

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

Ezequiel Augusto Kaufmann, Universidade de Santa Cruz do Sul – UNISC

ezequielaugusto@mx2.unisc.br

André Luiz Emmel Silva, Universidade de Santa Cruz do Sul – UNISC

andresilva@unisc.br

Jorge André Ribas Moraes, Universidade de Santa Cruz do Sul – UNISC

jorge@unisc.br

Liane Malmann Kipper, Universidade de Santa Cruz do Sul – UNISC

liane@unisc.br

Matheus André Mallmann, Universidade de Santa Cruz do Sul – UNISC

matheus.a.mallmann@hotmail.com

RESUMO

O desempenho acadêmico de estudantes universitários pode ser impactado por diversos fatores, dentre os quais o absenteísmo (falta às aulas) é um dos principais responsáveis. Desta forma, esse estudo teve por objetivo verificar se existe correlação entre a nota final dos estudantes e seus números de faltas nas aulas durante os semestres, nas disciplinas do curso de Engenharia de Produção da Universidade de Santa Cruz do Sul. Com base nos objetivos, fez-se uso de uma pesquisa descritiva, que empregou uma pesquisa documental para a coleta de dados. Os dados utilizados foram os totais de faltas e as notas finais dos alunos em cada semestre. Aplicou-se uma análise estatística de correlação e regressão linear, e o resultado mostrou que existe sim uma correlação entre o absenteísmo e o desempenho acadêmico dos discentes. Embora em alguns casos esta correlação não seja tão significativa, constatou-se que faltar às aulas diminui as notas dos estudantes.

Palavras-chave: Desempenho acadêmico, Absenteísmo, Engenharia de Produção.

DOI: <http://doi.org/10.51923/repae.v6i2.200>

Data de recebimento: 25/03/2020

Data do aceite de publicação: 10/11/2020

Data da publicação: 30/12/2020

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

CORRELATION BETWEEN ACADEMIC PERFORMANCE AND ABSENTEEISM IN A PRODUCTION ENGINEERING PROGRAM

Ezequiel Augusto Kaufmann, Universidade de Santa Cruz do Sul – UNISC
ezequielaugusto@mx2.unisc.br

André Luiz Emmel Silva, Universidade de Santa Cruz do Sul – UNISC
andresilva@unisc.br

Jorge André Ribas Moraes, Universidade de Santa Cruz do Sul – UNISC
jorge@unisc.br

Liane Malmann Kipper, Universidade de Santa Cruz do Sul – UNISC
liane@unisc.br

Matheus André Mallmann, Universidade de Santa Cruz do Sul – UNISC
matheus.a.mallmann@hotmail.com

ABSTRACT

The academic performance of students can be impacted by several factors, among them the absenteeism (class absences) is one of the main responsible ones. In this way, this study had as objective to verify if there is any correlation between the final grades of the students and their absences in the classes during the semesters, in the courses of the Production Engineering program of University of Santa Cruz do Sul, Brazil. Based on the objectives, a descriptive research was employed, which used documentary research to perform the data collection. The data used were the absentee totals and the final grades of the students in each semester. A statistical analysis of correlation and linear regression was applied, and the result showed that there is a correlation between absenteeism and the students' academic performance. Although in some cases this correlation is not so significant, it was verified that missing classes decreases students' grades.

Keywords: Academic Performance, Absenteeism, Production Engineering.

INTRODUCTION

Absenteeism has been a common and very extensive issue in the academic spheres since several years ago (Triadó-Ivern et al., 2013; López-Bonilla & López-Bonilla, 2015). There is no consensus about the influence of the non-attendance at classes in the academic performance, but it is certainly a reason for concern for teachers and academic managers (Levshankova et al., 2018). The absenteeism of the students in classroom-based classes affects the universities negatively, which have their resources underutilized; the professors, who become unmotivated due to the low attendance of the students; and turns the professor-student relationship difficult, affecting the professionalism negatively (Landin & Pérez, 2015). The volunteer and non-volunteer absenteeism is an inefficiency of the third-level education, once it means a waste of resources that could be very useful to the adequate education of undergraduate students (Triadó-Ivern et al., 2013). Moreover, those who skip classes miss valuable presentation materials, classroom discussions, professor-student interaction and classroom activities (Kinlaw, Dunlap & D'angelo, 2012).

