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FRONESTICAL APPROACH TO THE FORMATION OF PROFESSIONAL RESPONSIBILITY OF FUTURE SPECIALISTS OF TECHNICAL SPECIALTIES: MONITORING BY MEANS OF INFORMATION AND COMMUNICATION TECHNOLOGIES

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Abstract. The rapid development of information and communication technologies (ICT) and their active use in the educational process has been hugely intensified by the COVID-19 pandemic. In the process of acquiring generic and specific competencies and determining learning outcomes, it is important to develop a system of observations that will allow to respond quickly to problems arising in educational practice. The article presents the results of monitoring the ability to make responsible decisions by future specialists of engineering specialties. The virtual educational environment ATutor of Ternopil Ivan Pulyuy National Technical University (Ukraine), created on the basis of the learning management system, has been used for data collection. The results of the study led to identifying the differences in the algorithm of responsible decision-making by students of engineering specialties depending on gender, year of study and the specifics of the chosen specialty. All these factors are to be taken into account in pedagogical practice for the formation of professional responsibility. A phronestic approach to understanding the content and essence of professional responsibility in the anthropogenic environment has been discussed. This approach takes into consideration the specifics of ethical knowledge and focuses on sustainable individual priorities to determine personal responsibility in a particular situation in accordance with social needs. The necessity of reconsideration of responsibility as an element of phronestic knowledge is substantiated; its importance in the training of future engineering specialists is specified. Prospects for further research on the use of the phronestic approach in professional pedagogy are formulated, the results of which can serve as guidelines for modernizing the strategy of teaching social sciences in higher education.

Keywords: information and communication technologies; professional responsibility; students of engineering specialties; phronestic approach; strategy of teaching social sciences in higher education.

Introduction

Today, ICT does not only provide an opportunity to learn and teach remotely, but also offer a wide range of new effective tools and methods in pedagogy. The use of computers and other electronic equipment makes it possible to systematically monitor learning outcomes in higher education.

This is especially vital for higher engineering education as sustainable development of society is, first of all, responsible development that takes into account all the consequences of scientific and technological progress. Building information-oriented society of sustainable development inevitably draws attention to the problem of human responsibility for the negative consequences of scientific and technological progress, which are clearly manifested not only in the loss of environmental security, but also in the dominance of cyberculture. As M. Berdyaev claimed, social and technological progress is directly proportional to biological and anthropological regression (Berdiaev, 1995).

The global expansion of technology not only requires a serious theoretical analysis of the preconditions and current trends of processes that have led to both environmental and spiritual social crisis, but demands the development of specific practical measures to be taken in the future. The true social role of technology can be determined only by taking into account the nature of its connection with the improvement of the quality of life of an individual and with the functioning of the social organism as a whole. Engineering specialists have to understand this from the very beginning of their training in the professional realm.

Higher engineering education is special, because it combines all forms of knowledge identified by Aristotle (2002): episteme, scientific knowledge, the result of which is predictable, repeated in the same conditions; techne, which is based on the model (eidos) and phronesis, which is a contextual ethical knowledge, individual within the framework of the general common.

Phronesis (prudence, practical reasoning) is pragmatic virtuous knowledge of the special, individual part that belongs to something general. “Accordingly, science is concerned with proving and evidence, and for those whose principles could be either way, proving is impossible (because everything can be different). It is impossible to decide on the existing with necessity (originally in Greek: περί των εξ ανάγκης όντων), phronesis will be neither science nor art: it will not be science because an action and creativity are different by their nature. Thus, phronesis remains to be a true inherent in the judgment of the composition of the [soul], which involves actions that affect the good and the bad of a man” (Arystotel, 2002, 62). The result of such knowledge cannot be known, it is possible only in relation to a specific case (the so-called paradox of the hermeneutic circle) (Romanovsky, 2012, 230).

If we conditionally determine the share of episteme and techne in the modern basic training of an engineer, it is approximately 50 % to 50 %. Today, at the stage of professional training in pedagogical practice there is no application of phronesis, there is no understanding of its specificity, especially for developing ethical competencies of would-be experts.

Attempts made by the social sciences (including pedagogy) to adapt research methods to the “episteme”, according to B. Flyvbjerg, are notoriously unsuccessful.

Modern social sciences, trying to imitate the exact sciences, build knowledge according to the formula "from top to bottom", from theory to practice. The ideal of social science for B. Flyvbjerg is "applied phronesis", which is defined as a way "when the efforts of the scientist are directed 'from the bottom up'; it is contextual and action-oriented knowledge, practical wisdom in taking socially significant decisions" (Bakshtanovsky and Sogomonov, 2020)

The term "phronestic approach" hereinafter refers to the following key principles:

1. Recognition that moral and ethical, action-oriented knowledge, which underlies the development of integral and generic competencies, according to Aristotle's philosophy belongs to a specific type of knowledge known as phronesis, which is essentially different from the episteme and techne. This knowledge is defined by Aristotle through the general concept of "good" in the categories of virtue, measure, useful, and timely and convenient, and therefore, according to the philosopher "cannot be something common and unique" (Arystotel, 2002, 5). Its result cannot be predicted, it is possible only in relation to a specific case, action, situation, etc. Phronestic knowledge is acquired in accordance with socially significant ideals.

2. In social sciences, namely pedagogy, it is advisable to use B. Flyvbjerg's "applied phronesis" and focus more on the inductive method, i.e. research conducted from individual, or partial to general or whole.

