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Multimedia Phenomena and their Impact on Schoolchildren Case Study Boeny Region

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ABSTRACT*: In the age of digitalization, digital innovation is progressing rapidly and attracting a great deal of attention. Education based on new information and communication technologies (NICTs) must take into account the common cultures shared by young students. Some researchers emphasize the positive effects of ICT on learning, while others warn of the complex issue of the impact of ICT on school and academic learning. This trend is causing concern, particularly among parents, as the Internet has become a second life for today's generation. We can thus see that the application of ICT in different regions depends on the joint efforts of tripartite education: parents, students and schools. These efforts highlight the various elements that contribute to a computer culture, fostering sound computational thinking, mastery of IT tools and participation in social activities in a connected world. Factors justifying the regressive results include, among others, socio-demographic situation. This situation prompted us to study the impact of ICT on the education of young students. In the Boeny region, where access to ICT is still underdeveloped, our research attempts to answer the following question: why do young people tend to reproduce what they see on social networks, and is this a risk factor for academic failure? We undertake a methodological analysis using the PROMETHEE multi-criteria decision support method to describe young people's daily activities related to ICT use, and then study their cultures, referring to the study of values and norms of social, generational, professional and community groups, as well as social categories influenced by digital usage.*

Keywords: *Computer literacy, educational technology, digital, ICT, PROMETHEE.*

I. INTRODUCTION

In Madagascar, digitalization is booming, with the IT development sector proving particularly dynamic. Innovations, whether in hardware or software, follow one another in rapid succession. All the technologies now grouped under the term "New Information and Communication Technologies" (NICT) are radically reorienting the way in which the tools themselves are used, and have also modified the behavior of the users of these techniques (Fabrice P. 1998). This development has had a profound impact on society and the economy in all sectors: primary, secondary, tertiary, and especially in the education sector.

Our research focuses on a region characterized by its dry, warm tropical climate. The use of digital technology in different regions is conditioned by the necessary IT resources, the coverage of networks operated by Madagascar's four Internet service providers, such as Blueline, Orange, Airtel and Telma. In this context, Internet access is limited in areas with less coverage, resulting in unreliable use of ICTs. Young people in these places are not motivated and do not benefit from the advantages of ICTs. Only in regional capitals such as Mahajanga I are students now learning in an Internet-connected environment (Karsenti, 2002).

With the integration of Information and Communication Technologies (ICT), learning situations are undergoing considerable transformation. Digital resources can encourage students to adopt uses different from those prescribed by the institution or teachers, such as using a smartphone as a calculator or to send text messages (SMS), downloading lectures produced by other students instead of taking notes during lessons, or

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plagiarizing documents (Guibert and Michaut, 2011). In this context, our research aims, on the one hand, to identify the socio-demographic and academic characteristics of students who use or do not use certain student digital activities (downloading or not of digital media deposited by teachers on a platform, remote interactions between students, note-taking or not with a computer, time spent on the Internet to study, etc.), and on the other hand, to assess the impact of these different activities on students' statistical results in the Baccalaureate and BEPC examinations.

II. CONTEXT

Information and Communication Technologies (ICT) have a more significant positive impact on students from more affluent backgrounds, enabling them to achieve better performance. However, this impact seems to be less marked, or even negative, among students from less privileged backgrounds. It's essential to recognize reality, especially when it comes to ICT components such as social networking. Yet they can also serve as powerful tools for personal development or as sources of documentation. Unfortunately, their potential remains largely unknown to most young Madagascans, who use them mainly to chat, imitate and share photos. It is therefore imperative to make them aware of how to optimize the use of these tools, or, in the worst case scenario, to regulate their use if they are shown to have a truly negative impact on academic results.

2.1. Problematic

In our research, we are exploring two major issues. The first concerns material and organizational aspects, in interaction with the scientific and educational context. The second concerns students' exam performance, taking into account their social status and psychology. We observe that initial social inequalities could be exacerbated by the introduction of educational Information and Communication Technologies (ICT) (Mounir D and Ludovic R. 2009). The promotion of computer literacy is part of social movements aimed at emancipating individuals and giving them control over their environment.

