education sciences

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Student Absenteeism in Mathematics Lessons: Social Variables in the PGS of Namibe

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Received: 23 April 2019; Accepted: 6 June 2019; Published: 13 June 2019

Abstract: This article analyses social variables that cause student absenteeism from mathematics classes. It contrasts teachers' perceptions with the perceptions of students undertaking their second and third levels of a Bachelor's degree in Physics and Chemistry at the Pedagogical Graduate School (PGS) of Namibe, Angola. To perform this analysis, a Likert scale questionnaire was undertaken and descriptive and inferential statistical tests, a correlation analysis, a variance analysis, and a multivariate factorial analysis were carried out on the data. The results showed that lack of financial and emotional support from students' families and the students' discomfort upon moving to the educational centre were reasons behind absenteeism in mathematics lessons.

Keywords: student absenteeism; mathematical education; higher education

1. Introduction

There are many factors related to the school organisation that underlie the occurrence of school absenteeism, academic failure, and dropout within educational institutions [1–6].

González-Rodríguez [7] reported on social factors behind school absenteeism, distinguishing between family factors, educational factors, family structure, sociocultural background, family environment, and factors associated with social relationships with peers.

In the academic community, absenteeism has been reported as a key risk factor for violence, injury, substance use, food insecurity, psychiatric disorders, and economic deprivation [8–11]. For this reason, educational researchers have focused on the factors that cause absenteeism, which have been studied in various contexts and at various educational levels [12–16].

The relationship between absenteeism and school performance has also been paid much attention [17–21], particularly in the African context and in the subject of mathematics [22,23].

Absenteeism, academic failure, and dropping out of school are affected by several social factors. For this reason, an effective proposal to improve the quality of educational institutions is necessary [24–28]. This article analyses social variables that cause student absenteeism in mathematics classes; it contrasts teachers' perceptions with the perceptions of students undertaking their second and third levels of a Bachelor's degree in Physics and Chemistry at the Pedagogical Graduate School (PGS) of Namibe, Angola.

2. Methodology

The two study populations were composed of 44 teachers and 131 second- and third-level students undertaking a Bachelor's degree in Physics and Chemistry from the PGS. Table 1 shows the distribution of the study populations and the numbers in the study samples along with their topic specialities and levels of study.

Table 1. Distribution of the study populations and study samples * with the students' topic specialities and levels of study.

Population/Sample	Speciality				Subtotal
	Physics		Chemistry		
	Second Level	Third Level	Second Level	Third Level	
Students	38/27	17/13	41/30	35/29	131/99
Subtotal	55/40		76/59		
Teachers	12/11	10/10	12/11	10/9	44/41
Subtotal	24/22		20/19		
Total					175/140

* The first number represents the total number of students in the study population and the second number represents the size of the study group sample.

A questionnaire was given to 140 subjects; 99 students and 41 teachers, as shown in Table 1. A confidence interval (CI) of 95% and a sampling error of 3% were calculated for the data.

To investigate the causes of absenteeism, a questionnaire was given to the students. An analogous questionnaire was also given to the teachers to enable comparison with the data obtained from the students. Teachers, as observed in recent research, can provide rich information on the social environment and personal situations of students [29–31].

The questionnaire given to the teachers included general questions such as age, sex, years of work experience, and highest level of education. The questionnaire given to the students also included general questions such as age, sex, current career, years needed to complete their intermediate education, the institution at which the student is studying, years of work experience, and the sector in which they work.

Both sets of questionnaires consisted of 14 Likert scale-type questions with four response options: strongly disagree, disagree, agree, and strongly agree. These items measure the level of agreement of the participants (teacher or student) in response to questions about whether various social variables cause student absenteeism in mathematics classes at the Pedagogical Graduate School.

The teachers' group was composed of 63.6 ± 3% males with an average age of 44.18 ± 1.33 years and an average of 20.59 ± 0.61 years of work experience. In the sample population, three had a PhD, 17 had a Master's degree, 20 had a Bachelor's degree, and one had a technical qualification.

The student population was composed of 53.4 ± 3% males, for 91.9 ± 3% of which the PGS was their first university. They had an average age of 30.07 + 0.90 years and they had an average of 6.67 ± 0.20 years to complete their intermediate education.

Of the students, 56% were in secondary school teacher training, 12% were from a middle pre-university institute, 6% were in middle school administrative training, 15% were in a high school polytechnic, and 10% were involved in other types of training. Of the student group, 27% were not working, 23% worked in education (19% of them in the public sector), 7% were self-employed, and 9% were employees in the private sector. These data had a sampling error of 3%.

