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Fourth Industrial Revolution Skills as Influential Factors of Mathematics Performance

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The primary goal was to develop a structural model on emotional intelligence, critical thinking and creativity towards mathematics performance. Emotional intelligence, critical thinking, and creativity are important skills as we gear towards the 4th Industrial Revolution. The pandemic provided an opportunity for new teaching-learning modalities, which paved the way on how these skills predict performance. The study revealed that the level of Mathematics performance *did not meet the expectations* set by the K-12 curriculum despite displaying a *high* level of emotional intelligence. Their level of critical thinking was *low*, and creativity was *very low*. The study ascertained the existing *positive correlations* between critical thinking, emotional intelligence, and creativity with mathematics performance using the Pearson Product Moment Correlation. Furthermore, flexibility, analysis, inference, explanation, and self-management were *significant predictors* of Mathematics performance using multiple regression. Finally, the model was evaluated using fit indices involving Chi-square over degree of freedom, Goodness of Fit Index, Tucker-Lewis Index, Comparative Fit Index, Normed Fit Index, and Root Mean Square Error of Approximation. A *positive relationship* between critical thinking and emotional intelligence was established. In conclusion, the study theorized that mathematics performance is significantly attributable to their skills in critical thinking and emotional intelligence.

Key words: *Fourth Industrial Revolution; Emotional intelligence, Critical thinking, Creativity, Mathematics Performance*

INTRODUCTION

The world is currently on the stage of the fourth industrial revolution. Virtual reality, artificial intelligence, robotics, the internet of things, and cyber physical system are making their way through education. With these rapid changes, different skills are emerging and the future job market demands workers with fresh new abilities.

The World Economic Forum 2020, identified these top skills as analytical thinking and innovation, complex problem-solving, emotional intelligence, critical thinking and analysis, technology design and programming, among many others. These skills are perceived to be relevant to future work and secures a spot in the labor market (Schwab, 2020). With this in mind, there is a demand to transform teaching and learning practices to complement the trends of 4.0 industrialization.

When the pandemic hit the globe, people expressed panic as the spread grew exponentially. This shifted to approaching to the pinnacle of the fourth industrial revolution technologies. It played a crucial role in minimizing the COVID-19 outbreak (Ibrahim, 2020). The use of drones to check on social distancing policy implementation, the utilization of robots to transport food and other essentials, and, the employment of digital platforms to continue online education are only few examples that displayed the rise of technologies as they play a vital role in the never-ending changing world.

Even with the global crisis in the education system, schools during the pandemic utilized the use of technology to safeguard learner-teacher interaction. Some academic institutions made use of distance learning and widely used the internet to deliver instruction. However, the Philippines' Department of Education initiated the use of self-paced modules, radio-based instruction, and television-based programs, where students can safely stay in their homes and learn whenever they can. This only called attention to the scarcity of resources that should support the quality of education amid the pandemic. Internet connectivity remained inadequate, the access to supplemental materials are insufficient, and there is no abundance of necessary gadgets to support distance learning.

The pandemic branded the academic year 2020-2021 as the most challenging year as it paralyzed the education system's face-to-face teaching and learning modalities. It started a new experience which urged an act of resilience especially in the education sector. Shifting from face-to-face teaching pedagogies to distance learning allowed little space for a quality in-face interaction between the teachers and students. As COVID threatens people's quality of life, everyone is compelled to adjust and adapt to recent developments.

In the midst of a world-wide contagion, advancement of technologies have paved way to fields of medicine, business, engineering, and education. The role of the 4IR skills remain significant even with the gap the pandemic has created.

Nordin & Dakwah (2015) defined critical thinking as reasonable reflective thinking focused on deciding what to believe or do. It comes in the forms of summarizing, synthesizing, predicting, analyzing, and judging. As it is noticeable, this relates to Bloom's Taxonomy. In the classroom context, learners who are critical thinkers are the ones asking the right questions, which eventually lead them to create knowledge. These people make an effort to solve a challenging task using higher-order thinking skills. Thus, it is a prerequisite to success, especially in the generation of the 4IR (Rafzan et al., 2020). It allows students to be innovative and hones decision- making skills needed in the 4IR-environment that demands good problem- solving skills (Bangun and Pragholapati, 2021).

The extensive digital change presents new ways to meet people, cultivate relationships and make meaningful connections. EI is the person's ability to understand emotions, including one's own and others. It enables people to get acquainted with different feelings and distinguish one from another (Tyagi & Gautam, 2017). It is the ability to connect to one's inner sentiments that allow open expression to oneself and others. The pandemic accentuated the role of emotional intelligence, allowing one to remain calm during difficult situations (Delgado, 2020).

