International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 7, 2025
https://www.theaspd.com/ijes.php

A Study On The Use Of ICT Tools In Elearning And Its Impact On The Students Pursuing Higher Education

R. Mahadevan[1], S. Prabakar[2]
[1]VIT School of Media, Arts and Technology, Vellore Institute of Technology, Vellore, mahadevan@vit.ac.in
[2]School of Social Sciences and Languages, Vellore Institute of Technology, Vellore, prabakar.s@vit.ac.in

Abstract
The advancement in science and technology has drastically changed the lives of the people after the advent of computers during the late 1980's. With the rapid advancements happening on one side, the need for education to stay abreast with the evolving technologies has become the need of the hour. Moreover, the Psychology of the teenagers who pursue higher education plays a vital role in determining their future. The students rely upon Information Communication Technologies (ICT) to meet the daily requirements in higher education as current educational system mostly rely on New Media (Internet) and other social networking platforms. The effective use of ICT help the students to cope up with the changing environments with regard to additional learning and knowledge enrichment. The students with prolonged usage of the ICT tools through Mobile phones also get into psychological and emotional problems which restrict their personal career growth. Therefore, a detailed study will be undertaken to ascertain the impact caused by the usage of ICT tools based on their knowledge enrichment and career development aspects of the students. This paper address the impact of ICT tools experimented over a closed group and the results highlights both the advantages and disadvantages of ICT in education. Possible solutions for the effective use of ICT tools for the betterment of the student's health and their academic progress will also be suggested. Also, our research findings paves a new direction in the educational sector in India and other developing countries.
Keywords: *ICT, Knowledge enrichment, Career Development and Personal growth.*

1. INTRODUCTION

Due to the interruption of COVID-19 pandemic in India, the education sector faced a drastic change. The psychology of the students has changed because of the unexpected situations, leading them to make use of ICT tools whether they like it or not. The entire teaching learning process is enrouted to a different path without any advance notifications. This tilt has put lot of pressure on the students due to the unbound time academic activities. This emergency made it potential to study the benefits of ICT tools in the educational process. Starting from the primary purpose of the educational process and through the projection of future trends in education, this paper presents the guidelines for improvement of the teaching and learning processes and some opportunities for their implementation.

Today, the easy access of internet and broadband data has enabled us to make video calls, video conferencing through our mobile phone instantaneously from anywhere. Moreover, the advancement has also helped us in reshaping the world in a totally different way for all sectors. With this, the term ICT (Information Communication Technology) gained its importance where it encompasses technologies such as Radio, Television, Artificial Intelligence, Mobile Phones, Computer, Wired and wireless network which help in dissemination of information to all groups of people using the suitable network. As on figure 1.1 the elements of ICT are media technology, communication technology and information technology.

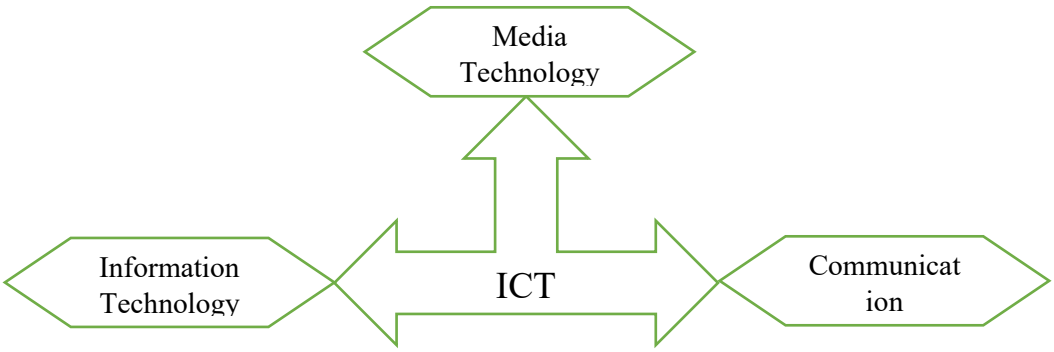


Fig 1.1 Elements of ICT

With the changing paradigm of communication technology, the mobile phones have become an indispensable mode of communication for everyone. The penetration of mobile phones has reached even the far-flung villages of every part of the Indian subcontinent. On the contrary, there are challenges' that has to be addressed with the usage of mobile phone. Students use mobiles primarily to communicate with their friends and share information among themselves.

The availability of many virtual platforms and digital tools supports the educational activities which became a very natural method of delivery. This method favours the interest of students in experimenting the learning process. When such a method is integrated with the academics, it becomes a challenge for the students from the rural community which is the primary concern. The access to internet and other advanced resource utilities adaptations turn out to be complicated. In the higher education, apart from the availability of the primary concerns, there are different things to be focused. Few such things are (i) Digital content creation for the lectures, (ii) Challenging experiments and innovative contents that kick start the interests, and (iii) the stress of students on the curriculum framework.

Related works are summarized and key points are highlighted in the literature review section. The objectives and significance of the study and the impact of ICTs on students are discussed in the proposed work section. The primary sources of data and tools used for analysis are mentioned in the research methodology section. Finally the results and discussion are provided.

2. LITERATURE REVIEW

Preschool educators have positive attitudes towards ICT integration. Age and experience do not significantly affect attitudes towards ICT. Educators primarily use personal resources due to lack of infrastructure. Recommendations include investing in ICT infrastructure in preschools [1]. To enhance the learning process a new model combining the education and the training is proposed to overcome the stress caused [2].

The preliminary insights into the outbound open innovation (OI) process and its relationship with information and communication technologies (ICT) tools, highlighting an under-investigated area is projected. It develops a conceptual framework that matches outbound OI phases with ICT categories, addressing gaps in existing literature. The framework aids in understanding how ICT can support specific phases of the outbound OI process, offering practical guidance for software developers. The research emphasizes the need for further empirical studies to refine the outbound OI process and ICT dimensions [3]. A high usage of mobile phones by the current generation students are observed. An insight towards the various dimensions are highlighted to understand the students [4].

