

MOTIVATION ENHANCEMENT OF FUTURE ENGINEERING TEACHER BY MEANS OF PEDAGOGICAL SUPPORT

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Abstract. The success of young people in future professional activities significantly depends on the quality of their training in higher education institution. The system of professional paradigm in higher education should be aimed at training future engineers-educators who will embody the values of civil society and at a high professional level will solve problems that arise in vocational schools. The article reveals the conceptual provisions of the development of the readiness of the future engineer-teacher for professional and pedagogical activities through the motivation enhancement. The technology of pedagogical support (substitution, imitation, cooperation, initiation, anticipation) is offered in the educational process of the higher education institution to increase the professional motivation for engineering teachers to be. The dynamics of the motives of professional activity among students in the period of 2018-2021 academic years is analyzed in the paper. The checkpoints were made after the first and the third years of the students' bachelor level and the first year of the master level at the Faculty of Engineering of Higher Educational Institution "Podillia State University" specialty "Professional Education (Engineering)" (full-time tuition). To diagnose professional and pedagogical motivation of students the method of motivation of professional activity by K. Zamir in the modification of A. Rean was used. It was proved that pedagogical support provided by the teachers influenced greatly on the motivational component of the education. Thus, the following dynamics were observed during the testing period: constant increase of internal motivation and regular decrease of external motivation. It underlines the importance of the teaching process essence rather than environmental and other external circumstances influencing it.

Keywords: engineering teacher, motivation, professional-pedagogical training, technology of pedagogical support.

Introduction

At the present stage of economic development in Ukraine, staffing is of paramount importance due to the real needs of the labor market and the requirements for the quality of production potential. A special role in solving this strategic task is played by the system of education, precisely vocational education, which is organically connected with production and provides training for highly qualified specialists, which, in turn, requires high-quality teachers with a high level of motivation.

The structure and dynamics of the professional and pedagogical motivation of students in the process of their training in higher educational institutions is of particular interest nowadays.

The modern system of education applied at the university is focused on activating the cognitive qualities of students, developing their self-education skills, and shifting priorities towards individual learning. The effectiveness of these processes increases significantly when providing a high level of motivation for learning activities. The use of motivation makes it possible to identify the internal reserves of the individual for development, training, and education, since motivation can influence both the performance of activities and development of the personality itself. Besides, students studying at technical universities usually pay more attention to sciences than humanities, which creates some educational gaps for them as future engineering teachers. Given this, the problem of motivation is relevant and requires constant study.

Pedagogical support is defined as a complex technology that provides conditions for successful professional development and effective mastery of innovative pedagogical tools, constructive decisions in various situations of professional and life choice, activation of sanogenic thinking as a prerequisite for future effective engineering and pedagogical activities, emotional burnout, psychological encapsulation, conflict strategies of behaviour, the development of internality in general and responsibility for their physical and mental health.

The main areas of support are learning to choose, creating a field of orientation for development, strengthening and increasing self-esteem, work on pedagogical mistakes, socio-cultural stereotypes, outdated rigid attitudes, creating an optimistic professional perspective and attitudes to success, victory, major, overcoming difficult circumstances of life and profession.

The results of the Global Teacher Status 2018 study based on a large-scale public survey of 35 countries show that there is a correlation between the teacher status and student learning outcomes in the country (Dolton et al., 2018). In many countries, teaching is considered a profession of last resort and does not enjoy the same respect as other professions that require a similar level of education. This makes it especially difficult to recruit and retain quality candidates. Young teachers often leave the profession after a few years to look for opportunities in other fields that offer higher wages or greater prestige. Improving incentives to attract and retain more qualified teachers may change these views but changing perceptions can be time consuming and require constant effort [1].

It should be noted that in Ukrainian polytechnical universities most of the lectures are given by highly qualified professors in technical fields, but they mostly do not have any pedagogical education. This demands certain adaptation both for students and teachers and involving specialists in pedagogics to the education process.

