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The relationship between school-related factors and student development: An empirical study of Vietnamese students in the Industry 4.0

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A B S T R A C T

The study examines how school-related factors influence the cognitive, psychological, and mental development of Vietnamese students. We randomly sent the questionnaires to more than 2000 students with different majors at five top universities in Vietnam based on the Ranking Web of Universities and conducted in-depth online interviews with respondents. Subsequently, we tested the correlation between student development and four school-related factors, including academic staff quality, school infrastructure, teaching curriculum, and school environment, using SPSS 22 and STATA version 2016. The findings suggest the significant role of staff quality in determining the level of student satisfaction. Specifically, students express their satisfaction and appreciation with their studies if their teachers have a solid academic platform. More importantly, infrastructure is positively correlated with three dependent variables, while teaching curriculum only influences cognitive development. The school environment positively affects psychological, mental, but not cognitive development. We also find that gender does not moderate students' development but does influence student satisfaction.

1. Introduction

In Vietnam, millions of students participate in a highly-skilled labor force annually after graduation, leading to a significant increase in national human capital. Human capital is considered as a factor that is of great importance to the development of the society as it determines the level of national competitiveness (Lonska & Mietule, 2015; Becker, 1962) and the strength of the economy (Schultz, 1971; Schultz, 1960; Schultz, 1963; Schultz, 1971). The capability of the organization to translate human capital quality into measurable outcomes determines the organizational effectiveness (Becker & Mark, 2006), competitive advantage (Hatch & Dyer, 2004; Collins, 2001), and future organizational success (Anastasia & Budhwar, 2006). Considered as an output of higher education, human capital quality can be seen as the input of every industry, influencing the performance of the organization (Becker & Mark, 2006; Collins, 2001; Tran & Vo, 2020; Tran & Vo, 2018; Hitt, Bierman, Shimizu, & Kochhar, 2001). Thus, it is crucial to analyze how higher education influences the development of students.

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Over periods, several academics have paid attention to the determinants of student development from many perspectives with different models, such as Duque & Weeks (2010); Gatten (2004); Gudeva, Dimova, Daskalovska, & Trajkova (2012); Vanwynsberghe, Vanlaar, Damme, & Fraine (2017); Guironnet & Peypoch (2017); Walker (2008). Although these studies are different in terms of methodology, scope, and results, they all agree that formal schooling is strongly correlated with student development. However, the number of studies conducted in the Vietnamese context is limited. Thus, in this study, we will suggest an empirical model with four school-related factors: the staff, infrastructure, curriculum, and environment as independent variables before testing the impact of these factors on the development of Vietnamese students.

We sent the online questionnaires to more than 2000 students with different majors at five universities in Vietnam, then did in-depth online interviews with some respondents to further investigate their responses. This study finds that students are more satisfied if their teachers have a solid academic platform. Moreover, infrastructure has a remarkable effect on student development due to their positive connections with psychological, mental, cognitive development, and individual satisfaction. We also find the positivity between curriculum, cognitive development, and satisfaction. Simultaneously, the school environment positively affects students' psychology, health, and satisfaction except for their cognitive development. On the other hand, the only demographic factor, gender, is of no importance to student development because of its negative connections with all dependent variables. In other words, schooling affects student development regardless of their gender.

2. Literature review

Human resources play a crucial part in all aspects of national development; consequently, prioritizing human development can help a country bring a more sustainable and prosperous future for its citizens (Lonska & Mietule, 2015). The Government always takes a high concentration on education by providing funds for primary and secondary education. The reason is that the national economy becomes more productive if the proportion of educated workers who can efficiently carry out tasks that require literacy and critical thinking increases (Hanushek & Woessmann, 2008). Hence, it confirms the inevitable status of school efficiency and student development since they are the most critical intellectual resources of society, contributing to national excellence. Student development theory depicts students in their changes, growth, and progress (Walker, 2008). In other words, it can be defined as the accumulation of knowledge, self-development, and initial acquirement of experience – the way they learn how to learn (Duque & Weeks, 2010). Although there are many different models of student development, the basic premise is still the same. Student development reflects on humans' growth under the influences of in-class and out-class activities.