The effectiveness in fostering dialogue among assessors regarding the implementation of ICT in schools are conducted. The methodology utilized qualitative attributes organized hierarchically, allowing for straightforward aggregation through if-then rules, which was well-received by assessors. The model's qualitative value domains facilitated easier cognitive interpretation compared to quantitative domains, making it beneficial when precise measurements are unavailable. The approach supports transparent decision knowledge modeling, enabling assessors to evaluate the current digitalization level and plan future actions effectively [5].

The Autorregulate tool significantly supports self-regulated learning (SRL) strategies among MOOC participants, particularly in goal setting, time management, and self-assessment. The evaluation demonstrated a high level of self-regulation in participants, with a mean score of 4.3 on the online self-regulated learning questionnaire (OSLQ). Usability and usefulness ratings were also high, with 92% of participants finding the tool usable and 97% considering it useful. The study contributes to the understanding of ICT's role in enhancing SRL in MOOCs and provides a foundation for future tool development [6].

The collective performance while undergoing e-learning is estimated [7]. ICTs positively affect structural change in sub-Saharan Africa. Internet usage has a greater impact than telephone usage. Higher labor costs correlate with lower structural change. Promoting ICT tools requiring specific skills accelerates structural change. Results vary by official language and cultural context. Negative structural change gains observed in specific periods. Central African countries showed the most dynamic structural change gains [8].

The international crises, like the COVID-19 pandemic, necessitate better selection and adaptation of available educational solutions, particularly in teaching models. It emphasizes the importance of developing critical thinking as a primary goal in higher education, highlighting students' perceptions and the role of ICT tools in the teaching process. The survey results indicate a preference among students for continuous assessment and the integration of ICT tools, which can enhance teaching practices and learning outcomes. The study also identifies strategic guidelines through SWOT analysis to improve the teaching process using ICT tools [9].

As many techniques emerges in to facilitate the eLearning process, the health also to be taken care to avoid the outburst [10]. The e-learning platforms serve as effective tools for enhancing English as a Foreign Language (EFL) acquisition, particularly in the domains of listening, speaking, reading, and writing. It highlights the necessity for the previous generation to adapt to this new learning paradigm, given the rapid technological advancements in education. The research emphasizes the importance of addressing the challenges of reduced human interaction and emotional engagement in technology-mediated learning. It advocates for further scholarly inquiry to deepen the understanding of the relationship between technology and the human aspects of education [11].

There is a significant positive association between knowledge attainment and knowledge creation among faculty members in the UAE. The use of knowledge attainment tools and reading knowledge sources positively influences the use of knowledge creation tools and the publishing of knowledge sources. The findings sustained the theory of knowledge consumption-production correlation, indicating that higher levels of knowledge consumption lead to higher levels of knowledge production. The research emphasized the need for academic institutions to enhance the availability of knowledge acquisition tools and sources to improve faculty research productivity [12].

The preservice science teachers exhibited a high level of TPACK, with medium scores specifically in the designing dimension, indicating challenges in creating materials using emerging ICTs. It was found that three ICT categories (hardware, desktop software, and emerging ICTs) significantly predicted TPACK scores, with desktop software and emerging ICTs being the most influential. The research highlighted the need for preservice teachers to enhance their ICT skills to effectively integrate technology into science teaching, considering the dynamic interactions of content, pedagogy, and learner characteristics [13].

As a part of psychological wellness analysis, the impact of online social networking is analysed on the Korean school aged students [14]. The impact of ICT over the students has shown a tremendous benefits for the education purpose [15]. The study concludes that East African faculties utilize western social media more than their Chinese counterparts, while Chinese faculties have greater experience with local social media and educational ICT tools. There is a significant difference in the weekly use of audio applications, with Chinese academicians reporting higher usage than East Africans. The findings indicate that attitudes towards ICT tools differ between the two regions, with ease of use and perceived value being crucial for East African faculties. The research highlights the need for East African faculties to enhance their use of Learning Management Systems (LMS) to improve educational access [16].

The preservice teachers' (PSTs) attitudinal beliefs, particularly those centred on the usefulness of ICTs, are the strongest predictors of their intentions to integrate mathematics teaching and learning ICTs in their future classrooms. It highlights the need for early exposure to various ICT tools during initial teacher education to enhance PSTs' self-efficacy and beliefs regarding the ease of use and pedagogical compatibility of these tools. The findings suggest that subjective norms are influenced more by the technological demands of the digital age than by traditional influences from superiors and peers [17].

There is a significant positive relationship between the use of ICT tools (cell phones, Internet, Instagram, and Telegram) and depression among teenagers in the Maku Free Zone. Frequent use of these technologies leads to increased stress, sleep disorders, and feelings of isolation, ultimately contributing to depression. It was found that reduced usage of these devices correlates with better psychological conditions, including less anxiety and improved sleep. The research emphasizes the need for educational organizations to inform teenagers about the negative effects of excessive ICT usage [18].

The new methodology improved students' usability and accessibility skills. Students became everyday users of their designed products. The approach enhanced understanding of design decisions' impact on users. Results showed significant academic performance improvement in experimental group. [19]

The elements of will, skill, and tool predict the integration of ICT in teaching science and mathematics in the Philippines, with the WST model explaining up to 54% of the variance in ICT

integration. Science teachers exhibited higher scores in all indices of will, skill, tool, and ICT integration compared to mathematics teachers. The strongest predictor of ICT integration in science was attitude toward ICT, while in mathematics, it was ICT skills. The study suggests tailored training programs for teachers based on subject-specific needs for effective ICT integration. [20].

