BRIDGING SKILL GAPS: PROMOTING CREATIVE AND CRITICAL THINKING IN GRADUATE LEARNERS THROUGH ALTERNATIVE ASSESSMENT METHODS

by

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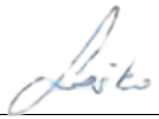

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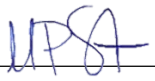

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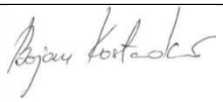

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Dedication

To my dad & mom.

"*The most beautiful experience we can have is the mysterious. This fundamental emotion stands at the cradle of true art and true science."*
-Albert Einstein

"*Anything you dream is fiction, and anything you accomplish is science; the whole history of mankind is nothing but science fiction, which is central to everything we have ever done."*
-Ray Bradbury.

Acknowledgments

I take this opportunity to show my heartfelt gratitude to everyone who has played a significant role in my learning and personal growth journey. Without the support and guidance of these remarkable individuals, I would not have achieved what I have today. First and foremost, I am immensely grateful to God for providing me with abundant resources and opportunities that have shaped my path. Your divine presence has been a source of strength and inspiration throughout my endeavors.

To my loving parents, I owe a deep debt of gratitude. Your unwavering love and encouragement have instilled in me a profound passion for learning. Your constant support has been invaluable, and I am forever grateful for the values you have instilled in me.

I would also like to extend gratitude to my lovely and intelligent daughter, bold and loving son, my supportive husband, colleagues, friends, and most importantly my institution and my students who journeyed with me. Your presence in my life has been a constant source of joy.

A special mention goes to my mentor, Dr. Bojan Kostandinovic, your guidance, expertise, and unwavering belief in my abilities have been instrumental in the completion of my work. I owe my gratitude to the Swiss School of Business for the engaging sessions.

ABSTRACT
BRIDGING SKILL GAPS: PROMOTING CREATIVE AND CRITICAL THINKING IN GRADUATE LEARNERS THROUGH ALTERNATIVE ASSESSMENT METHODS.

Mary Cordella Cruz
2023

Dissertation Chair: <Chair‟s Name>
Co-Chair: <If applicable. Co-Chair‟s Name>

In the World Bank Human Capital Index 2022 ranks India 132 out of 191 countries. This is an area of concern as India has the largest youth population, and therefore, they must have the right skill sets to find employment in an agile work environment. The workforce predictions indicate replacing a low- and medium-skilled workforce with smart automation. Given these trends, the Government of India introduced many programs to upskill and re-skill Indian youth, yet the employability of Indian graduates is below 50 percent. Educational reforms are slow-paced when compared to the technological revolutions of the 21st century.

This exploratory case study examined the impact of an innovative assessment method, specifically a flip-question paper, to enhance critical and creative thinking amongst graduate learners in a women's college in Bangalore. The survey was conducted with 112 respondents from India and abroad to understand current trends in education and skill gaps. The qualitative exploratory case study was conducted on fifty-four graduate learners over a longitudinal period of six months. The themes of the ACER creative thinking framework were evaluated using the rubric designed to generate the

quantitative data. The research aimed to validate that assessments should move from content-driven to more creative forms to improve skills. The concept of differentiated assessment brings out the abilities of each learner.

The quantitative data generated after the assessment supported and validated the three hypotheses stated in the study. The study's results confirmed that learners experimenting with their ideas could improve their creative and critical thinking. It can be concluded that this assessment method can be used as a model at the end of a program or the entry-level of employment.

It can be concluded that, in an age of rapid automation and smart technologies, educators should focus more on pedagogy and assessment that develop higher-order thinking skills. The findings of this study strongly suggest that alternative assessment methods can serve as a creative tool to bridge skill gaps. The future workspaces dominated by machines will require learners with highly developed skills. Therefore, having these skills marked in transcripts and content knowledge is essential.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

AO - Abstract Conceptualization

AISHE - All India Survey of Higher Education

ACER - The Australian Council for Educational Research 2020

CE - Concrete Experience

DL - Differentiated Learning

MDN - Median

RO - Reflective Observation

ROI - Return on Investment

RQ -Research Question

SOI - Structure of the Intellect.

CHAPTER I

INTRODUCTION

"Science fiction is the literature that always set my imagination on fire and fuelled my desire to push the boundaries of what is possible."

- Ann Leckie

1.1 Introduction

The quality of the nation‟s higher education system has the greatest impact on enhancing the earnings of its citizens and its consequent economic development. Thus, it is the role of educators to alter traditional 20th-century pedagogical practices and develop innovative practices to suit the needs of the 21st-century learner. The primary role of higher education should be to bridge the widening gap between university and industry by providing essential skills to learners. On the other hand, most universities still focus to a larger extent on the transmission of knowledge and assess the memory-retaining capability of the learner.