To analyse the data obtained from the questionnaire, the following techniques were used: descriptive and inferential statistics, bivariate correlation analyses (Pearson coefficient at 95% confidence level), variability tests (in the case of analysis of variance of two levels, Mann–Whitney tests were

applied, and in the case of analysis of variance of four levels, Kruskal–Wallis tests were applied), and multivariate factorial analysis (Kaiser–Meyer–Olkin procedure with Barlett test and Varimax rotation with Kaiser standardisation).

The descriptive and inferential statistics studied the relative frequencies in the different levels of the variables. The statistical inference had a statistical error of 3% and a confidence level of 95%.

3. Results of Statistical Tests

3.1. Social Variables That Cause Student Absenteeism in Mathematics Classes

Table 2 shows the relative frequencies in the levels of agreement between the teachers and the students of the PGS on the organisational causes of student absenteeism in mathematics classes. Furthermore, it shows the acronyms for each variable as well as the ratios and the standard deviations, placing both groups, teachers and students, in the same framework.

Table 2. Social variables that cause student absenteeism in mathematics classes; level of agreement between teachers and students * at the Pedagogical Graduate School.

	Relative Frequencies				$\overline{X}$ (1)	σ (2)
Variables (Acronyms)	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**		
Lack of emotional support for the student from their family (LES) (3),(4)	7.5 12.1	10.0 16.2	35.0 46.5	47.5 25.3	3.23 2.85	0.91 0.94
Lack of financial support for the student from their family (LFS) (3),(4)	5.0 14.1	17.5 15.2	47.5 47.5	30.0 23.2	3.03 2.80	.083 0.95
Absence of a positive relationship between students and their community (APR) (4)	17.5 13.1	22.5 21.2	20.0 36.4	40.0 29.3	2.83 2.82	1.15 1.00
Bad interpersonal relationships among students outside school (BIR) (3),(4)	14.6 12.1	36.6 20.2	34.1 46.5	14.6 21.2	2.49 2.77	0.93 0.92
Poor quality of communication between parents and teachers (PQC) (3),(4)	24.4 7.1	14.6 15.2	39.0 51.5	22.0 26.3	2.59 2.97	1.09 0.84
Lack of communication between teachers and politically influential people in education (LCT) (4)	14.6 10.1	17.1 16.2	36.6 49.5	31.7 24.2	2.85 2.88	1.04 .90
Insufficient collaboration between the school and other social institutions (ICS) (3)	22.0 13.1	9.8 19.2	36.6 30.3	31.7 37.4	2.78 2.92	1.13 1.05
Discomforts that affect students moving to the school (DAS) (3),(4)	7.3 10.1	14.6 12.1	36.6 51.5	41.5 26.3	3.12 2.94	0.78 0.89
Insufficient collaboration among members of the educational community (ICM) (3),(4)	26.8 9.1	17.1 15.2	24.4 52.5	31.7 23.2	2.61 2.90	1.20 0.86
Conflict between students' religious affiliation and the Pedagogical Graduate School (SRA)	17.1 17.2	34.1 17.2	24.4 41.4	24.4 24.2	2.56 2.73	1.05 1.01
Students' work responsibilities (SWR) (4)	9.8 8.2	22.0 13.3	39.0 50.0	29.3 28.6	3.00 2.88	0.95 0.86
Student frustration with socio-economic aspirations (SFA) (4)	7.3 11.1	29.3 18.2	29.3 47.5	34.1 23.2	2.90 2.83	.97 .92
Student insubordination against institutional regulations (SIR)	14.6 8.1	17.1 25.3	43.9 53.5	24.4 13.1	2.78 2.72	0.99 0.80
Insufficient communication among members of the educational community through Information and Communication Technologies (ICA) (4)	17.1 11.1	19.5 14.1	31.7 58.6	31.7 16.2	2.78 2.80	1.08 0.85

N = 42/131. n = 41/99. In each case the sampling error was 3%. (1) $\overline{X}$ = sample average. (2) σ = sample standard deviation. (3) Variable with statistically significant differences between subgroup levels (teacher/student). According to the Mann–Whitney test, $p < 0.05$ (two-tailed at a confidence level of 95%). (4) Variable with statistically significant differences between response levels on Likert scale. According to the Kruskal–Wallis test, $p < 0.05$ (two-tailed at a confidence level of 95%). * In each line, the data in the upper row of the line correspond to the teachers' results and the data in the lower row correspond to the students' results.

As seen in Table 2, the variables APR, LCT, SWR, SFA, SIR, and ICA show significant differences between agreement and disagreement levels for both groups (teachers and students) while mostly tending to agree with the variable statement under the Kruskal–Wallis test, a confidence level of 95%. This shows that both groups agree that these social variables cause student absenteeism in mathematics classes.

