² T. Kollárik, *Sociálna psychológia práce* [Social industrial psychology], Bratislava 2002, p. 89.

of social psychology, industrial psychology and organization. An integral part of these basic texts should be references to another recommended literature, classical and electronic. It is the task of the teacher to advise university students how to find their way in this offer.

Unsuitable on the contrary are optional subjects, offered by some faculties, that comprise exclusively specialized psychology topics, which are often pedagogically unqualifiedly assured, and do not provide to university students the basic psychological knowledge, nor the appropriate textbooks.

To define the appropriate professional exactingness is a relatively hard task that must be thought over by the author before he begins to write a psychology textbook for the technicians. Subjectively perceived easy grasp of the subject matter by the author could result in the fact that the written text will be uneasy, with excessive use of exacting terminology that will affect university students negatively. A contrary extreme represents a pursuit of the best comprehensibility, as the author's text will then be led verbose, with a low information density, and give the reader an impression that in psychology there is actually nothing to learn. The author will be forced to take into account an inevitable compromise between the both extremes during the whole process of the textbook writing, possibly with a continual verification of the degree of exactingness in the form of a feedback from students – the future users.

The consistency of the text can be understood as its internal accord and harmonization, with the selected level of exactingness kept in all the chapters that will be relatively equally proportional and emphasized. It can be assumed that the entire curriculum of psychology basics will be unevenly understandable to the technicians, and therefore the explanation of individual parts of the text must be adapted to this different exactingness. The text should also be consistent as to lingual style, particularly in case that the textbook is written by more than one author. Despite the fact that individual authors are not and cannot be mental doubles, the cooperation in preparation of the textbook should also comprise mutual consultations.

As fluency of the explanation can be understood the interconnection of its individual chapters that logically follow each other. Brief, encyclopaedically arranged sentence constructions, overinflated by terms and definitions, cannot give the technicians a vivid picture of the complicated, interrelated psychical phenomena, and result in mechanical memory mode of curriculum learning. The compactness of the textbook as a whole, should the reader assure explanation of all the questions placed in the text. The reference to a curriculum explained in the preceding chapters and explanation of interrelations and links to the following curriculum helps to a better acquirement of the new psychological knowledge. References to the important persons in the field of

study and a brief summary of their contribution to the scientific cognition contribute to a better orientation of the user in the broader contexts.

The clarity of the text supports the fluency of the explanation – properly structured and divided text, with separated units and highlighted key terms, facilitates the consistent reading. Orientation in a less structured text is more difficult. One of the possibilities, how to enable the user to be well informed right from the beginning, is a properly structured introduction where the structure of the text is briefly described in a couple of sentences. The same can be done at the beginning of each chapter where the user will be informed about its focal point. Separation of the explanation passages from the exercise and illustrative passages should be taken for granted. The author's sophistication in proper use of various fonts and other graphical aids in the psychological text will be appreciated by the technical user, as he himself actively uses them. Coherent control questions are not only used for verification of the respective knowledge but they also support divergent thinking of the users.

The lingual style is another characteristic of the curriculum that will be noticed by every technical user. Hereinabove was already stated that technicians are usually not fascinated by verbose texts, however they appreciate precise, understandable formulations aimed at the substance of the explained issue. Author's style has even a more important effect in view of the ascertained worsened knowledge of the mother tongue of technical university students. The experiences show that the situation is rather deteriorating, irrespective of the fact whether the student has finished his/her studies at the secondary school or vocational school. The reasons are generally known and discussed at different levels. The teacher of psychology and author of the psychological textbook remains beside his/her basic mission a propagator of the lingual style. The richness of vocabulary enables him/her to explain the problem in an original way and avoid the stereotypical phraseology. The technical vocabulary, he/she is used to in his/her professional publication activity or research, must be modified in order not to discourage the technical university students. Another aspect, to be taken into account by the author of the text, is the semantic accuracy, in particular there, where it comes about confluence of the common language and the psychological terminology. Many misunderstandings, with which the teachers of psychology are encountered at the examinations of technical university students, are caused by a reduced semantic perceptiveness of technicians that was not regularly corrected by the teacher during the lectures and exercises. Therefore it proves to be effective at more difficult topics of the curriculum, if further specifications of terms or statements are mentioned in the brackets, with the help of synonyms and other illustrative examples. A thorough work with the text and consideration

of its effect on understanding of the technical user, is sometimes more time-consuming than the selection of the curriculum itself.

Technical user friendliness. From the everyday life practise we know, how demanding used to be the understanding of various technical manuals, handbooks and instructions for use. The reason does not always consist in unprofessional translations from the foreign language but in a negligent work with the technical language. The English term “user friendly” was for example brought to the public notice from the technical practice. Manipulation with the technical products should be simple as much as possible and understandable for everybody, as it is explained in the engineering psychology.

Authors with a humanitarian background do not always keep to the same rules in writing of the psychological texts for a user with a technical background, when they are not able to free themselves from routine formulations and excessive use of foreign words. The popularization of psychology for the beginners in the given field does not decrease the professional quality of the author, as he himself sometimes is subconsciously feared of, but on the contrary it is a way how to bring along professionals with a technical background to the interest about psychology. If the psychological text is in addition aesthetically attractive, the true-blue technician will leaf it through with pleasure. We cannot of course expect from him that he will acquire its content completely.

Conclusion

Teaching of psychology cannot take place without respect to the specifics of the university student with a technical background, who is used to quantitative processing of data. Teachers of psychology and other humanities must themselves determine achievable objectives, comprising basic orientation of technicians in psychological sciences, with emphasis on the common and social psychology and also on the education objective - establishing of long-term positive attitudes to the psychology and understanding of its importance at the technical, managerial and personal level. The curriculum extent and contents can be made more precise just on the basis of thus formulated objectives. The teacher must pay an extraordinary attention to the work with professional psychological terms, explanation of the basic psychological laws and clarification of similarities and differences in acquirement of the respective empirical findings in natural, technical and humanistic fields. The methods of teaching must be subordinated to this objective, should the technician be able to acquire the psychology basics. Certain rules are also valid for crea-

tion of textbooks aimed at the user with a technical background. The basic requirements for its authors consist in respect for an appropriate extent of the text and its professional exactingness, keeping the consistency and fluency of the explanation, clarity and author's lingual style and his/her technical user friendliness.

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