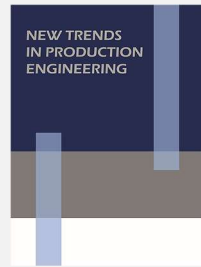


**STUDENT APPRENTICESHIPS
OF COURSE-OF-STUDY
AND DIPLOMA-RELATED TYPES
AS AN ELEMENT USED FOR
RAISING
THE PROFESSIONAL
COMPETENCES OF ENGINEERS
EDUCATED
FOR THE NEEDS OF MARITIME
AND INLAND SHIPPING INDUSTRY**

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Abstract. The purpose of the underlying paper is to highlight the significance of specialist and diploma-related apprenticeships at the bachelor degree studies provided by the technical university. The evaluation of the quality of apprenticeships was conducted among the students of the Economy, Engineering and Transport Faculty of the Maritime University of Szczecin (Poland), for the study directions Production Management and Engineering (Polish: ZiP), Logistics (L) and Transport (T). The research methodology was based on questionnaire form, statistical analysis of results reliability and the analysis of literature. The results of the conducted research unequivocally indicated a need to introduce changes to the organisation of the apprenticeships, as this area determines the quality of engineers practical education and influences their professional competences.

Keywords: quality of education, engineering education, professional competence

INTRODUCTION

The education process compliant with the rules of European Qualification Framework as well as National and Polish Qualifications Framework puts a strong emphasis on practical skills of the students, both for general academic profile and the practical profile. Most of the skills should be attained by the student as a result of completion of regular apprenticeships (Nunley et al., 2016; Vairis et al. 2013). The Faculty of the Economy, Engineering and Transport (Polish: WIET) aims for educating highly qualified management cadres for logistics and transport industries (particularly for seaports and inland ports) and attaches high emphasis to the execution of regular and diploma-related apprenticeships. The development of professional career is a complex psychological process involving self-exploration and the exploration of outer world conditions (Jordaan, 1963; Porfeli & Lee, 2012; Gamboa et al., 2013). The aim of the article is the presentation of research results in scope of the quality of student apprenticeships and its role, as evaluated by direct stakeholders – the students of the Maritime University in Szczecin. Moreover, relations were identified between the characteristics of respondents and their answers as well as the relations between the indicated areas. The research concerns three areas where according to the authors of the paper there is influence exerted on the course and quality of apprenticeships at the directions of study in question.

METHODOLOGY OF RESEARCH

The methodology of the research has been based on the analysis of literature in scope of academic education quality, taking into account education carried out on technical directions and using the questionnaire form method. The analysis of data has been based on the induction and deduction method. Research results have been presented using graphics and statistics. The described research into the quality of course-of-study apprenticeships at the study directions in question involved three areas: evaluation of the company and social conditions prevalent during the apprenticeship; interpersonal relations; evaluation of the tutor taking care of apprenticeships, designated by the Maritime University of Szczecin.

The following areas are discussed in the article:

1. Participation of the company and its significance for the execution of course-of-study practices,
 2. Influence of the university administration on the progress of student apprenticeships,
 3. The relation between the quality of course-of-study apprenticeships and the satisfaction of student needs as stakeholders in the process of raising their professional competences.
- The table below includes some selected questions from the questionnaire form, which are subjected to analysis in the following part of the article: Direct tests involved 236 students (including about 64% of women and 34% of men) from the third and fourth years of study from the three study directions at the Maritime University of Szczecin Faculty of Economy, Engineering and Transport (Production Management and Engineering about 33%, Logistics 40%, Transport 27%). They completed 95 diploma-related apprenticeships and 141 other course-of-study apprenticeships in industrial, maritime and transport-spedition-logistics (TSL) companies. The questionnaire consisted of parts including open and closed questions. The research has been conducted in October 2015.

RESULTS

Students at WIET Faculty have two types of apprenticeships defined in the education program. These include the directional apprenticeships (being a majority in the category of other course-of-study onshore apprenticeships), coming after the 4th semester, as well as diploma-related apprenticeships positioned after the 6th semester. Among the respondents about 44% were on the diploma-related apprenticeship, while the remaining 56% were on the course-of-study onshore apprenticeship. Table 1 below includes the most important questions from the questionnaire form.