Thus, our research question is as follows: What are the impacts of educational information and communication technologies on material and organizational aspects, as well as on students' exam performance, taking into account their social status and psychology?

To answer this question, we put forward the following hypothesis: The introduction of educational Information and Communication Technologies (ICT) could accentuate initial social inequalities in student exam performance, due to possible disparities in access to and mastery of these technologies, as well as their implications for social and educational dynamics.

2.2 Objective

The aim of this research is to gain a better understanding of the impact of Information and Communication Technologies (ICT) and their components on education in schools and students in the Boeny region.

2.3 Methodology

To achieve this objective, we will use the PROMETHEE multi-criteria decision support method. In this context, we have undertaken a statistical approach to the results of the Baccalaureate and BEPC examinations. Data processing is based on two types of criteria: the classification of the criteria studied (the examination session year from 2016 to 2020) and the sub-criteria or assessments indicating the names of each region.

III. TREATMENT OF THE PROBLEM

We observe a marked accentuation of the performance gap between students from privileged socio-professional categories and those from less privileged backgrounds, identifiable by their respective statuses. These disparities were clearly highlighted through analysis of the statistical results of the Baccalaureate exams (Table 1), marked by the overlap of two successive registration sessions in the year 2020 (2020 (1)) and (2020 (2)), resulting from the disruption caused by the Covid-19 pandemic, as well as the BEPC (Table 2) over the past five years. With this in mind, the presentation of the data in the two tables follows a descending sequence from environments with privileged access to the Internet, thus favoring the use of information and communication technologies (ICT) for learning, to environments where Internet access is limited or even problematic.

Table 1: Summary of Baccalaureate results in general education over the last five years in the Boeny region

Région Boeny	2 016	2 017	2 018	2 019	2020 (1)	2020 (2)
Mahajanga	43,14%	39,76%	40,70%	13,21%	44,60%	38,74%
Ambato boeny	35,89%	52,62%	55,33%	24,19%	54,60%	46,36%
Marovoay	48,59%	49,29%	44,64%	13,63%	42,83%	40,39%
Mitsinjo	47,95%	46,52%	51,72%	24,69%	41,97%	45,16%
Soalala	66,18%	46,30%	64,79%	24,69%	78,79%	53,61%

Source: DOB[1] University of Mahajanga, April 8, 2021

Table 2: Summary of BEPC[2] results in general education over the last five years in the Boeny region

Région Boeny	2 016	2 017	2 018	2 019	2 020
Mahajanga I	43,20%	26,81%	24,38%	25,51%	34,82%
Mahajanga II	54,85%	28,89%	33,47%	23,16%	48,75%
Ambatoboeny	38,20%	34,03%	47,40%	29,08%	37,45%
Marovoay	39,17%	21,77%	23,18%	25,19%	41,15%
Mitsinjo	37,36%	38,47%	47,41%	33,67%	43,78%
Soalala	22,74%	29,75%	43,20%	17,62%	52,77%

Source: DREN[3] of Mahajanga, April 9, 2021

PROMETHEE methods (J.B Rakotoarivelo, 2018) are based on an extension of the notion of criterion by introducing a function that expresses the decision-maker's preference for one action over another. For these two tables, the criteria or scenarios are the examination session years from 2016 to 2020, and the actions or evaluation criteria are the district names. The treatments are illustrated in Figures 1 and 2. We opt for the type I function: the usual criterion with the maximum order of preference to facilitate the ranking of alternatives from the best to the least good in our discrete statistical data.