In the future workplaces, the influence of digitization and automation will prosper. This scenario entails an in-demand set of higher skills, especially in creativity (Prisecaru, 2016). Creativity gives rise to novel ideas, and innovation uses these ideas to develop a product (Mehta et al., 2014). Thus, creativity is a humble tool that permits the emerging state-of- the-art technologies produced by innovation.

The Philippines has been known to struggle in the discipline of Mathematics. It ranked a poor seventh among nine Southeast Asian nations in education and innovation in 2011. The recent Program International Student Assessment 2018 results created a national commotion as the country fared at 78th place out of 79 participating countries in Mathematics (PISA, 2018). The Trends in International Mathematics Science Study (TIMSS) 2019 international results in Mathematics placed the Philippines at the last rank out of 58 countries.

In this study, the writer delimits the 4IR skills to critical thinking, emotional intelligence, and creativity. Mohd Nor et al. (2016) believe that emotional intelligence is essential in learning Mathematics, creativity in Mathematics is an important task to be developed (Nadjafikhah et al., 2012), and critical thinking is a 21st-century skill that is an essential attribute for success

(Zivkovica, 2016). To add, there is a scarcity of research that investigates the relationship between emotional intelligence, critical thinking, and mathematical creativity altogether, especially amidst the pandemic. These Fourth Industrial Revolution skills are viewed as imperative, and this study theorized to establish a structural model on the Mathematics performance of Grade 9 learners as influenced by their emotional intelligence, critical thinking skills, and mathematics creativity.

DEVELOPMENT OF HYPOTHESES AND MODEL

HYPOTHESES

The following hypotheses were tested at a 0.05 level of significance.

H1: There is no significant relationship between emotional intelligence and Mathematics performance;

H2: There is no significant relationship between critical thinking and Mathematics performance

H3: There is no significant relationship between mathematical creativity and Mathematics performance.

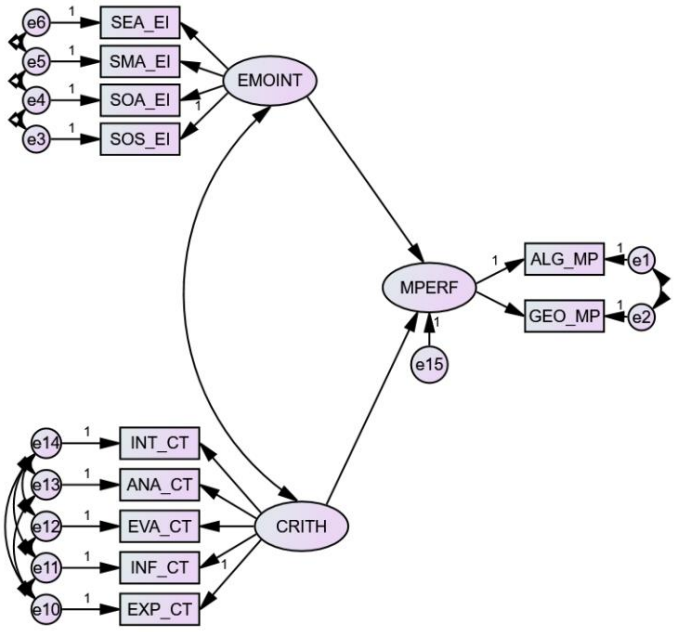
H4: There is no significant predictor that exists among emotional intelligence, critical thinking, and Mathematical creativity to learners' Mathematics performance.

H5: There is no structural model that best fits the Mathematical performance of Grade 9 learners.

HYPOTHESIZED STRUCTURAL MODEL

Emotional intelligence and critical thinking have direct effects toward mathematics performance, sharing a correlation. It can be seen that there is a presence of error co-variances on each variable featured in this model.

Figure 1. Hypothesized Structural Model on Mathematics Performance



Legend: MPERF = Math Performance; ALG_MP = Algebra; GEO_MP = Geometry; EMOINT = Emotional Intelligence; SEA_EI = Self-Awareness; SMA_EI = Self-Management;SOA_EI = Social Awareness; SOS_EI = Social Skills; CRITH = Critical Thinking; INTE_CT = Interpretation; ANA_CT = Analysis; EVA_CT = Evaluation; INF_CT = Inference; EXP_CT = Explanation; FLU_CR = Fluency; ORI_CR = Originality; FLE_CR = Flexibility Skills; CREA = Creativity

METHODOLOGY

RESEARCH DESIGN

This study used a descriptive, correlational, and causal-comparative design, which underwent a group of comparisons. This established a cause-effect relationships among the variables of the study. Furthermore, this determined the values of the observed variables to have a significant effect on the latent variables. Furthermore, the causal design was employed to describe the relationships found within the said variables.