Currently many scientists consider motivation to be the key point in any teaching profession. Thus Anghelache (2014) studied motivation for the teaching career in Romanian context and based on the survey conducted the researcher proved that there was some dependence relation between motivation and the age of the subjects. The increase of motivation was indicated with the subjects' ageing [2].

Yuce et al. (2013) investigated the Turkish context as for the motivation for choosing teaching as a career. It was stated that teaching profession eventually became more feminine in eastern countries, especially because of extrinsic/mercenary motives [3].

Oliylyk et al. (2019) analyze the concepts of designing, modeling, and validity in pedagogical science, studying the pedagogical model of future engineers' preparation based on massive online courses. The authors define several blocks dedicated to certain pedagogical aims. The motivation block is defined as the main one for the highly qualified specialists training [4].

The peculiarities of future engineers' training in the conditions of educational and informational environment at technical university were described by Rakhmanov et al. (2021). The researchers emphasize the necessity of methodological and informational support in the education process, where the key role is given to students-teachers cooperation [5].

As we can see, the research papers mostly embrace the teaching issue globally and generally, while the purpose of the current article is to analyze the motivation for engineering teachers, as this layer is not entirely covered yet and needs to be specified.

The aim of the article is to substantiate the conceptual provisions of the use of one of the personality-oriented technologies in higher education, precisely the technology of pedagogical support for engineering teachers and its influence on students' motivation enhancement.

Materials and methods

In this regard, we set the task to study the dynamics of the motives of professional activity among students in the period of 2018-2021 academic years. The empirical study involved 48 students. The checkpoints were made after the first and the third years of the students' bachelor level and the first year of the master level at the Faculty of Engineering of the higher educational institution "Podillia State University" specialty "Professional Education" (full-time tuition).

During the abovementioned period such types of pedagogical support, suggested by Strokova [6], were used in the following hierarchy: *substitution* (the teacher solves the most complicated tasks instead of the student with the following explanation); *imitation* (the teacher demonstrates the pattern and the student reproduces it); *cooperation* (the teacher and the student jointly discuss educational, personal or other difficult life situations for the student, together seek a way out of them; the teacher helps the student understand the essence of the problem, assess their capabilities, choose the best possible solutions); *initiation* (the teacher with the help of leading questions organizes heuristic or research activities of students, creates the necessary conditions for choosing the path or method of solving educational problems); *anticipation* (prevention of wrong steps or decisions, anticipation of possible mistakes of the student, because, having no experience, students are not aware of the consequences of their actions, deeds or words, cannot assess complex relationships).

To diagnose professional and pedagogical motivation of students the method of motivation of professional activity by K. Zamfir in the modification of A. Rean was applied [7; 8]. This technique allows differentially assessing the severity of each type of motivation on a 5-point scale.

Results and discussion

The engineering students (engineering teachers to be) were involved into the regular run of professionally oriented seminars, webinars and panel discussion aimed at providing necessary pedagogical support for enhancing professional motivation during the whole period of studying in 2016-2021 academic years with three checkpoints at the end of the first, the third and the fifth year of education. The educational and professional curricula for the specialty “Professional Education (Engineering)” [9; 10] were used as the framework for extracurricular activities as it was mutually designed with all the stakeholders due to the Bologna requirements and modern labor market demands.

Motivation is determined as the force that makes people act, set goals and achieve them. This is a psychophysiological process that controls human behavior, as well as sets its direction, actions and constancy. Professional motivation is a complex notion and is usually divided by different scholars into types: 1) extrinsic, intrinsic and family [11]; 2) extrinsic, intrinsic, prosocial [12] etc.

