On A Linear Model By Mean ICT In Transcendental Motivation Of Mining In Peru

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ABSTRACT

Information and communication technologies, motivation, teaching methods. In times of the second pandemic outbreak, the influence of ICTs on motivation in students of the mining studies program of the Instituto de Educación Superior Tecnológico Público Erasmo Arellano Guillén, Pataz, La Libertad, Perú was determined. The study corresponds to a non-experimental, descriptive correlational causal design, with explanatory scope. A population of 132 students and a sample of 79 students, chosen by non-probabilistic sample selection, were reported. The data collection instrument was the survey to determine the levels of TIC in students by (Minaya, 2022), which evaluates the dimensions: Knowledge of technology, use of technology and transformation of technology. Likewise, for the levels of motivation by (Minaya, 2022), it evaluates the dimensions: intrinsic, extrinsic and transcendental motivation. For the association, the Rho Spearman coefficient was used and for the influence the linear regression, registering: ICT and its dimensions have a significant influence ($p<0.01$) on motivation ($r= 0.523$; $r2 = 27.3\%$; $r=0.369$; $r2 = 13.6\%$; $r=0.385$; $r2 = 14.8\%$; $r=0.408$; $r2 = 16.7\%$). As a conclusion, the predictive model of the TIC on motivation there is an influence in 27.3% of explanation of TIC on motivation. It is suggested that teachers and students should be encouraged to include TIC in their learning processes in order to increase the motivation of the students under study.

Keywords: Information technology; Social media;; Motivation;; Student evaluation; Teaching methods; Pandemics.

1. Introduction

Digital technologies become a key factor that contribute to the full development of people, which is recognized by the member states of the United Nations in the 2030 Agenda for Sustainable Development, through SDG 4 - Education, which states as an objective "Ensure inclusive, equitable and quality education and promote lifelong learning opportunities for all"; On the other hand, the goal to 2030 states "Ensure equal access for all men and women to quality technical, professional and higher education.

ICT has a positive impact on international activities and distance learning in universities of the XXI century and an approach to the main technologies, trends and tools that today facilitate the teaching and learning process (Quintero, 2020); in the same line, the comparative study of technologies with motivation and emotions in automatic and meaningful learning is explored, for application to the productive sector (Kumar & Martin, 2023). In this sense, we consider the development of crowdsourcing learning (collective collaboration) that is associated with the transcendental motivation of students in stakeholders (Wu et al., 2023). These evidences are strengthened by the study conducted among 155 engineering students from the University of Miskolc, Hungary, where they had information technology training in their pre-professional practices,

managing to increase their intrinsic motivation and especially the transcendental, obtaining modern approaches to project management, technologies impose improved solutions and reducing times for effective productivity (Soltész & Berényi, 2023)

As a result of the Covid-19 pandemic, new ways of working emerged, such as fully remote to hybrid work, ICTs influence work experiences and how these shape people's own emotional functioning (Zamani & Spanaki, 2023); in that sense, a new perspective on the role adjustment of tasks with technology that tend to influence psychological states is considered, Depressions, emotional mood and indirectly influence work-related outcomes. Adjustment is sought by explaining part of the psychological mechanisms through which it affects work performance (Abelsen et al., 2021). In that sense, studies have been conducted on emotion recognition techniques, identifying the motivation for achievement, that is, the desire to achieve a significant achievement and apply it to the company (Hickson et al., 2019). Finally, gamification is considered to be a means to increase transcendental, collaborative motivation and opportunities for successful project completion (Priyadi et al., 2023).

In a study carried out on the sociodemographic profile of people treated for ICT addiction in the Addictive Behavior Units (ABU) of the Valencian Community, Spain, in 2018-2020. The person treated for ICT addiction in the Valencian Community is mostly male, under 30 years of age and with a primary education level or less, prevention should focus on these groups at higher risk (Cuquerella-Gilabert & García, 2023). Likewise, studies were carried out on a variety of prototypes to recognize emotions in humans, with artificial emotional intelligence. Primarily, inputs are classified into static and dynamic inputs (Hammed et al., 2020). In addition, gamification is considered to have numerous educational benefits, including increased student engagement, transcendental motivation , and understanding, as it provides a collaborative and enjoyable learning environment, resulting in high academic performance (Salah & Alzaghal, 2023). Finally, it is confirmed that ICT, like digital environments, allows to transmit specific methods of self-regulated learning and to develop specific motivational methods aimed at the self-determination of students (Pierpaolo & Antonia, 2023).