Carrying out systematic monitoring by means of ICT provides an opportunity to establish specific features, qualities, indicators of professional responsibility of students majoring in engineering in a particular educational setting and create a foundation for further work on developing integral and generic competencies "bottom up", from specific to general.

This article aims at monitoring (by means of information and communication technologies) individual features of making responsible decisions on the basis of the survey of students of engineering specialties conducted at Ternopil Ivan Pulyuy National Technical University (Ukraine). The research targets at determining the peculiarities of students' understanding of responsibility for socially significant consequences of their own professional activities; concretization and definition of the role of phronestic knowledge in the training of would-be engineering specialists.

Analysis of recent studies and publications

The motto of modern sustainable development society can be the advice of one of the most authoritative researchers who scrutinized the category "responsibility", philosopher Hans Jonas, "Make sure that the consequences of your activities are consistent with the continuation of authentic human life on earth" (Yonas, 2001).

The ratio of individually defined and socially significant is the basis for the formation of new guidelines for modern engineering education. The key results and outcomes of modern engineering education are provided in the Standards approved by the Ministry of Education and Science of Ukraine (2018, 2019, 2020, 2021, 2022) and are called the professional responsibility of future engineering specialists. J. Tharakan states that scientific and technical outcomes ensure that engineering graduates possess the requisite science, math, engineering and technology skills and capabilities that will

enable them to practice competently in their disciplinary engineering profession with technical, scientific and engineering rigor. Soft skills, on the other hand, which are being increasingly emphasized as critically necessary for engineering graduates to be employable and successful in the professional workspace, focus on teamwork, communication, ethics, global awareness (including social, economic, environmental and global impacts of engineering), and lifelong learning (Tharakan, 2020).

M. Katz proves that there is a necessity to introduce content on professional responsibility into the university curricula for undergraduates. The idea of this content is to make sure that of students of engineering specialities understand that knowledge is not only a technical pathway to professional qualifications (Katz, 2020).

In the work of A. Juozapaitis, E. Zavadskas, J. Tamošaitienė, A. Navickas, L. Sakalauskienė, D. Gedvilas (Lithuania) an effective multicriteria model of professional responsibility of an engineer is considered (Juozapaitis, et. al., 2015). A. Sysoev, A. Sysoev, V. Petrov and S. Poteshin proposed a new technology for the training of engineers, known as Professional Activity Imitation Education Technique (PAIET). Its basis is establishing training equivalent of professional activities of graduates (Sysoev, et. al., 2012). As part of research work conducted at Ternopil Ivan Pulyuy National Technical University on "Personal and Professional Development of Students of Technical Universities in the Study of Social Subjects", there has already been conducted a diagnostic study of professional responsibility formation in students of engineering specialties by means of information and communication technologies. The research aimed at identifying practical problems of formation of professional responsibility in future engineers and finding ways to solve them (Meshko, Habrusieva and Kryskov, 2021).

The main competencies that need to be formed in the process of studying in higher education institutions are conventionally divided into integral, generic and special (subject-oriented). The formation of integral and generic competencies of future professionals is ultimately reduced to basic ethical categories, in particular, "goods", which Aristotle attributed to the phronestic knowledge (Arystotel, 2002). G. Serrano traces the directive ability and competency from an Aristotelian perspective, which identifies three areas of knowledge, – theory, practice, and technique – essential for the comprehension and ability to complete specific tasks (Serrano, 2017).

For a high level of ethical competence and obtaining sustainable learning results and outcomes, it is necessary to focus on students' clear understanding of their uniqueness, the right to self-determination in specific situations and identity within the general common ideal. To achieve this goal, it is advisable to separate the moral and ethical categories and values that form the foundation of generic competencies from special ones and to form them using a phronestic approach.

*Theoretical and philosophical substantiation of the category "responsibility", which takes into account the individual characteristics of an individual acting in the context of a particular situation, has been provided by N. Myasnikova (*Miasnykova, 2008, *12). She derives the concept of "shimmering responsibility", which is manifested in various social practices of an individual in accordance with an exclusive/unique situation. This is a model of discrete responsibility. In this case, responsibility is attributed to the function of an integral element at both the individual and social levels.*

To denote irresponsibility, the concept of "responsibility attenuation center" is introduced, which makes it possible to show not the absence of responsibility, but its insufficiency in a specific situation. This interpretation of the concept of "responsibility" is fully consistent with the phronestic approach and was the basis of our study.

In defining the concept of "professional responsibility", we rely on the research of M. Sadova who used a personal-situational approach in her work (Sadova, 2019).

A leading expert on the application of phronesis in the social sciences is Professor B. Flyvbjerg from Denmark. Although this scientist uses phronesis predominantly in sociological research, but he also pays special attention to the use of phronesis in the educational process (Flyvbjerg, Landman, and Schram, 2012). The theoretical and methodological ideas behind the book, inspired by Aristotelian phronesis, represent an original perspective within the social sciences, and this volume gives readers for the first time a set of studies exemplifying what applied phronesis looks like in practice.

The phronestic approach deserves the attention of modern professional pedagogy because it allows for a line of behaviour of the individual in a given socially significant situation, to determine at the individual level what can be done for their own good and the good of others. The nature of phronestic knowledge and the feasibility of its application in the formation of professional responsibility of engineers is disclosed in the article (Habrusieva, 2019). Its essence is to form sustainable individual priorities for determining personal responsibility in a particular situation in accordance with socially set needs.