Survey data has been collected from 512 Grade 9 learners in Bukidnon, Philippines enrolled in the academic year 2020-2021. They have been subjected to a multistage sampling method.

The researcher made use of the following statistical measures in the analysis: mean, standard deviation, Pearson Product Moment Correlation, multiple regression, and Structural Equation Modeling maximum likelihood.

The model was statistically tested using the Chi-square test (X^2) over the degrees of freedom (df), the Root Mean Square Error of Approximation (RMSEA), the Normed Fit Index (NFI), the Comparative Fit Index (CFI), the Goodness-of-Fit Index (GFI), and the Tucker-Lewis index (TLI). These allow simultaneous analyses of unobserved latent variables and the observed variables.

RESEARCH INSTRUMENTS

The research made use of the Schutte Self-Report Emotional Test by Schutte with a reliability score of 0.84 using Cronbach's Alpha, Mathematics Creativity Test with a split-half reliability score of 0.89 and content validity score of 0.50 by Walia & Walia (2017), and teacher-made Critical Thinking Skills Test and Mathematics Performance Test with reliability scores of 0.88 and 0.87 using Kuder-Richardson 20, respectively.

RESULTS AND DISCUSSION

MATHEMATICS PERFORMANCE OF LEARNERS

As found in table 1, the learners' level of mathematics performance *did not meet the expectations* on both Algebra and Geometry. Consequently, the overall mathematics performance of the Grade 9 learners *did not meet the expectations* of the curriculum's minimum standards.

Table 1. Math Performance of Learners

Mathematics Performance	Mean	SD	Level of Mathematics Performance
Algebra	5.13	2.41	Did Not Meet Expectations
Geometry	4.26	2.07	Did Not Meet Expectations
Overall	9.39	3.62	Did Not Meet Expectations

Legend: 26 – 30 Outstanding; 23 – 25 Very Satisfactory; 21 – 22 Satisfactory; 18 – 20 Fairly Satisfactory; 0-17 Did Not Meet Expectations

It is important to note that the study took place amidst a pandemic. The academic school year 2020-2021 started with the challenges of an unexpected COVID-19 crisis. The policymakers like the Department of Education and local government units gave an immediate response to the threat the virus posed to the Philippine community.

The Department of Education released its policy guidelines for the provision of learning resources in basic education. The DepEd Order number18, series of 2020, enumerates the different alternative delivery modes, including the use of self-paced learning modules, radio-based instruction, video-based instruction, and many other platforms that may fit the needs of the learners. In this memorandum, the Most Essential Learning Competencies (MELCs) were part of the Department's response to the need for resilient education systems. This memorandum had a fewer set of competencies, identified according to its level of importance.

This situation implies that from the beginning of the academic school year, the education system has faced emerging challenges. For one, a face-to-face discussion is absent, with almost no student-teacher interaction in the Basic Education Curriculum. In the hope to terminate the spread of the COVID-19 virus, the head officials initiated the avoidance, a no-contact rule in the education sector to protect minors. This scenario has limited teacher facilitation and the practice of teaching pedagogies, all of which are essential features of face-to-face classrooms.

The sudden shift of learning in a physical classroom to an entirely different learning delivery created complex challenges not only to the educators but most especially, to the learners. The teachers needed to address challenges in module-making, radio-based instruction delivery, and crafting self-made videos. From the study of Alea et al. (2020), teachers had difficulty using e-platforms: using social media, emails, and other digital alternatives. Digital skills were tested, particularly on gadgets such as laptops and phones, as they were distressing to some of the teachers. Establishing communication with the learners also has been quite a struggle which resulted to limitations in monitoring student responses and student progress.

These data call to mind similar results from a local study made by Dangle and Sumaong (2020), who revealed the challenges brought about by the implementation of modular distance learning. On the one hand, there has been a struggle for learners to learn independently with this platform. Without the teacher to facilitate a healthy discussion, the learners are on their own. Parents, on the other hand, find difficulty academically guiding their children due to the lack of content knowledge of the subject matter. Hence, modules may only provide limited learning experiences to learners.

Another view to consider is the learners' inclusive access to digital learning resources (OECD, 2020). Not all learners may have the opportunity to information and communication technologies that may aid learners in their challenges toward independent learning. Some learners may not have access to stable internet connections, books, laptops, and smartphones. As self-paced learning is encouraged in the pandemic, the learners need to gear up with the right skills and resources to enable self-regulation, in the absence of a teacher.