While the specialists in education debate pedagogic methodologies and factors that affect its efficiency, there is a consensus that a significant part depends on the students

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

themselves (Andersen, 2011). Issues related to high dropout and failure rates in higher education are historical in Brazil, mainly in engineering courses (Nunes et al., 2015). When young people initiate their studies in a higher education institution, it is natural that they bring with them expectations in relation to the program, to their academic formation and their future as professionals (Mello, Jung & Stamm, 2017). Educational institutions propose professional profiles according to what industry, organizations and society expect from new professionals (Barrera et al., 2015). The challenge for the educators of the current days is to create a positive learning environment in the classrooms with the hope that this environment leads to a greater participation of the students, to a decrease in the absenteeism levels and to the improvement of the students' performance (López-Bonilla & López-Bonilla, 2015). It is common for students to feel that the knowledge transmitted in class has nothing to do with physical, real-world phenomena (Aizpun, Sandino & Merideno, 2015). Furthermore, it is the Higher Education Institutions' responsibility to maintain themselves updated with materials and teaching methods that encourage the knowledge and the due deepening in the most distinct knowledge fields that Production Engineering provides (Mello & Santos, 2015). The education in engineering is undergoing a transformation period, where new curriculums are based on learning through more integrated activities and sharing of past experiences (Carvalho et al., 2018).

There are several reasons for the high level of absenteeism in the higher education, but it is consensus for many authors that the new technologies allow the access to information without the necessity of attendance (Persky et al., 2014; Landin & Pérez, 2015). Nonetheless, to improve the quality of the education and to increase the performance of the students, it is required that they attend to the classes with some level of constancy (Tejero, Vadillo & Suarez, 2012).

Among the several factors that may influence the performance of the undergraduate students are the aspects related to work, family, teaching methods of the professors, the quantity of students in the classroom, the socioeconomic conditions, among other reasons (Souto-Maior et al., 2011). Understanding which factors are determinant to the academic performance is a crucial point for the improvement of the teaching-learning process. The absenteeism, which represents the non-attendance of the student at in-person classes, is regarded as one of the main reasons of the low academic performance, in a way that science has increasingly dedicated itself to this subject (Miranda, Araujo & Marcelino, 2017).

Considering the grade in the course the main factor in the academic performance, it is possible to find studies that aimed at identifying the determinant causes of it. Souto-Maior et al. (2011) present a research in which the result demonstrated that the students who had the highest number of absences presented lower performance than the other ones. The study of Nogueira et al. (2013) demonstrates that the absence in the classes has a direct relation with the students' performance. Notwithstanding, another research with more than seven thousand students that also sought to execute a performance analysis found as result that students with high absenteeism levels presented better performances, in contrast with what was expected as result by other researchers (Araújo et al., 2013).

Hence, this research has the objective of verifying if there is any correlation between the final grade of the students and their absence from classes during the semester, in the courses of the undergraduate program of Production Engineering of University of Santa Cruz do Sul – UNISC, Brazil. In order to support this verification a statistical analysis of correlation and linear regression was applied.

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

1 THEORETICAL FOUNDATION

1.1 Academic performance

One of the initial problems, which the researcher who seeks to study the academic performance faces, is the way to establish a method to measure it, once the academic performance can be considered a result of an extensive range of factors (Mamede et al., 2015). It is possible to find, in the scientific literature, researches that analysed individually: learning style, age, genre and number of absences, and present as result that these variables, in some cases, influenced the academic performance of the students in a significant way (Nogueira et al., 2013).

The term performance involves the dimension of the action, and the academic attainment is the result of its evaluation, expressed as grades or concepts acquired by the individual in determined activity (Munhoz, 2004). Thus, although the academic development is represented as just a grade in the majority of the times, its concept is much wider and encompasses different variables (Rodrigues et al., 2016).