In Colombia, new technological tools dynamize the teaching and learning process, which promote more welcoming and motivating pedagogical environments, allow the teacher to present the contents in a more dynamic and interactive way than that used in traditional instruction (Ospina-Hernández et al., 2016). Consequently, the university system is immersed in a process of change where the technological skills of students are fundamental (Gómez, 2018). Along the same lines, the inappropriate use of technological resources is one of the main causes of sedentary lifestyle, physical inactivity and the decline of healthy lifestyle habits of the population (Durán et al., 2022). The findings

support adaptation to interprofessional education (IPE), acceptable psychometric properties were obtained in Hong Kong health students. Intrinsic motivation positively predicted emotional engagement. Intrinsic motivation negatively predicted emotional disaffection. (Ganote et al., 2022).

In a survey of 546 students, it was examined how motivation, supports perceived learning, and self-regulated learning strategies, identified seven types of reasons for attending MOOCs, ranging from intrinsic to extrinsic motivations and demonstrated that cognitive and metacognitive learning strategies significantly mediated motivation (Wei et al., 2023). Along the same lines, Bervell & Arkorful, (2020) affirm that the learning management system favors distance education. Currently, the learning transfer process is part of systematizing information, using ICT, LMS and social networks, strengthening the academic performance of students (Hermann-Acosta & Pérez Garcias, 2019), These evidences support the relevance of ICT in intrinsic, extrinsic and transcendental motivation (Rojas-Pescio & Roa-Petrasic, 2021).

With a sample of 30,383 students from 62 countries, the study revealed that, amid the global lockdown, some students showed deficiencies in computer skills with decreased academic performance in the new virtual environment (Aristovnik et al., 2020); in that sense, respondents with online training improved their academic performance through knowledge management (Tus et al., 2020); In addition, different modes of e-learning were implemented using different platforms to achieve the objectives (Wang and Zhao, 2020). Affirming that teachers and students in virtual environments had favorable experiences in teaching-learning (Rasiah et al., 2020). These data are supported by De La Hoz et al., (2019) who proposed implementing virtual environments, strengthening the motivation to favor achievements in the flipped classroom with an efficiency of 91%.

Gamification can help students who are weak in motivation and poor academic performance, due to the diversity of challenges and rewards provided by the parts of the game, incorporating elements of the game into the classroom can serve as a transcendental motivation tool for students to learn (Ansar & George, 2023). The literature on the effect of gamification on motivation is still limited on multiple levels. There is a gap between theory and practice in the study of gamification (Alsawaier, 2018). A quasi-experimental study was conducted with a sample of 101 undergraduate education students who participated in online Kahoot questionnaires designing their own questions as part of formative assessment with motivated student outcomes. This evidence confirms that the integration based on games in the teaching process improved their active participation in learning, with interactive and stimulating environments (Campillo-Ferrer et al., 2020), in the same way, it is endorsed that the integration of ICT allows the acquisition of virtual resources and promotes motivation (Suryaman et al., 2020).

Being the b-learning that guides planning as an alternative for improvement at the higher level (Gisbert Cervera et al., 2017), in that sense the knowledge of this study is relevant for higher education institutions that strive to create a sustainable culture of academic research and grow a new generation of competent researchers (Rambe & Mbeo, 2017), in this sense, the incorporation of new virtual platforms has increased academic effectiveness (Acevedo-Correa et al., 2019). Likewise, research management favors the publication of scientific articles (Valles-Coral, 2019). This evidence affirms that knowledge management helps strengthen decisions and educational quality (Barzaga Sablón et al., 2019). This evidence supports continuous improvement in virtual education through innovation and creativity (Muñoz-Sánchez et al., 2021).