Research methods and methodology

B. Flyvbjerg determines the case study method (CS) as optimal for phronesis. He concludes, "In teaching, well-chosen CS will help the student to gain competence, and independent facts and rules will bring him only to the level of a beginner" (Flyvbjerg, 2005, 111).

Heinz C. Luegenbiehl and Rockwell F. Clancy investigated the role of case-study analysis within global engineering (Heinz, Luegenbiehl and Rockwell, 2017).

Many domestic scientists have been involved in the development of the use of CS in the pedagogical practice of vocational training, namely D. Stupak (Stupak, 2018); L. Kasianova, S. Kovalenko (2021); L. Kozak (2016) and others.

In vocational and technical education, it is especially important that emphasis should be put on individualized (Monteiro, 2017) and situational learning (Maher, Bailey and Tucka, 2018), as well as learning based on startups and research projects (Williams, Figueiredo, 2014) and (Pinho-Lopes, Macedo, 2014) to bring theory closer to practice.

An interesting study of mixed methods in the formation of professional responsibility was conducted by S. Janakiraman, S. Watson, W. Watson, Z. Cheng (Janakiraman, et.al., 2021).

All the above methods should be used in the educational process for the formation of professional responsibility, as they are focused on an individual approach and enhance the cognitive activity of students. However, the phronestic approach to the

formation of moral and ethical qualities which are at the basis of integral and generic competencies emphasizes the need to take into account the context of a particular situation under certain conditions; individual moral choice; a specific act in the framework of socially significant guidelines.

The phronestic approach makes it possible to combine three key factors in the formation of professional responsibility that can give a practical result in professional pedagogy:

1. Socially significant benchmarks, the idea of which is traditionally formed during the study of disciplines of the social cycle, in particular philosophy, history and culture of Ukraine, jurisprudence, etc.

2. Individual features of making responsible decisions according to gender, year of study and chosen specialty – monitoring by means of information and communication technologies performed in our article.

3. Situations during which the decisions were made which in practice led to certain consequences – can be considered in the practical classes, extracurricular activities (e.g. special courses, electives). At the Ternopil Ivan Pulyuy National Technical University for this purpose, students are offered a special course "Professional Responsibility of an Engineering Specialist in Modern Conditions".

This special course is designed taking into account the above factors. The theoretical part synthesizes socially significant benchmarks, gives students an understanding of the concept of "responsibility", "professional responsibility"; analyzes the specifics of the application of professional responsibility of engineering specialties in practice in historical and legal aspects. The course offers modern domestic and foreign approaches to the awareness of personal responsibility of future engineers (in particular, depending on the specialties, students are introduced to Professional Credo, Codes of Morality of Engineers, which are created in many countries).

The practical part consists of a set of tasks that are offered to students, taking into account the characteristics of their understanding of the concept of "professional responsibility" (Meshko, Habrusieva and Kryskov, 2021) and individual features of making responsible decisions, according to gender, year of study and chosen specialty. The article discusses the results of completed tasks having been monitored by means of information and communication technologies.

In the framework of scientific research that is being conducted at Ternopil Ivan Pulyuy National Technical University "Personal and Professional Development of Students of Technical Universities in the Study of Social Subjects", there is a system of implementing the monitoring the formation of integral and generic competencies by means of ICT. A virtual learning environment, which was created on the basis of the Learning Management System (LMS), is used for the data collection. This LMS, known as ATutor, has been successfully used to organize the learning process since 2002 (Meshko, Habrusieva and Kryskov, 2021).

For conducting pedagogical research, in the database of questions in distance-learning course "Philosophy", a questionnaire compiled on the basis of "12 Useful Tips for Decision-Making" offered by the American authors S. Deep and L. Sussman was introduced (Deep, Sussman, 1995). Among the test items available for assessing students' knowledge (alternative questions, ranking, multiple choice questions, open-

ended questions, etc.), we chose "assessment" option, which allows for built-in templates, including "completely agree – completely disagree". Respondents were informed that there are no correct answers to the proposed questions, their main task is to answer sincerely and honestly.

The survey involved 133 first - and second-year students of the Faculty of Mechanical Engineering, Structures and Technologies, the Faculty of Computer Information Systems and Software Engineering and Faculty of Economics and Management.

The study was conducted from September 2020 to June 2021.

The results and discussion

The results of the study made it possible to identify differences in the algorithm for making responsible decisions by students of engineering specialties depending on gender, year of study and the specifics of the chosen specialty.

In particular, the analysis of the answers to the question "Are you aware of your own tendencies and prejudices in decision-making?" shows that male respondents consider themselves more biased (Figure 1).