Based on the obtained data, the motivational complex of professional activity is determined in the paper, which is the ratio of three types of motivation: internal motivation (IM), external positive motivation (EPM) and external negative motivation (ENM). The internal type of motivation includes motives that encourage activity “by itself”. These include: the pleasure of the labor process itself, its content of positive results, as well as the possibility of full self-realization in this activity. If the motivation for professional activity is based on the desire to satisfy other needs that are external to the activity itself, then in this case it is considered that the motivation is external. External motivations themselves are differentiated into positive and negative. External positive motivations (EPM) include: the desire to earn more money, the desire for career advancement, the need to achieve social prestige and respect from others. External negative motivations (ENP) include: the desire to avoid possible trouble, stress, punishment, or the desire to avoid criticism from a manager or colleagues. IM and EPM are considered favorable for professional activity, and ENM – unfavorable. The optimal motivational complexes include two variants of the quantitative ratio of indicators of types of professional motivation: $IM > EPM > ENM$ and $IM = EPM > ENM$.

$ENM > EPM > IM$ is the worst motivational complex. Not only the ratio between the types of professional activity is considered, but also the quantitative difference between them.

The average values of kinds and types of professional activities motives of the first- and third-year bachelors and the first-year masters obtained in our study are shown in Table 1.

Table 1

Professional activities motives

Types of professional activities motives	Kinds of professional activities motives	Average indicators of professional activities motives for students		
		first-year bachelor students	third-year bachelor students	first-year master students
Internal motivation (IM)	1. Satisfaction with the process and results of educational activities	3.44	4.03	4.69
	2. Possibility of complete self-realization in this activity	3.00	4.28	4.56
External positive motivation (EPM)	1. Desire to earn more money	4.44	4.47	4.67
	2. Desire for career advancement	3.58	4.11	2.92
	3. Need to achieve social prestige and respect from others	4.56	3.89	3.39

Table 1 (continued)

Types of professional activities motives	Kinds of professional activities motives	Average indicators of professional activities motives for students		
		first-year bachelor students	third-year bachelor students	first-year master students
External negative motivation (ENM)	1. Desire to avoid criticism from the manager or colleagues	4.39	3.08	2.72
	2. Desire to avoid possible punishments or troubles	4.53	3.97	3.50

Table 1 shows that most types of motives for professional activity in the process of learning for engineering students linearly change, increasing or decreasing. Only the desire for career growth is oscillatory: by the third bachelor year it rises, and in the first master year it decreases. Throughout the entire learning process, indicators of satisfaction from the process itself and the results of educational activities, the possibility of full self-realization in this activity, and the desire to earn more money increase. On the contrary, there was a decrease in the characteristics of the need to achieve social prestige and respect from others, the desire to avoid possible punishments or problems. It should be noted that material motivation (the desire to earn more money), although already quite high in the first bachelor year (4.44 points), then develops weakly, reaching an average value of 4.67 points in the first master year. In fact, no significant changes in this motive were found.

Based on indicators characterizing the types of motives of students' professional activity, integral indicators of the types of this motivation were determined: internal and two external - positive and negative. The results obtained are presented in Table 2.

Table 2

Types of motives of student professional activity

Types of professional activities motives	Average indicators of professional activities motives for students		
	first-year bachelor students	third-year bachelor students	first-year master students
Internal motivation (IM)	3.22	4.15	4.63
External positive motivation (EPM)	4.19	4.16	3.66
External negative motivation (ENM)	4.46	3.53	3.11

As shown in Table 2, there is a clear increase in the indicators of intrinsic motivation for professional activities in the process of studying. External positive motivation for the third-year bachelor students is quite high and does not change significantly, and it significantly decreases for the first-year master students. Moreover, this decrease occurs mainly due to a drop in the desire for career advancement in the fifth year and partly due to a decrease in the need to achieve social prestige. The external negative motivation of professional activity among students is subject to the strongest decrease in comparison with other types. If the ENM indicator was 4.46 points for the first-year bachelor students, then it was 3.53 points for the third-year bachelor students, and it was 3.11 points for the first-year master students.