[1] DOB: Direction d'Office du Baccalauréat, 2020(1) and 2020 (2): meaning two examination sessions in 2020

[2] BEPC : Brevet d'Enseignement du Premier Cycle (First Cycle Teaching Certificate)

[3] DREN : Direction Régional de l'Éducation Nationale (Regional Department of National Education)

Scénario1	Bac 2016	Bac 2017	Bac 2018	Bac 2019	Bac2020 1	Bac2020 2
Unité	unit	unit	unit	unit	unit	unit
Cluster/Groupe						
Préférences						
Min/Max	max	max	max	max	max	max
Poids	1,00	1,00	1,00	1,00	1,00	1,00
Fn. de préférence	Usuel	Usuel	Usuel	Usuel	Usuel	Usuel
Seuils	absolu	absolu	absolu	absolu	absolu	absolu
- Q: Indifférence	n/d	n/d	n/d	n/d	n/d	n/d
- P: Préférence	n/d	n/d	n/d	n/d	n/d	n/d
- S: Gaussien	n/d	n/d	n/d	n/d	n/d	n/d
Statistiques						
Minimum	35,89	39,76	40,70	13,61	41,97	38,74
Maximum	66,18	52,62	64,79	24,69	78,79	53,61
Moyenne	48,35	46,90	51,44	20,16	52,56	44,85
Ecart-type	10,01	4,24	8,43	5,34	13,87	5,22
Evaluations						
Mahajanga	43,14	39,76	40,70	13,61	44,60	38,74
Ambato Bo...	35,89	52,62	55,33	24,19	54,60	46,36
Marovoay	48,59	49,29	44,64	13,63	42,83	40,39
Mitsinio	47,95	46,52	51,72	24,69	41,97	45,16
Soalala	66,18	46,30	64,79	24,69	78,79	53,61

Figure 1: Development of the Baccalaureate exam results scenario

Source: Author 2021

Scénario1	BEPC 2016	BEPC 2017	BEPC 2018	BEPC 2019	BEPC 2020
Unité	unit	unit	unit	unit	unit
Cluster/Groupe					
Préférences					
Min/Max	max	max	max	max	max
Poids	1,00	1,00	1,00	1,00	1,00
Fn. de préférence	Usuel	Usuel	Usuel	Usuel	Usuel
Seuils	absolu	absolu	absolu	absolu	absolu
- Q: Indifférence	n/d	n/d	n/d	n/d	n/d
- P: Préférence	n/d	n/d	n/d	n/d	n/d
- S: Gaussien	n/d	n/d	n/d	n/d	n/d
Statistiques					
Minimum	22,74	21,77	23,18	17,62	34,82
Maximum	54,85	38,47	47,41	33,67	52,77
Moyenne	39,25	29,95	36,51	25,70	43,12
Ecart-type	9,45	5,28	10,13	4,95	6,19
Evaluations					
Mahajanga 1	43,20	26,81	24,38	25,51	34,82
Mahajanga 2	54,85	28,89	33,47	23,16	48,75
Ambato Bo...	38,20	34,03	47,40	29,08	37,45
Marovoay	39,17	21,77	23,18	25,19	41,15
Mitsinio	37,36	38,47	47,41	33,67	43,78
Soalala	22,74	29,75	43,20	17,62	52,77

Figure 2: Development of the BEPC examination results scenario.