The digital tools significantly enhance the efficiency and quality of the road-mapping process, with a framework developed to map the most used tools and their applications. Four main domains of benefits and challenges related to digital tool implementation: data management, tools' integration, road-mapping performance, and user acceptance are identified. The study further highlights the need for further research on the digitalization of strategic management and the potential of emerging technologies like augmented and virtual reality in road-mapping. Limitations include a narrow focus on articles and reviews, potentially overlooking innovative tools [21]. Also, NPTEL courses in India were analysed over the impact on higher education students [22].

Activity-based learning significantly benefits engineering students' understanding. Game-based learning enhances student enthusiasm for courses. ICT tools streamline faculty evaluation efforts. Study can be expanded to larger student groups. Future studies can explore online and hybrid teaching modes [23]. Though the ICT usages has maximum benefits, it also affects the health related lifestyles on th higher education population [24]. This exploration of the relationships between ICT uses has concluded some disadvantages over the open distance learning system [25].

Engineering professors' digital competence needs improvement, especially pedagogically. Male professors exhibit higher digital competence than female professors. Gender gap in digital competence is wider in public universities. ICT use increased over 40% post-pandemic in all activities. Female professors in private universities increased ICT use more than males. Training should focus on pedagogical ICT application and specific learning objectives [26]. A study about the relationship between internet usage and social isolation among Iranian students were undertaken in many aspects [27].

The significant possibilities for adopting ICT as a pedagogical tool in community secondary schools (CSSs) in Tanzania, primarily due to the positive attitudes of teachers and students towards technology use. However, it also identifies critical constraints, including insufficient ICT devices, lack of technical support, and inadequate ICT skills among teachers. The study emphasizes the need for government investment in rural CSSs to bridge the digital divide and enhance ICT adoption. It recommends regular in-service training for teachers to improve their ICT competencies and suggests that ICT studies should be made compulsory in all CSSs [28].

The various e-Health methods and remote monitoring technologies (RMTs) significantly enhance the efficiency, accessibility, and quality of care for COVID-19 patients. Wearable sensors demonstrated great potential for non-invasive and timely diagnosis and monitoring. The review highlighted the need for further research on the cost-effectiveness and strategic features of these technologies, as well as the importance of security and privacy in handling sensitive patient data. Collaboration among healthcare professionals and technology producers is essential for optimizing remote patient monitoring systems [29].

The implementation of the Three Links Project (TLP) in rural China significantly enhances students' achievements, evidenced by a 3.4340-point increase in test scores and improvements in cognitive and non-cognitive abilities. The positive effects are attributed to increased teacher enthusiasm, greater parental involvement, and favorable student responses. Additionally, the TLP has a more pronounced impact on disadvantaged groups, including girls and low-income students, highlighting the role of ICT in addressing educational inequities. The findings contribute valuable insights for educational policy in China and similar developing countries [30].

The ICT plays a crucial role in transforming education into a knowledge and information society, emphasizing its importance in the teaching and learning process. It identifies significant challenges in implementing ICT, including weak government policies, insufficient funding, and a lack of trained teachers. The paper suggests that for successful ICT integration, there is a need for strong government policies, adequate funding, and training programs for teachers to enhance their skills in using ICT effectively. Overall, the paper advocates for a positive attitude towards technology and the development of local content to preserve cultural values [31].

The integration of Information and Communication Technologies (ICT) in management education is essential for enhancing the quality of teaching and learning experiences. It emphasizes that ICT-enabled

education can provide new skill sets to students, preparing them for the challenges of a competitive environment. The study highlights the need for revolutionary pedagogical changes to improve employability among business management graduates, which is currently a significant concern. Overall, the effective use of ICT is presented as a crucial factor in addressing the gaps in management education [32].

A new perception on the prospective impact analysis of teacher exhaustion in the intelligent era, emphasizing the importance of school ICT construction and teachers' information mastery as influencing factors. It concludes that good hardware and software facilities, along with effective ICT-related policies, can significantly reduce teacher burnout. The research confirms that information literacy mediates the relationship between school ICT construction and teacher exhaustion, highlighting the need for continuous professional development in TPACK for teachers. Suggestions are made for schools to enhance hardware and policies while promoting teachers' information literacy to mitigate burnout [33].

The student performance can be significantly enhanced through the use of social media, specifically via social media information, entertainment, and innovation, which contribute to social media knowledge generation. It emphasizes that social media knowledge generation is essential for improving student performance and that ICT knowledge plays a crucial moderating role in this relationship. The study also highlights the importance of social media in promoting the diffusion of new knowledge within academic communities, ultimately benefiting educational outcomes. The findings are expected to inform policymakers in education and industries engaging with youth about effective strategies in the social media landscape [34].

The integration of ICT in the education sector has enhanced the provision of online education using many e-learning platforms paving to flipped and blended learning. In spite of many advantages over the eLearning and ICT tools, the level of distraction also has increased drastically during the teaching learning process. Such distractions make them uncomfortable leading to poor health both physically and mentally. Making the students remain focussed and attentive throughout a session is tiresome. Hence alternative teaching methods and relevant course materials, are in need.

The adoption of ICT tools in education has provided seamless benefits in terms of students' performance and competing skills. The dark side is that how students face the health challenges. The psychology of the young generations has changed because of the open and continuous academic process. Whenever they access the ICT tools, they isolate themselves with the tools and the interactions among others reduces significantly. The continuous usage of such tools takes them to a new world where they enjoy the loneliness. The companion they prefer seems to be virtual, and when they face some real time challenges, they struggle to overcome the problem by themselves. Good availability of devices, infrastructure and expert in the field can bring many new changes in the education process.