In Peru, higher education trains technical professionals in the various areas and technology, to contribute to their personal development, inclusive social and work environment. With employability skills that contribute to the development of the country and the sustainability of the environment (Minedu., 2021); it is harmonized with the cognitive aspects of understanding, executing, summarizing, examining and innovating (Qadir & Al-Fuqaha, 2020), it is evident that B-learning from a general perspective oriented to planning in higher education as a motivational change strategy (Salinas et al., 2018) . Endorsed by the findings, the findings showed that the higher the perceived likelihood of receiving relational rewards and the greater the likelihood of intrinsic and transcendental motivation, the greater the positive effect on creative/innovative outcomes (Fischer et al., 2019).

In this sense, our problematic reality is considered to be the students of the IV and VI semesters, with a sample of 79 students that correspond to 59.8% of the population. These students are doing their initial and intermediate internships and some are working in various mining contracts in the area. In this sense, the students under study reflected a decrease in their academic work and some work; the reason is due to various work factors, such as Covid-19 infections, some work overtime, which cause fatigue, depression, without wanting to perform their academic tasks, socio-emotional fatigue and little knowledge of information technologies, weak internet connectivity in searching for information, some do not work in groups, etc. This suggests that students and teachers should be continuously and permanently involved in the various educational contexts for their academic performance. That is why teachers and students are constantly training in various information technologies and especially increase their transcendental motivation, such as collaborative work, synergy, which can greatly contribute to their academic performance and their integral formation.

In this sense, the study is relevant to the problem because from the discussion of its results will derive the relevance of decision-making for the execution of

reinforcement programs aimed at the student population under study. It acquires importance to the extent that it contributes to improving academic performance through the influence of ICT on intrinsic, extrinsic and transcendental motivation. Promoting innovation, continuous updating through the transfer of knowledge, strengthens the culture of experiences among teachers, researchers and students. By virtue of this, based on the factual and theoretical arguments previously put forward, it formulated the investigative question:

To what extent does ICT influence the motivation of students at the Erasmo Arellano Guillén Public Higher Technological Institute, Pataz-La Libertad?
The objective of this study was to demonstrate to what extent ICT influences the motivation of the students under study. As a hypothesis of the research, it was pointed out that information and communication technologies positively influence the motivation of mining students in times of Covid-19.

2. **Methodology**

The research is of quantitative approach, with explanatory scope of non-experimental, transversal, descriptive causal correlational design. The population was made up of 141 students enrolled in the II, IV and VI Semester 2022-II. The sample chosen through the intentional non-probabilistic sampling of 79 students of the population, of the IV and VI Semester, of the Mining Exploitation study program. With inclusion criteria, students of the IV and VI semesters are considered, because they are doing intermediate internships in mining companies in the area, a greater number of students and the acceptance of voluntary participation in said research. Likewise, the exclusion criteria, the students of the II semester do not have the voluntary acceptance due to availability of time and academic and work occupations.

Data collection techniques:

The technique to collect and store data was the survey from the application of the instrument with questionnaire, using the technical sheet to measure the levels of information and communication technologies prepared by (Minaya, 2022), which evaluates the dimensions: Dimension 1: Knowledge of the technology of 04 items ', Dimension 2: Use of the technology of 04 items', Dimension 3: Transformation of the technology of 04 items', being a total of 12 items, with 5 answer options Never = 1, Almost never = 2, Sometimes = 3, Almost always = 4 and Always = 5. Likewise, the instrument was applied to a pilot sample, with whose data the validity was carried out with confirmatory factor analysis with KMO of adaptation to sampling = 0.623 and following. < 0.01 with 51.93 % accumulated of the total variance explained by three components with average values of homogeneity: Knowledge of technology 0.674, Use of technology 0.598, Technology transformation 0.724, continuing with the calculation of reliability with alpha Cronbach of α Tics=0.847, with α Knowledge

of technology=0.828, α Technology utilization=0.819, α Technology transformation=0.818. Which are considered statistically significant reliability.