According to Walker (2008), the most often used typology theory is Bloom's taxonomy about learning objectives, including cognitive, affective (psychological), and psychomotor domain. From Posner's (1992) point of view, cognitive development is the accumulation of knowledge and thinking advancement. For knowledge assessment, since all course results are in academic transcripts, GPA is considered a reliable index. Besides, language comprehension and office computer proficiency are common indicators of essential soft skills students would aim for themselves. In term of psychology, Gatten (2004) conceptualized psychological development as the improvement of identity, interpersonal circle, and psychology usually evaluated by communication skills, personal initiative, motivation or interpersonal skills (Duque & Weeks, 2010; Gudeva, Dimova, Daskalovska, and Trajkova, 2012; Vanwynsberghe, Vanlaar, Damme, and Fraine, 2017). Finally, the psychomotor domain contains manual or physical skills, which are no longer as important in everyday life and work as before since both academics and practitioners do not take technical skills seriously in the context of automation. In this research, we add health comprising physical Health and mental Health as the fourth aspect that Bloom left out in his model to comprehend student development. It is due to numerous studies that have revealed a correlation between students' well-being and development and found that stress adversely influences performance outcomes (Sanders & Lushington, 2002). Furthermore, more and more students have faced mental and physical health problems, limiting their motivations and ability to develop during college years due to a significant rise in workload and parents' expectations (Sanders & Lushington, 2002; Wilks et al., 2020; Aljaaidis et al., 2020).

Undoubtedly, universities are one of the most crucial driver factors shaping student development about universities' effectiveness. Technical efficiency refers to maximizing possible outcomes produced at a given level of the inputs (Palmer & Torgerson, 1999; Phuc, Vinh, & Do, 2020). At an educational institute, researchers have reached

a consensus that the educational outcomes are student developments (Agasisti & Zoido, 2019; Guironnet & Peypoch, 2017), skill enhancement (Podinovski, Ismail, Bouzdine-Chameeva, & Zhang, 2014; Queiroz, Sampaio, & Sampaio, 2019), and psychosocial development (Kirjavainen, 2009). On the other hand, educational inputs are hard to measure since they are related to several qualitative perspectives, such as family background factors and school-related factors. The former comprises parents' educational background and socioeconomic class, and the latter include teacher quality, non-academic staff, and school curriculum. A significant concern has been raised about whether family background should be involved in the student input. While Guironnet & Peypoch (2017), Podinovski, Ismail, Bouzdine-Chameeva, & Zhang (2014), Queiroz, Sampaio, & Sampaio (2019) point out that family background is an essential factor besides school factors affecting students' outputs, other researchers reject family elements. This is because they argue that family-related factors are individual components that are not applicable in assessing the universities' efficiency (Abbott & Doucouliagos, 2003; Agasisti & Zoido, 2019).

3. Hypotheses and empirical models

3.1. Hypothesis

The study aims to determine and evaluate the impact of 5 different independent variables displayed in the models by raising five research hypotheses below:

H_1: *Academic staffs are positively correlated with student development.*

The correlation of academic staff with students can be determined by examining teachers' qualifications, experience, awareness, and accessibility. Harris & Sass (2010) indicate that teacher effectiveness enormously contributes to student development in cognitive and psychosocial development due to frequent interactions (Kaplan & Owings, 2001). Stronge, Ward, Tucker, and Hindman (2007) show that teachers with strong academic backgrounds tend to enhance student performance at school, while those with weaker qualifications may hurt students' outcomes. It is reasonable because teachers with a more profound understanding and stimulating teaching methods can precisely convey their knowledge to students and answer their confusion. Additionally, teachers' class practices significantly boost students' motivation and improve students' soft skills (Goe & Stickles, 2008). As a result, class activities, such as teamwork and outdoor learning activities, can help students accomplish both knowledge and generic skills by interacting and working with others on the given tasks.