The NASSCOM-McKinsey (2022) study estimates that over a million technical graduates, 2.3 million graduates, and 0.3 million postgraduates come from 350 universities, 18,000 colleges, and 6,000 technical institutes annually. India's Higher Education System is indisputably one of the largest in the world, boasting an impressive 903 universities, 4,000 colleges, and 10,075 stand-alone institutions according to AISHE (2019). The Department of Higher Education, Government of India reported a staggering 37.4 million enrolment in these institutions in 2019. The rate of graduate hiring in India is 26%, according to Statista Research Department, posing a potential threat to the economy if not addressed (Rathore, 2019). Many educated young people are struggling to find suitable employment due to traditional

educational methods. The traditional approach involves educators transferring knowledge to learners, but in today's age where most information is stored and easily

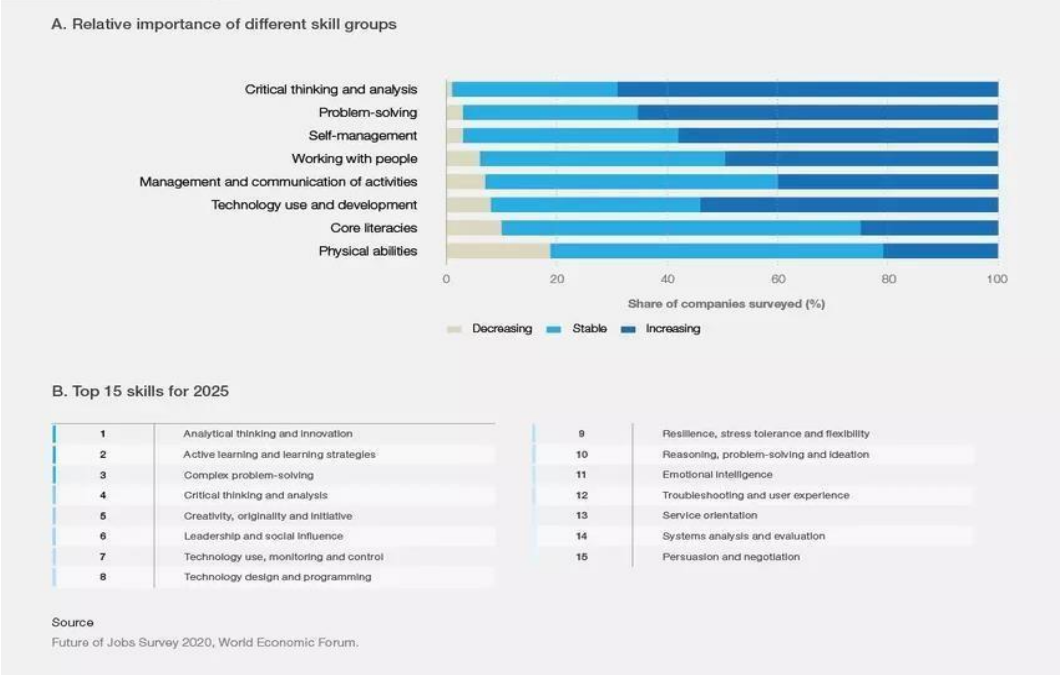


Figure 1
Reasons for Existing Skill Gaps
Source: Future of Jobs Survey 2020, World Economic Forum 2020.

accessible in the cloud, this approach seems outdated. In India, degree awarding examinations often prioritize knowledge-based questions over those that require application. According to the Future of Jobs Survey 2020, the percentage of jobs that will become redundant is expected to decrease from 15.4% to 9% by 2025. Additionally, the number of new professions created will increase from 7.8% to 13.5%. (World Economic Forum, 2020) According to respondent data, the number of jobs that will be lost due to technology is estimated to be 85 million. However, it is projected that 97 million new jobs will be created. It is important to note that around 40% of workers will require reskilling to keep up with the changing job market. The benefits of technological advancements can only be fully realized if workers possess

the necessary skills. The following data from the Future of Jobs survey by the World Economic Forum (2020) displays the perceived barriers to technology adoption. This is relevant to India since it has the youngest workforce, with a median age well below other countries, and by 2030, half of the population will be below 28.