Nevertheless, among the best methods that can be used to carry out an academic performance analysis in a large sample is the utilization of the objective and impartial grade, considering that it would be excessively complex to exactly analyse all the factors that compromise the students' attainments (Araújo et al., 2013).

1.2 Absenteeism

Absenteeism is a commonly used term in the field of Administration, being employed to evaluate the absences of the workers in the work environment due to reasons as withdrawals and delays, absences, justified or not, that end up affecting the performance of the organization. Even though it is not a very habitual term in the education context, it has increasingly become frequent in the literature of the area. In many occasions, the word has been utilized as synonym of the expression "not going to school" (Vasconcellos & Mattos, 2011).

Studies demonstrate that the presence and participation of the students in the classroom are directly linked to their grades. Furthermore, they indicate as a key factor the frequency in which the students participate of the discussions in the classroom, in order to improve their preparedness and involvement in the class and aiming at having a good performance. Therefore, it is highlighted that the presence of the students in the classroom is very positive (Dallimore, Hertenstein & Platt, 2010).

Another research demonstrates that the absence of the student in the classroom can result in a low performance in the exams, once the student might not know some questions of an exam due to not having gone to the class and not having updated himself/herself about the topics. Being this behaviour repeated continually, it might generate severe consequences, ending up compromising the performance of the undergraduate students (Teixeira, 2016).

Hagborg, Berglund e Fahlke (2018) emphasize that the academic absenteeism is a powerful prognostic of the academic bankruptcy. The authors comment that there is a relation between mistreatment and absenteeism, unveiling the complexity and the numerous factors that may affect the absenteeism. Lukkarinen, Koivukangas and Seppälä (2016) analysed the relation between the school attendance and the learning performance of the undergraduate students of a university program in which the attendance is not mandatory. They observed that not all the students can be considered

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

as a homogeneous group, but concluded that the in-class instruction is, in fact, important to the learning outcomes. They suggest that other studies can be done in order to analyse the correlation between academic performance and absenteeism.

1.3 Correlation

A correlation is the existent degree of relationship between two variables, where the data can be represented by ordered pairs (x,y), considering that x as the independent variable and y as the dependent variable (Larson & Farber, 2016). The studies of correlation are a tool used to generate and test important hypothesis and have a wide range of applications (Moltchanova et al., 2017). They are used to quantify the power and the direction of a presumed relation between two variables (Prion & Haerling, 2014). The correlation coefficient is probably the most used tool to measure the linear comovement between two variables, considering that the essential idea of correlation or correlation was conceptualized by Francis Galton and formally developed by Karl Pearson, which explains why it is called “Pearson correlation coefficient” (Kim, Kim & Ergün, 2015).

Pearson correlation coefficient (r): the Pearson correlation coefficient, also identified by the letter r, describes the linear correlation between two time series (Wang et al., 2013). It is widely used in the statistical analysis, and determines the strength of relationship between two vectors (Wang & Zheng, 2013; Zou et al.; 2014). It can be applied to a sample or to a population (Mu, Liu & Wang, 2018). It is represented by the formula of the equation 1, where x_i and y_i are the values of the variables X and Y. The \bar{x} and \bar{y} , respectively, are the averages of the values of x_i and y_i .

$$r = \frac{\sum_i (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_i (x_i - \bar{x})^2 \sum_i (y_i - \bar{y})^2}} \quad (1)$$

The result is a non-dimensional index that varies from -1 to 1. The signal indicates the negative or positive direction of the relationship and the value suggests the intensity of the relationship of the two variables. A coefficient of -1 or 1 indicates a perfect correlation, where the score of a variable can be exactly determined when the score of the other variable is known. On the other extremity, a correlation of 0 means that the two variables do not linearly depend on each other (Figueiredo Filho & Silva Jr., 2009). As bigger the absolute value is, stronger is the relation between the two variables. A positive correlation ($r > 0$) means that both variables move themselves in the same direction. A negative Pearson coefficient ($r < 0$) means that there is a negative or opposite relation between the variables of interest (Prion & Haerling, 2014).