The LFS, LES, and DAS variables show the highest averages for teachers (3.03, 3.23, and 3.12, respectively). Although these variables show high averages for students, there are significant differences between the students' and teachers' averages according to the Mann–Whitney test, $p < 0.05$ (two-tailed and at a confidence level of 95%). This means that, for teachers, these are the main variables that explain student absenteeism. For students, these variables also explain absenteeism, but not with the same importance. These variables require further research.

For the BIR, PQC, ICS, ICM, and SRA variables there is strong agreement among students, according to the Mann–Whitney test, $p < 0.05$ (two-tailed and at a level of confidence of 95%). For each of these variables there is stronger agreement for the students than for the teachers. The students agree that these social variables cause absenteeism in mathematics lessons. It is recommended that future studies investigate why these variables are important for students in explaining student absenteeism while they are not so important for teachers.

In addition, regarding the Mann–Whitney test, in the PQC, ICM, SIR, and ICA variables there are statistically significant differences between the standard deviations of the teachers' and the students' results. In each of these variables there is higher dispersion in the teachers' answers than in the students' answers. This could be interpreted as there being a more homogeneous position among students regarding these variables, while among the teachers there are more heterogeneous opinions.

3.2. The Relation between Social Variables That Cause Student Absenteeism in Mathematics Lessons

Table 3 shows the related social variables that cause student absenteeism in mathematics lessons at the PGS and their respective acronyms. In this table, teachers' coefficients are placed together with students' coefficients for comparison.

Table 3. The relations between social variables that cause student absenteeism in mathematics lessons according to teachers and students * at the Pedagogical Graduate School of Namibe.

	Variables	Pearson's Coefficient ρ												
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
1	Lack of emotional support for the student from their family (LES)													
2	Lack of financial support for the student from their family (LFS)	0.86 0.14												
3	Absence of a positive relationship between students and their community (APR)	0.91 −0.25	0.86 0.36											
4	Bad interpersonal relationships among students outside school (BIR)	0.89 −0.05	0.84 0.17	0.89 0.35										
5	Poor quality of communication between parents and teachers (PQC)	0.82 0.54	0.87 0.29	0.92 0.04	0.87 0.02									
6	Lack of communication between teachers and politically influential people in education (LCT)	0.88 0.73	0.93 0.10	0.92 −0.13	0.88 −0.26	0.91 0.68								
7	Insufficient collaboration between the school and other social institutions (ICS)	0.85 0.54	0.94 0.11	0.91 −0.23	0.84 −0.01	0.93 0.44	0.97 0.53							
8	Discomforts that affect students moving to the school (DAS)	0.93 −0.62	0.93 0.05	0.93 0.40	0.86 0.26	0.86 −0.32	0.90 −0.55	0.91 −0.44						

Table 3. *Cont.*

	Variables	Pearson's Coefficient ρ												
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
9	Insufficient collaboration among members of the educational community (ICM)	0.84 −0.62	0.89 0.08	0.93 0.42	0.87 0.22	0.94 −0.44	0.93 −0.56	0.95 −0.38	0.87 0.72					
10	Conflict between students' religious affiliation and the Pedagogical Graduate School (SRA)	0.89 −0.42	0.88 −0.04	0.92 0.48	0.94 0.51	0.90 −0.26	0.90 −0.45	0.88 −0.16	0.88 0.33	0.91 0.34				
11	Students' work responsibilities (SWR)	0.86 0.48	0.92 0.38	0.89 −0.06	0.86 0.06	0.90 0.57	0.97 0.27	0.95 0.31	0.89 −0.12	0.91 −0.23	0.89 −0.24			
12	Student frustration with socio-economic aspirations (SFA)	0.87 0.64	0.90 0.29	0.93 −0.25	0.86 −0.09	0.90 0.30	0.93 0.34	0.91 0.35	0.90 −0.38	0.93 −0.40	0.89 −0.33	0.93 0.59		
13	Student insubordination against institutional regulations (SIR)	0.86 0.36	0.89 −0.08	0.89 0.03	0.88 0.13	0.93 0.55	0.97 0.42	0.94 0.40	0.87 −0.38	0.89 −0.34	0.91 0.11	0.95 0.36	0.89 0.29	
14	Insufficient communication among members of the educational community through Information and Communication Technologies (ICA)	0.88 −0.11	0.92 0.27	0.95 0.30	0.88 0.33	0.93 0.14	0.97 −0.04	0.96 0.00	0.90 0.07	0.95 0.13	0.92 0.25	0.94 0.11	0.95 −0.23	0.93 0.20

N = 42/131. n = 41/99. In all cases $p < 0.01$ (two-tailed, with a sampling error of 3% and a level of confidence of 95%).
* In each line, the data in the upper row of the line corresponds to the teachers' results and the data in the lower row corresponds to the students' results.