The immediate response to the sudden emergence of the COVID-19 pandemic recalibrated the education sector towards resilience. However, the question lies whether the country is indeed ready for the platforms laid out. Did the teachers receive enough training to create effective self-paced modules? Are the learners given enough support at home? Are the contents of the modules validated and reviewed? Are there responsive initiatives by the Local Government Units intended for learners who lack academic resources? The pioneer year of a new learning era arose due to COVID-19. However, with the immediate response comes little preparation of the stakeholders involved. It may have resulted in birthing pains, such as learners getting low academic performance in Mathematics.

EMOTIONAL INTELLIGENCE SKILLS OF LEARNERS

Emotional intelligence enables learners to identify their state of emotions. Table 2 exhibits the emotional intelligence level of Grade 9 learners around Bukidnon, particularly on self-awareness, self-management, social awareness, and social skills. It shows that the learners display *high* skills in emotional intelligence. From these results, it means that learners may be able to respond to negative emotions, create and maintain relationships, resolve conflicts, and make better communication with other people.

Table 2. Level of Emotional Intelligence of Grade 9 Learners

Indicators	Mean	SD	QD
Social Awareness	3.54	0.65	High
Self-Awareness	3.56	0.72	High
Self-Management	3.63	0.64	High
Social Skills	3.66	0.77	High
Overall	3.60	0.60	High

In the intrapersonal aspect of emotional intelligence, learners display *high* self-awareness and self-management skills. This statement means that learners can identify their emotions, whether they are negative or positive. Recognizing feelings is essential because it results in appropriately responding to these existing emotions. Jesu and Vasimalairaja (2015) claimed that these skills have a stimulus on academic achievement. Therefore, identifying emotions and properly managing them can help learners generate strategies in achieving good mathematics performance.

The pandemic has brought stress, anxiety, isolation, and depression. Rakhmanov and Dane (2020) mentioned that learners had high anxiety levels during the pandemic. The prevalence of anxiety

and depression are also present among learners, according to Islam et al. (2020). From the results of table 2, implications include learners having the ability to keep themselves calm regardless of any negative emotions such as anxiety, frustration, confusion, and fear. The learners need to identify what caused these emotions. The feelings will ease, and individuals may consider responsible actions.

Kadiyono and Hafiar (2017) expressed the need for self-management to improve academic achievement. Meanwhile, Trevino-Maack al. (2014) emphasized how one can use self-management to enhance the amount of written work, primarily with the printed modules provided by DepEd. Because table 2 revealed that the learners have high self-management skills, they may maximize these skills to improve their Mathematics performance.

On the interpersonal aspect, the grade 9 learners have *high* social awareness and social skills. These results signify that learners recognize other people's emotions, and interact with them. Through this skill, emotional connections are built within their peers, and relationships are improved.

The pandemic has provided new schemas on social interaction. In the face of the COVID-19 outbreak, schools initiated limitations on face-to-face connections to avoid the spread of the deadly virus. Social activities have resorted to digital avenues. Learners communicated using different digital modalities such as Facebook, Instagram, Twitter, and other platforms. Even with social distancing, learners could make meaningful conversations utilizing the technology they were already familiar with. Relying on digital communication tools to create and maintain connection amidst a crisis is another form of adaptability.

These results confirm the argument of Mareta et al. (2020) that learners were able to find social groups and freely express opinions on social media. The idea of Sharma et al. (2016) points out that interpersonal interactions provided by learners' social skills allow work efficiency is also proven. The learners were able to find support groups with who they were able to confide. Furthermore, this can explain the statement that social media has transitioned to being a comfortable place for learners at a catastrophic time such as a pandemic.

CRITICAL THINKING SKILLS OF LEARNERS

Table 3 extracts the exceptional level of critical thinking skills of the grade 9 learners. As noticed, all skills resulted in *low* critical thinking. During the pre-pandemic, teachers encourage learners to engage in higher-order thinking (Nappi, 2017), equivalent to critical thinking. Teachers can enhance critical thinking through scaffolded questions that will help learners analyze, interpret, synthesize, and many others. It is a possibility that the art of questioning posed by the teacher promotes a higher level of interaction. Nordin and Dakwah (2015) agreed to this, affirming that

teachers' teaching methods of critical thinking must be employed and improved to develop these skills. Therefore, the teachers play a crucial role in the facilitation of learning.