Therefore, the magnitude of r gives a measure of the size of the dispersion existing probably in a sample of individuals around this trend line (Puth, Neuhäuser & Ruxton, 2014). The table 1 provides guidance about how to describe a correlation in words when the Pearson correlation coefficient (r) is known (Vargas, 2016).

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

Table 1. Value of r and its interpretations

Value of r (+ or -)	Interpretation
0,00 to 0,19	Very weak correlation
0,20 to 0,39	Weak correlation
0,40 to 0,69	Moderate correlation
0,70 to 0,89	Strong correlation
0,90 to 1,00	Very strong correlation

Source: Vargas, 2016.

2 MATERIALS AND METHODS

2.1 Research description

This study, based on its objectives, is classified as a descriptive research, considering that its purpose is to discover the existence of associations between the variables. In relation to the technical procedures, it is classified as a documental research, due to the use of materials that have not received an analytical treatment yet (Gil, 2017). Hence, this research was developed based on documental data obtained from a third-level educational institution. Utilized only each course's grade obtained by each student as the representation of the academic performance of the undergraduate students. The final grade is attributed to the student in the end of the semester, being an average of the grades of the exams assigned to him/her during it.

2.2 Procedures of data collection

This study made use of the final grades and absences of the students of UNISC's Production Engineering Program, in the courses of the basic, specific and professionalizing categories, amounting to 73 courses and 813 students. The data were collected through course summary reports from the grades database, which is inserted in the system by the professor of each course; the course summary reports have the students' final grades and absences. The courses used for this study were taught in the semesters of 2011/1, 2011/2, 2012/1, 2012/2, 2013/1, 2013/2, 2014/1, 2014/2, 2015/1, 2015/2, 2016/1, 2016/2, 2017/1, 2017/2 and 2018/1. Not all the courses occurred in all semesters, once UNISC's Production Engineering Program has changed over the last semesters, where some courses had their names changed or their contents divided.

The Production Engineering program has courses in common with other programs, which allows the students of those other programs to enroll themselves in courses of the Production Engineering program. Once the students of other undergraduate courses are not object of study in this research, they were not considered.

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

Table 2. Number of students per course from 2011/1 to 2018/1

Course	Number of students
Linear Algebra and Analytical Geometry	473
Environmental Management and Clean Technologies	91
Fundamentals of Mathematics	428
General Mechanics	166
Cost Management	26
Accounting Concepts	242
Industrial Economics	204
Informatics Applied to Engineering	123
Labour and Social Security Law	154
Environmental Science and Technology	206
People Management Strategies	13
Productive Systems	178
Computer Aided Design	112
Entrepreneurship Applied to Engineering	188
Metrology and Material Testing	82
IT Management and Innovation	73
Logistics and Distribution	92
Computer Aided Project	55
Manufacturing Tools	58
Quality Engineering	23
Maintenance Management	41
Project Management	16
Algorithms	79
Numeric Calculations	143
Technical Drawing	88
Company Project Development	187
Electricity	66
Transport Phenomena	211
Quality Assurance and Control	159
Introduction to Production Engineering	378
Operational Research Methods I	293
Operational Research Methods II	250
Metrology	207
Material Testing	215
Industrial Maintenance	187
Materials for Industrial Production	356
Production Planning and Control I	292
Production Planning and Control II	236
Manufacturing Processes	93
Strength of Materials	116
Simulation Applied to Production	274
Hydraulic and Pneumatic Systems	236
Heat Transfer	194
Product Engineering	216
Labour Engineering	242

