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FINAL REPORT

"Status of Digital Education Infusion in Higher Education Institutions: a case study of Timor-Leste"

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ABBREVIATION

ICT	Information and Communication Technology
MHESC	Ministry of Higher Education Science and Culture
SEAMEO	Southeast Asian Minister of Education Organization
HEI	Higher Education Institution
ANAAA	Agencia Nacional para a Avaliação e Acreditação Académica
LMS	Learning Management System
TPACK	Technological Pedagogical Content Knowledge
UNESCO	United Nations Educational Scientific and Cultural Organization
TLNQF	Timor-Leste National Qualification Framework
UNTL	Universidade Nacional Timor Lorosa'e
UNPAZ	Universidade da Páz
UNDIL	Universidade de Dili
DIT	Dili Institute of Technology
IOB	Institute of Business
UNITAL	Universidade Timor Oriental
ISC	Instituto Superior Cristal
IPDC	Instituto Profissional de Canossa
ICS	Instituto de Ciências de Saúde
ISFIT	Instituto Superior de Filosofia e de Teologia
IFFS	Instituto Filosófico de São Francisco de Sales
JSI	João Saldanha Institute
UCT	Universidade Católica Timorense
ICFP	Instituto Católico para Formação de Professores
ETCI	East Timor Coffee Institute
IPB	Instituto Politécnico de Betano
IBTL	Instituto Boaventura de Timor-Leste
ISJB	Instituto de São João de Brito
ISC-Baucau	Instituto Superior Cristal - Baucau
ISC-Manufahi	Instituto Superior Cristal - Manufahi
IOB-Maliana	Institute of Business - Maliana
DIT-KREO	Dili Institute Technology – Klasse Rejional Enklave Oecusse
AIS	Academic Information System

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ABSTRACT

The development of higher education in the 21st century is growing significantly and the massification of higher education is also increasing due to population growth. The increasing number of student enrollments in Timor-Leste higher education also shares the same trend as those observed in its regional counterparts. Meanwhile, the demand in the quality assurance area also requires higher education providers in Timor-Leste to design curricula that caters to both national and global demands. Thus, ICT integration in education is one fundamental aspect for the country in meeting such a demand.

The study aims: i) to understand the current state of ICT development in Timor-Leste's higher education sector; ii) to measure the current progress of ICT development and implementation in higher education institutions, particularly for the enhancement of teaching and learning services. iii) to establish demographic characteristics of ICT development of higher education institutions; and iv) to produce a comprehensive report with key ICT development challenges facing the higher education institutions of Timor-Leste.

This research study uses a mixed method, both qualitative and quantitative approaches. The qualitative approach is based on structural interviews for selected educational leaders and managers. The interviews are conducted directly face-to-face and virtually, asking the interviewees' opinions on the concept and practice of ICT adoption in education, implementation, and the challenges and opportunities. The quantitative method is based on questionnaires for academic staff, course directors, faculties, and students designed to investigate the management experiences, satisfaction, and the availability of resources involved in the process of teaching and learning.

The study results show that based on the digital education infusion status, the institutions of higher education in Timor-Leste can be categorized into the following classification: i) EMERGING stage: ETCI, ICS, IBTL, ISC-BAUCAU, ISC-MANUFAHI, DIT-KREO; ii) APPLYING stage: DIT, IOB, ICFP, UNTL, ISFIT, UNPAZ, IPDC, ISC, UNDIL, UNITAL, IFFS, ISJB, IPB, JSI, UCT, IOB-MALIANA; None of the institutions are yet to be categorized into the two advance orders, namely the INFUSING AND TRANSFORMING stages.

Further research is required to re-examine the topic covering a larger sample of respondents, with a special focus on the dimensions of *Professional development for leaders and lecturers* as well as *Teaching and learning pedagogies*.

KEYWORDS: *emerging, applying, infusion, transforming, digital education*

1. INTRODUCTION

1.1. Rationale

The use of information and communication technology (ICT) in the education system has been quite massive not only in magnitudes but also in its wider impact on various sectors of the market. This impact requires advanced technological skills and resources to meet the demands it brought in. Meanwhile, many people still perceive that the changes brought about by technology have detrimental effects that outweigh their positive impacts on society. However, there is a sheer number of people that consider ICT to provide great positive ramifications for shaping the current society. This dichotomy, however, persists among professionals and experts in the educational sphere. It is relatively noticeable that ICT is fast growing and continues to transform the way information is managed and shared, as the implementation of the educational system and its pedagogy in society. Ananiadou and Claro (2009) affirm in their study that the integration of ICT in the educational system has changed the way the teaching and learning processes is taking place in the classrooms. Furthermore, the skills required in the 21st century for the young generation are the competencies that are essential for the new form of emerging economic and social development models (Ananiadou & Claro, 2009, p. 5). Adding on the competency requirement for the current epoch, skills such as accessing and using reliable information are greatly enhanced by ICT. Baneres et al. (2022) exemplifies that ICT use in the learning process may become an important tool for students to engage more actively since it becomes easier for them to access information, generate discussion, and track the progress of their learning (Baneres, Guerrero-Roldán, & Rodríguez , 2022, p. 2). Although, there are still some debates about whether technology should take the place of traditional education and take the role of the teacher. Teachers still play a crucial role to facilitate and guide students in using ICT to achieve their required competencies. In the same way, the teacher could access a variety of tools to assess and track students' progress more effectively (Baneres et. al., 2022, p. 2).

Timor-Leste, a country born in the 21st century faces a key challenge of whether or not to leapfrog by using (digital) technology in its educational system, particularly the tertiary education providers. This is further evident with the Ministry of Higher Education, Science and Culture (MHESC) being granted observer status in the Southeast Asian Minister of Education Organization (SEAMEO) and has since been actively participating in all the activities and programs concerning the adoption of ICT organized by the SEAMEO (Anderson, 2010). After the covid-19 pandemic, many of the higher education institutions

(HEIs) in Timor-Leste are becoming accustomed and continuously opt to conduct teaching and learning using virtual platforms blended with face-to-face meetings as reported by the National Agency for Academic Assessment and Accreditation (ANAAA, 2021). However, with this radical transition and without putting careful consideration on the skills and resources, such an attempt may in turn cause detrimental effects on the teaching and learning process itself. Proper planning and training on digital skills for academic staff are paramount to avoid the negative ramification of adopting the approach. Hence, this study aims to examine the current condition of ICT integration in education by HEIs in Timor-Leste. This study is expected to address some theoretical background of adopting ICT for education, as well as the challenges and opportunities that may shed light on a further strategic approaches for the enhancement of quality education in the future.

1.2. Review of Literature

The ICT is a common term that encompasses all other terms about modalities such as communication and application, which include radio, television, mobile phones, computer, satellite system, networking of hardware and software, and other associated systems for video-conferencing and distance learning (Shende & Reddy, 2020). Studies on ICT integration in education believe that students have great access to various sources of learning resources and increase their engagement in the learning process, which is not only limited to the school areas but also can learn at their own pace. As Shende et. al (2020) describes that with various ICT modals, students perceive more engagement and proactive in their learning process. Not only do they have access to various technological tools, but they are also more motivated and demonstrate higher order of thinking in analyzing complex issues (Shende et. al., 2020, p. 153). The HEAD Foundation (2017) further confirms that integrating ICT into education improves the management process of education more effectively. It becomes more effective when tools like Learning Management System (LMS) and MOOCs are utilized to monitor the learning progress of the students. Such information may provide valuable data for the teacher to design lessons according to students' needs, as well as for educational leaders to have appropriate policies for their educational goals (The HEAD Foundation, 2017; Fu, 2013).

1.2.1. ICT Vision

Hinton (2012) in her article "A practical guide to strategic planning in higher education" argues that a vision statement is crucial for an institution to guide its strategic plan because it provides descriptions of the goals the institution intends to achieve in a certain period (Hinton, 2012)**.** Likewise, ICT vision is an integral part of digital education implementation in the educational landscape. Thus, it forces the educational actors to decide on the necessary policies and plans that will enable ICT to be integrated into their educational system. As consequence, it drives an effective transformation in the educational management system aided by the integration of ICT (SEAMEO, 2010).

In the Timor-Leste context, the government through the MHESC has laid out its strategic policies, which intends to enhance the quality of education in higher education institutions (MHESC, 2020). However, there are no clear policies presented concerning the integration of ICT into the higher education system.

1.2.2. Policy Consideration

Bringing about ICT into the teaching and learning from the HEIs policy-making point of view requires a degree of understanding in terms of the investment in ICT cost-effectiveness. This further requires coherence planning so that ICT not only facilitates the administrative system but also enhances the ultimate goals of the institutions by providing a good quality education for learning (Ng, Miao, & Lee, 2010). They added that for policymakers to decide on how ICT can be integrated into the educational system, much consideration has to be made on the educational goals, both at the national and institutional levels. This is crucial since it provides a strong rationale and strategic actions that will lead the educational leaders to decide on what ICT is appropriate and necessary to be brought on board (Ng et. al., 2010).

The educational leaders' knowledge in the digital world is paramount to translating policy into action. As explained by Arnold and Sangra (2018) that since educational leaders are the key actors in determining decisions and directions, they should be able to provide their peer with what access and appropriate resources are necessary and how to be innovative in achieving their goals (Arnold & Sangra, 2018). In light of this, for an institution to have an effective implementation in their educational ethos, the institutions have to have an integrated organizational structure for ICT to work. Greater achievements in the integration of ICT in an

organization can be met only if the IT services are appropriately aligned with the organizational strategies (Byungura, 2019).

1.2.3. Infrastructure and Resources

Integration of ICT into the education system requires considerable investment in terms of financial and human resources. Proper design of spaces and physical settings of ICT infrastructures such as power supply, server, computer room, networking, wireless hubs, and other associated software is crucial for its implementation (SEAMEO, 2010; Shende et. al., 2020). The infrastructure itself may not guarantee the success of ICT implementation. It requires competent and committed human resources to enable the effectiveness of those infrastructures in meeting the institutional necessities (Ng, et. al, 2010).

This is where the technological mapping in terms of the infrastructure is required to be considered by the institution. Angeli et. al. (2015) describes this process as an effort to establish technological tools that best feed the needs of the teachers to teach and deliver learning content in the best possible way (Angeli et. al., 2015). They further explain that due to the rapid development of digital tools for business and individual entertainment, institutions are challenged to assess and select the type of technological tools that best enhance the pedagogical purpose (Angeli et. al., 2015). This is where the assessment of tools in the institutions is crucial to determine the infrastructure that supports the learning process of the students.

Since teaching and learning are changing drastically, there are several aspects, which require careful consideration when selecting infrastructure for educational purposes, whether they are used for teaching purposes only or for generating students learning process. Shende et. al, (2020) classify technological tools used in education in four different ways such as computer-aided, computer-based, internet-based, and software-based (Shende et. al., 2020). These four ways are essential for the institutions to reflect when adopting ICT infrastructures into their educational program.

Best practice from other countries such as in Southeast Asia suggests that ICT development in education involves great support from the government. In the case of Malaysia, Singapore, and the Philippines, the government provides much support in terms of both ICT infrastructure and finances, while the management of this contribution is left at the expense of the institutions (SEAMEO, 2010; Ng et. al. 2010).

In the Timor-Leste context, the expenditure on public education remains a challenge. Since 2015, the government budget allocated to education declined to around 11% of their annual budget (Patrinos, 2015) and further down to 10% in the 2019 budget (Chen, 2020). During the COVID-19 period, the higher education institutions of Timor-Leste are in dire need of a reliable telecommunication and information technology infrastructure to enable the institution to leapfrog onto digital learning (Chen, 2020). Thus, for the government of Timor-Leste to adhere to the Incheon Declaration, Education 2030 for the regional benchmark of 15-20% educational budget requires great political will (Patrinos, 2015).