3. PROPOSED WORK

3.1 Objectives of the Study

1. To study the various reasons for using ICT tools by the higher education students.
2. Identify the most used technology through which they access all the information.
3. Understand various applications used by students for information creation and gathering.
4. Explore the problems faced by students with excessive use of ICT.
5. To analyse the implications of ICT on the Health of the students.

3.2 Significance of the Study

1. The study helps to determine various psychological factors which influence students to get deviated from their regular academic activity.
2. The reason for a student's academic performance can be corelated to the discussed parameters which would enable us to identify significant behavioural and psychological problem.
3. It will help the students to streamline their behavioural patterns to focus more on career objective than to get deviated by unnecessary attractions.
4. It will help the parents to keep an effective check on their children's health and behaviour, thereby suitably guide them in becoming responsible future citizens of the country.

3.3 Impact of ICT's on Students performance

The purpose of the research is to identify the impact on the health of students who are using the ICT tools for their various academic and entertainment needs. The students come from diverse backgrounds

and environment which is unique for each student. In an overall context, the advent of ICT has supported the students to meet the increasing demand in their academic activities, thereby helping them to cope up with the digital environment.

But the excessive use has also had its own negative effects and which affects the health, psychology and career of the student. Some of the most common health and psychological issues which students face with excessive use of ICT usage are mentioned below:

3.3.1 Psychological Issues

1. Urge to use ICT tools more often
2. Using ICT tools when undergoing anxiety or depression
3. Excessive usage leading to loss of sense of time
4. Relationship strain with parents, friends and relatives due to excessive ICT tools usage
5. Urge to purchase new ICT devices for more application or increased usage.
6. Exhibiting anger, tension, depression, irritability and restlessness when not able to use ICT tools due to technical limitations.

3.3.2 Health Issues

1. Strain to the Eyes
2. Problem with Neck & Spine due to improper posture
3. Possibility of excessive strain to brain cells.
4. Repetitive Strain Injury (RSI) in wrist and hands
5. Accidents while traveling in vehicle, while crossing and walking in the road.
6. Increased sleep disorders
7. Anxiety and Depression

4. RESEARCH METHODOLOGY

4.1 Survey Approach

A survey is defined as the way of collecting data from pre-defined target group or respondents based on our research problem. The respondents being the students who are currently pursuing their higher education and the various psychological, health issues that the students face during the course of completing their higher education was the main objective with respect to the use of (ICT) Information Communication and Technology.

4.2 Population and Sample:

The survey was conducted among 200 students pursuing their undergraduate degree in Engineering. Interested students were shared a link to submit their opinion through an online survey.

4.3 Data Collection Methods

4.3.1 Primary Sources

The students were selected based on probability sampling, where every individual had the probability to submit his / her opinion through the survey. A structured questionnaire was prepared to understand the various needs, requirements, behavioural patterns and objectives of the student to use ICT as a tool for gathering required information.

4.3.2 Tools for Data Analysis

The responses were compiled using Excel and represented in a graphical format as bar charts and a formative evaluation is done in the discussion section.

5. RESULTS AND DISCUSSION

5.1 Reasons for using ICT among Students

To understand the amount of usage of various ICT tools, students were asked about the usage of ICT for various requirements from their educational requirements, entertainment, social networking, gaming and general knowledge.

International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 7, 2025
https://www.theaspd.com/ijes.php

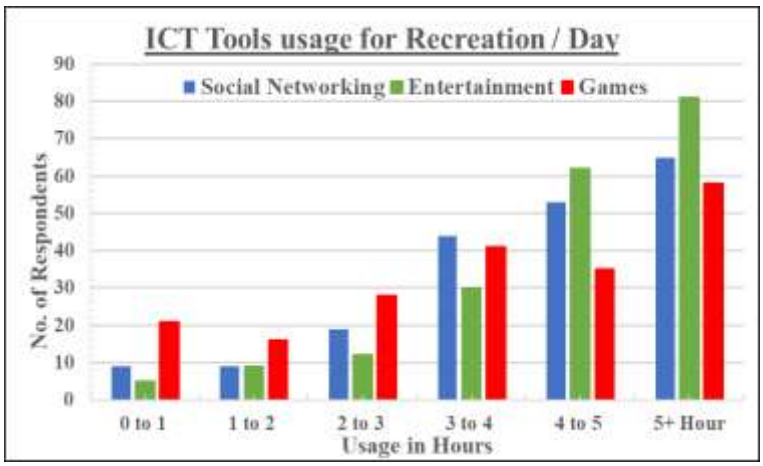


Fig 5.1

It is observed that the majority of the students community use ICT not less than 3 to 4Hrs/Day in an average when it comes to the usage related to Social Networking, Entertainment and Games as in Fig 5.1. Students mostly use ICT for the purpose of Entertainment followed by Social Networking and Games. The entertainment category includes short videos and many youtube channels.