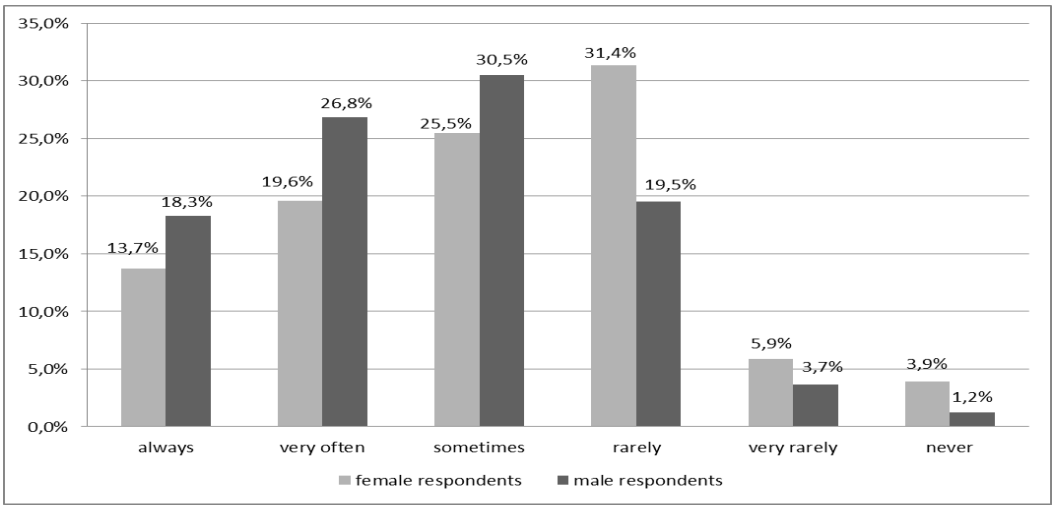

Fig. 1. Respondents' answers to the question "Are you aware of your own tendencies and prejudices in decision-making?"

Awareness of the subjectivity in the process of taking decisions and accepting responsibility is a very important factor. On the one hand, defining their own experience as a prerequisite for making a decision for which it is necessary to be responsible, male students are more prone to individual, personal responsibility for the consequences of their actions.

According to the survey results, no respondents were found who would never feel biased in their own decisions, while the share of men who chose the option "never" in response to this question is 1,2%, that is 2,7% less than in the female students (3,9%). The answers "rarely" prevailed among girls (31,4%). It is noteworthy that the answer

"sometimes", which indicates uncertainty, was more often chosen by male respondents (30,5%), compared to much smaller number of female respondents (25,5 %).

Men tend to shape future experiences more decisively, to make decisions faster, as evidenced by the following answers to the question "Do you like to act fast?" (Figure 2).

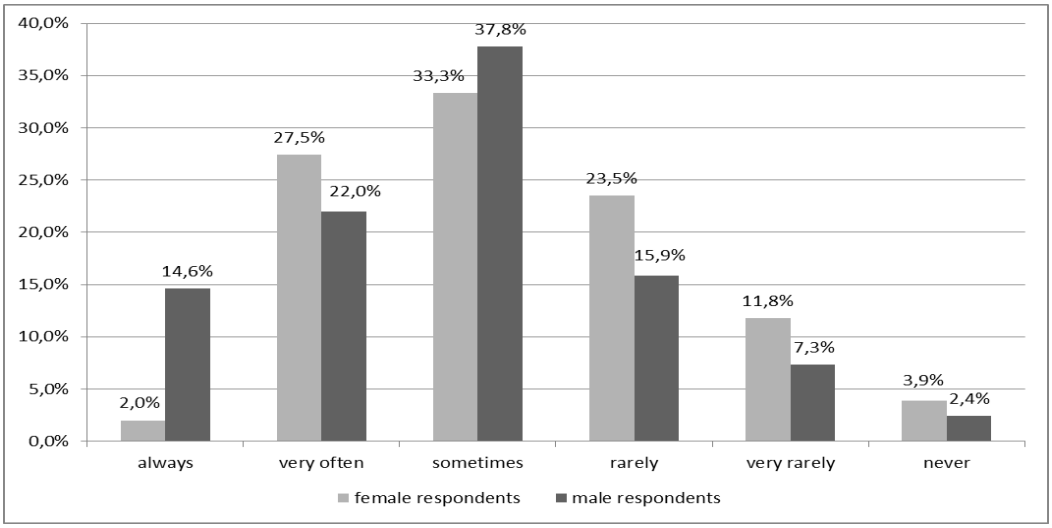

Fig. 2. Respondents' answers to the question "Do you like to act fast?"

The answer "always" in this question was chosen by more boys (14,6%) than girls (2,0%). The total number of affirmative answers, which can be attributed to "always" and "very often" in girls (29,5%) and boys (36,6%) is quite high, with advantage of the tendency to act quickly in male respondents (7,1%). The total number of answers "rarely", "very rarely", "never" is 13,6% higher in female students (39,2%) than in male students (25,6%).

The answers to the question of what mainly influences decision-making – an emotional factor or a rationale – were interesting. (Figures 3,4 and 5,6).

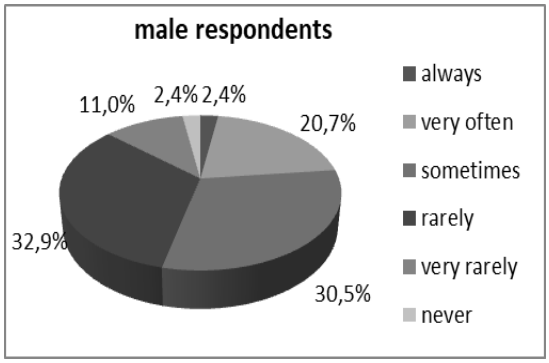

Fig. 3. Answers of male respondents to the question "Do you allow yourself to be emotional when making decisions?"

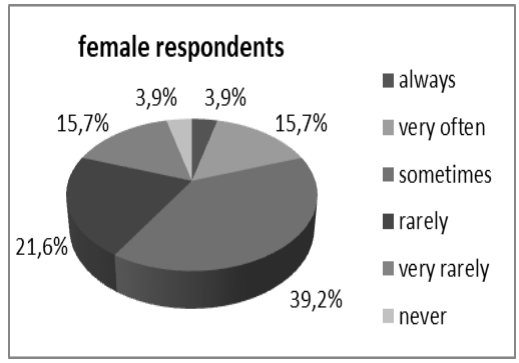

Fig. 4. Answers of female respondents to the question "Do you allow yourself to be emotional when making decisions?"