Source: Author 2021

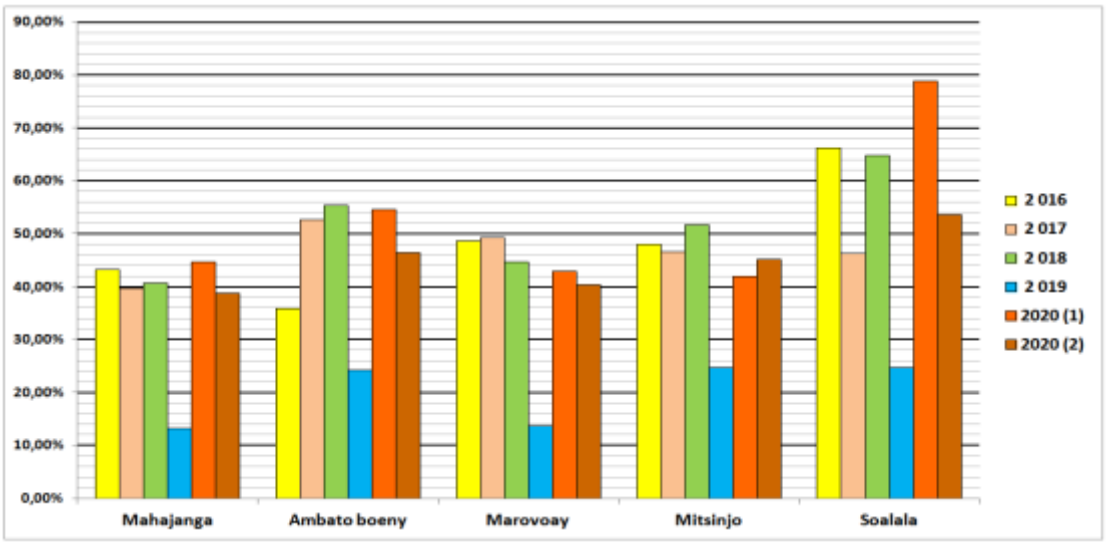
The criteria scenario, district evaluation and data entry are illustrated in Figures 1 and 2 above, along with the results of the mean and standard deviation calculations. Analysis of the various data leads to the following results.

IV. RESULTS

The results obtained make a complementary contribution to assessing the influence of Information and Communication Technologies (ICT) on student performance, as illustrated in graphic 3 and 4, using the results of analyses carried out via the PROMETHEE method. This is shown in Figures 3 and 5, with the aim of measuring the effects of various ICT-induced uses on student performance, taking into account the socio-economic and educational context. Today's excessive use of ICT is disrupting all educational institutions and impacting the cognitive domain. We have processed two results: the Baccalaureate and the BEPC. However, due to the coronavirus pandemic, the university has decided to operate with a reduced staff, which prevents us from obtaining university exam results.

4.1. Baccalaureate results and the multimedia environment

Graphic 3 shows the ranking of the region's districts in descending order according to the advantages and operating performance of digital acquisition resources, such as Mahajanga, Ambato Boeny, Marovoay, Mitsinjo and Soalala.



Graphic 3: illustration of Baccalaureate results by district
Source: Author 2021

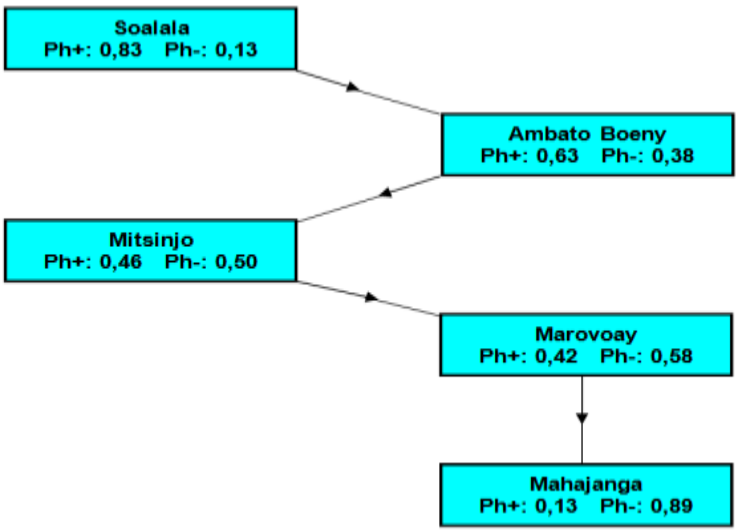


Figure 3: Evaluation and prioritization of districts based on Baccalaureate exam results.
Sosurce: Author 2021

Mahajanga: If we analyze the increase in the number of candidates each year (Table 1), we can see that in the overall results from 2016 to 2020, the region's capital recorded modest results. To illustrate, in 2016 (43.14%), 2017 (39.76%), 2018 (40.70%), with a significant drop in the success rate in 2019 (13.21%).