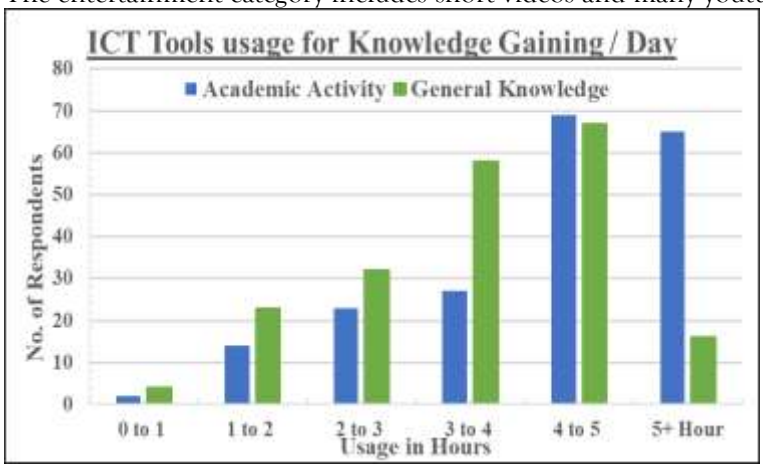
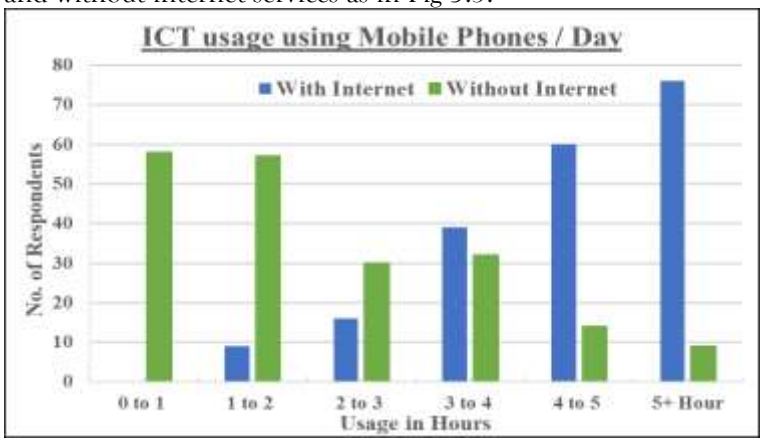


Fig 5.2

In contrast, the students use ICT for more than 4 to 5 Hrs/Day for their academic related activities such as completing their assignments, gathering related academic resources, enhancing their academic skills and so on as in Fig 5.2. With reagrd to their general knowedge skills, students on an average spend 3 to 4Hrs/Day which constittues to 55% of the total population and the rest of the group on an average use not more than 2 Hrs/Day for general knowedge.

5.2 Usage of ICT with & without Internet

To evaluate the difference in the usage of ICT tools with and without Internet, responses were gathered from the students. It is found out that there is a vast change in the usage pattern of devices with and without internet services as in Fig 5.3.



oFig 5.3

It is observed that most of the students use Mobile phones with internet not less than 4Hrs /Day and only 5% of the students use the mobile phones less than 2Hr/Day with Internet. On the contrary, about 90% of the respondents are not interested to use their mobile phone without internet not more than 1 to 2Hrs/Day. Only 12% of the students are interested to use the mobiles without internet for more than 4Hrs/Day.

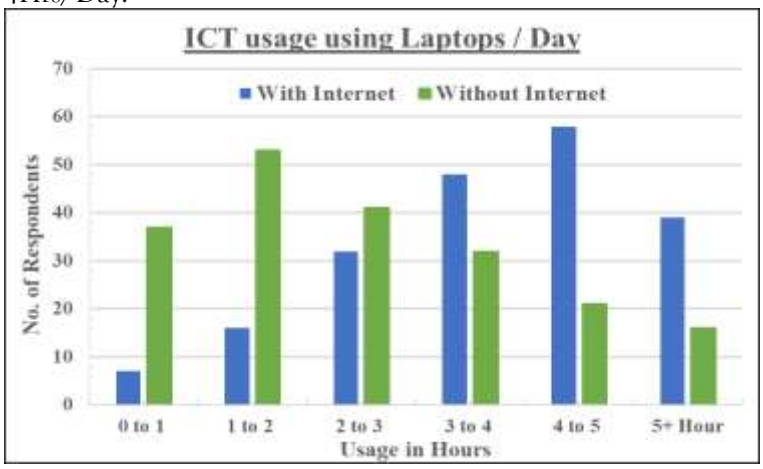


Fig 5.4

It is clear from the Fig 5.4, about 70% of the students use laptop with internet more than 4 to 5 Hrs/Day. About 20% of the students use laptops for more than 5Hrs/Day and less than 10% of the students use the laptop with internet for 1 to 2 Hrs/Day. When there is no internet, 65% of the students did not want to use their laptops for more than 1 to 2 Hrs/Day.

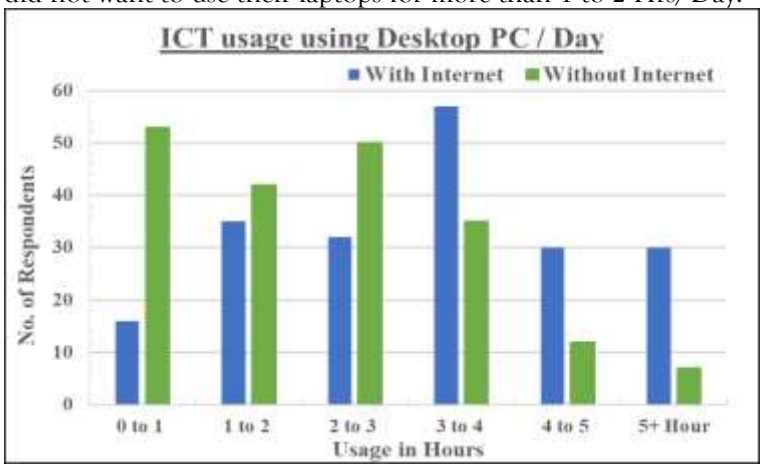


Fig 5.5

Fig 5.5 represents about 90% of the students use a personal computer for a minium of 3 to 4 Hrs/day with internet. But when there is no internet, 90% of the students do not want to use the PC for more than 1 to 2 Hrs/Day.

5.3 Usage of ICT based on location

In todays evolving world, the need to stay connected with people through technology is a necessity. Students extensively use their mobile phones to access data and get connected to their friends. On a daily basis, a student spends most of his/ her time in their classes, followed by hanging out with their friends in cafeteria, while traveling to their colleges and in their rooms.

Inorder to understand the usage of ICT at various places, the locations were broadly classified into 2 categories namely academic location and personal location based upon which students were asked to submit their responses.