For the second instrument Academic performance with the questionnaire, using the technical sheet to measure motivation levels prepared by (Minaya, 2022), which evaluates the dimensions: Dimension 1: Intrinsic motivation of 04 items, Dimension 2: Extrinsic motivation of 04 items, Dimension 3: Transcendental motivation of 04 items, Being a total of 12 items, with 5 answer options Never = 1, Almost never = 2, Sometimes = 3, Almost always = 4 and Always = 5. Likewise, the instrument was applied to a pilot sample, with whose data validity was performed with confirmatory factor analysis with KMO of adaptation to sampling = 0.607 and following. < 0.01 with 48.840 % accumulated of the total variance explained by three components with average values of homogeneity: Intrinsic motivation '0.566', Extrinsic motivation '0.712', Transcendental motivation '0.626' , continuing with the calculation of reliability with alpha Cronbach of α Motivation = 0.833, with α Intrinsic motivation = 0.821, α Extrinsic motivation = 0.80, α Transcendental motivation = 0.803. Which are considered statistically significant reliability. In this sense, confirmatory factor analysis was performed to demonstrate the validity of the factorial structure previously obtained with exploratory factor analysis to obtain evidence of validity (Pérez-Gil et al., 2000).

The information of the same students on the use of ICT was collected, the answers of the survey were also received in the Excel database, the acceptance and authorization of the director of the institution was had, also the students were informed about the reasons for the evaluation and the voluntary nature of their participation in the research and the confidentiality of the answers.
Before the application of the survey, students were guided by their e-mail, how to make the answer by executing the corresponding link. (Agustin Mawarni et al., 2020).

Data were entered into the SPSS v. 25 program, validity analysis was performed with confirmatory factor analysis and reliability with Cronbach's alpha; the descriptive part with prescription of levels and analysis of frequencies and percentages of variables and subvariants; the normality test was executed, identifying that the variables with their dimensions detect a non-parametric distribution (some sig. <0.05), therefore the Rho Spearman statistical test for measuring correlations with significance ($p<0.05$) was applied in the inferential part; for the measurement of the impact of ICT on motivation, linear regression was used.

3. Results

3.1 Levels and dimensions of ICTs.

Table 1. Levels and dimensions of ICTs, in Covid-19.

Dimensions	Knowledge of technology		Use of technology		Technology transformation		Information and communication technology	
Levels	f	%	f	%	f	%	f	%
Deficient	00	00,0	1	1,3	2	2,5	1	1,3
Regular	49	62,0	37	46,8	34	43,0	33	41,8
Good	28	35,4	36	45,6	37	46,8	41	51,9
Very good	02	2,6	5	6,3	6	7,7	4	5,0
Total	79	100,0	79	100,0	79	100,0	79	100,0

As can be seen in Table 1, learners are most prevalent at the regular level in the knowledge dimension of technology (62.0%, 49), followed by the good level in the ICT variable (51.9%, 41), followed by the very good level in the technology transformation dimension (7.7%, 6). Finally, it was evidenced in lower supremacy at the deficient level in the dimension transformation of technology with (2.5%, 2).

3.2 Levels and dimensions of motivation.

Table 2. Levels and dimensions of motivation, in Covid-19.

Dimensions/Variable	Intrinsic Motivation		Extrinsic Motivation		Transcedental motivation		Motivation	
Levels	f	%	f	%	f	%	f	%
Deficient	0	00,0	1	1,3	2	2,5	1	1,3
Regular	60	75,9	47	59,5	45	57,0	47	59,5
Good	19	24,1	30	38,0	30	38,0	31	39,2
Very good	0	00,0	1	1,2	2	2,5	0	0,0
Total	79	100%	79	100%	79	100%	79	100%

Learners, according to Table 2, are located with greater hegemony at the regular level in the dimension intrinsic motivation (75.9%, 60), followed by the good level in the motivation variable (39.2%, 31). Finally, it was evidenced in the deficient levels and very good in the transcendental dimension with (2.5%, 2).

3.3 Relationship of ICTs and motivation

Table 3. Relationship between ICTs and motivation, in times of pandemic.