Following the adjustment of two registration periods, one intended for 2019 students affected by Covid-19 (blank year) and the other dedicated to 2020 students, we note that the first 2020 registration (1) (44.66%) corresponded to a repeat of 2019, while the second registration was reserved for new 2020 registrants (2) (38.74%). As a result, two special baccalaureate sessions have been organized for the 2019-2020 school year in Madagascar.

The city of Mahajanga has an adequate IT and digital literacy infrastructure for all ICT learners. This status is favored by its tourist potential, economic importance, warm climate, and diverse entertainment venues with entertainment organizations and small receptions.

However, we observed a downward trend in the success rate and noted that despite the benefits of digital and computer literacy, young students are not motivated by their studies. Of the 120 students surveyed, 98 (81.5%) said that their distractions center around the use of ICT, notably games, especially on social networks such as Facebook, Twitter, Instagram, while the remaining 22 (18.5%) prefer documentary research on the Internet to strengthen their intellectual abilities.

Ambato Boeny, Mitsinjo and Soalala: These districts are characterized by unavoidable parameters such as logistical problems and limited road infrastructure. Electricity in these districts comes mainly from thermal sources, and drinking water distribution networks and the availability of electricity are often limited due to frequent load shedding during half the day.

Network coverage is inadequate, making ICT use unreliable. In these regions, ICT learning is less advanced due to financial constraints linked to the purchase of smartphones, access to the Internet and social networks, notably Facebook, which remain major obstacles to the development of computer and digital cultures. Despite these persistent challenges, our observations of baccalaureate exam result over the last five years show an improvement.

Marovoay: As the district closest to Mahajanga, travel between the two districts is frequent, encouraging exchanges and a relatively similar lifestyle between young people. However, differences persist between the main town and the suburbs. Figure 3 shows that the Marovoay district has posted slightly higher baccalaureate exam results over the past five years. This suggests that ICT learning is even less advanced in this region.

Electricity sources in Marovoay are similar to those in the three districts mentioned above, with drinking water distribution networks and frequency of electricity use still insufficient. Network coverage is unsatisfactory, and in general, the socio-economic situation of local residents can be described as modest. At this stage, young people have limited access to ICTs due to time constraints, thus explaining the baccalaureate exam results compared to those of the Mahajanga ville district.

The PROMETHEE results, shown in Figure 3, summarize overall district rankings based on student assessment and examination results over the past five years. Following the data processing carried out by PROMETHEE, we chose the maximum preferences (Max) in order to privilege the examination results of districts with higher values than others.

By analyzing the preference indices for each criterion in the baccalaureate exam results, we can conclude that, on two evaluation criteria, the Soalala and Ambato Boeny districts have positive preference indices (Phi) of 0.7083 and 0.2500 respectively. These two districts are consistently rated against the other three districts, Mitsinjo, Soalala and Mahajanga, which have negative preference indices (Phi) of -0.0417, -0.1667 and -0.7500, as shown in Figure 4. However, when it comes to exam results for the three districts, they have no preferences, as their PROMETHEE feed results are all negative, and the ranking follows descending mathematical order.