H_2: *Infrastructure is positively associated with student development.*

The relationship between infrastructure and student development can be tested by the quality of school facilities, including the library, classroom, computer lab, health care center, and demonstration rooms. School facilities are among the most crucial factors affecting academic outcomes since they can equip students with the best learning conditions before enhancing students' performance. School conditions directly correlate with health issues (Earthman & Lemasters, 1996). The supporting facilities, such as gym centers and healthcare services at schools, can boost students' mental and physical well-being. By contrast, poor school infrastructure, such as broken toilets, or unsanitary canteen, negatively influences students' comfort (Duran-Narucki, 2008). Therefore, it can be said that the relationship between infrastructure and cognitive development, as well as student's health, is positive.

H_3: *Curriculum has a positive effect on student development.*

The impact of teaching curriculum on student development can be determined by evaluating the quality, efficiency, attractiveness, and availability of study materials, along with the suitability of the studying timetable. Kuh, Buckley, Bridges, and Hayek (2006) illustrate the importance of the school curriculum to student achievement; notably, this factor decides whether students have opportunities to approach reliable, easily and updated academic resources, thereby helping them better perform at school (Katula & Threnhauser, 1999). Kuh, Buckley, Bridges, and Hayek (2006) emphasize the cruciality of the efficient school curriculum to determine the students' outcomes since if school lessons are appealing but impractical, students will not know how to use them. Besides, according to (Kain et al., 2017), a suitable timetable can positively affect student development since it can make the course logical and workable and improve student strength and reduce studying stress. As a result, student development positively links to the school curriculum.

H_4: *School environment has a positive effect on student development.*

By looking at school extracurricular and class activities, we can examine the impact of the school environment on student development. Wechsler, Devereaux, Davis, and Collins (2000) emphasize the significant contribution of the teaching environment to cognitive development, psychosocial development, and students' health improvement. Students, especially the active ones, can acquire knowledge and interpersonal skills in-class activities because they must interact with one another during the events (Leeming, Porter, Dwyer, Cobern, & Oliver, 1997). Additionally, Cooper, Valentine, Nye, & Lindsay (1999) show that extracurricular activities can strengthen students' mental and physical health. They can explore and learn new life lessons and skills beyond books, which balances both their academic and social life. Consequently, the school environment is one of the critical factors for students to achieve complete development (Harafsheh et al., 2020).

3.2. Empirical models

Quantitative research is a prevalent method in our research to clarify the impact of 5 independent variables (academic staff, infrastructure, curriculum, school environment, and personalities) on three variables (cognitive development, psychosocial development, and health). We build regression models and take advantage of both SPSS 22 and STATA 2016 in analyzing these models. Three following models to measure three dependent variables can be built as follow:

Model 1: $COG = \alpha + \beta_1 \times ACA + \beta_2 \times INF + \beta_3 \times CUR + \beta_4 \times ENV + \varepsilon$,

Model 2: $PSY = \alpha + \beta_1 \times ACA + \beta_2 \times INF + \beta_3 \times CUR + \beta_4 \times ENV + \varepsilon$,

Model 3: $HEA = \alpha + \beta_1 \times ACA + \beta_2 \times INF + \beta_3 \times CUR + \beta_4 \times ENV + \varepsilon$,

where: α, β_1, β_2, β_3, β_4, β_5, β_6, β_7, and β_8 are coefficients, D_1, D_2, D_3, D_4 are dummy variables presenting five different personalities, ε is error.

Table 1 below illustrates the meaning and the role of both dependent variables and independent variables.