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

Engineering Economics	128
Research Methods and Techniques	70
Industrial Sociology	97
Industrial Safety	346
Chemistry	328
Environmental Chemistry	124
Technical Drawing I	185
Technical Drawing II	102
Quality and Productivity	208
Manufacturing Information Systems	262
Algorithms and Programming	186
Organizational Management	113
Statistics Applied to Engineering	191
Calculus I	162
Calculus II	160
Calculus III	145
Physics Applied to Engineering I	376
Physics Applied to Engineering II	266
Physics Applied to Engineering III	201
Experimental Physics I	195
Experimental Physics II	138
Industrial Costs Management	187
Machine Parts	138
Manufacturing Processes I	196
Materials for Mechanical Construction	179
Project Ergonomics	261
Manufacturing Processes II	202
Strategies for Production Management	215

Source: Authors

2.3 Data analysis procedure

In order to be approved in a course, the student must have a grade equal or higher than 7,00. In the cases where this grade is not attained, the student has the right of taking an improvement exam. However, for the purpose of this study only the final grades (before the improvement exam) were considered as academic performance level.

After collecting the data, it was transposed to electronic spreadsheets, where they were classified by courses. The final grades and total of absences of each course were organized in two columns, taking into account all the semesters, from 2011/1 to 2018/1, in which the course was offered.

After having it done, a correlation analysis aided by the software EXCEL was executed. The formula "CORREL" was applied, using as input data in the matrix 1 the column "final grades" and "total of absences" in the matrix 2. As a result, the software informed the correlation coefficient between the two groups of data.

3 RESULTS AND FINAL COMMENTS

The study was developed together with UNISC, which is located in the city of Santa Cruz do Sul, Brazil. Currently, UNISC has more than twelve thousand students

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

distributed in the fifty undergraduate programs, forty Lato Sensu specializations, eight master programs and five doctorate programs.

The program of Production Engineering of UNISC has more than twenty years of existence, having three hundred students currently. The program has its courses divided in three categories: basic category, professionalizing category and specific category. This study was based on all the categories, encompassing all the courses.

At UNISC, in one 4-credit course, one day of class amounts to four presences. As it is mandatory that the student attend to at least seventy-five percent of the classes, he/she can have a maximum of eighteen absences during one semester. If a number higher than 18 absences is accumulated, the student fails the whole course in that semester.

Following the data analysis, the values of correlation coefficients (r) were found, which are informed in the Table 5. The same table also presents the information regarding the interpretation of each correlation coefficient, indicating the degree of correlation between the two groups of data - final grades and absences. As all the correlation results were negative, it means that when the variable “final grade” increases, the variable “total of absences” decreases.

Table 5. Pearson correlation coefficient results and its interpretations

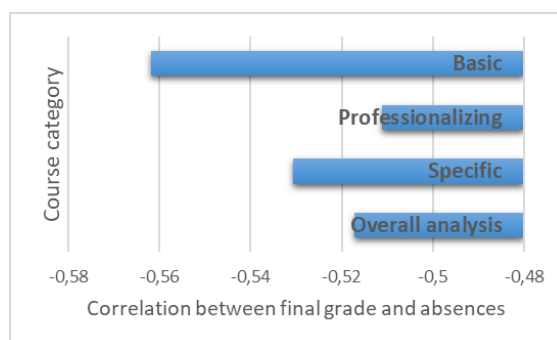
Category	Pearson correlation coefficient (absences x final grade)	Classification
Specific	-0,530	Moderated correlation
Basic	-0,561	Moderated correlation
Professionalizing	-0,511	Moderated correlation

Source: Authors

Based on the table 5, it is possible to verify that only one was the type of correlation that resulted among all the analyzed courses, which is the moderated correlation. Notwithstanding, the basic category presented the highest correlation value, 9% above the professionalizing category and 6% above the specific category.

Furthermore, an overall analysis of the data was executed, considering all the courses between the semester 2011/1 and 2018/1, and the result was a coefficient correlation of -0,517, a moderated correlation. The results of the four data analyses are summarized in the Figure 1 below.