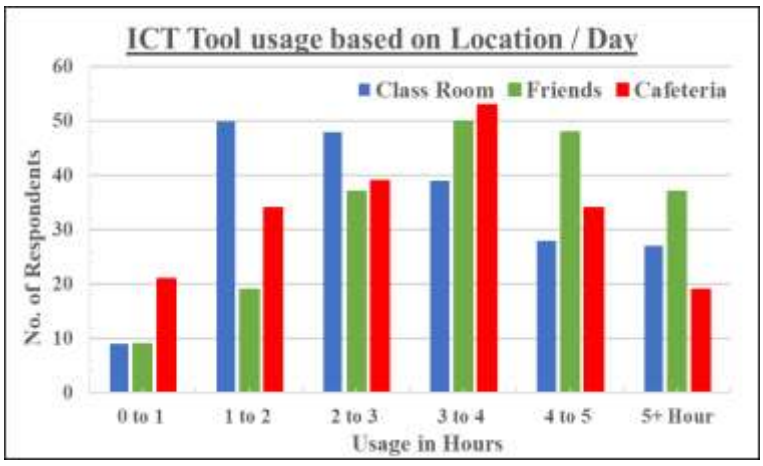


Fig 5.6

It can be seen from Fig 5.6 that about 55% of the students use ICT tools in classrooms for 1 to 2 Hrs/Day, follwed by 87% of the students accessing their ICT tools for 4 to 5 Hrs/Day when they are with their friends and 94% of the students using their it when thy are in the cafeteria for 3 to 4 Hrs/Day on an average.

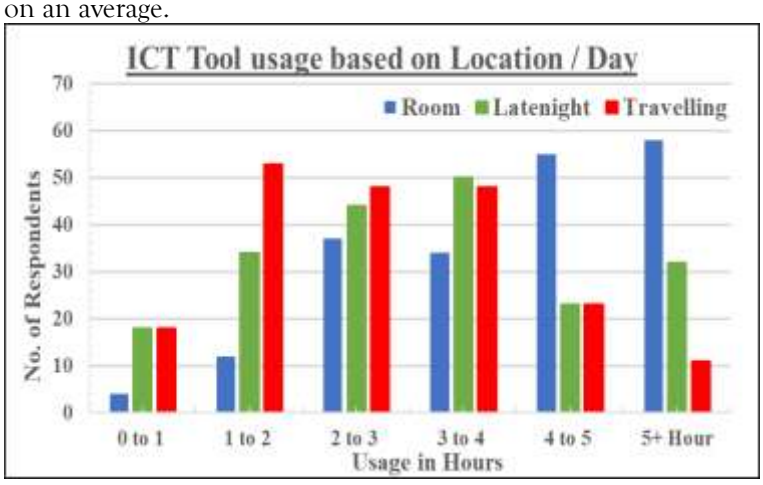


Fig 5.7

When the amount of usage in the students personal location was analysed, it is observed from Fig 5.7 that 55% of the students use ICT based tools in their rooms for more than 5 Hrs/Day and 91% of students use it at an average of 3 to 4 Hrs/Day in their rooms. During latenight time, 77% of the students use ICT related tools for 3 to 4 Hrs/Day and while travelling to their classroomsfrom their rooms and houses, 73% of students use ICT related tools for 2 to 3 Hrs /Day to gather their desired information.

5.4 Usage of various ICT Tools

The technological advancements with gadgets and internet, communciation devices have changed the way we used to communciate a decade ago. The various ICT tools acessed by students would give us an insight into the various desired needs that the students seek inorder to get them occupied. A list of 9 famous applications were selected and students were asked to mention the amount of time, they would use the particular application for their information gathering.

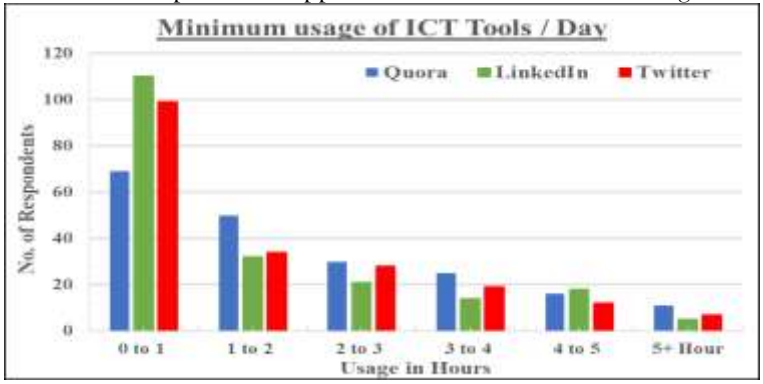


Fig 5.8

It was observed from Fig 5.8 that the students were not interested in professional network building, problem solving and its related applications on the whole. About 55% of students did not use LinkedIn followed by 50% for Twitter and 30% for Quora. Majority of the current generation of students are not into interested in professional networking and development.

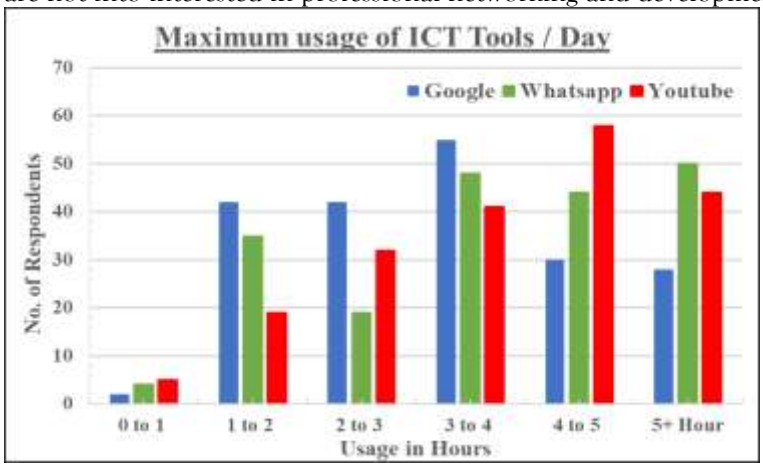


Fig 5.9

On the contrary, from Fig 5.9 it is observed that 97% of the students are interesed to use Google search engine for more than 3 to 4Hrs/Day on an average for getting their required information. This is followed by 98% of the students using Whapsapp in their mobile for an average of 3 to 4Hrs/Day and 70% of the students interested in watching videos on Youtube for more than 4 to 5 Hrs/Day.