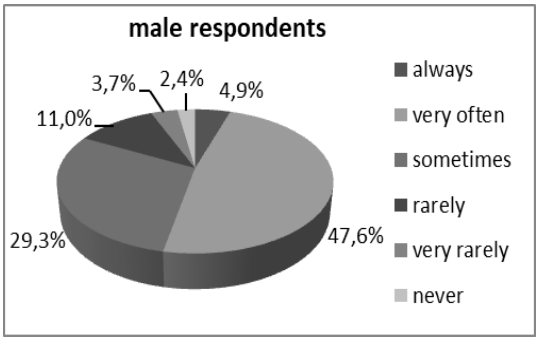

Fig. 5. Answers of male respondents to the question "Do you think most of your decisions have been logically justified?"

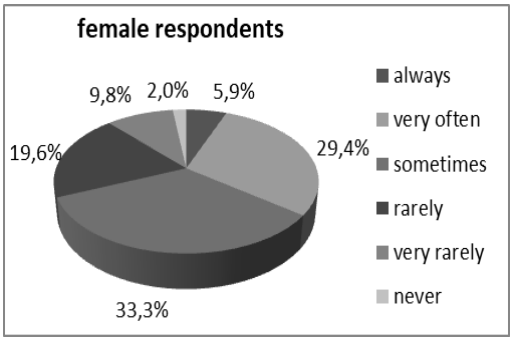

Fig. 6. Answers of female respondents to the question "Do you think most of your decisions have been logically justified?"

Traditionally, women are considered to be more emotional than men. This was confirmed by our survey. 1,5% more girls than boys allow themselves to be emotional in making responsible decisions. However, more female respondents (5,9%) than male respondents (4,9%) also consider their decisions to be logically justified. The difference 1% in favor of women. The total number of affirmative answers to the question “Do you think most of your decisions have been logically justified? “Always” and “very often” in men (52,5%) and women (29,4%) significantly different. The difference 23,1% in favor of men. The same number of men (2,4%) admitted that they "never" allow themselves to be emotional when making decisions, and "never" think most of their decisions have been logically justified. The “sometimes” option, which avoids a clear answer to both questions, was chosen by a larger number of female students.

The survey revealed differences in the algorithms for making responsible decisions by students of different faculties. The survey was undertaken by students who chose applied technical specialties of the Faculty of Mechanical Engineering, Structures and Technologies and students of the Faculty of Computer Information Systems and Software Engineering.

Generalized answers to the question “Are you able to overcome the temptation to use methods of solving yesterday's problems to overcome today's issues?” in Figure 7.

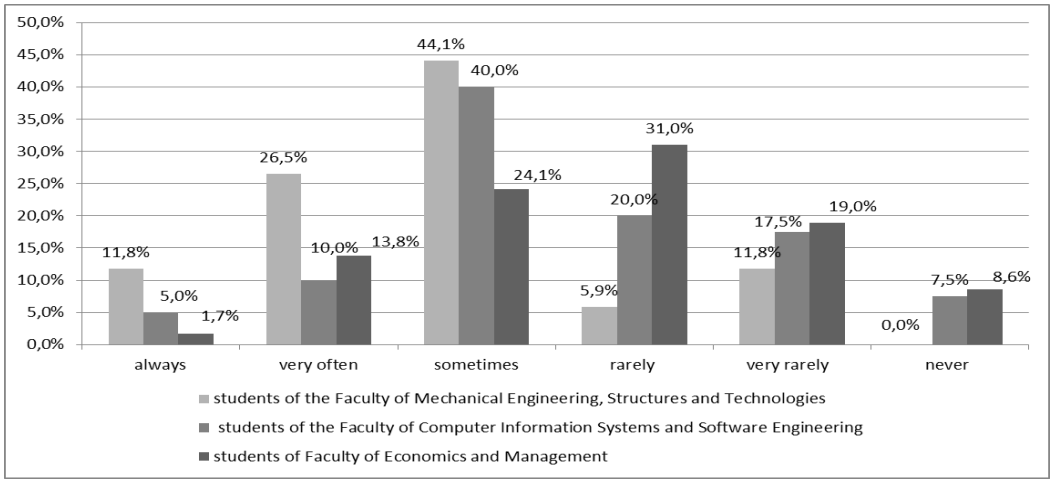

Fig. 7. Respondents' answers to the question "Are you able to overcome the temptation to use methods of solving yesterday's problems to overcome today's issues?"

The total number of affirmative answers to the question "Are you able to overcome the temptation to use methods of solving yesterday's problems to overcome today's issues?" ("Always" and "very often") is higher among students of the Faculty of Mechanical Engineering, Structures and Technologies (38.3%). Students of the Faculty of Computer Information Systems and Software Engineering proved to be most conservative in making responsible decisions. Only 15% of respondents are able to overcome the temptation to use yesterday's methods in solving today's problems. And if none of the Faculty of Mechanical Engineering, Structures and Technologies respondents gave a "never" answer to this question, then 8,6% of Faculty of Economics and Management respondents chose this option. The total number of negative answers ("rarely", "very rarely", "never") is higher at the Faculty of Economics and Management (58,6%) compared to 45.0%of negative answers from students of the Faculty of Computer Information Systems and Software Engineering and 17,7% Faculty of Mechanical Engineering, Structures and Technologies.