Flux PROMETHEE

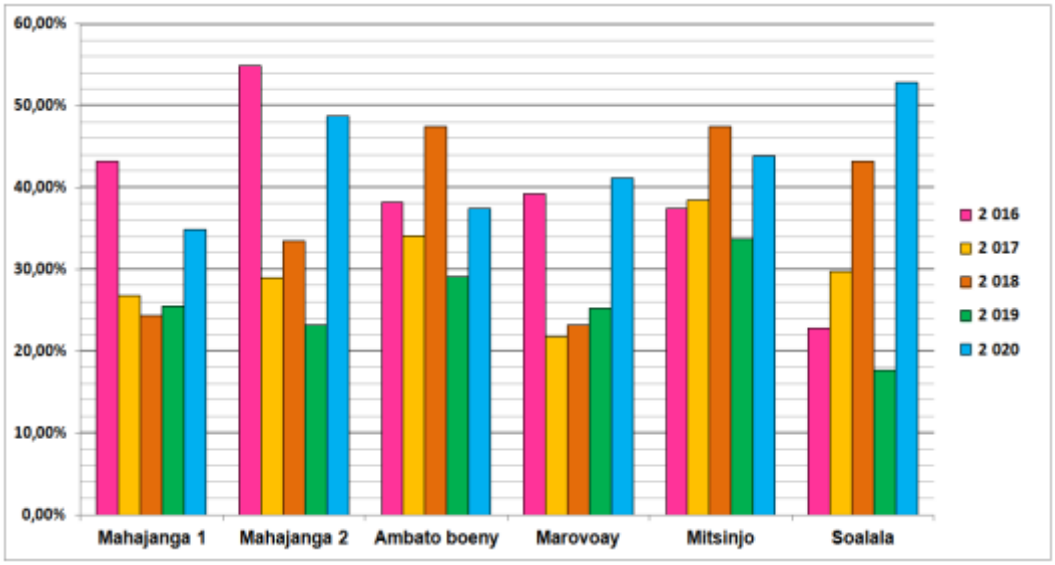
Ran	action	Phi	Phi+	Phi-
1	Soalala	0,7083	0,8333	0,1250
2	Ambato Boeny	0,2500	0,6250	0,3750
3	Mitsinjo	-0,0417	0,4583	0,5000
4	Marovoay	-0,1667	0,4167	0,5833
5	Mahajanga	-0,7500	0,1250	0,8750

Figure 4: Optimizing the preference index by ranking flows using the PROMETHEE method
Source: Author 2021

The districts of Soalala and Ambato Boeny have recorded the best baccalaureate exam results over the last five years in the Boeny region. This ranking suggests that young people in these localities pay more attention to their studies, despite still limited access to the internet and other related media. According to explanations given by some teachers and officials at the Office du Baccalaureate, part of the mediocre results of high school students can be attributed to social networks, in particular Facebook. This social network seems to captivate students considerably, distracting them from their studies, even during the baccalaureate exams. It's undeniable that platforms such as Facebook and Instagram have become an integral part of the daily lives of young Madagascans in big cities, who remain constantly absorbed by their phones. We have deepened our analysis of subsequent BEPC results.

4.2 BEPC results and the multimedia environment

Graphic 4 illustrates the decreasing ranking of the region's districts in terms of efficiency and performance related to the acquisition of IT resources. The six districts considered are Mahajanga I, Mahajanga II, Ambato Boeny, Marovoay, Mitsinjo and Soalala.



Graphic 4: Graphic illustration of BEPC results by district.
Source: Auteur 2021

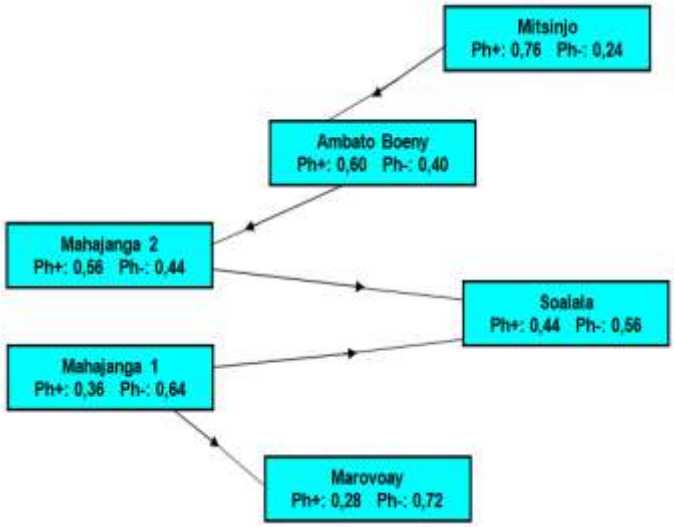


Figure 5: Evaluation and prioritization of districts based on BEPC exam results.
Source: Author 2021

Mahajanga, I has seen exponential growth in the number of BEPC exam registrants over the past five years, from 2016 to 2020 (Table 2). However, the results obtained show a decreasing trend compared to 2016, with success rates of 43.20% in 2016, 26.81% in 2017, 24.38% in 2018, 25.51% in 2019 and 34.82% in 2020. Although Mahajanga ville, as the capital of the Boeny region, benefits from a number of advantages such as climate, tourism, dynamic economic activity and various regular events, access to communications is easy. However, this could indicate that college students are not motivated in their studies. Certain environmental factors could influence their engagement, particularly at puberty age, when they may be more likely to reproduce what they see on ICT platforms such as Facebook and the Internet.