In the teachers' population, high correlation coefficients are observed among all the social variables. For every pair of studied variables x and y, $\rho_{xy} > 0.80$ and $p < 0.01$ (two-tailed, with a sampling error of 3% and a level of confidence of 95%).

This is not observed in the student population, where there is higher diversity between the variables and strong correlations, significant and insignificant, both positive and negative.

For the students, the variables LES and LCT are positive and strongly related with APR and ICS. Likewise, the variables LES and LCT are strongly and inversely related with DAS and ICM, with positive correlation between them. The PQC variable is directly and strongly correlated with SIR and SWR. Finally, the students consider the BIR and SRA variables to be directly and strongly related.

3.3. Student Absenteeism Variability in Mathematics Lessons Explained by Social Factors and Variables

Table 4 shows the percentage of variance of student absenteeism in mathematics lessons in the PGS, which can be explained by each factor and each variable, both for the teacher and student populations.

In the case of the teachers, the multivariate factorial analysis enables us to determine that just one factor explains 91.09% of student absenteeism in mathematics lessons in the PGS, with KMO = 0.882 (Kaiser-Meyer-Olkin coefficient), χ^2 = 1197.25, and Sig. < 0.0001, with a sampling error of 3%. All the variables have a strong relation with this factor. This factor consists of all the variables of the research, and, therefore, is seen as a key explanation of student absenteeism by this group.

In the case of the students, the multivariate factorial analysis enables us to establish four factors that explain 70.73% of the factors' variability, with KMO = 0.701, χ^2 = 744.51, and Sig. < 0.0001, with a sampling error of 3%. For this population, the first two factors are the most influential on student absenteeism; however, both explain very little: 28.64% and 15.7%, respectively. The Varimax rotation method ensures that those two factors will consist of the variables with greater saturations and with a positive and strong correlation with their factor.

All the social variables within the study, according to the teacher population, influence student absenteeism by greater than or equal to 84.17%. For the students, all these variables do not have a significant influence. In these cases, Mann-Whitney tests, $p < 0.05$ (two-tailed and at a level of confidence of 95%), point out significant differences between teachers and students.

Table 4. Percentage of variance of student absenteeism in mathematics lesson explained by social factors and variables, according to teachers and students of the Pedagogical Graduate School of Namibe.

Variable	Teachers [1]				Students [2]			
	Factor	% Variability that the Factor Explains	Correlation Coefficient with Its Factor	% Variability that the Variable Explains	Factor	% Variability that the Factor Explains	Correlation Coefficient with Its Factor	% Variability that the Variable Explains
Lack of emotional support for the student from their family (LES)	1	91.09	0.92	84.17	1	28.64	0.71	20.42
Lack of financial support for the student from their family (LFS)	1	91.09	0.94	85.99	2	15.7	0.68	10.66
Absence of a positive relationship between students and their community (APR)	1	91.09	0.96	87.54	3	13.31	0.71	9.50
Bad interpersonal relationships among students outside school (BIR)	1	91.09	0.93	84.26	4	13.08	0.78	10.22
Poor quality of communication between parents and teachers (PQC)	1	91.09	0.95	86.44	1	28.64	0.67	19.25
Lack of communication between teachers and politically influential people in education (LCT)	1	91.09	0.98	88.99	1	28.64	0.78	22.25
Insufficient collaboration between the school and other social institutions (ICS)	1	91.09	0.97	88.27	1	28.64	0.66	19.02
Discomforts that affect students moving to the school (DAS)	1	91.09	0.95	86.08	3	13.31	0.26	3.43
Insufficient collaboration among members of the educational community (ICM)	1	91.09	0.96	87.26	3	13.31	0.28	3.75
Conflict between students' religious affiliation and the Pedagogical Graduate School (SRA)	1	91.09	0.95	86.63	4	13.08	0.79	10.37
Students' work responsibilities (SWR)	1	91.09	0.96	87.72	2	15.7	0.80	12.48
Student frustration with socio-economic aspirations (SFA)	1	91.09	0.96	87.08	2	15.7	0.76	11.96
Student insubordination against institutional regulations (SIR)	1	91.09	0.96	87.36	1	28.64	0.74	21.08
Insufficient communication among members of the educational community through Information and Communication Technologies (ICA)	1	91.09	0.98	89.18	3	13.31	0.69	9.18

Extraction method: Main component. Rotation method: Varimax with Kaiser's normalisation. Sampling error: 3%. [1] Convergence achieved with zero rotations, with N = 42, n = 41, KMO = 0.882 (Kaiser-Meyer-Olkin coefficient), $\chi^2 = 1197.25$, Sig. < 0.0001. [2] Convergence achieved with seven rotations, with N = 131, n = 99, KMO = 0.701, $\chi^2 = 744.51$, Sig. < 0.0001.