Faculty of Mechanical Engineering, Structure and Technologies students are more likely to analyze the maximum number of solutions (Figure 8).

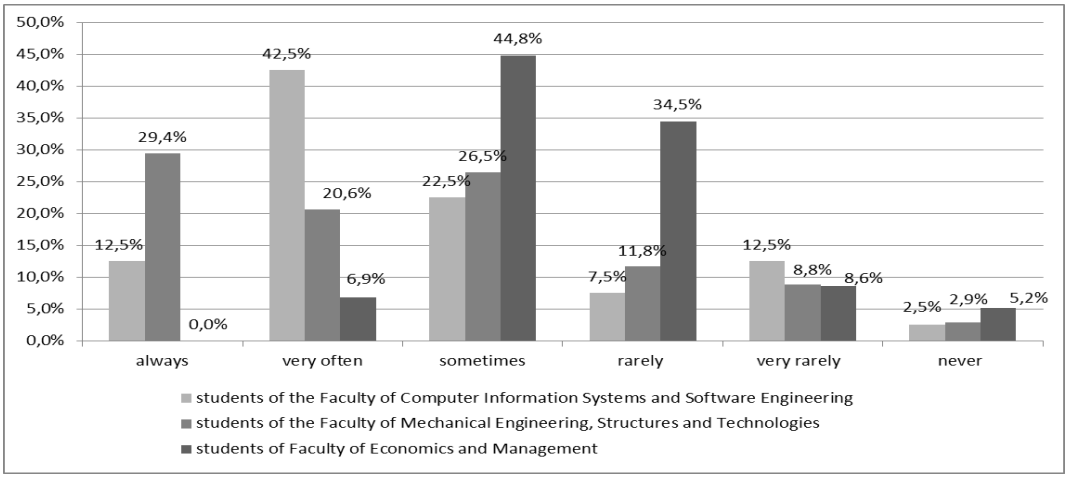

Fig. 8. Respondents' answer to the question "Do you analyze the maximum number of solutions?"

As can be seen from the diagram, none of students of Faculty of Economics and Management chose the answers “always” to this question. Confident answer “always” was given more often by FMT respondents. The difference between FMT and FIS students is 16,9%.

The number of affirmative answers (“always” and “very often”) among students of the Faculty of Mechanical Engineering, Structures and Technologies (50%), which is 5% more than among students of the Faculty of Computer Information Systems and Software Engineering (45%). It is significant that there are some students who do not consider it necessary to analyze the maximum number of solutions (10,6%) and have chosen the answer “never”. Among them of students of Faculty of Economics and Management prevail (5,2%).

Analysis of the answers to the question "Do you check the “hard facts” that you use to solve a particular problem?” enabled us to get the following results (Figure 9):

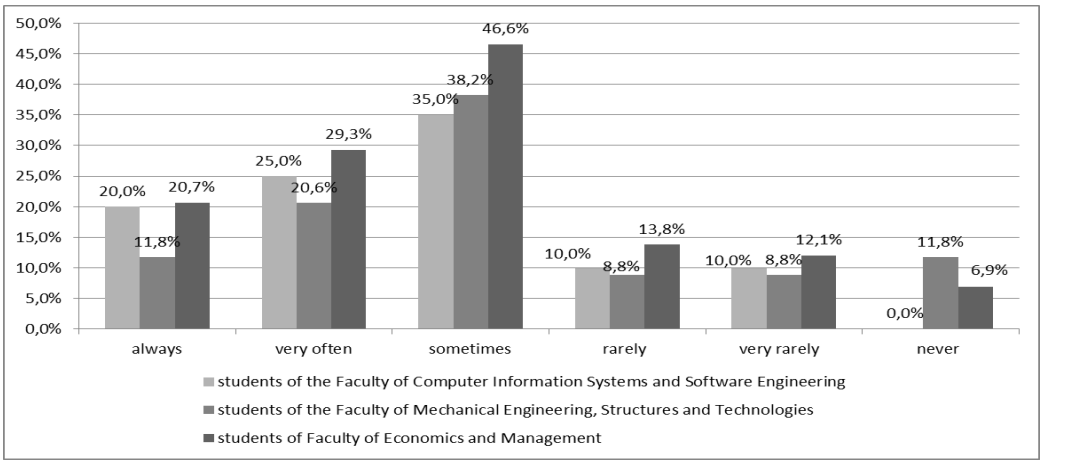

Fig. 9. Respondents' answers to the question "Do you check the "hard facts" that you use to solve a specific problem?"

A significant number of Faculty of Economics and Management (46,6%),of Faculty of Mechanical Engineering, Structures and Technologies students (38,2%) and Faculty of Computer Information Systems and Software Engineering students (35,0%) answering this question, chose the answer "sometimes". A fairly high percentage of respondents from the latter FMT and FEM (11,8% and 6,9%) "never" doubt the facts, which can be called “tough”, and boldly use them to make responsible decisions. Instead, there was not a single student at the Faculty of Computer Information Systems and Software Engineering who chose the “never” option when answering this question. The number of respondents who chose affirmative answers (“always” and “very often”) is higher at the Faculty of Economics and Management (50%).