1.2.4. Curriculum and implementation

The MHESC of Timor-Leste has recently issued a Decree Law on higher education curriculum DL - N^{o}.3/2022, 12th January, which establishes a minimum of 55% contact hours out of the total students learning hours while the rest of the learning hours are allocated for autonomous study (MHESC, 2022). The autonomous study under this curriculum framework has remained unclear on whether to be left under the stewardship of the institutional leaders to initiate. Meanwhile, a report suggests that higher education institutions in Timor-Leste are out of the privilege to carry out teaching and learning processes using digital technology, which is commonly adopted by other universities worldwide (Chen, 2020).

The extent of using technology in school curricula has varied in terms of its purpose and implementation. Shende et. al. (2020) identify the level of technology usage in five different levels such as presentation, demonstration, drill and practice, interaction, and collaboration (Shende et. al., 2020). They further add that the use of the Learning Management System (LMS) and other web tools have also been a great advantage for interactive and collaborative learning among students and teachers (Shende et. al., 2020). To support this argument, Fu (2013) exemplifies that ICT integration in education should consider all the teaching methods to achieve the learning outcomes for the students (Fu, 2013).

Anderson (2010) explains that for ICT to transform the culture and pedagogical practice, it must be integrated within the curriculum and the subject content systematically. Furthermore, for this transformation to be in effect, the supporting technological tools should be made accessible such as the use of a learning management system, software for simulation and modeling, networking, and tools for interactive activities (Anderson, 2010). Likewise, students are also able to share, communicate and collaboratively work with their peers even

with those in other parts of the world. Through this, students may learn about other experiences from other countries (Fu, 2013).

There are still some arguments among educational experts that integrating ICT into the curriculum should not take the place of the traditional way of learning. It challenges institutional resources in finding ways that best facilitate students to engage in their learning. As emphasized by Anderson (2010) a blended method or blended learning can be utilized to cater to both online and traditional ways in a curriculum structure (Anderson, 2010). However, to make this combination into the pedagogic environment, institutions need to take into consideration whether teachers are competent enough to design lessons with such an approach. Angeli et. al. (2015) emphasize that further knowledge is required of teachers to be competent, and thus is called the knowledge intersection among technology, pedagogy, and content (TPACK) (Angeli et. al., 2015). They further extrapolate that with the competency in the TPACK model, teachers are becoming capable of producing effective teaching and learning (Angeli et. al., 2015). Thus, teachers' professional and technological skills should be paramount for continuous career enhancement (UNESCO, 2018).

1.3. Problem Statement

This research study aims to find out **"what is the stage of ICT integration in the higher education institutions in Timor-Leste?"** The study will describe the principles of digital education and its potential impact on the enhancement of quality education. It is pertinent to focus on this since the use of ICT for the advancement of quality education is at the heart of Timor-Leste's National Qualification Framework (TLNQF) and the 2011-2030 National Strategic Development Plan (NSDP) considered as guiding principles orienting the process of teaching and learning.

In light of this problem statement, the initiative that the study aims to develop involves literature research on perspectives of ICT integration in education (Anderson, 2010) and Teaching, Pedagogic, Content, Knowledge (TPACK) (Ali Bostancıoğlu & Zoe Handley, 2018), as well as of those identified by other studies. The literature has revealed the critical components of ICT integration in education and this study will identify the key challenges and strategic measures for the development of ICT in education and the current conditions and efforts being made in terms of ICT progress in HEIs of Timor-Leste.

1.4. Objectives

In the context of modernizing the education sector of Timor-Leste as stipulated in the National Strategic Development Plan (NSDP) and the Education Strategic Development Plan of Timor-Leste 2011 – 2030, this study aims, upon conclusion, to achieve the following objectives:

- To understand the current state of ICT development in Timor-Leste's higher education sector.
- To measure the current progress of ICT development and implementation in higher education institutions, particularly for the enhancement of teaching and learning services.
- To establish demographic characteristics of ICT development of higher education institutions.
- To produce a comprehensive report with key ICT development challenges facing the higher education institutions of Timor-Leste.

1.5. Significance of Study

The development of higher education in the 21st century is growing significantly and the massification of higher education is also increasing due to population growth. The increasing number of student enrollments in Timor-Leste higher education also shares the same trend as those observed in its regional counterparts. Meanwhile, the demand in the quality assurance area also requires higher education providers in Timor-Leste to design curricula that cater to both national and global demands. Thus, ICT integration in education is one fundamental aspect for the country in meeting such a demand, by **facilitating teaching and enhancing learning.** Arguably, opting for ICT in education may not only mitigate the swarming of the physical classrooms as experienced greatly by some of the higher education institutions in Timor-Leste, but it also provides broader accessibility and opportunities for learning outside the classroom (UNESCO, 2016, p. 73). In the meantime, during the post covid-19 surge in Timor-Leste, many of the higher education institutions have ever been accustomed to and continue to conduct the teaching and learning process virtually despite their ill-preparedness to take up the approach (Chen, 2020). However, such an ambitious move without devising the skills and resources necessary for academic staff to take on such tasks may, in turn, cause some detrimental effects on the teaching and learning process. Proper planning and training on digital skills are necessary on this issue thus the negative ramification of this could be avoided (UNESCO, 2016, p. 32).

As such, this study is crucial and is expected to inform the educational actors in Timor-Leste to take necessary measures before adopting ICT into education and on the commitment that it does not erode the quality of education.

1.6. Organization of the Study

This study is based on the ICT integration in education model established by Jonathan Anderson (2010) in measuring the state of ICT development in education in Southeast Asian countries. There are four stages used to indicate the development process namely emerging, applying, infusing, and transforming (Anderson, 2010, pp. 31-32). Anderson (2010) emphasizes that this model of progress has received high credentials in Southeast Asian countries and had been used by several countries in the region to track their progress in terms of ICT adoption. He further elaborates on two broad components that engulf and become critical to the four stages namely technology and pedagogy (Anderson, 2010).

In addition to these four stages, there are ten dimensions developed by SEAMEO (2010) complemented by a matrix of indicators that will be utilized to assess the availability and accessibility of each of the ten dimensions against the four stages in terms of ICT integration in education. The ten dimensions range from the ICT vision, policies, infrastructure, curriculum and implementation, assessments, and research (SEAMEO, 2010, p. 7).

The technology and pedagogical content knowledge (TPACK) of Shulman (1986) as cited by Bostancıoğlu et. al. (Bostancıoğlu & Handley, 2018) is also used to guide this study, particularly on the level of ICT implementation for teaching and learning purposes, as experienced by the academic staffs and students (Bostancıoğlu et. al., 2018). The findings will be linked to the metrics of the corresponding dimension of ICT integration in education for further categorization.

2. METHODOLOGY

2.1. Research Methodology

The methodology used for this research study is a mixed method (both qualitative and quantitative). The qualitative approach is based on structured interviews with all educational leaders and managers. The interviews were conducted both face-to-face or/and through virtual platforms, and asking their experiences in terms of ICT integration into their educational system, including the current implementation, the challenges, and opportunities. On the other hand, the quantitative approach uses questionnaires for academic staff, course directors, faculties, and students, designed to investigate the management experiences, satisfaction, and the availability of ICT resources to facilitate the teaching and learning process. As the sample size for the quantitative data collection was not representative of the whole population from each institution, a statistical treatment of the data was not possible. The quantitative data, therefore, was merely used as a crosscheck indicative against the opinions provided by the institutions' top management.

2.2. Population and sampling

The population as well as the sampling of this study covers all 18 accredited higher education institutions (HEI) and the 4 accredited satellite campuses in Timor-Leste, situated both in the urban and rural areas. There are 13 (thirteen) HEIs located in an urban area (DILI): UNTL, UNPAZ, UNDIL, DIT, IOB, UNITAL, ISC, IPDC, ICS, ISFIT, IFFS, JSI, and UCT. Meanwhile, there are 9 (nine) HEIs located in rural areas (outside DILI), 5 (five) accredited HEIs, and 4 (four) satellite campuses: ICFP, ETCI, IPB, IBTL, ISJB, ISC-Baucau, ISC-Manufahi, IOB- Maliana, and DIT-KREO.

The contributors to the qualitative data are mainly the head of the institutions such as Rectors or Vice-Rectors, making up a total of 22 respondents from 22 institutions. Respondents for quantitative data compose of 2 respondents from each institution under the category of administration and management unit, 10 respondents from each institution in the faculty member's category, and 10 from the student category. The selection of the students is made in the following categories: 3 students selected from the early semester (semesters 1 to 3), 3 students selected from middle semesters (semesters 4 to 6), and 4 students representing the final year students (semesters 7 and 8). The list of higher education institutions and satellite campuses is presented in the Table below.

Table 1. List of Higher Education Institutions of Timor-Leste, 2022

STATUS	INSTITUTIONS
Public Institution	1. Universidade Nacional Timor Lorosa'e (UNTL) 2. Instituto Politécnico de Betano (IPB) – *in the accreditation process*
Private institution under Diocesan management	3. Instituto Profissional de Canossa (IPDC) 4. Instituto Católico para a Formação de Professores (ICFP) 5. Instituto Superior de Filosofia e de Teologia (ISFIT) 6. Instituto Filosófico de São Francisco de Sales (IFFS) 7. Instituto São João de Brito (ISJB) – *in the accreditation process* 8. Universidade Católica de Timor (UCT) – *in establishment process*
Private institution under Foundation management	9. Universidade da Paz (UNPAZ) 10. Universidade Oriental Timor Lorosa'e (UNITAL) 11. Universidade de Díli (UNDIL) 12. Dili Institute of Technology (DIT) 13. Institute of Business (IOB) 14. Instituto Superior Cristal (ISC) 15. East Timor Coffee Institute (ETCI) 16. Instituto de Ciências de Saúde (ICS) 17. João Saldanha Institute (JSI) – *in the accreditation process* 18. Instituto Boaventura Timor-Leste (IBTL) – *in the accreditation process*
Satellite Campuses	19. ISC – BAUCAU 20. ISC – MANUFAHI 21. DIT – KREO 22. IOB – MALIANA

2.3. Data Collection

2.3.1. Qualitative Data

This study has utilized a convergent parallel design method where qualitative and quantitative data collection and analysis are compared first prior to arriving at the interpretation of the research topic. Both approaches are crucial for this study since the respondents under the two approaches are those people who are directly experiencing and involved in the use of ICT in their academic institutions. The qualitative data collection uses a structured interview with the head of the institutions representing the top management. The interview schedule for qualitative data collection is carried out through the existing National Agency for Academic Assessment and Accreditation (ANAAA)'s line of coordination. A direct interview (face-to-face) is carried out with 16 higher education leaders, comprising Rectors, Vice-Rectors, and School Coordinators. The institutions directly attended the face-to-face interview were UNTL, UNPAZ, UNDIL, UNITAL, UCT, DIT, IOB, ISC, ICS, IPDC,

ISFIT, IFFS, ETCI, ISJB, IBTL, ISC-Manufahi, and JSI. Four other institutions were interviewed virtually using *zoom,* namely IPB, ISC-Baucau, IOB-Maliana, and DIT-KREO. ICFP was the only institution that provided written interview feedback based on the set of questions provided. All the interview sessions were documented using recording devices, and only the interview with DIT experienced a technical failure in the recording session. To mitigate this failure, an information note was presented in word format to DIT for review and comments.