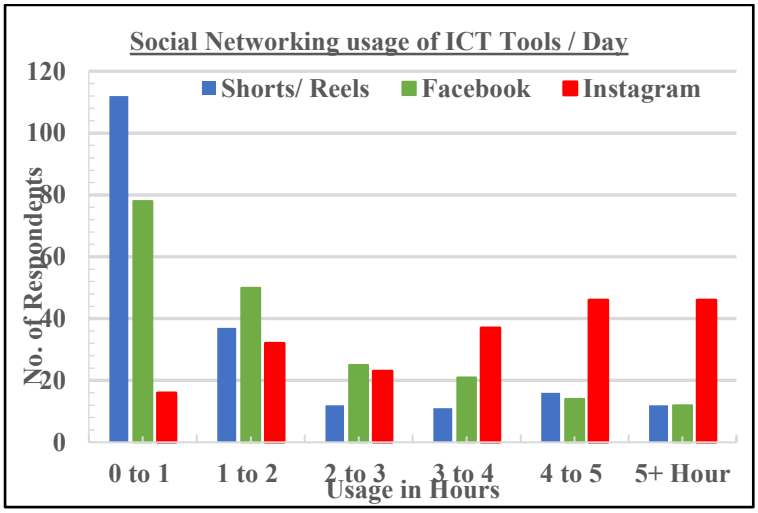


Fig 5.10

The current younger generation students are not interested in social networking as in Fig 5.10 when compared to that of other applications such as YouTube for videos and WhatsApp for mobile chatting. About 85% of the students prefer using Instagram for 3 to 4 Hrs/Day on an average for social networking than Facebook users who are at 63%.

6. CONCLUSION

The significant impact of ICT tools in enabling assisted learning in higher education is a welcoming one. The role of ICT in supplementing the educational outcomes of students has been in a positive trend. The entertainment aspect of ICT, changes the psychological and social behavioural aspects of the student's community. With an alarming growth rate of 32% every year and billions of young subscribers already an integral part in it, ICT has its own negative sides if not used properly. It will have significant impact in the life of students if not used for the right purpose. With the proper curriculum assistance and education system framework, it is possible for all the students to have an efficient and effective learning. The need for such an educational policy is very alarming at this juncture and with the help of artificial intelligence tools it becomes potential.

7. Recommendations

1. Considering the time of need, suitable educational policy can be framed.
2. Intelligent assistance both for the usage and learning of technologies.
3. Time bound use of ICT tools for recreation purpose should be practiced.
4. Involvement in outdoor activities and other social activities with relatives and neighbours which would help to keep the body fit and use time effectively.
5. Working for prolonged hours with ICT tools should be minimised by taking short breaks.
6. Proper sitting posture, ergonomics should be adhered if you are using ICT tools for prolonged hours.
7. Parents should suitably mentor, monitor and guide their children for effective use of ICT in their home.