Figure 1. Summary of the correlation results



Source: Authors

Analyzing the results, it is possible to verify that although absenteeism does not have a strong impact on the academic performance, the absences in general tend to have some influence on it. Therefore, this study meets the results obtained by Souto-Maior et

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

al. (2011), Nogueira et al. (2013), Lukkarinen, Koivukangas and Seppälä (2016) and Hagborg, Berglund and Fahlke, (2018) which indicate that absenteeism really is a factor that influences the academic performance of the students, being important the existence of other studies about the topic. Consequently, the results found in this study refute the results of the one executed by Araújo et al. (2013), which found as result that the students with the highest number of absences have the best performance levels.

4 FINAL CONSIDERATIONS

Considering that this study had the objective of verifying the existence of correlation of the undergraduate students' final grade with their absences in the classes during the semester, it was possible to conclude through the statistical correlation analysis that there is an influence of one variable on the other. Once it was possible to verify that there is a correlation between the final grades and the number of absences of each course, even the correlation being weak in some of the them, it always occurred. It is also important to emphasize that, even in the cases with the strongest correlation, it is not possible to conclude that one variable causes the occurrence of the other one - it only indicates the strength and direction of the relationship.

This study limited itself to a case-by-case analysis of the courses of UNISC's Production Engineering program. Therefore, there is not any intention of extrapolating the results found here to another courses, in other programs. Nonetheless, a more extensive knowledge of absenteeism and its influence on the academic performance will lead to a better control and correction through procedures focused on decreasing it.

As suggestion for further research on the topic, a correlation analysis of absences and academic performance in other engineering courses as well as a research aiming at discovering the reasons that lead the students to the non-attendance at classes would present a significant contribution to the knowledge about absenteeism and its influence on academic performance.

REFERENCES

AIZPUN, M., SANDINO, D. & MERIDENO, I. (2015). Developing students' aptitudes through University-Industry collaboration. *Ingeniería e Investigación*, 35(3), 121-128. DOI:10.15446/ing.investig.v35n3.48188

ANDERSEN, M. H. (2011). The world is my school: Welcome to the era of personalized learning. *Futurist*. 45 (1), 12-17.

ARAÚJO, E. A. T., CAMARGOS, M. A., CAMARGOS, M. C. S. & Dias, A. T. (2013).

ACADEMIC PERFORMANCE OF ACCOUNTING STUDENTS: an analysis of their determinants factors in a private high school. *Revista Contabilidade Vista & Revista*. 24(1), 60-83.

BARRERA, M. C., DUARTE, O. G., SARMIENTO, C. & SOTO, R. A. (2015). A quantitative definition of engineering professional profiles. *Ingeniería e Investigación*, 35(2), 89-95. DOI:10.15446/ing.investig.v35n2.46318

CARVALHO, G. D. G., CORRÊA, R. O., CARVALHO, H. G., VIEIRA, A. M. D. P.,

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

STANKOWITZ, R. F. & KOLOTELO, J. L. G. (2018). Competencies and Performance of Engineering Professors: Evidence from a Brazilian Public University. *Ingeniería e Investigación*, 38(3), 33-41. DOI:10.15446/ing.investig.v38n3.70998

DALLIMORE, E. J., HERTENSTEIN, J. H. & PLATT, M. B. (2010). Class participation in accounting courses: factors that affect student comfort and learning. *Issues in Accounting Education*. 25(4), 613-629. DOI:10.2308/iace.2010.25.4.613

FIGUEIREDO FILHO, D. B. & SILVA JR, J. A. (2009). Desvendando os Mistérios do Coeficiente de Correlação de Pearson (r). *Revista Política Hoje*, 18(1), 115-146. Retrieved from: <http://www.ufpe.br/politicohoje/index.php/politica/article/view/6/6>.

GIL, A. C. (2017). *Como elaborar projetos de pesquisa*. 6. ed. São Paulo: Atlas.