2.3.2. Quantitative Data

To complement the qualitative data, questionnaires were also distributed to the HEIs targeting administrative & management staff, academic staff, course directors, lecturers, and students through the intuitions' Internal Quality Assurance (IQA) units. A majority of filled-in questionnaires were collected and submitted to the research team. The questionnaires for the top management, faculty members, administration staff, and students are presented in *Annexes 1a, 1b, 1c, and 1d*, respectively.

During the collection of the data, only 20 HEIs were able to complete the questionnaires for students and two institutions failed to submit the data. In terms of qualitative data gathered from the part of the faculty, 21 HEIs complete the data, while for the administrative and management parts, 4 out of 22 institutions were unable to complete the questionnaires. Thus, only the questionnaires from seventeen (17) higher education institutions were taken into account in this study.

3. DATA ANALYSIS AND PRESENTATION OF THE FINDINGS

3.1. Data Analysis

The analysis of the interview data is carried out using a thematic analysis approach. The information data of each institution is assessed and categorized according to the stages of ICT in education development progress (SEAMEO, 2010) as shown in Table 2.

Table 2. Stages of ICT infusion in Education

Emerging	Those who have just started their ICT in education journey
Applying	Those who have developed a new understanding of the contribution of ICT to learning
Infusing	Those who have integrated ICT into existing teaching, learning, and administration.
Transforming	Those who have used ICT to support new ways of teaching, learning, and administration.

To further understand the development level of ICT in education for each of the institutions, ten dimensions of SEAMEO (SEAMEO, 2010) are used to assess the data, before categorizing them into each of the four stages. The ten dimensions considered in this study include:

- National ICT in education vision
- National ICT in education plans and policies
- Complementary national ICT and education policies
- ICT infrastructure and resources in schools
- Professional development for teachers and school leaders
- Community/partnerships
- ICT in the national curriculum
- Teaching and learning pedagogies
- Assessment and
- Evaluation and research.

The descriptors for each dimension (*Annex 2a and 2b)* are used to analyze the data from the interview and the questionnaires. Since the HEIs in Timor-Leste have distinct demographic, geographic, and economic concerns, they may present different characteristics in terms of efforts to develop ICT in education. For this reason and the convenience of the discussion, the institutions are grouped into institutional accreditation status administered by the National Agency for Academic Assessment and Accreditation (ANAAA, 2021) as presented in Table 3.

Table 3. Grouping of Higher Education Institutions based on accreditation and establishment status.

Grouping based on accreditation and establishment status	Institutions
A - Accreditation A or equivalent	IOB, UNTL, DIT, ISFIT
B - Accreditation B or equivalent	ICFP, UNPAZ, IPDC, ISC, UNITAL, UNDIL
C - Accreditation C or equivalent	ETCI, ICS, IFFS
D - New institutions	ISJB, IPB, IBTL, JSI, UCT
E - Satellite campuses	ISC-Baucau, ISC-Manufahi, IOB-Maliana, DIT-KREO

The results from the qualitative and quantitative research covering interviews with the top management representatives and questionnaires distributed to students, staff, and faculty members from all the higher education institutions including the satellite campuses are presented in Table 4.

Table 4. The HEIs of Timor-Leste based on the digital education status by dimension in 2022

No.	Dimension	Emerging	Applying	Infusion	Transformative
1	*ICT vision*	ISC-BAUCAU, DIT-KREO, IBTL, ISC-MANUFAHI	UNDIL, UNITAL, ISC, IPDC, IFFS, ETCI, DIT-KREO, JSI, ICS, ISJB, IOB-MALIANA, ICFP	DIT, UNTL, IOB, IPB, UNPAZ, UNTL, IPDC, ISFIT, UCT	
2	*ICT in education plans & Policies*	IBTL, ISC-MANUFAHI, DIT-KREO, ICS	UNDIL, UNITAL, ISC, UNTL, IFFS, ETCI, JSI, ISC-BAUCAU, IOB-MALIANA, ICFP	DIT, UNPAZ, IOB, IPB, IPDC, ISFIT, UCT, ISJB, ICFP	
3	*Complementary ICT & Education Plan*	ISC-BAUCAU, DIT-KREO, IBTL, ISC-MANUFAHI, ETCI, DIT-KREO, IOB-MALIANA, ICS, UNDIL, UNITAL,	DIT, UNPAZ, ISC, IOB, UNTL, IPB, ISFIT, UCT, ISJB, IPDC, IFFS, JSI, ICFP		
4	*ICT Infrastructure & resources in HEI*	JSI, ISC-BAUCAU, ICS, IBTL, ISC-MANUFAHI, ISJB	DIT, UNDIL, UNPAZ, UNITAL, ISC, IOB, UNTL, IPB, IPDC, ISFIT, IFFS, ETCI, DIT-KREO, JSI, UCT, IOB-MALIANA, ICFP		
5	*Professional Development for leaders & Lecturers*	UNDIL, UNITAL, UNTL, IFFS, ETCI, DIT-KREO, JSI, ISC-BAUCAU, UCT, IBTL, ISC-MANUFAHI, IOB-MALIANA	DIT, UNDIL, UNPAZ, UNITAL, ISC, IOB, UNTL, IPDC, IPB, ISFIT, DIT-KREO, JSI, ICS, UCT, ISJB, IOB-MALIANA, ICFP		
6	*Community & Partnership*	UNITAL, UNTL, ETCI, JSI, ISC-BAUCAU, ICS,	DIT, UNTL, UNDIL, UNPAZ, ISC, IPB, IPDC, ISFIT, IFFS,	DIT, UNPAZ, IOB, UNTL, IPB, ICFP	

		IBTL, ISC-MANUFAHI, DIT-KREO,	UCT, ISJB, ICFP		
7	*ICT in curriculum*	DIT, UNDIL, UNPAZ, UNITAL, ISC, IOB, UNTL, IPDC, ISFIT, IFFS, ETCI, DIT-KREO, ISC-BAUCAU, ICS, UCT, ISJB, IBTL, ISC-MANUFAHI	DIT, UNDIL, ISC, UNPAZ, IOB, UNTL, IPDC, ISFIT, IFFS, DIT-KREO, JSI, IPB, UCT, ISJB, IOB-MALIANA, ICFP		
8	*Teaching & learning pedagogies*		ETCI, UNITAL, ICS, IBTL, ISC, ISC-BAUCAU, ISC-MANUFAHI	DIT, UNDIL, UNPAZ, UNITAL, IOB, ISFIT, IFFS, UNTL, IPB, IPDC, JSI, UCT, ISJB, IOB-MALIANA, ICFP	
9	*Assessment*		DIT, UNPAZ, IOB, UNTL, IPB, ISFIT, IFFS, ETCI, DIT-KREO, JSI, UCT, ISJB, IOB-MALIANA, UNDIL, UNITAL, ISC, ISFIT, DIT-KREO, ISC-BAUCAU, ICS, IBTL, ICFP.		
10	*Evaluation & Research*	UNITAL, ETCI, DIT-KREO, JSI, ISC-BAUCAU, ICS, IBTL, ISC-MANUFAHI	DIT, UNDIL, IPB, UNPAZ, UNTL, ISC, IOB, IPDC, ISFIT, IFFS, UCT, ISJB, IOB-MALIANA, ICFP		

The qualitative data analyses on the **ICT vision** dimension suggest that the majority of the institutions fall into the applying stage while four institutions from Group A (DIT, IOB, UNTL, and ISFIT) are moving towards the infusion stage together with two institutions from Group B (UNPAZ and IPDC) and two institutions from Group D (UCT and IPB). This evidence is also confirmed by feedback gathered from students and faculty members through questionnaires with a confirmation rate ranging from 63% - 100%, respectively for group A, B, and D members abovementioned. None of the institutions are yet to be categorized within the transformative stage.

For the dimension of **ICT in education plans and policie**s, DIT, IOB, and ISFIT from group A and IPDC and ICFP from group B are considered in the infusing stage. Although they are newly established, ISJB, IPB, and UCT from group D are starting to provide solid grounds in terms of ICT in education plans and policies as the institutions are on the same pace as those institutions from group A and B for this dimension. The rest of the institutions for this dimension are still at the applying stage. Most of the faculty and students from groups

A, B, and D, are aware of such plans and policies being implemented in their institutions, as revealed by their feedback.

As for the **complementary ICT and education plan,** the results reveal that most of the group A members are in the applying stage alongside the group B members, excluding UNITAL and UNDIL. Meanwhile, the majority of group D members also share the same stage as groups A and B, and only one member (IBTL) remains at the emerging stage. The majority of the HEIs from groups C and E are also still in the emerging stage. One indication from this dimension is that for the institutions to have an effective implementation of this dimension, it needs further support from the national ICT policy and education policy of the country.

The majority of higher education claims that although there may be a policy or plan in place at the institutional level, connectivity and accessibility remain a challenge to implementing the policies and plans effectively. As expressed by one of the institutions, although the institution has invested quite a lot in ICT infrastructures, the Internet connection and the reliability of the state power grid hamper the implementation of the ICT plan. This dimension requires a larger scale of coordination among different sectors from the state and the institutions to have policies that complement one another.

Proper **ICT infrastructure and resources** in HEIs is a necessary conditions for ICT to mediate teaching and learning. This condition should not be limited only to the classrooms or in the school premises but should be extended beyond the institutional premises. For this particular dimension, the majority of the institutions are largely dispersed between the emerging and applying stages. None of the groups are yet to make it to the infusing and transforming stages.

Group A members (DIT, UNTL, and IOB) still show similar trends as the previous dimension in terms of ICT infrastructure and resources in HEI together with all the HEIs from group B and two from group D members (except JSI and ISJB) that fall into the applying stage. One of the group D members (ISJB) although still in the emerging stage, starts moving toward the applying stage in terms of some of the ICT applications. Meanwhile, the majority of the group E members remain at the emerging stage and only one institution (IOB-Maliana) is moving to applying stage.

The characteristic of ICT infrastructure is not limited only to the availability of computers and the Internet but the accessibility and effectiveness of these components to

support teaching and learning. As evidence of this, students and faculty members confirmed that current ICT service in their education area in terms of accessibility and quality of networking remains a challenge. Quantitative data shows that around 76% of the faculty members are having difficulties accessing the Internet, while the student feedback data suggest that the effectiveness and its connectivity are only around 26%. Moreover, data from students also indicate that they have easier access to the physical library (88%) than to the online library (43%). More than 50% of the students are not aware of or do not agree with whether there is an online library in their institutions.

None of the HEIs are revealed to be at the infusing and transforming stages concerning the **professional development of leaders and lecturers.** Although there seems to be a breakthrough shown from the group B members (UNPAZ, ICFP, and ISC) and one from group D members (IPB) that currently have professional development program for their faculty members, it seems that the focus of the training is yet to emphasize on teaching with ICT modalities. The results from the interview also revealed that most of the institutions only began to teach with ICT modalities virtually during the Covid-19 period. Otherwise, most of their lesson presentations were heavily concentrated on face-to-face or classroom-oriented. Student feedbacks affirm this condition as 85% agree that all the lessons are oriented and delivered in the classroom. Meanwhile, a few faculty members (slightly over 30%) attest that they have been provided with continuous training while around 60% of them are not aware of such training. Due to such conditions, the majority of the group members are still falling within the applying stage while a large number of them remain at the emerging stage under this dimension.

For **community and partnership**, three of the group A HEIs (DIT, IOB, and UNTL), two HEIs from group B (UNPAZ and ICFP) and one from group D (IPB) are progressing towards the infusing stage. Only IOB from group A is considered to be fully developed into the infusing stage, while the rest partially appear also in the applying and emerging stages. The group E members are considerably making up the configuration of the emerging stage.