Table 1
Selected questions from the questionnaire form

| AREA 1. Evaluation of the company and the social conditions encountered during the apprenticeship | |
|---|--|
| 1.1. | Were the industrial safety and fire safety trainings etc. organized during the apprenticeship? |
| 1.2. | Were you able to become familiarised with the organisation of work in the company? |
| 1.3. | Did you have the possibility to fulfill the duties of employed workers? |
| 1.4. | Did you have the possibility to become familiarised with the equipment/ machinery/software/other, which are crucial for the functioning of the company? |
| 1.5. | Did the apprenticeship give you the possibility to become familiarised with work in a given industry? |
| 1.6. | The remarks concerning the execution of apprenticeship programme. |
| 1.7. | Were you allowed to use the internal materials of the company for the writing of diploma thesis (only for diploma-related apprenticeships). |
| 1.8. | Grade the social conditions prevalent in the company (where 1 is the worst and 5 is the best). |
| AREA 2. Interpersonal relations | |
| 2.1. | Did the company designate the tutor for the apprenticeship? |
| 2.2. | Were the requirements concerning the rules of behaviour in the interpersonal relations (superior – apprentice, apprentice – superior) clearly specified by the superior? |
| 2.3. | Were the rules of apprentice's responsibility for the designated tasks specified by the superior? |
| 2.4. | a. Was the atmosphere at work friendly (1 – worst grade, 5 – best grade)? b. Student's rationale. |
| AREA 3. The evaluation of the apprenticeships tutor designated by the Maritime University in Szczecin. | |
| 3.1. | Were you informed who is the tutor of your apprenticeship. |
| 3.2. | Was the meeting with the tutor organised before the announced periods of apprenticeships? |
| 3.3. | Was all the necessary information given, concerning: |
| 3.3.A. | a. organisation of apprenticeships |

| | |
|--------|---|
| 3.3.B. | b. rules used for getting a pass for the apprenticeship |
| 3.3.C. | c. making entries in the apprenticeship logbook |
| 3.3.D. | d. other (what type)? |
| 3.3.E. | e. Explain your choices. |

In response to question 1.1 the majority of students (99,15%) confirmed that they had industrial safety and fire safety training, while 233 respondents answered positively to question 1.2, which means that 99% of companies gave the apprentices the capability to get familiarised with their organisation of work, Fig. 1.



Fig. 1. The capability to get familiarised with the company's organisation of work for the students of WIET Faculty during their apprenticeships

A majority of respondents (233 people) gave positive answers to question 1.4, with only three negatives. Almost all companies (99,15%) familiarised the apprentices with the available means of work. A few negative answers concerned group practices in company A. Question 1.5 was responded positively by 217 respondents, which is shown in Fig. 2. Among respondents, 92% of them have been familiarized with work in a given industry. The largest number of negative remarks concerns group practices conducted at port-based companies of maritime industry.

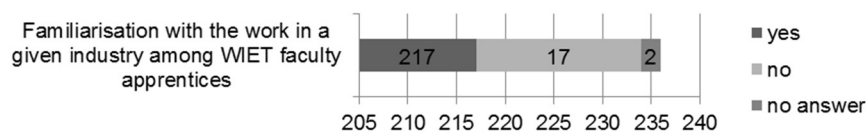


Fig. 2. Familiarisation with the work in a given industry among WIET faculty apprentices

Among the companies, 77% allow for the use of their materials for the writing of diploma thesis without any confidentiality clauses under a condition that the thesis should include the name of the company and be public. About 20% of the companies do not allow the use of company image (publication of name) in the published works.

Fig. 3 shows the answers to question 2.1, 221 students answered positively. The negative answer indicating the lack of an appointed tutor was most common among students doing their apprenticeships in small and micro companies. In the remaining 94% of the cases the companies did appoint the person responsible for the apprentice.