HAGBORG, J. M., BERGLUND, K. & FAHLKE, C. (2018). Evidence for a relationship between child maltreatment and absenteeism among high-school students in Sweden. *Child Abuse & Neglect*. 75, 41-49. DOI:10.1016/j.chiabu.2017.08.027

KIM, Y., KIM, T. H. & ERGÜNC, T. (2015). The instability of the Pearson correlation coefficient in the presence of coincidental outliers. *Finance Research Letters*. 13, 243-257. DOI:10.1016/j.frl.2014.12.005

KINLAW, C. R., DUNLAP, L. L. & D'ANGELO, J. A. (2012). Relations between faculty use of online academic resources and student class attendance. *Computers & Education*. 59(2), 167-172. DOI:10.1016/j.compedu.2011.12.028

LANDIN, M. & PÉREZ, J. (2015). Class attendance and academic achievement of pharmacy students in a European University. *Currents in Pharmacy Teaching and Learning*. 7(1), 78-83. DOI:10.1016/j.cptl.2014.09.013

LARSON, R. & FARBER, B. (2016). *Estatística Aplicada*. 6. Ed. São Paulo: Pearson, 2016.

LEVSHANKOVA, C., HIRONS, D., KIRTON, J. A., KNIGHTING, K. & JINKS, A. M. (2018). Student nurse non-attendance in relation to academic performance and progression. *Nurse Education Today*. 60, 151-156. DOI:10.1016/j.nedt.2017.10.006

LÓPEZ-BONILLA, J. M. & LÓPEZ-BONILLA, L. M. (2015). The multidimensional structure of university absenteeism: an exploratory study. *Innovations in Education & Teaching International*. 52(2), 185-195. DOI:10.1080/14703297.2013.847382

LUKKARINEN, A., KOIVUKANGAS, P. & SEPPÄLÄ, T. (2016). Relationship between class attendance and student performance. *Procedia-Social and Behavioral Sciences*, 228, 341-347. DOI:10.1016/j.sbspro.2016.07.051

MAMEDE, S., MARQUES, A., ROGERS, P., & MIRANDA, G. J. (2015). Psychological Determinants of Academic Achievement in Accounting: Evidence from Brazil. *Brazilian Business Review*, 12(Special Ed), 50-71. DOI:10.15728/bbrconf.2015.3

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

MELLO, M. F., JUNG, P. L. & STAMM, G. R. (2017). Profile and expectations of production engineering students of a federal university. *Exacta – EP*, 15(3), 471-486. DOI:10.5585/ExactaEP.v15n3.7034

MELLO, J. A. V. B. & SANTOS, V. J. D. (2015). Academic training in production engineering, market demand, and disciplines in public higher education institutions of Rio de Janeiro. *Exacta – EP*. 13(1), 55-66. DOI:10.5585/ExactaEP.v13n1.5349

MIRANDA, G., ARAUJO, T., & MARCELINO, I. (2017). The academic absenteeism and its more obvious results. *Revista Gestão Universitária na América Latina - GUAL*, 10(1), 172-189. DOI:10.5007/1983-4535.2017v10n1p172

MOLTCHANOVA, E., GERHARD, D., MOHAMED, F., GAW, S. & GLOVER, C. N. (2017). On correlation analysis of many-to-many observations: an alternative to Pearson's correlation coefficient and its application to an ecotoxicological study. *Australian & New Zealand Journal of Statistics*, 59(4), 371-387. DOI:10.1111/anzs.12211

MU, Y., LIU, X. & WANG, L. (2018). A Pearson's correlation coefficient based decision tree and its parallel implementation. *Information Sciences*. 435, 40-58. DOI:10.1016/j.ins.2017.12.059

MUNHOZ, A. M. H. (2004). A multidimensional analysis between intelligence and academic performance in university students. PhD thesis, University of Campinas.

NOGUEIRA, D. R., COSTA, J. M., TAKAMATSU, R. T. & REIS, L. G. (2013). Issues that influence academic performance: an analysis with students from the accountancy course inside classroom. *Revista de Informação Contábil*, 7(3), 51-62.

NUNES, A., SILVA, T., MOTA, J., ALMEIDA, A. & ANDRIOLA, W. (2015). Validation of the academic management evaluation instrument based on principal component analysis for engineering and technological courses. *Ingeniería e Investigación*, 35(2), 96-102. DOI:10.15446/ing.investig.v35n2.47369.