The **ICT in the curriculum** dimension seems to foresee another great challenge for all the HEIs. The data uncover that most of the five group members are dispersed only across the first two stages, the emerging and applying stages. Despite this dispersion, the majority of the group A members (DIT, IOB, and UNTL) are starting to infuse ICT in their curriculum and to integrate the ICT as a learning strategy in some of the subjects for the student to engage in problem-solving (SEAMEO, 2010). One of the factors that may be the cause for

this dispersion is the fact that ICT is included in the curriculum as a separate subject. Hence, the study results indicate that the majority of HEIs in the five groups are still categorized either in the emerging or applying stage. Faculty members when asked whether there is any official platform used to facilitate the teaching and learning process, less than 50% confirm the existence of a learning management system (LMS) in their institutions. On the part of the students, around 53% agree that ICT is still considered a stand-alone subject or compulsory for them to take, and only 34% agree to adopt an LMS in their institutions.

In terms of efforts to integrate **ICT in teaching and learning pedagogy**, most of the five group members are in either the applying or infusing stages. All the group A members are falling into the infusing stage at this dimension, similar to the group B members, excluding ISC. Four out of five members from group D (ISJB, IPB, JSI, and UCT) are also revealed to be at the infusing stage, together with one each from group C (IFFS) and group E (IOB-MALIANA). HEIs at the applying stage are UNITAL, ISC, ETCI, ICS, IBTL, ISC-MANUFAHI, and ISC-BAUCAU (from groups B, C, and D respectively).

The results on the ICT dimension of **assessment** reveal that all of the HEIs fall into a single category only, which is the applying stage. As evident from the interviews' data most of the assessment is either teacher-based assessment, skill-based and relatively around the subjects. The study results also show that none of the assessments is done by integration with ICT and students do not use ICT to monitor the learning progress of their learning as suggested by SEAMEO (SEAMEO, 2010). Feedback provided by the faculty members suggested that only 39% agree to administer online assessments for students. Further investigation is required to unearth whether this assessment utilizes an assisted computer to assess students' performance or to develop exam items that are unclear at this stage.

The last dimension of ICT in education is **evaluation and research**. The data demonstrates a significant number of HEIs considered to be within emerging and applying stages. Only one HEI from group A (DIT) is believed to be moving into the infusing stage with the research on ICT that they are having with Telkom University. However, the frequencies and usability of such efforts remain contested at this stage. The rest of the group A members (IOB, UNTL, and ISFIT) remain at the applying stage. Five members of group B (UNPAZ, ICFP, IPDC, ISC, and UNDIL) are all set at the applying stage while one of its members (UNITAL) is left at the emerging stage. Representing group C, IFFS is in the applying stage, while the other two members are still in the emerging stage. Categorized into the applying stage from group D are ISJB, IPB, and UCT, while the other two members IBTL

and JSI are still at the emerging stage as they are yet to conduct any evaluation and research in terms of ICT integration into their curriculum. From the group E members, only IOB-MALIANA is moving to the applying stage while the rest of the members (ISC-BAUCAU, ISC-MANUFAHI, and DIT-KREO) are still in the emerging stage.

Summing up the research data from the interviews and questionnaires the stages of digital infusion in the HEIs can be drawn into the following summary as shown in the table below.

Table 5. The HEIs of Timor-Leste and the stages of digital education infusion in 2022

Emerging	ETCI, ICS, IBTL, ISC-BAUCAU, ISC-MANUFAHI, DIT-KREO
Applying	DIT, IOB, ICFP, UNTL, ISFIT, UNPAZ, IPDC, ISC, UNDIL, UNITAL, IFFS, ISJB, IPB, JSI, UCT, IOB-MALIANA
Infusing	*None*
Transformative	*None*

The approach used by the research team to arrive at the results shown in the above Table is firstly by counting the number of times a respective institution appears in each of the dimensions being applied. If an institution appears in more than five dimensions in a particular stage, then the institution is categorized within that particular stage. Secondly, if an institution appears at equal times in two stages adjacent to one another, means that the institution is not fully integrated into the upper stage, and thus is still regarded to be within the lower stage.

3.2. Discussion of the results

The study aims to have an in-depth understanding of the stage of ICT infusion in higher education institutions in Timor-Leste. The research team has made an effort to comprehend the level of status and progress made by each institution in integrating ICT as an added value in teaching and learning. At the same time, it also attempts to observe how higher education institutions effectively utilize modalities of ICT to enhance the quality of education provided.

The methodology and framework adopted in this study have been utilized earlier by SEAMEO (SEAMEO, 2010), with a focus to examine ICT integration in all schools in Southeast Asia, including Timor-Leste. The study revealed that the Timor-Leste education

sphere in the sense of ICT integration in all the schools at the national level is considerably still at the emerging stage, the lowest of the four stages. There has been no further study with a similar approach being made to assess the progress in the last decade. The information on ICT integration in the higher education institutions in Timor-Leste has also been very limited. Thus, the research team has taken this opportunity to explore and assess the gap by focusing on the progress made by the higher education institutions by adopting the ICT infusion framework developed by UNESCO (SEAMEO, 2010) and its ten dimensions. The following discussion will present an overall understanding of the stage of each institution based on the results of this study.

3.2.1. ICT stages and Dimensions

Having an ICT vision for an institution is a crucial aspect for both internal and external stakeholders to share a common goal. It guides the leader and the management level to draw policies that enable the institution to have a direction in achieving its goals. As emphasized by the SEAMEO (SEAMEO, 2010) a vision for ICT in education will serve as an instrument for institutional leaders and education actors to plan effectively in using ICT to enhance and achieve their educational goals, through clear and informed policies and practices in their educational system.

The study results shown in Table 4 indicate that all group A members (IOB, UNTL, DIT, ISFIT) clearly express that there is an ICT vision to guide their ICT development in the institution. For instance, IOB, UNTL, and DIT are planning to digitalize the management system, and the teaching-learning process, as well as communication system, to be managed digitally. The majority of the institutions are becoming aware of having an ICT embedded in their institutional vision and this includes two members from group B (UNPAZ and IPDC) and two members from group D (IPB and UCT). All these institutions are considered to be moving into the infusion stage, while the majority of them are still in the applying stage. In contrast, the majority of the group E members are remaining in the emerging stage and only one member is considered to be moving towards the applying stage for this dimension.

Despite having the ICT vision as well as being categorized into the infusion stage, there are still a few issues for these institutions in gearing towards the achievement of the vision. Some of the compendium issues include the lack of government support in terms of policy and reliable infrastructure (telecommunication and power grid). These issues hamper the institutions to proceed with a full-scale ICT implementation, despite large investments in infrastructures that have been made. On the other hand, the vision should be supported with

clear policies for the management system as well as for the operational level. One phenomenon observed during the interview was that despite the existence of vision, there is a weak policy framework to enforce the implementation of ICT. It was evident in the interview that some of the institutions have no policy in place to guide the management system, faculty, and students in achieving their ICT vision. Meanwhile, a faculty from UNTL (group A) has initiated to development of an Academic Information System (AIS) that can be considered a model to be adopted by other faculties and institutions. If such an approach is supported with a strong policy and widely adopted by other faculties within the institution, then UNTL could be categorized into the transforming stage for this dimension.

Of the institutions grouped in the infusion stage for this particular dimension, only UNPAZ expresses a clear ICT vision such as "By 2030, all the faculties are planned to be digitalized". However, such a statement poses a further challenge for this institution and various aspects need to be taken into account when developing its policies and practices that do not contradict other policies. Whereas, the use of digitalization in the education system, as well as in teaching and learning is supposed to facilitate and enhance learning, and not otherwise fully undertake traditional learning (Lye, 2013).

3.2.2. ICT in Education Plans and Policies

For this dimension, all the group A members are considered to have educational plans and policies that guide its strategic plan for ICT adoption therefore they fall in the infusion stage. The overall implementation of ICT in education plans supported by rigorous policies and budget allocation will enable the institution to achieve its ICT vision. One of the group A members (DIT) has developed its strategic plan and which includes policies and security measures for ICT development by involving an external partner such as Telkom University from Indonesia. Likewise, the same approach is also adopted by one of the group B members (UNPAZ) in developing its ICT infrastructure. UNTL on the other hand, as a public university that enjoys the most contribution and support from both government and donors, is still considered underdeveloped in terms of policies related to ICT development. Some faculties within UNTL however, have advanced quite well in their ICT policies beyond their university.

3.2.3. Complementary ICT and Education Plan

Educational plan in terms of ICT integration in education seems to receive less attention from both the government and higher education institutions. This is even worse

during the Covid-19 period when MHESC issued a dispatch requesting all the HEIs to conduct all the teaching and learning activities through a virtual mode (Chen, 2020). On the one hand, it was evident that both teachers and students are ill-prepared to resourcing on such an approach since they do not have prior experience engaing in such a method of teaching and learning. On the other hand, accessibility of quality network and infrastructures are meager for all the higher education institutions to generate effective virtual learning.

As was revealed from the interviews, all the institutions are having an ICT educational plan and some of them are still in the process of developing their ICT infrastructure. However, such plans should also be supported by national policies and plans so that the strategic approaches of the government and those of the institutions can complement one another. MHESC is yet to define clearly how ICT should be integrated into the curriculum structure and the teaching and learning process, which involves the use of digital technology tools. Meanwhile, higher education institutions are moving forward to develop their ICT integration at their own expense without clear plans and guidelines. Thus, policy alignment and plans for this dimension are necessary for both the government and the institutions to reflect upon.

3.2.4. ICT Infrastructure and resources in HEIs

A major condition for an institution to fully develop its ICT integration in education is by establishing an infrastructure that meets the need for teaching and learning purposes (SEAMEO, 2010). When asking students and faculties in terms of their accessibility to ICT tools such as computers or computer laboratories, more than 50% confirm that these resources are accessible to them. Moreover, teachers and students also need to use these facilities for other purposes such as research. Hence, it requires a reliable network to facilitate them in carrying out research tasks. The majority of the institutions reported that there is an online library available for students and faculty to access. On the contrary, less than 50% of the students and faculties confirm access to the online library available in the institutions.

Some of the group A members (DIT, IOB, UNTL) together with UNPAZ and ICFP are considered to be advanced in terms of ICT infrastructure and resources in their institutions. There is an ICT unit being set up to oversee the ICT development within the institution. Most of the tasks carried out by this unit focus on providing ICT services and other networking systems within the institutions. However, there are also efforts being made in terms of developing data management systems for the institutions. For instance, DIT has developed a system called DIT-SMART; IOB, UNTL, and UNPAZ have also implemented an

academic management system. This management system is mainly used to store students' academic records as well as data purposes for faculty/university. This management system can be effectively accessible only within the premises of the institutions. The learning management system (LMS) is yet to be adopted by all the institutions and it was evident that the majority of the institutions are not aware of such tools for educational purpose or for managing teaching and learning activities. Meanwhile, only IOB is reported to be in the process of incorporating some of the courses available in an online platform such as Coursera (an online platform that provides free online courses).

Looking at the conditions faced by the higher education institutions in Timor-Leste, the government can initiate a more robust approach by adopting some good practices from other countries. For instance in Vietnam, the government adopted and developed Moodle, which is contextualized to the local needs and provides access to all the schools with ready-made lesson plans to use (SEAMEO, 2010). Such an approach may prove cost-effective for the government and institutions, considering the current educational environment and the huge financial burden required for the ICT infrastructure.

3.2.5. Professional Development for Leaders and Lecturers

Ng et. al. (2010) citing the framework developed by Anderson (2010) suggests that for teachers to carry out the teaching and learning activities aided by ICT tools, their competency in this area must not be limited only to how to use them but they can be proficient in choosing tools that are appropriate for the teaching and learning. Furthermore, the development program for teachers using ICT skills is more effective when such a process is carried out within the subject context and teaching pedagogy (Ng et. al., 2010).