Spearman's Rho Correlation	Intrinsic Motivation	Extrinsic Motivation	Transcendental Motivation	Motivation
rmation and communication technology	,407**	,429**	,416**	,592**
Sig. (bilateral)	,000	,000	,000	,000

Table 3 shows the existence of a significant positive relationship between information and communication technologies with motivation and its dimensions intrinsic motivation, extrinsic motivation, transcendental motivation, with values (r = 0.407**; r = 0.429**; r = 0.416*; r = 0.592**; ∀ p <0.01).

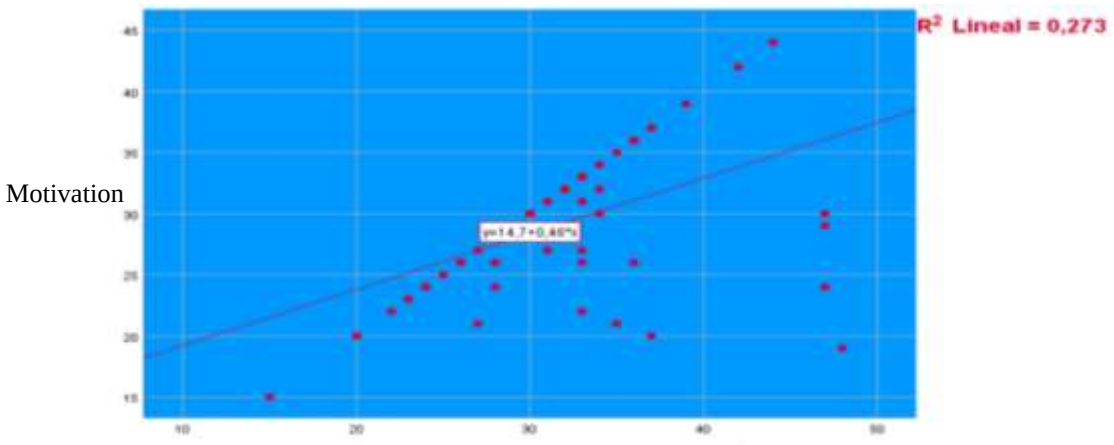
3.4 Linear regression model of ICT in Motivation

Table 4. Predictors of tics in motivation and its subvariables, in times of pandemic.

Model	R	**R squared**	R Fitted square	Standard error of The estimate
Tics/Motivation	,523[a]	,273	,264	4,551
ICTs/Intrinsic Motivation	,369[a]	,136	,125	1,896
Tics/Extrinsic Motivation	,385[a]	,148	,137	2,251
Tics/Transcendental Motivation	,408[a]	,167	,156	2,453

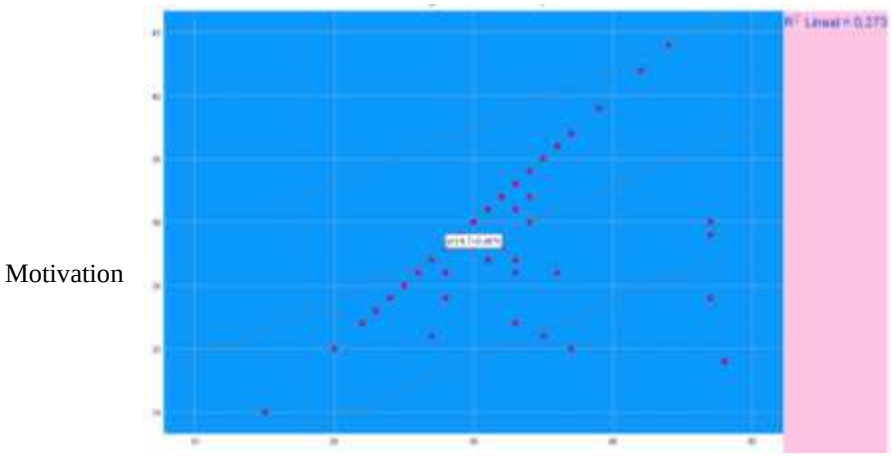
As shown in Table 4, information and communication technology significantly influences motivation, the subvariables intrinsic motivation, extrinsic motivation, transcendental motivation, whose values are (r 2 = 27.3%; r 2 = 13.6%; r 2 = 14.8%; r ^{2} = 16.7%; ∀ p < 0.01).