Soalala and Marovoay face economic, logistical and strategic infrastructure challenges. Although Marovoay is closer to Mahajanga, the exchanges and lifestyles of the young people have a number of similarities. However, Marovoay's BEPC exam results over the last five years are lower than those of Mahajanga I, while the Soalala district has achieved better results than Mahajanga I and Marovoay. These results suggest that progress in ICT learning in these districts is still limited. What's more, network coverage is unreliable, and the location of school infrastructure and the distance between school and home are factors that can hinder students' exam success, as most students have to travel a greater distance to get to school.

Mitsinjo, Ambato Boeny and Mahajanga 2 face problems related to road infrastructure, leading to the isolation of these regions and having a socio-economic impact on their local development. Network coverage is still unfavorable, making ICT use unreliable. Access to the Internet and social networks, particularly Facebook, is also limited. Although these regions face environmental problems, such as the distance of schools from villages, Mitsinjo has better BEPC results than the districts of Ambato Boeny and Mahajanga 2. Despite its proximity to Mahajanga 1, Mahajanga 2 shares similar school infrastructure problems with the other two districts. Overall, students in these regions are highly motivated by their studies, but the obstacles lie in the limited school infrastructure and means of communication.

The results of the PROMETHEE method, illustrated in Figure 5, show the overall ranking of the 6 districts according to student assessment and examination results over the last five years. Analyzing the preference indices for each criterion in the BEPC results, we found that the districts of Mitsinjo, Ambato Boeny and Mahajanga 2 had positive preference indices (Phi) of 0.5200, 0.2000 and 0.1200 respectively. These three districts are systematically ranked above the three districts of Soalala, Mahajanga 1 and Marovoay, which have negative preference indices (Phi) of -0.1200, -0.2800 and -0.4400, as shown in Figure 6. In summary, the review results for the last three districts show no preference, as their PROMETHEE feed results are all negative and the ranking follows the descending mathematical order.

Flux PROMETHEE

Ran	action	Phi	Phi+	Phi-
1	Mitsinjo	0,5200	0,7600	0,2400
2	Ambato Boeny	0,2000	0,6000	0,4000
3	Mahajanga 2	0,1200	0,5600	0,4400
4	Soalala	-0,1200	0,4400	0,5600
5	Mahajanga 1	-0,2800	0,3600	0,6400
6	Marovoay	-0,4400	0,2800	0,7200

Figure 6: Optimizing the preference index by ranking flows using the PROMETHEE method.
Source: Author 2021

The districts of Mitsinjo, Ambato Boeny and Mahajanga 2 have posted the best BEPC exam results over the last five years in the Boeny region. This ranking suggests that young people in these localities are more focused on their studies, as access to the Internet and other related resources is not as favourable, relegating ICT learning to second place in terms of study results. Overall, the impeding factors for the districts of Mitsinjo, Ambato Boeny, Soalala, Marovoay and Mahajanga 2 are linked to school infrastructure and socio-economic resources. However, in the Mahajanga 1 districts, school failure factors are better equipped in terms of various conditions such as behavioral situation, Internet access, games and integration into social networks.

V. DISCUSSION

The discussions raised crucial questions about the growing influence of media and technology on young people's lives. We have some important discussion points: Access to information: Digital media offer young people unprecedented access to a vast array of information and knowledge. However, it is essential to examine how this access can be used constructively to enrich learning and skills development.