It was revealed from the information provided by the faculties, up to around 40% of teachers have attended professional development of using ICT in teaching. This development program is either accessible through online training or face-to-face. Nevertheless, only three institutions confirmed to have professional development programs for faculty with teaching. However, the type of training program for the faculty is still vague to understand whether the training is focused only on the teaching pedagogic or encompasses the technology aspect of teaching. One of the challenges that this study faced during the collection of data, there seems to be a tendency where the majority of the university leaders and the faculties have no full understanding of the issue of technological and pedagogical knowledge. Hence, the result found about this dimension seems to be contentious and requires further assessment.

3.2.6. Community and Partnership

The characteristics of this dimension require higher education institutions to expand the learning environment beyond the four walls of the classroom, which is limited not only to the national level but it should be extended to the globalized world. Moreover, with the use of technology-enabling tools, students are given the opportunities to approach critically dynamic issues that confront the global community (SEAMEO, 2010).

The institutions such as UNTL and ICFP appeared to be relying heavily on government and external donors when it comes to the development of ICT infrastructure. DIT and UNPAZ on the other hand, though with meager financial capacity, have begun to develop their information and research management system, with the technical support provided by the Technology University of Indonesia. The government through the MHESC has so far taken a positive move by providing free Internet services to the HEIs. The HEIs are also observed having a partnership with three local telecommunication providers such as Timor Telecom, Telemor, and Telkomsel by providing both internet and user applications.

Aside from having ICT development support from external partners, higher education institutions should initiate their contribution to the community it serves. The example shown by the UNPAZ in cooperation with KOICA and JICA where students involved in the use of Cobo tools for agricultural research and application of prepaid access for public water service. Another best example is promoted by UNTL and its Department of Information Technology where they support the development of application of information management systems for other institutions.

The main idea under this dimension is for the institutions to not only benefit from donors but they also need to place themselves as a source of information and innovative center. Faculty and students have to serve the community with affordable tools in ICT to alleviate issues that most confront the community.

3.2.7. ICT in Curriculum

ICT should be integrated systematically into the curriculum structure and it should be considered as an enabler for teaching other subjects and not as a separate subject in the curriculum setting (SEAMEO, 2010). Reflecting on the results of this study, none of the groups are yet to make it into the infusion and transformative stage. Most of the institutions are still at the emerging stage while few others are in the applying stage. Practically, ICT subject teaching is offered at an upper-secondary level while the tertiary level focuses more

on ICT as an enabler for teaching other subjects (Anderson, 2010). Various studies also suggest that for ICT to be fully embedded in the curriculum, it must incorporate the learning management system for its effective implementation.

One of the factors that affect all the institutions in implementing ICT into the higher education setting would be the curriculum policy that requires ICT as a separate subject under the foundation course (MHESC, 2022). Likewise, the curriculum policy of the government has not provided a clear definition of the use of ICT to facilitate teaching and learning. This further hampers the initiative from universities to incorporate ICT into the learning environment, as well as to what extent should they invest in their ICT infrastructure. As consequence, some of these issues have perhaps contributed greatly to the massive use of instructional media such as black / whiteboard and PowerPoint presentations. ICT tools for simulation and practice, drills, and collaborative are only used by a few selected subjects in the engineering and economics area, but there seems no evidence of these tools being used in science subjects.

Meanwhile, none of the institutions have mentioned the use of a learning management system in their institutions. There are, however, web tools such as Google Classroom, Whatsapp, and Zoom been utilized sporadically by the teachers at their own expense. Even if the tools are made available into the learning activities and process, the reliability of the networking system still obstructs their effectiveness in use.

3.2.8. Teaching and Learning Pedagogies

The use of ICT tools in teaching and learning is built upon the constructivist theory of learning where students are expected to demonstrate their cognitive skills in the higher order of thinking. In this approach, students are considered to be an agent of knowledge construction, as well as to reconstructing knowledge they have acquired. Meanwhile, the teachers' role in this process is not to teach but rather to facilitate and guide students in their learning progress. When institutions have applied such conditions in their educational environment, that institution is capable to be considered in the transformative stage (SEAMEO, 2010).

As for this dimension, the majority of the institutions are considered to be in both the applying and infusing state. Despite this classification, it was revealed by the students and faculty that much of their teaching and learning activities are heavily oriented in the classroom setting. Although the institution reported that classrooms are all equipped with

projectors and presentations are made with computer-aided software such as PowerPoint, there is a tendency that those tools are merely for presentation purposes. On the other hand, as discussed earlier that to facilitate students' engagement in a higher-order of thinking effectively, the learning management system and other web tools are integrated into the learning process. Thus, the result of institutional classification in the infusing stage can be placed on a contest and the assessment of this issue can be generated further.

3.2.9. Assessment

Most of the institutions for this dimension are grouped into the applying stage and none have been categorized into the infusing and transformative stages. Under this condition, institutions have not integrated the ICT assessment tools in any of their subject areas. Characteristics under this dimension include the use of a management bank for assessment items, and the use of ICT to meditate on the assessment of students learning outcomes (SEAMEO, 2010).

The use of ICT tools in the assessment process for most of the institutions is either in the use of a computer to develop assessment items for students or students and teachers use ICT tools to transmit exam items to students. In general, the majority of the institutions have not administered any computer-based or Internet-based assessment. Even though some of the institutions have in place their information management system, but this information system has only been utilized to store data, and the assessment scores of students. However, there were no reports of such a system being used for assessment purpose.

3.2.10. Evaluation and Research

Evaluation and research are two dichotomies that can be misunderstood interchangeably. Evaluation and research in this regard refer to the institutional audit and assessment of ICT implementation based on the policies and practices. Furthermore, all the stakeholders that have the intention to use ICT in education must be involved so that relevant gaps and further improvements can be identified (SEAMEO, 2010). On the other hand, ICT research is usually designed carefully with theoretical ground that provides evidence regarding ICT implementation, and informs how ICT in education could be improved in the future (SEAMEO, 2010).

Regarding this dimension, there are efforts have been made by some of the institutions to assess their ICT integration in education. However, this evaluation seems to be generic and it was unclear whether it was conducted regularly. For instance, IPDC has its evaluation on

ICT usage shared during regular meetings. UNPAZ has ever since conducted an internal assessment of the Internet bandwidth and speed. Meanwhile, only DIT has administered a research study on digital systems focusing on e-library, e-budgeting, and assessment system. This research also identified infrastructure and security measures for the system. On the other hand, IOB reported that the research on ICT integration is made through students' final projects. But how the results of this research have been considered in the institutional policies and plans remains unclear. By contrast, all other institutions are yet to proceed with such research in their institutions.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

The results show that based on the digital education infusion status, the institutions of higher education in Timor-Leste can be categorized into the following classification: i) **EMERGING stage:** ETCI, ICS, IBTL, ISC-BAUCAU, ISC-MANUFAHI, DIT-KREO; ii) **APPLYING stage:** DIT, IOB, ICFP, UNTL, ISFIT, UNPAZ, IPDC, ISC, UNDIL, UNITAL, IFFS, ISJB, IPB, JSI, UCT, IOB-MALIANA; None of the institutions are yet to be categorized into the two advance orders, namely the INFUSING AND TRANSFORMING stages.

4.2. Recommendations

4.2.1. The Higher Education Institutions should consider:

- An ICT vision, which is supported by a well-defined strategic plan with clear policies for the top management level as well as for the operational level supported by the implementation of ICT annual plans, policies and budget allocation.
- A major condition for an institution to fully develop its ICT integration in education is through a well-established infrastructure for teaching and learning purpose, with particular attention given to the data management systems and learning management systems.
- Faculty leaders and staff professional development of using ICT in teaching, most particularly to enhance their technological and pedagogical knowledge.
- Higher education institutions should place themselves as sources of information and innovative centers, allowing faculty members and students to serve the community with affordable tools in ICT to alleviate issues facing the community.
- ICT to be integrated systematically in the curriculum structure and it should be considered as an enabler for teaching other subjects and not as a separate subject in the curriculum setting.
- Integrate the learning management system and other web tools into the learning process to facilitate students' engagement in a higher order of thinking effectively.
- Use computer-aided and the Internet to facilitate learning and teaching assessment as well as the ICT integration into its overall education system.

4.2.2. The Government and Ministry of Higher Education, Science and Culture to consider:

- Establishment of a more powerful, stable yet accessible Internet service provision and connectivity as well as a stable and reliable power supply.
- Maintain and expand the assistance intervention packages provided during the Covid-19 pandemic period with relevant digital ICT models and applications and further assistance on curriculum design and implementation.
- Support the HEIs with co-funding ICT infrastructure development projects as well as professional development programs for HEIs faculty members and staff.

4.2.3. Further research is required to:

- Re-examine the infusion stages of digital education covering a larger sample of respondents, in general and into the dimensions of *Professional development for leaders and lecturers* as well as *Teaching and learning pedagogies*, in particular.

5. Bibliography

ANAAA. (2021). *Higher Education Institution; Institutional Accreditation Result 2021.* National Agency for Academic Assessment and Accreditation. Dili: ANAAA.

ANAAA. (2021). *Manual for Virtual Assessment and Accreditation* (Vol. 1). (P. Edmundo Viegas, Ed.) Dili, Timor-Leste: ANAAA.

Ananiadou, K., & Claro, M. (2009). 21st Century Skills and Competences for New Millennium Learners in OECD Countries. *OECD Education Working Papers , 41*.

Anderson, J. (2010). *ICT Transforming Education.* UNESCO Bankok.

Angeli, C., & Valadines, N. (2015). *Technologinal Pedagogical Content Knowledge.* New York: Springer.

Arnold, D., & Sangra, A. (2018). Dawn or dusk of the 5th age of research in educational technology? A literature review on (e-)leadership for technology-enhanced learning in higher education (2013-2017) . *International Journal of Educational Technology in Higher Education* , 22.

Baneres, D., Guerrero-Roldán, R., & Rodríguez , M. (2022). Technology enhanced learning or learning driven by technology. *International Journal of Education Technology in Higher Education* , 1.

Bostancıoğlu, A., & Handley, Z. (2018). Developing and validating a questionnaire for evaluating the EFL 'Total PACKage': Technological Pedagogical Content Knowledge (TPACK) for English as a Foreign Language (EFL). *Computer Assisted Language Learning* , 1-28.

Byungura, J. C. (2019). *Improving IT Integration for Higher Education Institutional Performance* . Sweden: Stockholm University.

Chen, L. (2020, 08 17). *Global Campus Asia Pacific*. (Institute of Human Rigths and Peace Studies) Retrieved 10 12, 2022, from asiapacific.gchumanrigths.org: https://asiapacific.gchumanrights.org/2020/08/17/timor-leste-reflecting-online-distance-learning-in-higher-education-under-covid-19-bitter-lessons-from-timor-leste/

Fu, J. S. (2013). ICT in Education: A Critical Literature Review and Its Implications. *International Journal of Education and Development using Information and Communication Technology* , 1-14.

Hinton, K. H. (2012). A Practical Guide to Strategic Planning in Higher Education . *Society for College and University Planning* , 1-48.

Lye, L. T. (2013). Opportunities and Challenges Faced by Private Higher Education Institution Using the TPACK Model in Malaysia. *Procedia - Social and Behavioral Sciences* , 297.

MHESC. (2022, January 12). National Curriculum Standard. *Decree Law No. 3* . Dili, TImor-Leste: Journal Republica.

MHESC. (2020). Timor-Leste.