Of interest for our study are the results of comparing the responses of first- and second-year students, which also revealed differences. For example, in the answers to the question “Do you encourage constructive criticism?” significant differences were recorded in the answers “rarely”, “very rarely” and “never” (Figure 10):

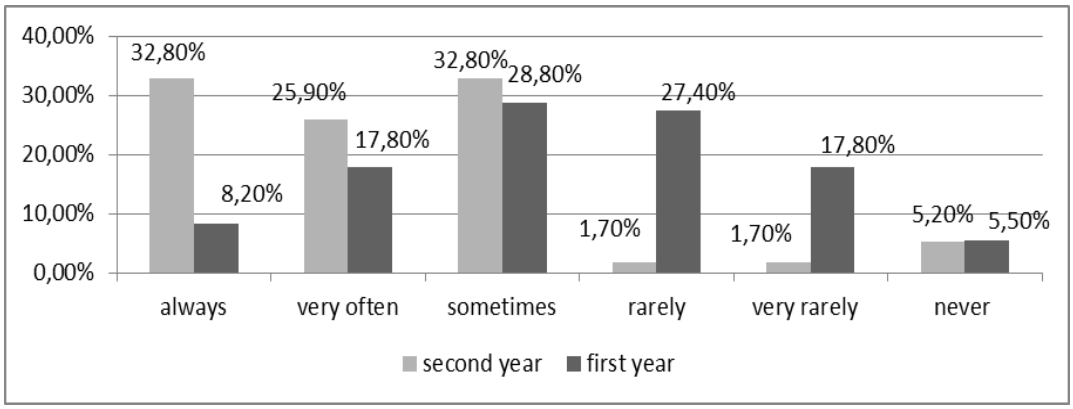

Fig. 10. Respondents' answer to the question "Do you encourage constructive criticism?"

As can be seen from the diagram, already in the first year the share of students who have a negative attitude to constructive criticism is quite high, in general, the answers “rarely”, “very rarely” and “never” are 50,7%. The total number of affirmative answers (“always” and “very often”) to the question asked by first-year students is 37,2% lower than that of second-year students. The large number of "sometimes" answers also attracts attention, which indicates the insecurity of the respondents and is 28,8% in the first year (this is 4,0% lower than in the second year) (32,8%)).

A similar situation was revealed during the analysis of the answers to the question “Do you listen to the views that differ from yours?” (Figure 11).

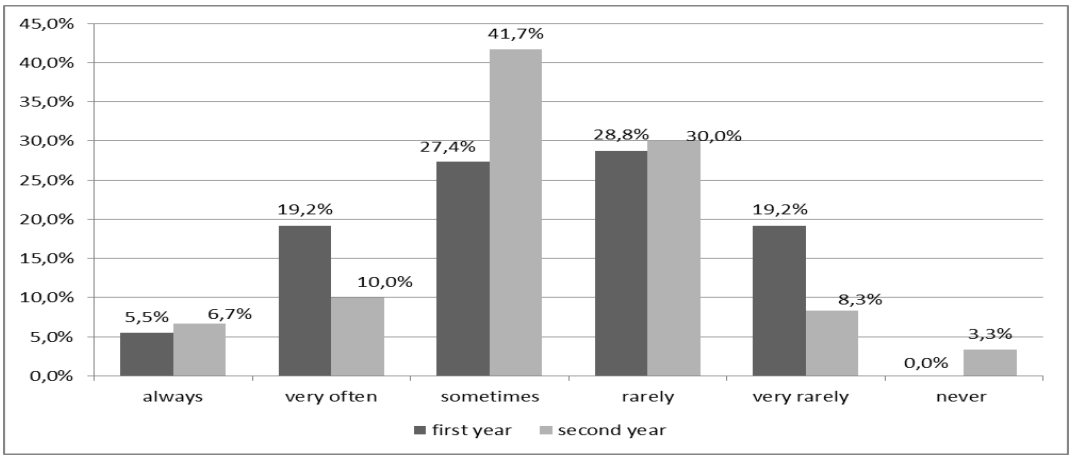

Fig. 11. Respondents' answers to the question "Do you listen to the views that differ from yours?"

As can be seen from the diagram, none of the first-year students chose the answers “never” to this question. However, already in the second year the share of students the answers “never” are 3,3%. The total number of affirmative answers (“always” and “very often”) to the question asked by first-year students is 8% higher than that of second-year students. The large number of “sometimes” answers also attracts attention, which indicates the insecurity of the respondents and is 41,7% in the second year (this is 14,3% higher than in the first year (27,4%)).

Conclusions and prospects for further research

A necessary condition for the sustainable development of society is the professional responsibility of specialists, in particular the specialists in engineering field, who in man-made environment are able to improve the quality of life of modern people.

The results of the study indicate that the pedagogical practice does not take into account the features of responsible decision-making algorithms that exist in some student groups and underlie professional responsibility as one of the key outcomes and consequences of higher education. Such research is important for adjusting the work on developing students' integral and generic competencies. This makes it possible to bridge the gap between knowledge of moral and ethical concepts (which are largely formed in the study of social disciplines), and the skills of concrete and practical action of the individual in a clearly defined situation.

The conducted research study revealed differences in the algorithm for making responsible decisions by students of engineering specialties depending on gender, specifics of the chosen specialty and year of study. In particular, the male respondents who were interviewed by us are able to take action faster, although they consider themselves less emotional in making responsible decisions than the female respondents, who avoided categorically negative “never” answers and more often chose a neutral “sometimes” answer to questions. Students of applied technical specialties (Faculty of Mechanical Engineering, Structures and Technologies) are

more inclined to analyze the maximum number of solutions and look for new methods to overcome old problems. However, students of the Faculty of Computer Information Systems and Software Engineering of Ternopil Ivan Pulyuy National Technical University more often question previously proven facts. Second-year students react more sharply to constructive criticism and views that differ from their own than first-year students, and so on.