Table 3. Level of Critical Thinking Skills of Grade 9 Learners

Indicators	Mean	SD	QD
Inference	1.53	1.12	Low
Analysis	1.59	1.12	Low
Interpretation	1.76	1.14	Low
Evaluation	1.82	1.12	Low
Explanation	2.49	1.47	Low
Overall	9.19	3.14	Low

Unfortunately, independent study programs during the pandemic, especially on the use of self-modules, allow teachers to throw questions with limitations on the different questioning methods. Using the self-paced modules may not satisfy learners' meaningful learning experience with restricted teacher- student interactions.

Table 3 provides us with how the skills were low on the five domains. According to Jupri and Drijver (2016) and Ramirez et al. (2019), most of the challenges in interpreting mathematical symbols, equations, and mathematics word statements are in the incapacity to produce schemas formulate diagrams augmented with lack of comprehension, lack of vocabulary and many others. With this, the inability to interpret ubiquitous mathematics symbols and statements impend the ability to solve problems correctly. This explains why the learners *did not meet the expectations* of their mathematics performance, discussed in Table 1.

Permana et al. (2019) put another critical thinking skill, analysis, in the limelight, saying it has the highest contribution to the declared primary variable. Given that the analytical thinking skills of learners were *low*; conversely, it may also mean that the general critical thinking skills results were affected by the poor analysis skills of the learners.

Yulina et al. (2019) also reasoned out that school materials must enhance the analytical thinking skills of learners. This statement high- points the current materials used by the education system during the pandemic. Do the printed modules, radio-based learning, tv-based learning, and online learning allow the development of these analytical skills?

Vo (2013) and McIntosh et al. (2020) relayed that evaluative thinking is primarily associated with providing evidence, reasoning, and proper use of collected data. These skills are imperative in

solving problems. Having poor evaluation skills may have resulted in poor performance in mathematics as well.

Skills on inference and explanation are equally important as the other domains of critical thinking. Studies of Bagheri and Ghanizade (2015), Muller (2016), and Hamel et al. (2015) showed that improvement follows when inference and explanation skills are taught to learners. In the current situation, instructional materials provided by the Department of Education may have embedded these skills. An inquiry can be made, however, in whether the learners were able to acquire these skills with such limited student-teacher interaction during the pandemic.

Odora (2017) pointed out that a lack of skills on properly explaining solutions may have been caused by lack of communication. During the pandemic, communication is minimal and mainly revolves around digital platforms. Given this scenario, the lack of communication and the quality of conversations may have caused the poor explanation skills in Table 3. For learners to be employable in the future, especially in the emerging 4^{th} Industrial Revolution, the learners' critical thinking skills must be enhanced.

Developing critical thinking skills can imply that progressively, the skills can be improved given the proper training, experience, and environment. The challenge to this is how the education sector can provide all these given the constraints of a global crisis. The challenge to learners is how they can respond to the provisions of what schools have exhausted for them.

CREATIVITY SKILLS OF LEARNERS

Creativity in Mathematics revolves around how learners can solve problems in numerous ways. These problems are usually open-ended so that fluency, flexibility, and originality may be demonstrated. Unlike the close-ended questions like multiple-choice tests and dichotomous tests, open-ended questions allow free-form answers. This will enable learners to think outside the box. One can notice in Table 4 that learners reflected *very low* skills on fluency, flexibility, and originality.

Table 4. Level of Creativity Skills of Grade 9 Learners

Indicators	Minimum	Maximum	Mean	SD	QD
Fluency	0	58	0.63	2.13	Very Low
Originality	0	18	2.47	4.27	Very Low
Flexibility	0	26	5.36	9.64	Very Low
Overall	0	93	8.45	15.17	Very Low

Fluency allows learners to provide multiple correct answers to one open-ended question without limitation. It is the ability to show countless ideas in one problem. With more correct answers provided, there is an exhibit of concept mastery.

One can trace the results shown in Table 4 back to the results in Table 1. Without mastery of Algebra and Geometry concepts, learners cannot produce more answers inside this concept. To be fluent, it is a prerequisite to understand the basic concepts first to generate similar ideas. As mentioned, the highest score of 58 under the fluency tier. It the ability of one learner to achieve a very impressive score. However, many of the respondents scored a zero, pulling down the mean to 0.63. Its respective standard deviation illustrates how their scores are widely spread.

Flexibility in Mathematics indicates that learners' answers can be classified into different categories. The more classes are supplied, the more proficient learners are. However, Table 4 shows that flexibility has a higher rate in terms of a mean and standard deviation compared to the other skills. This result means that in terms of categorization, the scores of these learners are better, but the variations of the score are very wide.

Shaw et al. (2020) purported that the number of existing solutions is significantly related to flexibility. It is incontestable that the number of flexibility scores is less than the number of fluency scores. It means that in answering open-ended questions, a unique construct like flexibility may result to the generation of strategies (Dina et al., 2018). In this case, these strategies are the ability of learners to replace answers in different categories.