Ng, W.-k., Miao, F., & Lee, M. (2010). Capacity-building for ICT integration in Education. *Digital Review of Asia-Pacific* .

Patrinos, H. A. (2015, June 25). *How Timor-Leste is transforming education*. Retrieved March 2022, from World Economic Forum: https://www.weforum.org/agenda/2015/06/how-timor-leste-is-transforming-education/

SEAMEO. (2010). *Status of ICT Integration in Education in Southeast Asian Countries.* Bangkok: SEAMEO.

Shende, S. N., & Reddy, B. M. (2020). Integration of ICT in Higher Education Institutions: Scope and Challenges . *UGC Care Journal , 40* (31).

The HEAD Foundation. (2017, January). ICT in ASEAN Education: Challenges and New Opportunities. *The Policy Bref No. 2* .

UNESCO. (2016). *Building Digital Citizenship in Asia-Pacific through Safe, Effective and Responsible Use of ICT.* UNESCO Bankok.

UNESCO. (2018). UNESCO ICT Competency for Teachers. 19.

Wall, J. (2015, October). Leadership in Implementing Technology Enhanced Learning in Educational Institutions .

6. APPENDICES AND ANNEXES

6.1. Appendices

6.1.1. KESTIONÁRIU BA REITÓR NO DIRETÓR/KOORDENADÓR KURSU:

Using Technology, Pedagogy, Content & Knowledge (TPACK) approach.

No.	*Dimensaun iha ICT*	*Pergunta*
1	*ICT vision*	1. Oinsá instituisaun haree importánsia husi TIC ba dezenvolvimentu interna, no kualidade jestaun no ensinu-aprendizajen?
2	*ICT in education plans & Policies*	2. Karik nu'udar alvu prioridade ida-ne'ebé inklui ona iha planu estratéjiku ka planu anuál instituisaun nian? 3. Instituisaun halo ona estudu/peskiza ruma hodi informa Planu no polítika TIC iha instituisaun laran?
3	*Complementary ICT & Education Plan*	4. Oinsá instituisaun ho governu (ministériu relevante) kompleta malu iha dezenvolvimentu uza TIC hodi hasa'e kualidade sistema jestaun no ensinu-aprendizajen?
4	*ICT Infrastructure & resources in HEI*	5. Sekarik inklui ona iha planu estratéjiku, faze implementasaun to'o ona iha ne'ebé, intermus infraestrutura no rekursu iha universidade? 6. Sistema jestaun dijitál saida mak instituisaun utiliza hodi fasilita iha prosesu administrasaun, jestaun dadus, peskiza, biblioteka no komunikasaun? 7. Dezafiu saida de'it mak instituisaun enfrenta intermus dezenvolve infraestrutura no rekursu kona-ba TIC?
5	*Professional Development for leaders & Lecturers*	8. Formasaun saida mak instituisaun oferese ona ba direjente no dosente sira kona-ba utilizasaun TIC? 9. Foku husi formasaun hirak-ne'e maka kona-ba saida no frekuénsia husi formasaun ida-nee oinsá? 10. Problema saida mak instituisaun enfrenta intermus kapasitasaun dosente iha area TIC?
6	*Community & Partnership*	11. Komunidade ka parseria saida de'it mak instituisaun hola parte hodi dezenvolve TIC iha instituisaun laran? 12. Apoiu sira-ne'e ho modelu saida de'it? 13. Progresu atividade husi komunidade no parseria sira-ne'e ho durasaun oinsá no to'o ona iha faze ida-ne'ebé?
7	*ICT in curriculum*	14. Matéria/dixiplina saida de'it mak inklui iha kurríkulu aprendizajen kona-ba TIC? 15. Foku aprendizajen kona-ba matéria sira-ne'e mak oinsá? 16. Modelu avaliasaun husi matéria hirak-ne'e administra oinsá?
8	*Teaching & learning pedagogies*	17. Rekursu aprendizajen dijitál saida de'it mak daudaun eziste iha instituisaun laran? 18. Plataforma/Sistema jestaun aprendizajen própriu ka aprovadu kona-ba TIC ida-ne'ebé mak asesivel no utiliza ona iha prosesu ensinu aprendizajen?
9	*Avaliasaun*	19. Prosesu avaliasaun ba ensinu aprendizajen iha instituisaun laran atraves meius saida de'it? 20. Iha ka lae polítika interna sekarik dosente ida hakarak uza meius virtual ba prosesu avaliasaun/ezame?
10	*Avaliasaun & Peskiza*	21. Avaliasaun/survey/peskiza ruma ne'ebé instituisaun inisia ona atu haree kona-ba dezenvolvimentu TIC iha instituisaun laran, intermus uza ba jestaun no ensinu-aprendizajen?

6.1.2. KESTIONARIU BA DOSENTE

TITULU PESKIZA: "Estadu infuzaun TIC iha instituisaun ensinu superior: Estudu Kazu husi Timor-Leste"

Informasaun respondente nian:

Naran Dosente:	
Departamentu:	
Instituisaun/universidade:	
Lokalizasaun Instituisaun (*munisípiu*):	
Dixiplina hanorin	1.
	2.
	3.
Data Prienxe:	
Oras (otl):	

Instrusaun:

- *Favor tau vistu "✓" iha koluna mamuk iha sorin loos ne'ebé nia deklarasaun kondíz/relevante liu ho ita-boot sira-nia situasaun no prátika.*
- *Solisita ita-boot sira responde ho onestu.*

Kestionáriu ba respondente:

Dimensaun	*Kestionáriu*	*Konkorda*	*Neutru*	*La-konkorda*
1	1. Ha'u hatene katak ha'u-nia instituisaun iha vizaun kona-ba TIC.			
	2. Ha'u fiar katak TIC sei fó vantajen di'ak ba instituisaun hodi hasa'e kualidade ensinu-aprendizajen ba dosente no estudante.			
2	3. Instituisaun iha planu & polítika kona-ba TIC ne'ebé daudaun implementa hela.			
3	4. Iha polítika interna ho regulamentu akadémiku iha nivel instituisaun no fakuldade/programa estudu atu uza modalidade TIC hodi hanorin			
	5. Iha unidade espesífiku ida-ne'ebé responsabiliza ba dezenvolvimentu TIC iha instituisaun laran.			
	6. Iha formasaun kontinua ba dosente no estudante oinsá utiliza modalidade TIC ba prosesu ensinu-aprendizajen.			
4	7. Iha fasilidade TIC ne'ebé disponivel no asesivel iha instituisaun laran.			
	8. Dosente sira bele asesu livru uza meius:			
	o Biblioteka fiziku			
	o Biblioteka *online*			
	o Seluk (*Favor hakerek naran biblioteka iha espasu fornese)*	.....		
	9. Fasilidade sira temi iha leten bele asesu iha:			
	o Iha resintu kampus			
	o Asesu mós husi li'ur			
	10. Kualidade rede internet iha instituisaun laran:			
	o Efetivu no lais			
	o Normal			
	o Susar atu asesu			
	o Presiza aumenta ka hadi'a			

5	11. Instituisaun iha programa kapasitasaun ba dosente kona-ba TIC ba ensinu aprendizajen no organiza kada:			
	o Semestre			
	o Kada tinan dala-ida.			
	o Partisipa de'it bainhira iha oportunidade.			
	12. Formasaun ne'e fornese via:			
	o Online			
	o Prezensiál			
	13. Formasaun ne'e organiza husi:			
	o Instituisaun rasik			
	o Organizasaun/ajénsia lokál			
	o Organizasaun/ajénsia internasionál			
6	14.Kooperasaun no parseria iha dezenvolvimentu ka utilizasaun TIC mosu husi inisiativa iha nivel hanesan:			
	o Nivel institusionál			
	o Nivel Fakuldade			
	o Nivel program estudu/dosente			
	15. Kooperasaun ho entidade esterna intermus utilizasaun ekipamentu TIC ba ha'u-nia dixiplina nu'udar responsabilidade husi:			
	o Instituisaun			
	o Fakuldade			
	o Departamentu/Dosente rasik			
	16.Iha rede kooperasaun eziste iha nivel departamentu ho entidade sira hanesan tuirmai:			
	o ONG/Ajénsia lokál			
	o ONG/Ajénsia Internasionál			
	o Asosiasaun Família			
	o Emprezáriu sira			
	o Asosiasaun Professional sira			
7	17. Métodu aprendizajen ne'ebé dalabarak ha'u uza hodi hanorin:			
	o Face-to-face			
	o Virtual			
	o Mistura			
	18. Plataforma ka Sistema Jestaun Aprendizajen (*Learning Management System)* online ne'ebé dalabarak ha'u uza:			
	o *Blackboard collaborate*			
	o *Learn line*			
	o *Moodle*			
	o *Google Classroom*			
	o *Seluk (favor fornese naran*	.....		
8	19. Dezeña lisaun utiliza modalidade TIC nian nu'udar preferénsia husi:			
	o Dosente			
	o Polítika fakuldade no/ka instituisaun			
	20. Dalabarak dosente sira buka rasik meius atu uza ekipamentu TIC hodi aprezenta sira-nia lisaun.			
	21. Instituisaun fasilita ona ha'u hodi tuir formasaun pedagójiku uza TIC iha ensinu-aprendizajen.			
	22.Instituisaun iha polítika no obrigatóriu atu dezeña planu lisaun ho meius:			
	o Face-to-face			
	o Virtual/online			
	o Preferénsia husi kada dosente			
	23. Ha'u sente konfortavel atu dezeña métodu aprendizajen oioin uza rekursu TIC.			
	24. Meius instrusaun ne'ebé dalabarak ha'u uza ba aprezentasaun planu lisaun mak hanesan:			

	o *Kuadru hakerek*			
	o *Power Point Presentation*			
	o *Google Classroom*			
	o *Zoom*			
	o *Whatsapp*			
	o *Nsst. (favor indika took naran)*	.....		
	25.Meius ba instrusaun virtual ne'ebé temi iha leten, baibain fornese husi:			
	o Instituisaun			
	o Dosente rasik			
	26.Informasaun sira kona-ba deskrisaun, kritériu no sílaba dixiplina nian distribui ba estudante sira ho meius:			
	o Email			
	o Website instituisaun/fakuldade			
	o Sistema Jestaun Aprendizajen online			
	o Plataforma media sosiál *(Facebook, Whatsapp, nst.)*			
	o Distribui diretamente ba estudante iha inísiu husi aula ida.			
	27. Ha'u ladún hetan apoiu másimu husi ha'u-nia lider sira atu dezeña ha'u nia planu lisaun utiliza modalidade TIC.			
9	28. Rekursu online instituisaun nian disponivel atu administra prosesu avaliasaun online ba estudante.			
	29. Dadus ba valor estudante nian arkivu iha:			
	o Arkivu ho surat tahan			
	o Sistema baze dadus - *offline*			
	o Sistema baze dadus - *online*			
	30. Dadus kona-ba rezultadu avaliasaun ba kada estudante sira, asesu liuhusi:			
	o Pedidu ba administrasaun akadémiku/fakuldade			
	o Sistema baze de dadus *online/offline*			
10	31.Ha'u konsente katak instituisaun halo ona peskiza interna kona-ba modu aprendizajen virtual ne'ebé involve dosente sira.			
	32.Instituisaun iha polítika atu implementa avaliasaun semestrál ka annual kona-ba utilizasaun ensinu aprendizajen uza modu virtual:			
	o Implementa ona			
	o Iha ona planu			
	o Seidauk iha			

6.1.3. KESTIONARIU BA OFISIAL ADMINISTRASAUN & XEFE DEPARTAMENTU

TITULU PESKIZA: "Estadu infuzaun TIC iha instituisaun ensinu superior: Estudu Kazu husi Timor-Leste"