Table 1
List of dependents and independent variables of the regression models

Variables		Meaning	Determined by	Role	Model
COG	KNO	Knowledge	GPA	Dependent variable	COG1
	SKI	Skill	IT	Dependent variable	COG2
			Language	Dependent variable	COG3
PSY		Psychosocial	Communication	Dependent variable	PSY1
			Teamwork	Dependent variable	PSY2
			Motivation	Dependent variable	PSY3
			Interpersonal skills	Dependent variable	PSY4
HEA		Health	Mental Health	Dependent variable	HEA1
			Physical Health	Dependent variable	HEA2
ACA		Academic Staffs	Qualifications	Independent variable	ACA1
			Evaluation fairness	Independent variable	ACA2
			Teacher practices	Independent variable	ACA3
			Teachers' awareness	Independent variable	ACA4
			Teachers' accessibility	Independent variable	ACA5
INF		Infrastructure	Health services	Independent variable	INF1
			Sanitation	Independent variable	INF3
			Library and other learning resource centres	Independent variable	INF4
			Lecture room/ classroom	Independent variable	INF5
			Computer lab	Independent variable	INF6
			Demonstration rooms and skills lab	Independent variable	INF7
CUR		Curriculum	Qualified materials	Independent variable	CUR1
			Efficient materials	Independent variable	CUR2
			Attractive materials	Independent variable	CUR3
			Information availability	Independent variable	CUR4
			Timetable	Independent variable	CUR5
ENV		School Environment	Vocational activities	Independent variable	ENV1
			Entertainment	Independent variable	ENV2
			Peer attitude	Independent variable	ENV3
			Extracurricular	Independent variable	ENV4

3.3. Research methodology

In this research, intending to have an accurate and appropriate judgment of students' progress, it is necessary to evaluate student development through cognitive and psychological development and a thorough consideration of their health issues (Nusche, 2008). Research data were collected by randomly giving questionnaires to more than 400 students per chosen university, including freshman, sophomore, junior, senior, and graduate. Moreover, students attending our survey come from numerous faculties, institutes, or majors to ensure that the collected data is reliable, transparent, and accurate. With in-depth online interviews and 2000 online questionnaires given out at five different universities, we conducted 1374 observations to get the best estimate. On that basis, we set up three regression models for analysis and verification with the help of specialized software such as SPSS 22 and STATA version 2016.

Table 2
Research observations

	Freshman	Sophomore	Junior	Senior	Graduate	Total
Hanoi University of Science and Technology (HUST)	94	158	33	33	24	342
National Economics University (NEU)	85	101	41	6	5	238
Foreign Trade University (FTU)	135	68	20	13	14	250
Ho Chi Minh City Medicine and Pharmacy University (YDS)	109	38	4	23	38	212
Hanoi Medical University (HMU)	58	47	53	52	95	305
Total	481	412	151	127	176	1347

We have surveyed in three different school categories, including economics, science and technology, and medicine in the top five best universities in Vietnam based on Ranking Web of Universities, including Ho Chi Minh City Medicine and Pharmacy University (YDS), Hanoi Medical University (HMU), Hanoi University of Science and Technology (HUST), Foreign Trade University (FTU), and National Economics University (NEU). We randomly selected 400 students, including freshman, sophomore, senior, and graduate from each chosen university to collect opinions from different faculties. To verify the research statement that whether a good school is suitable for every student, we believe that these five schools are one of the best options mainly because those are leading schools with high ranking in each field in Vietnam.

4. Results

4.1. Descriptive analysis

Fig. 1 provides data on four indicators of school efficiency, consisting of the curriculum (CUR), academic staffs (STA), infrastructure (INF), and school environment (ENV) from four top schools in our country (HUST – Hanoi University of Science and Technology, NEU – National Economics University, FTU – Foreign Trade University, YDS – Ho Chi Minh Medicine and Pharmacy University, HMU – Hanoi Medical University). As shown in the figure below, HMU has lower ENV and ACA figures than the other schools, whereas FTU has the lowest CUR and INF points. In terms of curriculum, YDS has the highest score in the four schools because the score of YDS makes up for nearly 3.51, which is about 0.3 higher than that of NEU and HMU, approximately 0.19 higher than that of FTU (the school receives the least positive feedbacks on curriculum). On the contrary, concerning academic staff, the figure for NEU is about that for HUST as it ranked at 3.4 and 3.41 for HUST and NEU in the order given. As illustrated in the chart, HMU has the lowest academic staff level at nearly 3.24, which is lower than HUST's point by 0.16. Likewise, to CUR, INF is ranked at 3.51 for FTU, which is lower than the other mentioned schools' figures. Regarding infrastructure, NEU leads the others as it is ranked at 3.94, which is higher than the YDS and HUST score by about 0.03 and 0.18, respectively. A similar pattern applies to the level of ENV as NEU comes first with a score of 3.63, followed by FTU with a level of 3.58, next with YDS with a figure of 3.47. The chart's striking feature is that the gap between the mentioned schools' figures is not significant.