Originality, however, highlights the number of unique answers from all of the research participants. It can be seen that the entire population was only able to produce 18 unique answers. The mean score of 2.47 further tells how this reflects a *very low* skill on originality.

On originality, the learners could only supply quite a few unique answers. This result further indicates that despite the numerous solutions provided, many of these are repetitive compared to other learners' responses. Suyitno and Suyitno (2018) asserted that innovation characterizes the nature of the originality domain. This result suggests that learners' innovation skills are yet to be improved. In its entirety, it is only logical that the learners displayed *very low* skills on creativity.

CORRELATION ANALYSES ON MATHEMATICS PERFORMANCE

The significant associations between the exogenous and endogenous variables are shown in Table 5. The Table further reveals the correlation of emotional intelligence, critical thinking, and creativity towards mathematics performance.

Table 5. Correlation Analyses on Mathematics Performance

Variables	r-value	p-value
Emotional Intelligence	.121	0.006**
Self-Awareness	.110	0.013*
Self-Management	.094	0.033*
Social-Awareness	.118	0.007**
Socials Skills	.089	0.044*
Critical Thinking	.313	0.000**
Interpretation	.157	0.000**
Analysis	.244	0.000**
Evaluation	.150	0.001**
Inference	.210	0.000**
Explanation	.102	0.021*
Creativity	.349	0.000**
Fluency	.327	0.000**
Flexibility	.373	0.000**
Originality	.258	0.000**

Note: ** significant at 0.01 ; * significant at 0.05

It is evident from Table 5 that emotional awareness found a significant association between mathematics performances. Along with its essential domains, it is apparent that *positive correlations* exist between the respective sub-variables and the endogenous variable, mathematics performance.

Generally, the positive correlations reflected on this table show that when emotional intelligence, critical thinking, and creativity are relatively high, it will also follow that the learners will have a better mathematics performance. In another point of view, when learners fail to recognize intrinsic and extrinsic emotions, with low critical thinking skills, or with low creativity skills, poor performance in mathematics will follow. Therefore, it is safe to conclude that the learners' *did not meet the expectations* of the mathematics performance for the particular reason that the critical thinking and creativity skills were also *low*.

Therefore, the results led the researcher to reject the null hypotheses H1, H2, and H3, that *there are no significant relationships between learners' emotional intelligence, critical thinking skills, creativity, and mathematics performance*.

REGRESSION ANALYSIS OF MATHEMATICS PERFORMANCE

The use of multiple linear regression analysis allowed investigation on the causal effects of the domains of emotional intelligence, critical thinking, and creativity. The Analysis of Variance results are reflected in Table 6.

Table 6. Regression Analysis of the Mathematics Performance

	Unstandardized Coefficients		Standardized Coefficients	T	P-value
	B	SE	B		
(Constant)	16.385	2.938		5.577	.000
Flexibility	.931	.113	.330	8.245	.000
Analysis	.120	.026	.187	4.639	.000
Inference	.080	.025	1.27	3.146	.002
Explanation	.048	.020	.097	2.471	.014
Self-Management	1.482	.747	.079	1.938	.048

Note: $r = 0.463, r^2 = 0.214, adjusted\ r^2 = 0.207, F - ratio = 27.604, p - value = 0.000$

Noticeably, flexibility, analysis, inference, explanation, and self-management revealed a significant prediction towards Mathematics Performance. Furthermore, the F-ratio equivalent to 27.604 provides a significant prediction model on the dependent variable. The coefficient of determination puts 21.4% of the variances of the mathematical performance explaining the regression model.

It is noticed in table 6 that the three latent variables, named as emotional intelligence, creativity, and critical thinking, have domains that predict mathematics performance. Flexibility as a domain of creativity; analysis, inference, and explanation as variables of critical thinking; and self-management as a scale of emotional intelligence, are said to predict mathematics performance.