Informasaun respondente nian:

Naran:	
Pozisaun:	
Departamentu:	
Instituisaun/universidade:	
Lokalizasaun instituisaun (*Munisípiu)*:	
Data Prienxe:	
Oras (otl):	

Instrusaun:

- *Favor tau vistu "✓" iha koluna mamuk iha sorin loos ne'ebé nia deklarasaun kondíz/relevante liu ho ita-boot sira-nia situasaun no prátika.*
- *Solisita ita-boot sira responde ho onestu.*

Kestionáriu ba respondente:

Dimensaun	*Pergunta*	*Konkorda*	*Neutrál*	*La-konkorda*
1	2. Ha'u hatene katak ha'u-nia instituisaun iha ona vizaun kona-ba utilizasaun TIC.			
	2. Ha'u fiar katak TIC sei fó vantajen di'ak ba instituisaun hodi hasa'e kualidade jestaun no administrasaun.			
2	3. Instituisaun iha planu & polítika kona-ba TIC ne'ebé daudaun implementa hela.			
3	4. Iha polítika interna ho regulamentu akadémiku iha nivel instituisaun no fakuldade/programa estudu atu uza modalidade TIC hodi administra jestaun interna.			
	5. Iha unidade espesífiku ida-ne'ebé responsabiliza ba dezenvolvimentu TIC iha instituisaun laran.			
	6. Iha formasaun kontinua ba ofisial administrasaun kona-ba oinsá utiliza modalidade TIC ba prosesu administrasaun no finansa.			
4	7. Iha fasilidade TIC ne'ebé disponivel no efetivu hodi asesivel iha instituisaun laran.			
	8. Dosente no estudante sira bele asesu livru uza meius:			
	o Biblioteka fiziku			
	o Katálogu *offline*			
	o Biblioteka *online*			
	o Seluk (sekarik *"iha", Favor hakerek naran biblioteka iha espasu sorin los)*	.....		
	9. Fasilidade sira temi iha leten bele asesu husi:			
	o Só iha resintu instituisaun			
	o Asesu mós husi li'ur/uma/*website*			
	10. Kualidade rede internet iha instituisaun laran:			
	o Efetivu no lais			
	o Normal			
	o Susar atu asesu			
	o Presiza aumenta ka hadi'a			
5	11. Instituisaun iha programa kapasitasaun ba ofisial administrasaun kona-ba utilizasaun TIC ba			

	jestaun, ne'ebé organiza kada:			
	o Semestre			
	o Kada tinan dala-ida.			
	o Partisipa de'it bainhira iha oportunidade.			
	12. Formasaun ne'e fornese via:			
	o Online			
	o Prezensiál			
	13. Formasaun ne'e organiza husi:			
	o Instituisaun rasik			
	o Organizasaun/ajénsia lokál			
	o Organizasaun/ajénsia internasionál			
6	14.Kooperasaun no parseria iha dezenvolvimentu ka utilizasaun TIC mosu husi inisiativa iha nivel hanesan:			
	o Nivel institusionál			
	o Nivel Fakuldade			
	o Nivel program estudu/dosente			
	15. Kooperasaun ho entidade esterna intermus utilizasaun ekipamentu TIC ba ha'u-nia serbisu nu'udar responsabilidade husi:			
	o Instituisaun			
	o Fakuldade			
	o Departamentu/indivíduu rasik			
	16.Iha rede kooperasaun TIC eziste iha nivel instituisaun ho ajénsia esternu ba área sira hanesan tuirmai:			
	o Fornesimentu liña internet			
	o Ekipamentu TIC			
	o Biblioteka online			
	o Pagamentu online			
	o Rejistu/matrikulasaun online			
	o Sistema baze dadus online			
7	17. Ha'u uza plataforma ka Sistema Jestaun Programa (*Program Management System/software)* online hanesan *MeisterTask, Basecamp, Nifty, Teamwork Project, free balance, proof hub, nsst.,* ba ha'u-nia serbisu loro-loron.			
	18.Informasaun kona-ba kursu/dixiplina hanesan durasaun, abilidade dosente, deskrisaun, matrís rezultadu aprendizajen no avaliasaun bele asesu liuhusi:			
	o Pedidu ba fakuldade/programa estudu			
	o Broxura			
	o *Website*			
8	19. Dalabarak ha'u buka rasik meius atu uza ekipamentu TIC hodi utiliza ba ha'u-nia serbisu.			
	20. Instituisaun fasilita ona ha'u hodi tuir formasaun uza TIC iha jestaun no administrasaun nian.			
9	21. Rekursu TIC instituisaun nian disponivel atu administra serbisu jestaun no administrasaun ho kualidade.			
	22. Dadus ba valor estudante sira-nian dokumenta iha:			
	o Arkivu manual			
	o Sistema baze dadus - *offline*			
	o Sistema baze dadus - *online*			
	23. Dadus kona-ba rezultadu avaliasaun ba kada estudante sira, asesu liuhusi:			
	o Pedidu ba administrasaun akadémiku/fakuldade			
	o Sistema baze de dadus *online/offline*			

10	24.Ha'u konsente katak instituisaun halo ona peskiza interna kona-ba utilizasaun rekursu TIC iha serbisu administrasaun nian.			
	25.Instituisaun iha polítika atu implementa avaliasaun semestrál ka annual kona-ba utilizasaun TIC ba prosesu jestaun no administrasaun:			
	o Implementa ona			
	o Iha ona planu			
	o Seidauk iha			

6.1.4. KESTIONARIU BA ESTUDANTE

TITULU PESKIZA: "Estadu infuzaun TIC iha instituisaun ensinu superior: Estudu Kazu husi Timor-Leste"

Informasaun respondente nian:

Naran:	
Semestre:	
Departamentu:	
Instituisaun/universidade:	
Lokalizasaun Instituisaun (*munisípiu*):	
Data Prienxe:	
Oras (otl):	

Instrusaun:

- *Favor tau vistu "✓" iha koluna mamuk iha sorin loos ne'ebé nia deklarasaun kondíz/relevante liu ho ita-boot sira-nia situasaun no prátika.*
- *Solisita ita-boot sira responde ho onestu.*

Kestionáriu ba respondente:

Dimensaun	*Kestionáriu*	*Konkorda*	*Neutrál*	*La-konkorda*
1	3. Ha'u hatene katak ha'u-nia instituisaun iha vizaun kona-ba TIC.			
	2. Ha'u fiar katak TIC sei fó vantajen di'ak ba instituisaun hodi hasa'e kualidade ensinu-aprendizajen ba dosente no estudante.			
2	3. Instituisaun iha planu & polítika kona-ba TIC ne'ebé daudaun implementa hela.			
3	4. Iha polítika interna ho regulamentu akadémiku iha nivel instituisaun no fakuldade/programa estudu atu uza modalidade TIC hodi fasilita prosesu:			
	o Rejistrasaun manual			
	o Rejistrasaun *online*			
	o Pagamentu manual			
	o Pagamentu *online*			
	5. Iha unidade espesífiku ida, ne'ebé responsabiliza ba dezenvolvimentu TIC iha instituisaun laran.			
	6. Iha formasaun kontinua ba dosente no estudante oinsá utiliza modalidade TIC ba prosesu ensinu-aprendizajen.			
4	7. Iha fasilidade TIC ne'ebé disponivel no asesivel iha instituisaun laran ho kualidade ne'ebé aas.			
	o Laboratóriu Komputadór			
	o Rede internet			
	o Laboratóriu audio-vizuál			
	8. Estudante sira bele asesu livru uza meius:			
	o Biblioteka fiziku			
	o Biblioteka *online*			
	o Seluk (*Favor hakerek naran biblioteka iha espasu fornese)*	.....		
	9. Fasilidade sira temi iha leten bele asesu iha:			
	o Resintu kampus			
	o Asesu mós husi li'ur			
	10. Kualidade asesu rede internet iha instituisaun laran konsidera:			

	o Efetivu no lais			
	o Normal			
	o Susar atu asesu			
	o Presiza aumenta ka hasa'e ninia *bandwidth*			
	11. Bainhira presiza modalidade TIC hanesan software ka ekipamentu TIC seluk, hirak-ne'e fornese husi:			
	o Instituisaun/fakuldade			
	o Estudante buka rasik			
	12. Fakuldade/programa estudu iha aula komputadór ne'ebé disponivel atu estudante sira uza.			
5	13. Instituisaun fornese formasaun kontinua ba estudante sira kona-ba utiliza TIC ba prosesu ensinu-aprendizajen.			
	14. Formasaun ne'e organiza kada:			
	o Semestre			
	o Kada tinan dala-ida.			
	o Partisipa de'it bainhira iha oportunidade.			
	15. Formasaun ne'e oferese via:			
	o Online			
	o Prezensiál			
	16. Formasaun ne'e organiza husi:			
	o Instituisaun rasik			
	o Organizasaun/ajénsia lokál			
	o Organizasaun/ajénsia internasionál			
6	17. Ha'u konxiente katak instituisaun involve asosiasaun inan-aman no organizasaun esternu balu ba dezenvolvimentu TIC iha instituisaun laran			
7	18. Dixiplina TIC iha ami-nia kurríkulu, konsidera nu'udar:			
	Dixiplina Obrigatóriu			
	o Opsionál			
	19. Tipu aprendizajen ne'ebé dalabarak ha'u-nia dosente uza:			
	o *Aula/klase*			
	o *Plataforma online*			
	o *Plataforma mídia sosiál (facebook, zoom, Whatsapp, Google Classroom nst.)*			
	o *Seluk (favor fornese nia naran*	.....		
8	20. Ha'u-nia instituisaun iha programa kapasitasaun ba estudante kona-ba uza TIC atu fasilita prosesu ensinu aprendizajen			
	21. Instituisaun fornese ona ba ha'u formasaun kona-ba uza TIC iha ensinu-aprendizajen.			
	22. Fakuldade/departamentu fó preferénsia/opsaun ba estudante atu hili ensinu aprendizajen ho maneira:			
	o *Face-to-face*/prezensiál			
	o Virtuál/aula *online*			
	o Métodu mistu (*Prezensiál & online*)			
	23. Iha laboratóriu komputadór ne'ebé instituisaun prepara ba estudante atu uza.			
	24. Komputadór sira-ne'e bele asesu ba rekursu informasaun oioin ka internet hodi fasilita ha'u-nia traballu.			
	25. Ha'u-nia dosente dalabarak uza media instrusaun tuirmai hodi aprezenta sira-nia lisaun:			
	o *Kuadru hakerek*			

	o *Power Point Presentation*			
	o *Google Classroom*			
	o *Zoom*			
	o *Whatsapp*			
	o *Nsst. (favor indika nia naran)*	.....		
	26. Informasaun sira kona-ba deskrisaun, kritériu avaliasaun no sílaba dixiplina nian, baibain ha'u asesu husi:			
	o Email			
	o Website instituisaun/fakuldade			
	o Sistema Jestaun Aprendizajen online			
	o Plataforma media sosiál *(Facebook, Whatsapp, nst.)*			
	o Distribui diretamente husi dosente iha inísiu kada aula ida.			
	27. Baibain dosente sira uza plataforma online /mídia sosiál, dalabarak ba objetivu atu:			
	o Aprezenta lisaun			
	o Diskusaun grupu			
	o Avaliasaun			
	o Anúnsiu / informasaun kona-ba kursu/matéria			
	o Komunikasaun entre dosente ho estudante			
	28. Bainhira ha'u hetan difikuldade/problema tékniku ho ha'u-nia komputadór, ha'u bele rezolve ho:			
	o Asisténsia husi unidade TIC instituisaun nian			
	o Servisu komputadór iha li'ur			
9	29. Iha dixiplina barak ne'ebé hala'o ezame administra liu iha aula/klase.			
	30.Rekursu ne'ebé ha'u asesu barak hodi hetan referénsia ba ha'u-nia peskiza/traballo mak:			
	o Aula Biblioteka			
	o Biblioteka Online Instituisaun nian			
	o Biblioteka husi fonte online sira-seluk, inklui Google.com			
	o Referénsia dosente mak fornese			
	31. Dadus ba valor estudante nian arkivu iha:			
	o Arkivu ho surat tahan			
	o Sistema baze dadus - *offline*			
	o Sistema baze dadus - *online*			
	32. Bainhira ha'u hakarak hatene valór ba dixiplina sira-ne'ebé ha'u liu, ha'u bele asesu ho meius:			
	o Pedidu ba administrasaun akadémiku/fakuldade			
	o Sistema baze de dadus *online/offline*			
10	33.Ha'u konsente katak instituisaun halo ona peskiza interna kona-ba modu aprendizajen virtual ne'ebé involve estudante sira.			
	34.Instituisaun iha polítika atu implementa avaliasaun semestrál ka annual kona-ba utilizasaun ensinu aprendizajen uza modu virtual:			
	o Implementa ona			
	o Seidauk iha			
	o Iha ona planu			