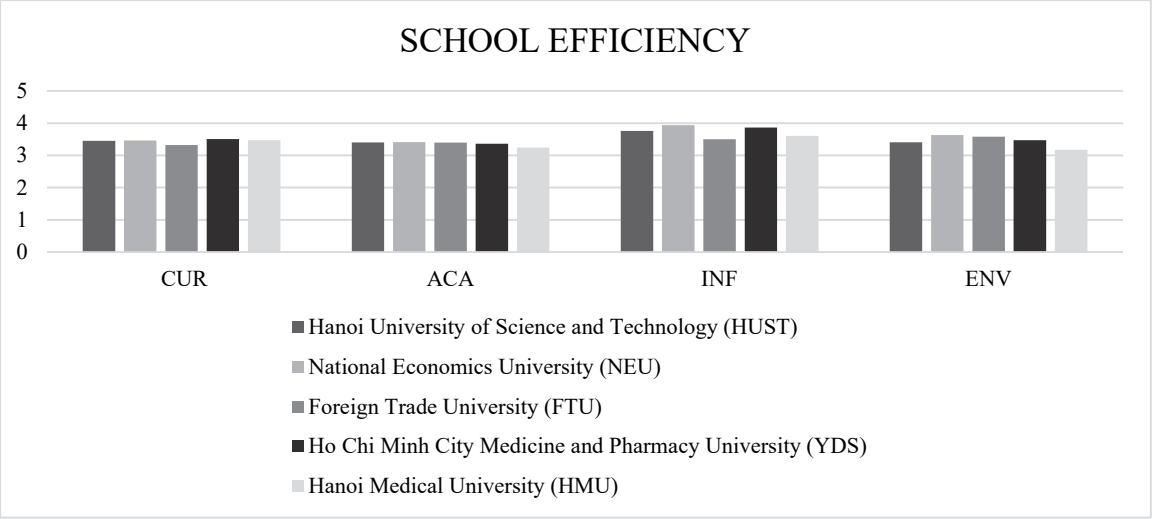

Fig. 1. Independent variables of 5 universities

Fig. 2 illustrates five differences about student development, comprising GPA, IT, Language, PSY (Psychosocial), and HEA (Health) from the most famous university in Vietnam such as Hanoi University of Science and Technology (HUST), National Economics University (NEU), Foreign Trade University (FTU), Ho Chi Minh City Medicine and Pharmacy University (YDS), and Hanoi Medical University (HMU). Observation shows that FTU has the highest level of GPA, Language, and Psychosocial, whereas this university has the lowest level of health. Moreover, we can see that NEU reaches the peak of IT, replaced by YDS in Health. By contrast, HMU has the lowest level of both IT and Psychosocial, but HUST in Language.

More specifically, it is ranked at 3.624 for FTU and approximately 3.063 for NEU regarding GPA. However, there is quite a big difference in GPA's rank between FTU and YDS. Remarkably, the GPA's level for YDS is 2.367, which is 1.257 lower than GPA's level for FTU. Furthermore, FTU continues to reach Language and Psychosocial peaks at 2.456 and 2.684, respectively. Besides, the figure indicates that NEU has the highest level of IT at 2.655. Simultaneously, IT's level for NEU is slightly higher than for the other universities, such as 0.061 higher than YDS and 0.159 higher than FTU. One of the most incredible things is the students' health level for five chosen universities is slightly different and relatively high. Mainly, YDS had the highest point of about 3.368, while the health levels for HUST, NEU, FTU, and HMU are 3.351, 3.344, 3.332, and 3.339, respectively.