With the significant predictors shown on table 6, mathematics performance can be predicted and modeled with:

Mathematics Performance = 16.385 + 0.931Flexibility + 0.120Analysis + 0.080Inference
+ 0.048Explanation + 1.482Self-Management

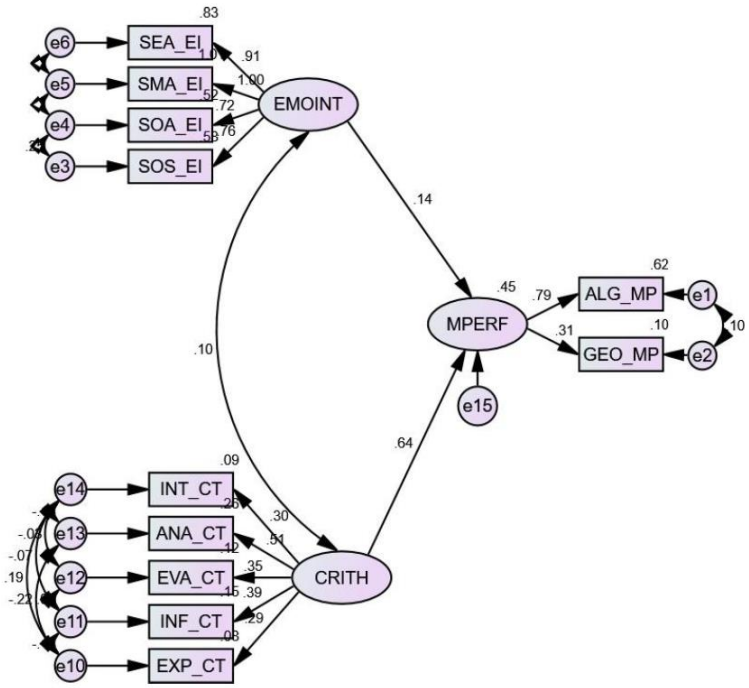
Following this concept, results reveal that flexibility gave away 33%, analysis measured 18.7%, inference disclosed 12.7%, explanation shared 9.7%, and self-management provided 7.9 % causal effects toward Mathematical Performance. The general mathematics performance of the learners may have been caused by the presence of these five skills. With this, it is safe to reason that the learners' mathematics performance was low because of the quality of skills on flexibility, analysis, inference, explanation, and self-management. An increase of 0.931, 0.120, 0.80, 0.048, and 1.482 in mathematics performance will also take place for every growth index in skills under flexibility, analysis, inference, explanation, and self-management, respectively.

From the generated equation, it suggests that self-management is the most significant variable affecting mathematics performance while explanation has the most negligible impact on mathematics performance. Therefore, this study rejects the null hypothesis H4 that says, *there is no significant predictor that exists among emotional intelligence.*

STRUCTURAL MODEL ON MATHEMATICS PERFORMANCE

The endogenous variable in this study is identified as the Mathematics Performance of the grade 9 learners, following its latent variables, Algebra and Geometry. This paper has three exogenous variables namely, emotional intelligence, critical thinking skills, and mathematical creativity.

Figure 2. Structural Model on Mathematics Performance



The Goodness-of-Fit indices of the model has $X^2 = 30.467$, which is in between $0df \leq X^2 \leq 2df$. P-value is 0.493, which is > 0.05. χ^2/df=0.983, which is <2. RMSEA value is 0.000, which is <0.05. NFI value is 0.981, which is >0.95. CFI value is 1.000, which is >0.95. GFI = 0.989, which is >0.95. TLI = 1.001, which is >0.95. With these figures, the model satisfied the goodness-fit threshold of all the indices considered.

This figure concludes that self-management has the highest effect size compared to its cohorts by a point of 1.00. Social awareness has the slightest effect size carrying a point of 0.72. Despite all the values, from the rule of thumb (> 0.40), these factor loadings values show that all of the domains of emotional intelligence are important. The variance can mean that the data set is very widespread.

It is also noticeable that among all the domains of critical thinking, analysis has the highest effect size of 0.54. This claim is the same with the results of Permana et al.'s (2019) study, where analytical skills have the highest contribution to other domains of critical thinking skills. In contrary to that, explanation has the least effect size of 0.29. Studying their variances, the values are relatively very low, stipulating that the data is fairly very close to each other.

The correlation between critical thinking and emotional intelligence can also be seen in the Figure. The two variables share an apparent positive correlation (r = 0.10). This result suggests that when critical thinking is high, emotional intelligence is also high. On another view, when critical thinking is low, emotional intelligence is low, too.

Consequently, we can say that when the learners manifest a high level of emotional intelligence, the level of critical thinking is also high. Being accountable of one's emotions and using these to create healthy and productive social interactions can result to academic success. The results of this study further suggest that an alternative course of action may be possible to improve learning through actively and proficiently using the skills of critical thinking and emotional intelligence.

Modification indices also illustrate that indicators co-vary in measuring their construct as reflected by the co-variances of the measurement of errors. With the error correlation in consideration, there is a common error between the values.

Furthermore, the direct, indirect, and total effects of critical thinking and emotional intelligence on mathematics performance can be seen in the model. Critical thinking takes the most effect of 0.64, while emotional intelligence carries the least effect size of 0.14 towards mathematics performance. When the standard deviation of critical thinking rises at one point while the other variable is held constant, mathematics performance improves at 0.64 for each point increase. This result is the same for emotional intelligence, with a point of 0.14.