6.2. ANNEXES

6.2.1. Indicators of Stages of ICT in Education

ICT in Education Dimensions	Emerging	Applying	Infusing	Transforming
1. National ICT in Education Vision	Vision in ICT-driven with no or lack of consideration for existing culture, policies and practices.	Vision focuses on the use of ICT to support existing culture, policies and practices.	Vision focuses on driving changes in culture, policies and practices mediated by ICT.	Vision is of exemplary quality and is being studied and emulated by other countries.
2. National ICT in Education Plans and Policies	Non-existent or ICT-driven plans and policies. No planned funding.	Limited. ICT development led by specialist. Centralized policies. Hardware and software funding. Automating existing practices.	Individual subject plans include ICT. Permissive policies. Broadly-based funding, including teacher professional development.	ICT is integral to overall school development plan. All students and all teachers involved. Inclusive policies. All aspects of ICT funding integral to overall education budget. Integral professional development.
3. Complementary National ICT and Education Policies	There is no or lack of linkage between the ICT in education policies and national ICT and education policies	There is a linkage between the ICT in education policies and national ICT and education policies but some of the policies are contradictory.	The ICT in education policies complements the national ICT and education policies. However, it is usually the latter that inform and/or support the former.	The ICT in education policies complements the national ICT and education policies. The policies inform and support one another.
4. ICT Infrastructure and Resources in Schools	Stand-alone workstations for administration. Individual classrooms. Computers and printers. Word processing, spreadsheets, database, presentation software. School administration software.	Computer lab or individual classrooms for ICT specific outcomes. Computers, printers and limited peripherals. Word processing, spreadsheets, databases, presentation software. ICT software. Internet access.	Computer lab and/or classroom computers. Networked classrooms. Intranet and Internet. Resource-rich learning centres. Range of devices, including digital cameras, scanners, and video and audio recorders. Video-conferencing. Range of subjects-oriented content. Range of subject specific software and localized digital resources accessible via the central repository system.	Whole school learning with ICT with access to technology resources and a wide range of current devices. The whole range of devices in the column to the left and web-based learning spaces. Conferencing and collaboration. Distance education. Web courseware. Student self-management software. Schools have the autonomy to manage their own infrastructure and resources. Schools share the digital resources that they have created with one another.

ICT in Education Dimensions	Emerging	Applying	Infusing	Transforming
5. Professional Development for Teachers and School Leaders	Awareness of needs for professional development but no plan for teachers and school leaders. If a plan exists, it is not based on a needs and situation analysis.	ICT applications training. Unplanned. Personal ICT skills.	Subject specific. Professional skills. Integrating subject areas using ICT. Evolving.	Focus on learning and management of learning. Self-managed, personal vision and plan, school supported. Innovative and creative. Integrated learning community with students and teachers as co-learners.
6. Community/ Partnerships	Discreet donations. Problem-driven. Accidental.	Seeking donations and grants. Parental and community involvement in ICT.	Subject-based learning community providing discrete, occasional assistance, by request. Global and local networked communities.	Broad-based learning community actively involves families, business, industry, & universities. School is a learning resource for the community – physically and virtually.
7. ICT in the National Curriculum	ICT literacy development is part of the national curriculum.	Applying ICT within discrete subjects. Use of artificial and isolated contexts.	Infusion with non-ICT content. Integrated learning systems. Authentic contexts. Problem solving projects.	Virtual and real-time contexts. ICT is accepted as a pedagogical agent & the curriculum is delivered online and face-to-face.
8. Teaching and Learning Pedagogies	Teacher-centred. Didactic	Factual knowledge-based learning. Teacher-centred. Didactic. ICT a separate subject.	Learner-centred learning. Collaborative.	Critical thinking. Informed decision-making. Whole leaner, multi-sensory learning styles. Experimental.
9. Assessment	Equipment-based. Budget-oriented. Discrete subjects. Didactic. Paper and pencil. Closed tasks.	Skills-based. Teacher-centred. Subject focused. Reporting levels. Moderated within subject areas	Integrated. Portfolios. Subject-oriented. Learner-centred. Multiple media to demonstrate attainment. Moderated across subject areas.	Continuous. Holistic – the whole learner. Peer-mediated. Learner-centred. Learning community involvement. Open-ended. Project-based.
10. Evaluation and Research	There is no evaluation and research plan in the formulation and implementation of the ICT plan.	Evaluation of the implementation of the ICT plan is summative in nature. There is no research to provide evidence-based policies.	Evaluation is both summative and formative. Research provides evidence-based policies but does not push the boundaries of existing policies and practices.	Evaluation is both summative and formative in nature. Research provides evidence-based policies and pushes the boundaries of existing policies and practices.

6.2.2. STAGES OF ICT INTEGRATION

STAGES	DESCRIPTIONS
EMERGING	• Just begun to introduce computers. • Having one or two computers and a printer, either donated or purchased by the education department. • Administrators and one or more pioneering teachers begin to explore the potential of ICT for school management and for classroom teaching. • The focus in the classroom is often on learning basic ICT skills and identifying ICT components.

	• Teachers at this stage frequently use available equipment for their own professional purposes, such as word processing to prepare worksheets, spreadsheets for managing class lists. • Locating information or communicating by e-mail if there is internet. • Teachers begin to develop their ICT literacy skills and learn how to apply ICT to a range of professional and personal tasks. • Learning to use a range of tools and applications, and becoming aware of the potential of ICT in their future teaching. Classroom practice is still very much teacher-centred.
APPLYING	• School administrators use ICT for more organizational and management tasks. • Teachers begin to adapt the curriculum in order to increase the use of ICT in different subject areas, applying specific software tools such as drawing, designing, modeling and simulations in their teaching. • ICT are used almost as a separate curriculum area. • Teachers may "do" things on computers with their students (such as word processing or using other software) in isolation from what is being studied in class. • Computers are seen as a reward" for fast finishers in classroom activities, and much initial use is for playing games on the computer. • Teachers at the applying stage still tend to dominate learning activities in the classroom. • Teachers used ICT for professional purposes, focusing on improving their subject teaching in order to enrich how they teach with a range of ICT applications. • Teachers gradually gain confidence in using specialized ICT tools in teaching in their subject fields. • The opportunity to apply ICT in all the teaching is often limited only by a lack of ready access to ICT facilities and resources.
INFUSING	• At this stage, almost all classrooms are equipped with computers, as are school offices and the library, and schools have internet connections. • A wide variety of other ICT is in evidence across the institution, in classrooms, laboratories and administrative offices. • ICT infuse all aspects of teachers' professional lives in such ways as to improve student learning and management of learning. • ICT is integrated into all subject areas and is perceived as one of the key enablers to engage students in their learning. • The approach of senior leaders is to support active and creative teachers who are able to stimulate and manage the learning of students, and to integrate a range of preferred learning styles in achieving their goals. • Teachers easily integrating different knowledge and skills from other subjects into project-based curricula. • The curriculum begins to merge subject areas to reflect real-world applications. • ICT are not completely fused with other regular learning activities. • Students are slowly given more control over their learning and a degree of choice in projects undertaken. • Teachers use ICT to assist their students to assess their own learning in achieving the aims of personal projects. • It becomes quite natural for teachers to collaborate with other teachers in solving common problems and to share their teaching experiences with others.
TRANSFORMING	• ICT are tools used routinely to assist learning in such a way that they are fully integrated in all classes. • ICT are fully integrated in all regular classroom learning activities. • ICT is used to rethink and renew institutional organization in creative ways, and when ICT are a regular part of the daily life of the institution. • ICT become an integral, though invisible part of daily personal productivity and professional practice. • The focus in classrooms has moved fully from teacher-centred to learner-centred that integrates subject areas in real-world applications. • Part of such teachers' responsibilities is to keep track of developments in ICT, and to assist in recommending and acquiring ICT facilities and resources to support the curriculum throughout the institution.

	• With the school head, such staff may assist in developing an ICT plan for the institution. • The whole ethos of the institution is changed: teachers and other support staff regard ICT as a natural part of the everyday life of their institutions, which have become centres of learning for their communities.

6.2.3. MAPPING ICT STAGES ONTO LEARNING AND TEACHING

A. Learning About ICT

Becoming aware of ICT	**Emerging**	• Teachers and learners become aware of ICT tools, how they function, and how they are used. • Emphasis on ICT literacy and basic skills.
Learn how to use ICT in subject teaching	**Applying**	• Learning how to use ICT tools and beginning to use them in different subjects in the curriculum. • It involves using general and particular ICT applications.
Understanding how and when to use ICT	**Infusing**	• Selecting particular ICT tools to complete a given project. • The ability to recognize situations where ICT will be helpful. • Choosing the most appropriate tools for a particular task. • Using the combination of ICT tools to solve real-life problems.
Specializing in the use of ICT	**Transformative**	• ICT has been incorporated within pedagogical practices and organizational management. • Specialization in the use of ICT tools and systems. • School heads and administrators learn how school organization, its administration, planning and other business functions, can benefit through the deployment of ICT. • ICT is not taught as a separate subject and students enter more deeply into the science that creates and supports ICT. • ICT integration model largely through the vision and curriculum leadership that the head and senior teachers provide

B. Teaching with and through ICT

Applying Productivity tools	**Emerging**	• Teacher starts using ICT by using productivity tools like word processors, programs to make visual presentations, spreadsheets, databases, and email to support their daily teaching. • The emphasis is usually on how to use office software.
Enhancing traditional Teaching	**Applying**	• Use computer- assisted learning software as an adjunct to regular teaching in different subjects of the curriculum. • Gradual integration of computer-based learning into regular teaching.
Facilitating learning using multi-modal instruction	**Infusing**	• Teachers using a variety of multimedia tools to aid their students' learning. • Teachers select what is the most appropriate tool for a given task, and to use these tools in combination to solve real-life problems. • Teachers have to recognize situations where various multimedia and specialized software can be useful for teaching and learning.
Creating and Managing	**Transformative**	• Heads of schools provide vision and leadership in

innovative learning environment		curriculum planning for the whole institution. • They innovate with delivery methods of learning content. • They establish ICT coordinating teams and support teachers' innovative use of ICT to facilitate students' knowledge construction and higher-order thinking within and across subjects.

6.3. Ethical Approval Letter

6.4. Documentation