The study revealed many features that can be used while working with specific student groups to bridge the gap between just knowing what responsibility is and being responsible for professional actions and decisions. To achieve significant results in the formation of professional responsibility as one of the key outcomes and consequences of learning in higher education, it is important to take into account the above-mentioned individual characteristics of students, to teach them to act responsibly in the context of a specific situation. This can serve as a guide in modernizing the strategy of teaching social subjects in higher education.

To implement this task, it is advisable to use a phronestic approach, which focuses on sustainable individual priorities of technical specialists in a particular situation in accordance with social needs. The origins of phronesis lie in the understanding of the specifics of the practical application of moral and ethical knowledge in the philosophy of Aristotle, further developed in the reasoning of postmodernists (M. Heidegger, A. Schutz, G. Gadamer) and today attracts a wide range of scholars working in various fields (sociology, psychology, ecology, etc.). B. Flyvbjerg, a world-renowned sociologist who focuses on the phronestic approach, emphasizes the need to use it in professional pedagogy (Flyvbjerg, 2005, 111).

Today, Ternopil National Technical University is implementing our distance learning course “Professional Responsibility of a Technical Specialist in Modern Conditions”, the main purpose of which is to combine the capabilities of social cycle disciplines to form generic competencies and important learning outcomes, including professional responsibility. Working in a remote format allows one to take into account the individual interests, needs and specifics of responsible decision-making of individual students, to offer differentiated contextual tasks and to get acquainted with relevant socially significant theoretical materials. For example, students are offered a variety of situations when they need to make decisions and take responsibility for further development of the situation or upcoming event. Such cases are common in real life, especially in the engineering field. Students choose at their own discretion the development of events, which is then compared with the decision made by experts, and assess the consequences of the situation.

The phronestic approach to the formation of general competencies is able to synthesize theory and practice, individually defined features and socially significant ideals in the process of forming professional responsibility of students of engineering specialties and contribute to the fact that in a sustainable society they will act responsibly and consciously.

Prospects for further research on phronesis are quite broad: it is necessary to clarify the difference between phronestic and ethical knowledge, which underlies the formation of integral and generic competencies from purely technical and epistemic, which are different in nature. It is important to assess its scientific rigor, capabilities

and feasibility of use in professional pedagogy. It is necessary to study the specifics of using methods for the formation of ethically defined competencies and determine the role of social disciplines in this process. It is the objective of the social subjects to instil in students of engineering profile ideas about global, commonly important touchstones. It is within these guidelines that engineering specialists in the future will have to take personal responsibility for professional decisions.

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ФРОНЕСТИЧНИЙ ПІДХІД ДО ФОРМУВАННЯ ПРОФЕСІЙНОЇ ВІДПОВІДАЛЬНОСТІ МАЙБУТНІХ ФАХІВЦІВ ТЕХНІЧНИХ СПЕЦІАЛЬНОСТЕЙ: МОНІТОРИНГ ЗАСОБАМИ ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНИХ ТЕХНОЛОГІЙ

Наталія Габрусєва, аспірантка кафедри педагогіки та менеджменту освіти Тернопільського національного педагогічного університету імені Володимира Гнатюка; асистент кафедри українознавства і філософії Тернопільського національного технічного університету імені Івана Пулюя, Тернопіль, Україна; gabrusyeva@gmail.com

Анотація. *Стрімкий розвиток інформаційно-комунікативних технологій (ІКТ) та активне використання їх в освітньому процесі зумовлені потребами часу, зокрема пандемією COVID-19. У процесі формування інтегральної та загальних компетенцій, результатів і наслідків навчання важливо вибудувати систему спостережень, яка дасть можливість оперативно реагувати на проблеми, що виникають в освітній практиці. У статті представлено результати моніторингу здатності до прийняття відповідальних рішень майбутніми фахівцями технічних спеціальностей. Для збору даних використано віртуальне освітнє середовище Тернопільського національного технічного університету імені Івана Пулюя (Україна), яке було створене на базі системи управління навчанням (Learning Management System – LMS) ATutor. Результати дослідження дали змогу виявити відмінності в алгоритмі прийняття відповідальних рішень студентами технічних спеціальностей залежно від статі, курсу навчання та специфіки обраного фаху, що важливо надалі враховувати в педагогічній практиці для формування професійної відповідальності. Запропоновано фронестичний підхід до розуміння змісту та суті професійної відповідальності в сучасному техногенному середовищі, який враховує специфічність етичного знання, зосереджує увагу на стійких індивідуальних пріоритетах на визначення особистої відповідальності в конкретній ситуації відповідно до суспільно заданих потреб. Обґрунтовано необхідність переосмислення відповідальності як елемента фронестичного знання; конкретизовано його значення в підготовці майбутніх фахівців технічного профілю. Сформульовано перспективи подальших досліджень щодо використання фронестичного підходу у професійній педагогіці, результати яких можуть слугувати орієнтирами для модернізації стратегії викладання суспільних дисциплін у закладах вищої освіти.*

Ключові слова: *інформаційно-комунікативні технології; професійна відповідальність; студенти технічних спеціальностей; фронетичний підхід; стратегія викладання суспільних дисциплін у вищих навчальних закладах.*

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