PERSKY, A. M., KIRWIN, J. L., MARASCO JR., C. J., MAY, D. B., SKOMO, M. L. & KENNEDY, K. B. (2014). Classroom attendance: Factors and perceptions of students and faculty in US schools of pharmacy. *Currents in Pharmacy Teaching and Learning*. 6(1), 1-9. DOI:10.1016/j.cptl.2013.09.014

PRION, S. & HAERLING, K. A. (2014). Making Sense of Methods and Measurement: Pearson Product-Moment Correlation Coefficient. *Clinical Simulation in Nursing*. 10(11), 587-588. DOI:10.1016/j.ecns.2014.07.010

PUTH, M. T., NEUHÄUSER, M. & RUXTON, G. D. (2014). Effective use of Pearson's product-moment correlation coefficient. *Animal Behaviour*. 93, 183-189, 2014. DOI:10.1016/j.anbehav.2014.05.003

SOUTO-MAIOR, C. D., BORBA, J. A., KNUPP, P. S. & CROLL, E. S. (2011). Analysis of factors affecting the performance of undergraduate students in administration and accounting in

CORRELAÇÃO ENTRE DESEMPENHO ACADÊMICO E ABSENTEÍSMO EM UM CURSO DE ENGENHARIA DE PRODUÇÃO

the discipline of operational research. In: Meeting of ANPAD, 35, Rio de Janeiro.

RODRIGUES, B. C. O., RESENDE, M. S., MIRANDA, G. J. & PEREIRA, J. M. (2016). Determiners of the students' academic performance in accounting courses in distance education. *Enfoque: Reflexão Contábil*, 35(2), 139-153. DOI:10.4025/enfoque.v35i2.30105

TEIXEIRA, A. A. C. (2016). The impact of class absenteeism on undergraduates' academic performance: evidence from an elite Economics school in Portugal. *Innovations in Education and Teaching International*. 53(2), 230-242. DOI:10.1080/14703297.2014.937730

TEJERO, N. C., VADILLO, M. T. P. & SUAREZ, M. M. El efecto del absentismo universitario en el expediente académico y en la percepción de sus causas. (2012). *The Spanish Journal of Accounting, Finance and Management Education*. 3, 47-65.

TRIADÓ-IVERN, X., APARICIO-CHUECA, P., GUÀRDIA-OLMOS, J., PERÓ-CEBOLLERO, M. & JARÍA-CHACÓN, N. (2013). Empirical approach to the analysis of university student absenteeism: proposal of a questionnaire for students to evaluate the possible causes. *Quality & Quantity*. 47(4), 2281-2288. DOI:10.1007/s11135-011-9654-3

VARGAS, V. C. C. (2016). Correlação. Retrieved from: http://www.inf.ufsc.br/~vera.carmo/Correlacao/Correlacao_Pearson_Spearman_Kendall.pdf

VASCONCELLOS, S. S. & MATTOS, C. L. G. (2011). O absentismo escolar e sua regulamentação. *Etnografia e educação: conceitos e usos* [online]. Campina Grande: EDUEPB.

WANG, G. J., XIE, C., CHEN, S., YANG, J. J. & YANG, M. Y. (2013). Random matrix theory analysis of cross-correlations in the US stock market: Evidence from Pearson's correlation coefficient and detrended cross-correlation coefficient. *Physica A: Statistical Mechanics and its Applications*. 392(17), 3715-3730. DOI:10.1016/j.physa.2013.04.027

WANG, J. & ZHENG, N. (2013). A Novel Fractal Image Compression Scheme With Block Classification and Sorting Based on Pearson's Correlation Coefficient. *IEEE Transactions on Image Processing*. 22(9), 3690-3702. DOI:10.1109/TIP.2013.2268977

ZOU, Y., DONG, F., LEI, B., SUN, S., JIANG, T. & CHEN, P. (2014). Maximum similarity thresholding. *Digital Signal Processing*. 28, 120-135. DOI:10.1016/j.dsp.2014.02.008