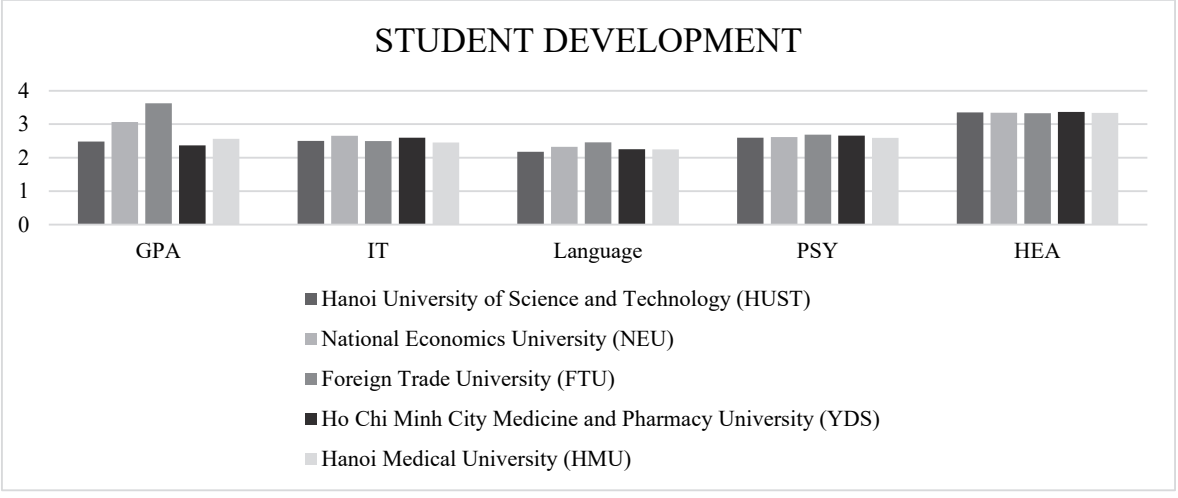

Fig. 2. Dependent variables of 5 universities

4.4. Regression analysis

In this study, besides three models of COG, PSY, and HEA, as mentioned above, we also built the SAT model to judge whether the students are whether or not satisfied with school efficiency. Adding the SAT model is essential in this study's analysis because students are products and schools' customers.

The table indicates that the COG model's R-squared is 0.015, indicating that the changes in cognitive development can be explained by 1.5 % of four independent variables' changes. Similarly, the PSY, HEA, and SAT model's R-Squared values are 0.015, 0.042, and 0.08, respectively, indicating that changes in psychosocial development, students' health improvement, and student's satisfaction can be explained by 1.5 %, 4.2%, and 8% respectively of the changes of four independent variables. In conclusion, the R-squared values of the four models are low. Therefore, school is not the only factor that determines study performance. Although school affects the student's development, this influence is not much. Indeed, many different determinants outside of school influence study performance; perhaps they are the environment, family, individual capacity, study personality awareness, etc.

Table 3
Regression results

VARIABLES	(1) COG model	(2) PSY model	(3) HEA model	(4) SAT model
ACA	-0.0814**	0.00532	-0.00499	0.0499***
	(0.0343)	(0.0317)	(0.0314)	(0.0169)
INF	0.128***	0.0802**	0.127***	0.0373*
	(0.0390)	(0.0360)	(0.0357)	(0.0192)
CUR	0.0347	-0.0620**	0.00164	0.0398***
	(0.0303)	(0.0280)	(0.0278)	(0.0149)
ENV	-0.0180	0.110***	0.163***	0.00345
	(0.0371)	(0.0342)	(0.0339)	(0.0183)
GENDER	-0.00280	-0.00551	-0.00347	-0.0129**
	(0.0124)	(0.0114)	(0.0113)	(0.00610)
Constant	2.357***	2.497***	2.871***	0.475***
	(0.0944)	(0.0871)	(0.0865)	(0.0465)
Observations	1,347	1,347	1,347	1,347
R-squared	0.015	0.015	0.042	0.080

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

More specifically, academic staff (ACA) has a significant impact on cognitive development, and student's satisfaction with P-value is less than 0.05 and 0.01, respectively. However, ACA negatively affects cognitive development with a coefficient of -0.0814. This result points out that the more fair-minded teachers evaluate during the studying process, the lower their GPA. In contrast, ACA positively affects student's satisfaction with a coefficient of 0.0499. This result reflects that the students would be more satisfied if they know their teacher's academic level. Likewise, infrastructure has powerful and positive effects on all dependent variables (COG, PSY, HEA, and SAT) with a coefficient of 0.128, 0.0802, 0.127, and 0.0373, respectively. The results show that infrastructure has a strong impact on cognitive development and students' health improvement. Indeed, the students access school facilities such as the library, classroom, computer lab, health care center, and demonstration rooms to gain knowledge, language, and IT skills, and improve health since students are more comfortable and relaxed. The more modern and higher quality school provides facilities, the more students develop.