4. Conclusions and Recommendations

From the study of the social variables that cause student absenteeism in mathematics lessons in the PGS (Pedagogical Graduate School of Namibe), it was identified that:

1. There was a high level of agreement, both by teachers and students, that the absence of a positive relationship between students and their community, the lack of communication between teachers and politically influential people, the job responsibilities of the students, student frustration surrounding socio-economic aspirations, students' insubordination against institutional regulations, and insufficient communication between educational community members through ICT (Information and Communication Technologies) are the causes of school

absenteeism in mathematics lessons in the PGS. This has previously been pointed out in research on the subject [32,33]. The factorial analysis highlighted that for the teacher population these are the variables that affect absenteeism and that these variables are highly interconnected. It is recommended that research be undertaken to identify a way to reduce these deficiencies as an effective way to reduce student absenteeism.

2. The lack of economic and emotional support from students' families and the inconveniences that students face when moving to the educational centre were found to be factors that the teachers most strongly agreed with as causes of absenteeism in mathematics lessons in the PGS. Additionally, teachers considered that these factors strongly influence student absenteeism and that they are positively and strongly related. The students also considered these variables to be causes of absenteeism, but with lower levels of agreement. It is recommended that these limitations be studied in greater depth to identify an appropriate way to reduce student absenteeism. Absenteeism studies conducted in other contexts also pointed to a strong relationship between lack of family support and absenteeism [19].
3. In the student population there was a high level of agreement that bad interpersonal relationships between students outside the school, disputes between their religious affiliation and the PGS, the poor quality of communication between parents/tutors and teachers, and insufficient collaboration between the members of the PGS with other social institutions are factors that cause student absenteeism in mathematics lessons. However, the students did not clearly stress these as being factors that explain absenteeism. There was not significant agreement among teachers concerning these factors; however, teachers who did consider them to be causes of student absenteeism rated them highly. These divergences open research areas for the further understanding of causes of absenteeism in mathematics lessons in the PGS. It would be beneficial to initiate lines of research in this area. These results are also consistent with researches that highlighted the relationship between maltreatment against students and absenteeism [9,15].
4. For the students, factors such as lack of emotional support from their family and lack of communication between teachers and politically influential people in education were positively and strongly related, and were related to the poor quality of communication between parents/tutors and teachers as well as insufficient collaboration between the school and other social institutions. This is in accordance with the findings of other investigations [34]. Likewise, the lack of emotional support for students from their families and the lack of communication between teachers and political influential people in education were strongly and inversely related to the discomforts that affected the students when moving to the educational centre and the shortcomings in collaboration between educational community members; both of these factors were positively correlated. For this population, the poor quality of communication between parents/tutors and teachers was directly and strongly correlated with the students' insubordination against the institutional regulations and the students' job responsibilities. These responsibilities were related to student frustration with socio-economic aspirations, and this frustration was related to the lack of emotional support for the student from their family. Finally, the student population considered that bad interpersonal relationships between students outside the school and disputes between the students' religious affiliation and the PGS were directly and strongly related. It should be noted that the lack of student aspirations as a negative factor in mathematics education has been pointed out as a factor in student absenteeism in recent research [23].

Author Contributions: Conceptualization, E.C.-B., J.-A.M.-M., A.-P.S.-d.-S. and J.-M.T.-T.; Methodology, E.C.-B., A.-P.S.-d.-S. and J.-M.T.-T.; Validation, A.-P.S.-d.-S.; Formal Analysis, E.C.-B. and A.-P.S.-d.-S.; Investigation, A.-P.S.-d.-S. and J.-M.T.-T.; Resources, A.-P.S.-d.-S. and J.-M.T.-T.; Data Curation, E.C.-B. and A.-P.S.-d.-S.; Writing-Original Draft Preparation, E.C.-B.; Writing-Review & Editing, E.C.-B., J.-A.M.-M. and J.-M.T.-T.; Visualization, E.C.-B., J.-A.M.-M. and J.-M.T.-T.; Supervision, J.-M.T.-T.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

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