8. REFERENCES

[1] Akyar, B.C., Monteiro, A. and Fernandes, P., 2024. Exploring Portuguese preschool educators' attitudes and practices on information and communication technology (ICT). Education and Information Technologies, pp.1-22.
[2] Allan, J. and Lawless, N., 2003. Stress caused by on-line collaboration in e-learning: A developing model. Education+ Training, 45(8/9), pp.564-572.
[3] Aloini, D., Lazzarotti, V., Pellegrini, L. and Zerbino, P., 2019. Inside-out: the forgotten side of ICT-enabled open innovation. Measuring business excellence, 24(1), pp.24-38.
[4] Alpana Vaidya, Vinayak Pathak, and Ajay Vaidya, Mobile Phone Usage among Youth, International Journal of Applied Research and Studies, Volume V, Issue 3, 2016, pp: 1-16
[5] Čampelj, B., Karnet, I., Brodnik, A., Jereb, E. and Rajkovič, U., 2019. A multi-attribute modelling approach to evaluate the efficient implementation of ICT in schools. Central European journal of operations research, 27, pp.851-862.
[6] Ceron, J., Baldiris, S. and Quintero, J., 2024. Autorregulate, an alternative to support self-regulation in MOOCs. IEEE Access.
[7] D. Castillo-Merino and E. Serradell-López, "An analysis of the determinants of students' performance in e-learning," Computers in Human Behavior, vol. 30, pp. 476–484, 2014.
[8] Fabrice, N., Bertrand, N.A.S. and Adamou, N., 2024. Effects of Information and Communication Technologies on Structural Change in Sub-Saharan Africa. Journal of the Knowledge Economy, pp.1-29.
[9] Hell, M., Knežević, A. and Kekez, I., 2022. Estimating the usefulness of ICT tools for implementing critical thinking in higher education. Management: Journal of Contemporary Management Issues, 27(1), pp.31-44.
[10] Honka, A., Kaipainen, K., Hietala, H. and Saranummi, N., 2011. Rethinking health: ICT-enabled services to empower people to manage their health. IEEE reviews in biomedical engineering, 4, pp.119-139.
[11] Immanuel, J. and Hameed, M.S., 2024. Resilient Pedagogical Advancements: Fostering Ict Tools for Post-Pandemic Esl Learning Through Sustainable Development–A Review. Revista de Gestão Social e Ambiental, 18(1), pp.e04905-e04905. [11]
[12] Kaba, A. and Ramaiah, C.K., 2020. Predicting knowledge creation through the use of knowledge acquisition tools and reading knowledge sources. VINE Journal of Information and Knowledge Management Systems, 50(3), pp.531-551.
[13] Kadıoğlu-Akbulut, C., Cetin-Dindar, A., Acar-Şeşen, B. and Küçük, S., 2023. Predicting preservice science teachers' TPACK through ICT usage. Education and information technologies, 28(9), pp.11269-11289.
[14] Kim, H.H.S., 2017. The impact of online social networking on adolescent psychological well-being (WB): a population-level analysis of Korean school-aged children. International Journal of Adolescence and Youth, 22(3), pp.364-376.
[15] Muhammad Saqib Khan, Irfanullah Khan, Siraj-u-Din, Hafiz Muhammad Ismail, Rafid Khattak, Rahimullah Jan, The impacts of ICT on the students' Performance: A Review of Access to Information, Research on Humanities and Social Sciences, 5(1), 2015, pp 85-94.
[16] Munyengabe, S., Niyigena, J.P., Mukamusoni, D. and Nshimiyimana, J., 2021. East Africa and China faculty use of information and communication technology tools: a descriptive and comparative analysis. Educational Technology Research and Development, 69(3), pp.1773-1797.
[17] Ndlovu, M., Ramdhany, V., Spangenberg, E.D. and Govender, R., 2020. Preservice teachers' beliefs and intentions about integrating mathematics teaching and learning ICTs in their classrooms. ZDM, pp.1-16.
[18] Pashaie, S., Abdavi, F. and BadriAzrin, Y., 2021. Partial Least Squares in Explaining the Relationship between the Using of Information and Communications Technology (ICT) Tools with Teenagers' Depression. International Journal of Management, Accounting and Economics, 8(6), pp.468-482.
[19] Pertegal-Felices, M.L., Marcos-Jorquera, D., Jimeno-Morenilla, A., Gilar-Corbi, R. and Mora, H., 2020. Training Future ICT Engineers in the Field of Accessibility and Usability: A Methodological Experience. IEEE Access, 8, pp.65812-65820.
[20] Sasota, R.S., Cristobal, R.R., Sario, I.S., Biyo, J.T. and Magadia, J.C., 2021. Will–skill–tool (WST) model of technology integration in teaching science and mathematics in the Philippines. Journal of Computers in Education, 8, pp.443-464.
[21] Serrano, K.M., Oliveira, M.G., de Sousa Mendes, G.H., Phaal, R. and Grison, P., 2023. Roadmapping and Digital Tools: A Systematic Literature Review. IEEE Transactions on Engineering Management.
[22] Sharmistha Mandal, Giridhar Maji, Impact of ICT on Higher Education in India with Special Focus on NPTEL, Journal of Emerging Technologies and Innovative Research, March 2019, Volume 6, Issue 3, pp: 425-430
[23] Sreemahadevan, S., 2024. A case study on the comparison of teaching–learning and performance evaluation methods applied to engineering students. Education and Information Technologies, pp.1-13.

[24] Toda, M., Monden, K., Kubo, K. and Morimoto, K., 2006. Mobile phone dependence and health-related lifestyle of university students. Social Behavior and Personality: an international journal, 34(10), pp.1277-1284.
[25] Van Der Merwe, D., 2019. Exploring the Relationship between ICT Use, Mental Health Symptoms and Well-Being of the Historically Disadvantaged Open Distance Learning Student: A Case Study. Turkish Online Journal of Distance Education, 20(1), pp.35-52.
[26] Vergara, D., Antón-Sancho, Á. and Fernández-Arias, P., 2024. Engineering professors' habits: didactic use of Information and Communication Technologies (ICT). Education and Information Technologies, 29(6), pp.7487-7517.
[27] Vida Fallahi, Effects of ICT on the youth: A study about the relationship between internet usage and social isolation among Iranian students, Procedia Social and Behavioral Sciences 15 (2011) 394–398.
[28] Warioba, M.M., Machumu, H., Kulunga, K. and Mtweve, L., 2022. Adoption of ICT as a pedagogical tool in community secondary schools in Tanzania: Possibilities and Constraints. Education and Information Technologies, pp.1-24.
[29] Chatterjee, A., Prinz, A., Riegler, M.A. and Das, J., 2023. A systematic review and knowledge mapping on ICT-based remote and automatic COVID-19 patient monitoring and care. *BMC health services research*, *23*(1), p.1047.
[30] Zhao, C. and Chen, B., 2023. ICT in education can improve students' achievements in rural China: The role of parents, educators and authorities. *Journal of Policy Modeling*, *45*(2), pp.320-344.
[31] Saha, T., 2023. The Role of ICT in Education: Challenges and Issues. *Journal of Emerging Technologies and Innovative Research (JETIR)*, *10*(2), pp.f794-f802.
[32] Rani, R., Sable, A., Srinivas, V. and Prasad, K.D.V., 2023. Integration of information and communication technologies in management education: a path for success. *Revista de Gestão e Secretariado*, *14*(7), pp.10863-10879.
[33] Chen, M., Zhou, C., Wang, Y. and Li, Y., 2022. The role of school ICT construction and teacher information literacy in reducing teacher burnout: Based on SEM and fsQCA. *Education and Information Technologies*, *27*(6), pp.8751-8770.
[34] Dzogbenuku, R.K., Amoako, G.K. and Kumi, D.K., 2020. Social media and student performance: the moderating role of ICT knowledge. *Journal of Information, Communication and Ethics in Society*, *18*(2), pp.197-219.