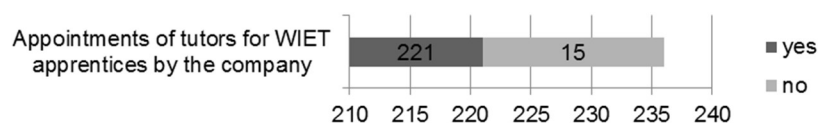


Fig. 3. Appointments of tutors for WIET apprentices by the company

Question 2.2 was responded positively by 208 respondents. Each group included persons reporting a lack of clearly specified rules with regard to interpersonal relations between apprentices and superiors. 88% of answers indicate that the rules were clearly established in a majority of companies, which is illustrated in Fig. 4.

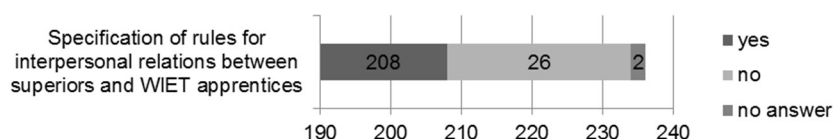


Fig. 4. Specification of rules for interpersonal relations between superiors and WIET apprentices

Question 2.3 was responded positively by 215 students, which means that 91% of apprentices have no doubts regarding their scope of responsibility for the tasks assigned to them. Results are shown in Fig. 5.

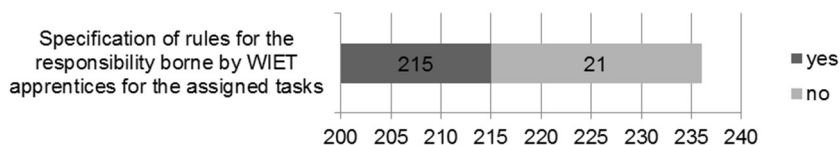


Fig. 5. Specification of rules for the responsibility borne by WIET apprentices for the assigned tasks

Question 3.1 in Fig. 6 has been answered positively by 140 respondents. 59% of students claim that they have had a meeting with apprenticeship tutor before the apprenticeship, while 37% of students have stated that such a meeting did not take place with them. Comparing these data with the noted 20% presence of students during the meeting with Faculty's apprenticeship tutor which took place on 12.06.2015, the following questions may be posed:

- Why students do not participate in the meetings?
- Do students know about dates/times of the meetings?
- Do students differentiate between Faculty's tutors and company's tutors?
- Why don't company tutors take part in the meeting with the Faculty's apprenticeship tutor? Is it possible to arrange it so that they do participate?

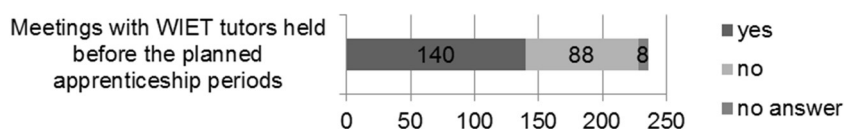


Fig. 6. Meetings with WIET tutors held before the planned apprenticeship periods

About 83% of the students responded that they have been provided with all the necessary information regarding the organization of apprenticeships (question 3.3A). About 15% had reservations about obtained information, while the remaining part did not provide an answer. About 80% of respondents gave positive answers to question 3.3B, while 18% consider the provided information to be incomplete or have other reservations. Fig. 7 shows the answers to question 3.3 C. Over 61% of students report that they have been given all the information necessary for making entries in the apprenticeship book. This means that nearly 39% of students consider the information they obtained to be incomplete, and so they need precise guidelines on how to make entries in the apprenticeship book.

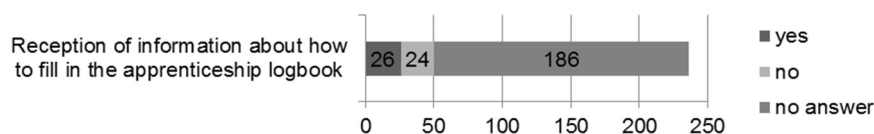


Fig. 7. Reception of information about how to fill in the apprenticeship logbook

DISCUSSION

In the analysis of research into the quality of student apprenticeships an χ^2 test was used, verifying the hypothesis about the independence of particular characteristics, which means that H_0 in this case takes the form H_0 : where characteristics X and Y are independent in relation to alternative hypothesis H_1 : while the characteristics X and Y are not independent. „Statistica“ software has been used for the verification of hypotheses, providing the value of test statistics χ^2 and the test probability p as a result of the test. Boundary value of probability p with H_0 being rejected equals 0.05.