Fig. 1. Graph of the linear regression model of ICTs in motivation.



In figure 1, predictive model of ICT in motivation, there is an influence on a 27.3% explanation of ICT in motivation.

Fig. 2. The band of confidence of ICTs in motivation



In figure 2, it is appreciated that the trust band will influence 95% of the cloud of points.

Table 5

ANOVA, Sum of squares, square mean and significance of ICT in Motivation.

Model		Sum of squares	gl	Quadratic mean	F	Sig.
1	Regression	599,006	1	599,006	28,918	,000[b]
	Residue	1594,994	77	20,714		
	Total	2194,000	78			

a. Dependent variable: MOT

b. Predictors: (Constant), TIC

Note. ICT Database in Motivation.

In table 5, p = 0.00 < 0.05 we reject the null hypothesis and accept the hypothesis of the researcher, so it is concluded that the variables are linearly related and explained.

Table 6

ICT Coefficients in Motivation.

		Non-standardized coefficients		Standardized coefficients		
Model		B	Desv. Error	Beta	t	Sig.
1	(Constant)	14,700	2,708		5,428	,000
	TIC	,455	,085	,523	5,378	,000

a. Dependent variable: MOT

Note. ICT Database in Motivation

Table 6 shows the coefficients of the regression line. The coefficient corresponding to the constant is the origin of the regression line a = 14.7. Likewise, the coefficient corresponding to the ICT is the slope of the regression line b = 0.455, as this value is positive it indicates that it is a direct relationship. In general terms, what is analyzed by a regression is how the mean of Y changes when the values of X change. In that sense, the equation of the line is as follows:

Y = 14,7 + 0,46 X

4. Discussion

ICT and student motivation are important variables in the teaching and learning process, according to (Gustiani, 2020) online learning for some students lacks motivation and it should also be considered that some parents thought they could have their children's study time to perform some household activities.

The results regarding the use of ICTs show that learners are most prevalent at the regular level in the knowledge of technology dimension (62.0%, 49), followed by the good level in the ICT variable (51.9%, 41), followed by the very good level in the technology transformation dimension (7.7%, 6). Finally, it was evidenced in lower supremacy at the deficient level in the dimension transformation of technology with (2.5%, 2). Finally, they agree with Budiman et al. (2018) indicates that when performing the integration of ICT there is a benefit for both the teacher and also for the student, such integration can generate the improvement of transcendental motivation in students and provides a new way for the teaching-learning process through ICT tools, recommends enhancing the management of ICT by students so that they can have a better experience in the development of the sessions to be carried out.

With respect to motivation, they are located with greater hegemony at the regular level in the intrinsic motivation dimension (75.9%, 60), followed by the good level in the motivation variable (39.2%, 31). Finally, it was evidenced in the deficient levels and very good in the transcendental dimension with (2.5%, 2). These evidences coincide in the decrease in the health emergency that had a substantial impact on students and the virtual irruption in education that caused significant psychological depressions and therefore low esteem, motivation and the use of ICTs among medical students during the period of home quarantine (Arima et al., 2020). In this sense, the study is relevant to the subject and the use of technologies by its teachers and students encourages the development of cognitive skills activities according to academic training (Alsuraihi et al., 2016).

A significant high mean positive relationship was found between ICTs, knowledge of technology, technology use and transformation of technology with motivation and its dimensions intrinsic motivation, extrinsic motivation and transcendental motivation ($r = 0.407^{**}$, $p < 0.01$ moderate positive correlation;

r = 0.429**, p <0.01 moderate positive correlation; r = 0.416*, p <0.01 positive correlation moderate; r=0.592**, p <0.01 high mean positive correlation). These evidences agree that there is a positive correlation (r = 0.506) between the variables, tics and motivation, according to similar results such as (Chumpitaz, 2020); likewise, the use of ICTs and motivation in the area of Social Sciences where it obtained as a result of Spearman's Rho correlation: 0.604 in which it is assumed that the relationship is moderate and it is considered that teachers should continue training in the application of ICT to motivate students and at the same time encourage them the correct use of technology for the exchange of information based by (Rodríguez et al., 2009).