The formulas for the ratio of types of motivation for professional activity in the learning process of students change as follows:

- for the first-year bachelor students: $ENM > EPM > IM$ ($4.46 > 4.19 > 3.22$);
- for the third-year bachelor students: $IM = EPM > ENM$ ($4.15 \approx 4.16 > 3.53$);
- for the first-year master students: $IM > EPM > ENM$ ($4.63 > 3.66 > 3.11$).

Thus, the dynamics of the structure of motivational types, which is determined by their ratio, indicates that there is the worst motivational set for professional activity in the first bachelor year, then it becomes positive in the third bachelor year. And the optimal complex of professional activity motives of students is defined in the fifth year (master degree).

Conclusions

The presence of problems arising in the system of vocational education is due to certain reasons, including: a decrease in the prestige of working professions, insufficient participation of business entities in solving the problems of vocational education, outdated material, and technical base; imperfection of the qualification characteristics of the profession and types of work, state standards of vocational education; insufficient level of training of teachers. All this leads to employers' dissatisfaction with the quality of workforce training.

The profession of an engineering teacher belongs to a small group of professions that function simultaneously in two different systems: "man-man" and "man-technology".

By deliberately attracting opportunities for cooperation and quality professional development, well-thought-out teacher policies can help increase motivation and professionalism. When teachers and students work together in an atmosphere of cooperation and mutual support, the students' professional motivation and confidence multiply. Teacher and student networks stimulate increasing the amount of time spent together, leading to an increase in actual education time.

The method of motivation of professional activity by K. Zamfir in the modification of A. Rean was applied in the research to check professional and pedagogical motivation of students. The motivational complex of professional activity which is the ratio of three types of motivation: internal motivation (IM), external positive motivation (EPM) and external negative motivation (ENM) was determined in the research. Based on indicators characterizing the types of motives of students' professional activity, integral indicators of the types of internal motivation increased totally at the course of studying, while external motives generally decreased. Precisely, the indicators of internal motivations were constantly growing in the process of education; the indicators for external negative motivation were permanently lowering; the dynamics for the external positive motivation indexes was variable: the money issue was always an essential motive for students, while career success and social prestige lost their importance at the end of the studying period.

The following dynamics of the studied indicators was observed: the first-year bachelor students: $ENM > EPM > IM$ ($4.46 > 4.19 > 3.22$); the third-year bachelor students: $IM = EPM > ENM$ ($4.15 \approx 4.16 > 3.53$); the first-year master students: $IM > EPM > ENM$ ($4.63 > 3.63 > 3.11$). The positive dynamics of internal motivation should be underlined. The indicator of IM started with 3.22 and ended with 4.15 at the end of the research. Also, the decrease of ENM indicators can be observed, that was 4.46 at the beginning of the research and 3.11 at the end, respectively. It emphasizes the significance of the teaching process essence over the environmental and other external factors affecting it.

To obtain effective results of motivation enhancement for engineering teachers, training a competitive specialist, pedagogical support must be carefully worked out both from the standpoint of theoretical and methodological justification, and technological support. The main areas of support are learning to choose, creating a field of orientation for development, strengthening, and increasing self-esteem, work on pedagogical mistakes, socio-cultural stereotypes, outdated rigid attitudes, creating an optimistic professional perspective and attitudes to success, victory, major, overcoming difficult circumstances of life and profession.

Author contributions

Conceptualization, Iryna Humeniuk and Olha Chaikovska; methodology, Iryna Humeniuk and Olha Chaikovska; software, Iryna Mushenyk and Oleksandr Humeniuk; Iryna Humeniuk and Iryna Mushenyk; formal analysis, Iryna Mushenyk and Oleksandr Humeniuk; investigation, Iryna Humeniuk, Olha Chaikovska and Iryna Mushenyk; data curation, Iryna Mushenyk and Oleksandr Humeniuk; writing – original draft preparation, Iryna Humeniuk; writing – review and editing, Iryna Humeniuk; visualization, Oleksandr Humeniuk; project administration, Iryna Humeniuk; funding acquisition, Iryna Mushenyk. All authors have read and agreed to the published version of the manuscript.

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