In those cases where the independence hypothesis has been rejected, the correlation coefficient was calculated. „Statistics“ software allows for checking all the possible combinations of questionnaire content (questions and answers). Below only those of them are presented where

the dependence of characteristics was statistically significant, e.g. $p < 0.05$. The first part of the analysis accounted for the influence of respondent characteristics on the answers provided in the questionnaire. The second part includes the analysis of correlations between the examined areas including the apprentice evaluations (1 – 3). Fig. 8 presents the evaluation of social conditions depending on the direction of study:

The independence test χ^2 provided the test statistics at the level of 68.7 which translates to test probability equalling $p=0.000001$. This implies that there is a dependence between the characteristics under scrutiny, and the strength of this dependence is specified by the contingency coefficient equalling 0.47 and V-Cramer coefficient equalling 0.38. The value of this coefficient attests to an above-average correlation between the direction of study and the grading of social conditions encountered during the analysed apprenticeships, while it should be pointed out that the type of apprenticeship did not influence the grading of abovementioned conditions. Test χ^2 has test probability equalling $p = 0.35$, so the characteristics are independent. In spite of gender differentiation the test results did not indicate a significant correlation between the grading of social conditions and the gender ($p = 0.26$).

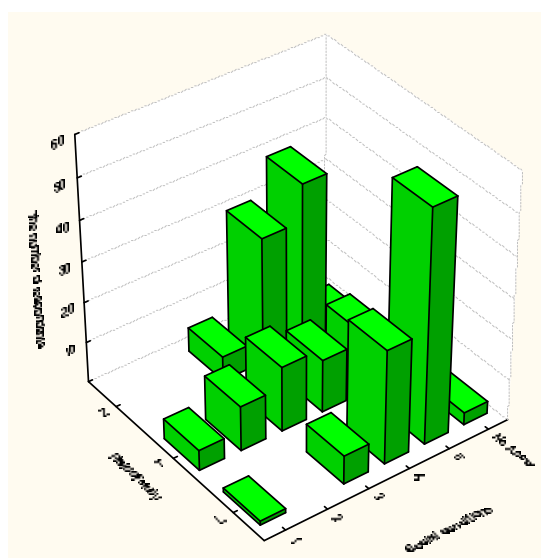


Fig. 8. Evaluations of social conditions in relation to directions of study, Statistica 8.0

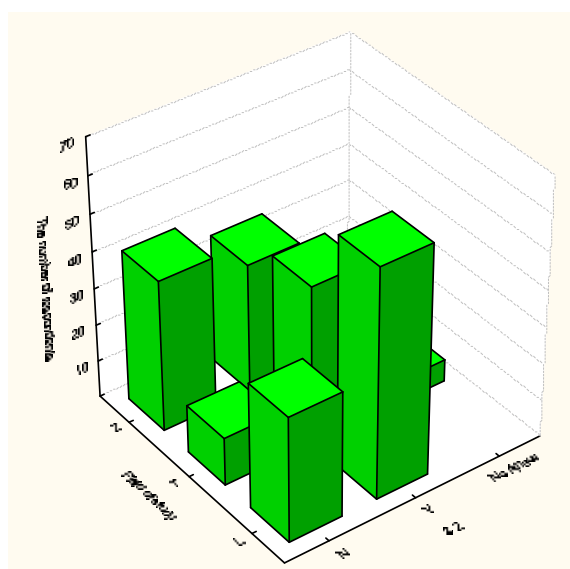


Fig. 9. Dependence of study directions for the answer to question 3.2., Statistica 8.0

Statistically significant differences occurred among answers depending on the direction of study ($p = 0.00007$) for the question "Was a meeting with tutor held before the designated periods of

apprenticeships?”. The majority of students from Production Management and Engineering direction reported no earlier meeting with the tutor, which has a negative impact on the organisation of apprenticeships. Another problem raised by the students from this direction was a lack of information regarding the rules used for scoring credits for completed apprenticeships. The independence test χ^2 had test statistics equalling 14.3 and $p = 0.006$, so the characteristics are dependent.