Information and communication technologies, knowledge of technology, use of technology and transformation of technology, significantly favor motivation and its dimensions intrinsic motivation, extrinsic motivation and transcendental motivation whose values (r 2 = 27.3%; r 2 = 13.6%; r 2 = 14.8%; r^2 = 16.7%; ∀ p < 0.01). Supported by the above assessments, it is agreed that there is a positive relationship in the research process, with transcendental motivation being the determining achievement of academic success (Wigfield et al., 2016).

This research highlights the relationship between ICT use and motivation as indicated (Salamanca & López, 2021). In the same line, the integration of ICT in the education sector generates methodologies that motivate students and at the same time contribute to increase greater interest and confidence at the time of the teaching process. Considering the students who use the interactive whiteboard and are observed more motivated in terms of the development of the activities, the number of students who carry them out increased (Cancelo et al., 2017).

In Peru, it is endorsed in the coincidence with (Príncipe, 2020) that determined the relationship between ICTs and the extrinsic motivation of students, with a result of r = 0.423, who concluded in a moderate positive correlation, there being a relationship between the use of ICT and extrinsic motivation in the area of mathematics. Likewise, intrinsic factors (interest, enjoyment, satisfaction) influence students' learning motivation towards their online learning by 81.2%. In the same vein, motivations in online learning correlate positively with students' curiosities to learn new knowledge and enjoy new learning experiences (intrinsic motivation) and are influenced by regulation and environmental condition (extrinsic motivation) and collaborative group work (transcendental motivation) (Gustiani et al., 2022).

5. **Conclusions**

In this way, information and communication technologies represent best practices in current organizations and specifically in higher education institutions, which have the role of being managers of change for creation, dissemination, learning and innovation. This justifies the investment in

platforms, software and infrastructures that allow establishing networks to share and renew knowledge.

The results regarding the use of ICTs show that learners are most prevalent at the regular level in the knowledge of technology dimension (62.0%, 49), followed by the good level in the ICT variable (51.9%, 41), followed by the very good level in the technology transformation dimension (7.7%, 6). Finally, it was evidenced in lower supremacy at the deficient level in the dimension transformation of technology with (2.5%, 2). It is concluded that students should strengthen the transformation dimension of technology through tutoring and teacher training.

With respect to motivation, they are located with greater hegemony at the regular level in the intrinsic motivation dimension (75.9%, 60), followed by the good level in the motivation variable (39.2%, 31). Finally, it was evidenced in the deficient levels and very good in the transcendental dimension with (2.5%, 2). It is concluded that the transcendental dimension should be strengthened, which does not lie so much in the person himself, but is more focused on the group, and is closely related to the business environment.

A significant high positive relationship was found between ICTs, knowledge of technology, use of technology and transformation of technology with motivation and its dimensions intrinsic motivation, extrinsic motivation and transcendental motivation ($r = 0.407^{**}$, $p < 0.01$ moderate positive correlation; $r = 0.429^{**}$, $p < 0.01$ moderate positive correlation; $r = 0.416^{*}$, $p < 0.01$ positive correlation moderate; $r=0.592^{**}$, $p < 0.01$ high mean positive correlation). It is concluded that all teachers and students of the mining institute have the orientation of carrying out information and communication technologies to raise intrinsic, extrinsic and transcendental motivations in their respective learning.

Information and communication technologies, knowledge of technology, use of technology and transformation of technology, significantly favor motivation and its dimensions intrinsic motivation, extrinsic motivation and transcendental motivation whose values ($r\ 2 = 27.3\%$; $r\ 2 = 13.6\%$; $r\ 2 = 14.8\%$; $r^{2} = 16.7\%$; $\forall\ p < 0.01$). It is concluded that the present research allows to make a pedagogical contribution with the incidence of communication and information technologies in the motivation in mining students, Peru. Being, the variable of information and communication technologies that influences 27.3% with respect to the motivation variable.

Generally speaking, what is analyzed by a regression is how the mean of Y changes when the values of X change.

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