Moreover, the table also illustrates that curriculum (CUR) is statistically significant in the PSY model and the SAT model at the confident level of 95% and 99%, respectively. These results indicate that the higher material's quality is, the more available and promptly information is, the more developmental psychosocial is, and the more satisfied students can get. The school environment positively affects psychosocial development and students' health improvement with a confidence level of 99%. This result reflects that the school environment will help students' mental and physical levels be better and more relaxed. The study also shows that gender only impacts student satisfaction; however, this effect is slight, indicating that gender does not strongly affect two genders (male and female). Therefore, there is no difference between the two genders at school. In other words, schools where male and female students are treated equally. However, the coefficient's value is negative (-0.0129), meaning that male students are less satisfied than female students.

In summarize, the models can be written:

$$COG = 2.357 - 0.0814 \times ACA + 0.128 \times INF + \varepsilon,$$

$$PSY = 2.497 + 0.0802 \times INF - 0.0620 \times CUR + 0.110 \times ENV + \varepsilon,$$

$$HEA = 2.871 + 0.127 \times INF + 0.163 \times ENV + \varepsilon,$$

$$SAT = 0.475 + 0.0499 \times ACA + 0.0373 \times INF + 0.0398 \times CUR - 0.0129 \times GENDER + \varepsilon.$$

5. Conclusions and Recommendations

5.1. Conclusions

School efficiency is the factor that affects student development, but it is not at all. Besides school, we also have many different factors determining student development, such as family, the environment, friends, etc. Following the study results mentioned above, it can be said that academic staff has a significant impact on cognitive development and student satisfaction. Nevertheless, this factor negatively influences cognitive development, whereas it has an impact on student satisfaction positively. In contrast, academic staff does not affect both psychosocial development and health improvement.

On the other hand, infrastructure affects all four dependent variables (cognitive development, psychosocial development, students' health improvement, and student satisfaction). However, the curriculum only affects psychosocial development and student satisfaction in the opposite direction. More significantly, while curriculum negatively affects psychosocial development, this factor positively affects student satisfaction. The curriculum does not impact cognitive development (GPA, language, and IT) and health development.

This research also identifies that the school environment significantly affects students' psychosocial and health development (or students' physical and mental). Nevertheless, the study's findings indicate no relationship between cognitive development or student satisfaction and school environment. Finally, gender slightly affects student satisfaction. This finding reflects that there is no difference between female students and male students at school. However, males are often less satisfied than females.

5.2. Limitations

Although this study has explored many new findings, it still cannot avoid some limitations that should be overcome in future studies. Firstly, the sample size is limited because this research was conducted only at five universities in Vietnam, and the quantity of observation is restricted. This limitation could influence the research's study more or less, and this study's results can not accurately reflect whole students at universities in Vietnam. Therefore, further studies should collect data with more extensive observations at many universities in Vietnam to boost data's reliability. Secondly, this research has not considered the effect of school incentive policies on student development, such as a scholarship or plus points.

5.3. Recommendations

School is not the only factor that affects student development; however, school efficiency plays an extremely crucial role in developing students and improving human resource quality. Therefore, today it is necessary for universities in Vietnam to gain school efficiency, especially in Industry 4.0. Firstly, universities should focus on investing and improving health services, Sanitation, Library, classrooms, Computer lab, and skills lab to serve students' studying. Students would be more interested in learning and acquiring knowledge at school. Besides, accessing and using the computer and skills lab help students gain skills in IT and other skills.

On the other hand, students will be more relaxed and comfortable when they are studying in a large space. From that, it will be good for the student's mental and physical health. Secondly, besides studying in the classroom, the school should organize many extracurricular activities to improve students' communication, teamwork, and self-motivation skills. Besides, joining extracurricular or entertainment activities helps students reduce studying pressure and have a better spirit and health.

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