STRUCTURAL PARAMETER ESTIMATES FOR THE MODEL

The significant causal relationships are in Table 7. All the variables tested in this model are statistically significant with p-value level below 0.05. Mathematics performance is said to increase by points of 2.808 and 1.090 by every index increment in intelligence and critical thinking, respectively.

Table 7. Structural Parameter Estimates for the Model

Structural Relationship			Unstandardized Parameter Estimate (B)	S.E.	C.R.	B	P
MPERF	<---	EMOINT	2.808	1.092	2.572	0.140	0.010
MPERF	<---	CRITH	1.090	.366	2.980	0.641	0.003
ALG_MP	<---	MPERF	1.000			0.786	
GEO_MP	<---	MPERF	.390	.106	3.697	0.313	***
SOS_EI	<---	EMOINT	1.000			0.764	
SOA_EI	<---	EMOINT	0.794	.043	18.481	0.720	***
SMA_EI	<---	EMOINT	1.090	.194	5.607	1.003	***
SEA_EI	<---	EMOINT	1.115	.200	5.572	0.910	***
EXP_CT	<---	CRITH	1.000			0.286	
INF_CT	<---	CRITH	1.070	.349	3.067	0.388	0.002
EVA_CT	<---	CRITH	.925	.319	2.903	0.345	0.004
ANA_CT	<---	CRITH	1.384	.424	3.264	0.513	0.001
INT_CT	<---	CRITH	.819	.280	2.922	0.301	0.003

The results also show that four domains of critical thinking, specifically inference, evaluation, analysis, and interpretation, will increase by respective points of 1.070, 0.925, 1.384, and 0.819 when critical thinking will improve to a point. The same logic asserts that the three emotional intelligence sub-variables, precisely on social awareness, self- management, and self-awareness, will rise to scores of 0.794, 1.090, and 1.115 when emotional intelligence moves up by a scale.

FINDINGS AND CONCLUSION

As seen in the model, critical thinking and emotional intelligence carry direct influences on mathematics performance. As noticed, creativity doesn't hold any effect on the endogenous variable. To elaborate, it still shares a positive relationship with mathematics performance but does not necessarily have an effect towards it. Additionally, some members of the three exogenous

variables' domains, specifically flexibility, analysis, explanation, inference, and self-management, predict the students' performance in mathematics.

The continuous advancements of technology brought the world to transition to an environment filled with computers, smartphones, the internet, and artificial intelligence. These advancements impacted people's communication using more convenient platforms, influenced the work environment and work productivity, and challenged the education system to prepare learners for future employability.

Given the era of the Fourth Industrial Revolution, creativity, emotional intelligence, and critical thinking are crucial survival skills. These variables are the 4IR skills. However, this model emphasizes only two of these skills, critical thinking, and emotional intelligence, as affecting variables of learners' performance in mathematics. These are believed to be important in the world of mathematics but also to an environment of technological innovations.

The current pandemic encapsulated the challenges it brought to teachers, students, parents, and other essential stakeholders. The role of teachers, as experts in their field, is top-viewed as valuable during the pandemic classroom. Teacher-facilitation spurts intellectual and emotional growth in students. When the Philippines adopted the self-paced modules, it limited the student-teacher interaction and created a wide gap between teaching and learning.

The school and other stakeholders should be able to support the endeavors of learners, especially in their journey to be aware of their emotions, as well as others. One way to do this is to conduct webinars to enhance their well-being, especially in the emotional aspect. It may also be good to practice healthy open forums, enabling learners to express themselves to others and vice versa. There may be other activities at school to create a safe space for learners to improve their emotional intelligence. During the early pandemic where physical schools remain closed, schools may maximize digital communication tools to maintain valuable social interactions.

Critical thinking is the primary affecting variable that causes efficiency in mathematics performance. Despite the current health risks given by the COVID situation, there is still a vast opportunity to practice critical thinking. The internet is a powerful tool to train and enhance critical thinking. With the pandemic, the internet only opened more avenues for people to accept information, construct interpretations, challenge oneself, identify the current real-life problems, practice good decision-making skills, and make sensible solutions.

Teachers should be able to encourage the use of these skills inside and outside the classroom walls. Since the traditional classroom has converted itself to an e-classroom in response to the current pandemic, the teachers should be able to equip themselves with effective teaching and learning

activities for their learners. Therefore, schools should create an environment for learners which enhances their creativity, develop their critical thinking, and be able to regulate their own emotions.

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