Impact on learning: Multimedia technologies can play a significant role in the education of young people, offering interactive and engaging learning resources. However, it's also important to assess how excessive media use can affect students' concentration, motivation and academic performance.

Influencing behavior: Media, especially social networks and online games, can influence young people's behavior in terms of socialization, decision-making and self-esteem. It's crucial to examine how these influences shape young people's attitudes and values, and how they can be positively channeled.

Mental health risks: Excessive exposure to digital media can lead to mental health risks for young people, such as anxiety, depression and addiction. It's important to discuss strategies for managing media use, and to raise awareness of the signs of mental distress in young people.

Balance between online and offline life: It's essential to encourage young people to maintain a healthy balance between their online and offline lives, by promoting activities such as sports, creative hobbies and face-to-face interaction. This discussion can also address the challenges of peer pressure and social norms online.

We offer a valuable opportunity to understand the challenges and opportunities facing young people in an increasingly connected world. By critically examining these phenomena and encouraging responsible media practices, we can promote healthy, balanced development among young people.

VI. CONCLUSION

At present, we are convinced that the pandemic as well as the political and economic crisis, both global phenomena, are leading to a steady decline in the State's financial resources. This decline is reflected in a marked deterioration in families' means and in a lack of strategic focus, leading to a rapid deterioration in Madagascar's main school enrolment indicators. The Malagasy education system comprises five levels, namely literacy and pre-school, primary education, general secondary education (college and lycée), technical and vocational training, and higher education and scientific research (CREAM, 2013). In this context, the Boeny region is one of those where the educational level of the working population is relatively low, with significant proportions of people having had no training, primary, secondary or tertiary education. In terms of access to education, less

than half the population has reached primary level, and the proportions of those who have attended secondary and higher education are low, similar to the rest of the country. More than a third of the population remains uneducated, constituting a handicap, as improving productivity always requires a minimum level of education (CREAM, 2013).

That's why our objective has been fully achieved in terms of understanding the impact of ICT and its components on student learning in public, private and university establishments in the Boeny region. Indeed, the evolution of computer and digital culture has far surpassed the limits of certain levels of education and the knowledge of students' parents. To moderate the quality of ICT learning among young students in the region, we advocated a tripartite contribution involving parents, students and the institution. This approach highlights the different elements that contribute to the creation of sound computer thinking, mastery of IT tools and participation in social activities in an interconnected world. The transformation of the education system through the integration of ICT depends to a large extent on the commitment of the educational community. Thus, support for headteachers and teachers, reinforced by improving their ICT skills, is both an essential lever for the widespread use of ICT in the education system, and a logical and natural condition underpinning their long-term commitment.

It's important to stress that there are no good or bad social networks; only the judicious use of these platforms is important.

VII. REFERENCES

1. CREAM. (2013), Centre de Recherches, d'Études et d'Appui à l'Analyse Économique à Madagascar, Monographie région Boeny, p. 69, 128.
2. Fabrice Pirolli. (1998), Impact des nouvelles technologies sur le comportement des utilisateurs de systèmes de recherche d'information : application à la gestion électronique de documents, ENSSIB, université lumière de Lyon 2, p. 5.
3. Guibert, P. et Michaut, C. (2011), Le plagiat étudiant. Éducation et sociétés, 28(2), 149-163.doi : 10.3917/es.028.0149.
4. Jean Baptiste Rakotoarivelo, (2018), Aide à la Décision Multicritère pour la gestion des risques dans le domaine financier, Université Paul Sabatier Toulouse France, p 73.
5. Karsenti, T. (2002), L'alphabétisation et les technologies de l'information à l'aube du nouveau millénaire : nouvelle conception, nouvelles perspectives. Canadian Journal for the Study of Adult Education : Revue canadienne pour l'étude de l'éducation des adultes, 15(2), 37-60.
6. Mounir Dahmani et Ludovic Ragni (2009), L'impact des technologies de l'information et de la communication sur les performances des étudiants, Cairn.info, matières à réflexion, p.88.