The percentages of students who did not receive information concerning the rules for scoring credits for the apprenticeship were respectively 15.63% for direction Logistics, 8.06% for Transport, and a large 28.21% for Production Management and Engineering. In the remaining cases the direction, gender and type of apprenticeship had no impact on the differentiation of answers.

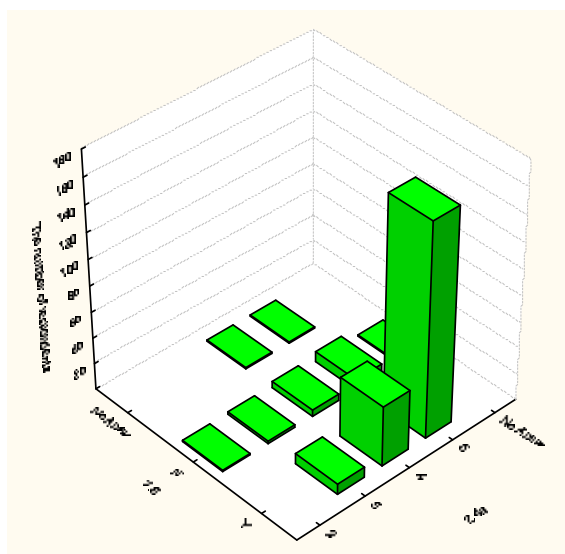


Fig. 10. Dependence of answers to questions: 1.5.-2.4.A., Statistica 8.0.

The respondents positively grading the question concerning the atmosphere in the company at the same time gave positive responses to 1.5, 1.4 and 1.3, while the highest coefficient of correlation in this case was noted for question 1.5, equalling 0.34, while the V-Cramer coefficient equalled 0.26. The coincidence of the responses to questions 1.5 and 2.3 deserves particular attention. In this case the contingency coefficient amounted to 0.37, while the V-Cramer coefficient – 0.4, which implies an average level of correlation between answers to questions 1.5 and 2.4 A. This may imply that the tasks assigned to students with the involved responsibility have an influence on the level of students' familiarization with the work in a given industry. In the independence test χ^2 the test statistics for the relation between 1.3 a 3.3.C. amounted to 12.22, which implies statistically significant dependence ($p = 0.002$). The strength of correlation is not very high and the contingency coefficient and V-Cramer coefficient both amounted to 0.22, which may imply that the students who had tasks assigned were able to make more precise entries in the apprenticeship logbook.

CONCLUSION

The analysis included in the article concerned:

1. Participation of the company and its significance for the execution of course-of-study apprenticeships;
2. The influence that university administration has on the progress of student apprenticeships
3. The connection between the quality level of course-of-study apprenticeships and satisfying the needs of students as stakeholders in the process of raising their professional competences; and it allows for concluding that a majority of companies do fulfill the expectations of apprentices. The voices of dissatisfaction concern mostly isolated situations related to interpersonal relations, on which the university has no direct influence. It should however be

remembered that the interpersonal conditions and the level of company's commitment have a significant impact on the exploration broadening the student's practical knowledge (Ryan, Toohey, & Hughes, 1996). The largest number of negative opinions related to the organisation of apprenticeships and their social conditions concerns group apprenticeships held in port companies (15.7% of all respondents), which suggests that they may be replaced with individual apprenticeships better serving the individual development of each student. We can thus agree with Blustein, 1997 and Ryan and Deci, 2000, that the raising of professional competences at each stage of career development depends on the process of learning through experience at specific work stations, as well as the conditions in which the student learns (Csikszentmihaly & Schneider, 2000). Listening to the voices of students and taking into account the results of other researchers in this field (Mercader-Trejo, 2016, Euler, 2013; Göhringer, 2002) the organisation of apprenticeships should be modified by:

- unambiguous specification of the rules for making entries in apprenticeship's logbooks as well as the rules for crediting the completed apprenticeship as a whole. The guidelines should be clear and publicly available.
- the issue of deadlines for obtaining passing grades should also be looked into.
- making the students' communication with the units responsible for the organisation of apprenticeships more efficient and more uniform.

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