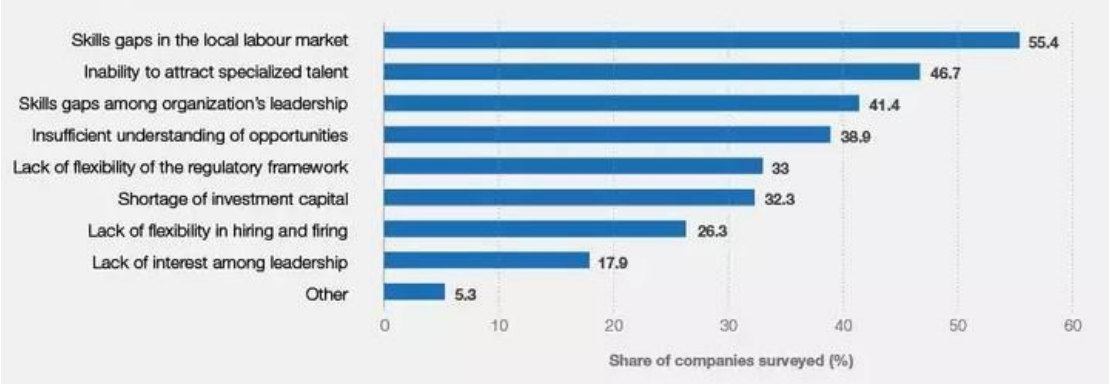


Figure 2
Perceived Barriers to the Adoption of New Technologies
Source: Future of Jobs Survey 2020, World Economic Forum 2020.

The above figure indicates the reasons for existing skill gaps according to the Future of Job Survey 2020 by the World Economic Forum. Rapid Technological transformations have made life easier and also eliminated the need for low and medium-skilled labor. Education should equip the learner with the 21st-century skills to work in an agile work environment, creativity and critical thinking are two important skills that machines cannot replicate. Therefore, all learners must develop these skills and the best way forward is to see that educational institutions develop higher-order thinking skills.

The instructional and assessment techniques should be upgraded from one that primarily encourages learners to memorize large chunks of data to one that develops skills that are in demand for the 21st-century workforce. The concept of memorizing is irrelevant today, instead, educators should encourage the creation and application of the existing knowledge. This research aims to develop an assessment method to

develop Creative and critical thinking in undergraduate learners. Though the educational landscape of the digital natives is entirely different, most educators and institutions still depend on the pedagogy of the 20th century. The teaching-learning process can be utilized to its full potential if educational reforms are speeded up and revamped with every technological revolution.

1.2 Research Problem

1.2.1 Technology 4.0.

Current Technological Evolution creates large-scale displacement in organizations and along with it creates new business models. The global survey by McKinsey in 2021 indicated that 90% of all organizations will require reskilling of the existing workforce in the next five years (McKinsey & Company, 2021) Most respondents identified the development of softer, advanced cognitive skills like leadership, critical thinking, and decision-making. The rise of smart automation can be an asset to the economy if along with it the workforce skills are improved to complement this development. It seems reasonable to assume that the future of work will be significantly different due to the rapid Technological advancements as conveyed by Lewis Slikin (Silkin, 2020). The change in Industry Revolution 4.0 is happening at a faster rate with 3,000 times the impact when compared to the first Industrial Revolution. To reap the economic benefits of smart cities the educational transformation should be equally fast-paced.

1.2.2 Education 4.0

According to Lasry et al. (2013), the complexity of imparting 21st-century skills requires an evolution of instructional techniques that ignite the learner‟s environment. The educational transformation should allow the learner to explore and synthesize the information available on multiple platforms. Greenstein (2012) strongly argued that students need to develop complex skills to prepare for the rigor of

college and the demands of the workforce. It is observed that educational reforms are slow and almost two generations behind the Technological revolution Tompkins (2014). The purpose of 21st-century education will be to prepare the learner to meet the demands of society and to make a substantial contribution to the workforce. Awadhya and Kanjilal (2019) emphasized the need for Indian Universities to offer customized skills and this was mentioned years back by Santandreu and Shah (2016) the need for the curriculum to be set to equip the learners to have workforce readiness. The expectations from employers indicate that well-developed skills are required along with a sound academic background Yorke (2006) and the current situation of remote working and smart automation demands more skills than ever before. Though government agencies and policies are in place research findings by Wheebox (2020) indicate a wide disparity in the expectations of the industry and the education offered by the universities. Most employers prefer job-specific skill training to compensate for the lack of skill education in universities; this incurs a loss of time and money for the industries.

The problem that arises out of an education system that primarily focuses on imparting theoretical knowledge instead of developing critical and creative thinking will be a large population of educated youth that cannot find the right employment. This is a matter of grave concern as India has one of the largest populations of youth in the world.

The technology revolution of IR 4.0 is embedding intelligence in machines giving rise to a new generation of smart Automation along with the development of Artificial Intelligence. Rapid Technological transformations have made life easier and eliminated the need for low and medium-skilled labor. Education should equip the learner with the 21st-century skills to work in an agile work environment, creativity and critical thinking are two important skills that machines cannot replicate.

Therefore, all learners must develop these skills and the best way forward is to see that educational institutions realize shifting trends in Technology and fine-tune pedagogy to develop higher-order thinking skills. The surveys by various forums indicate the growing importance of higher-order thinking skills for future workspaces. Machine dominance and the rise of smart cities will require highly skilled and creative manpower.

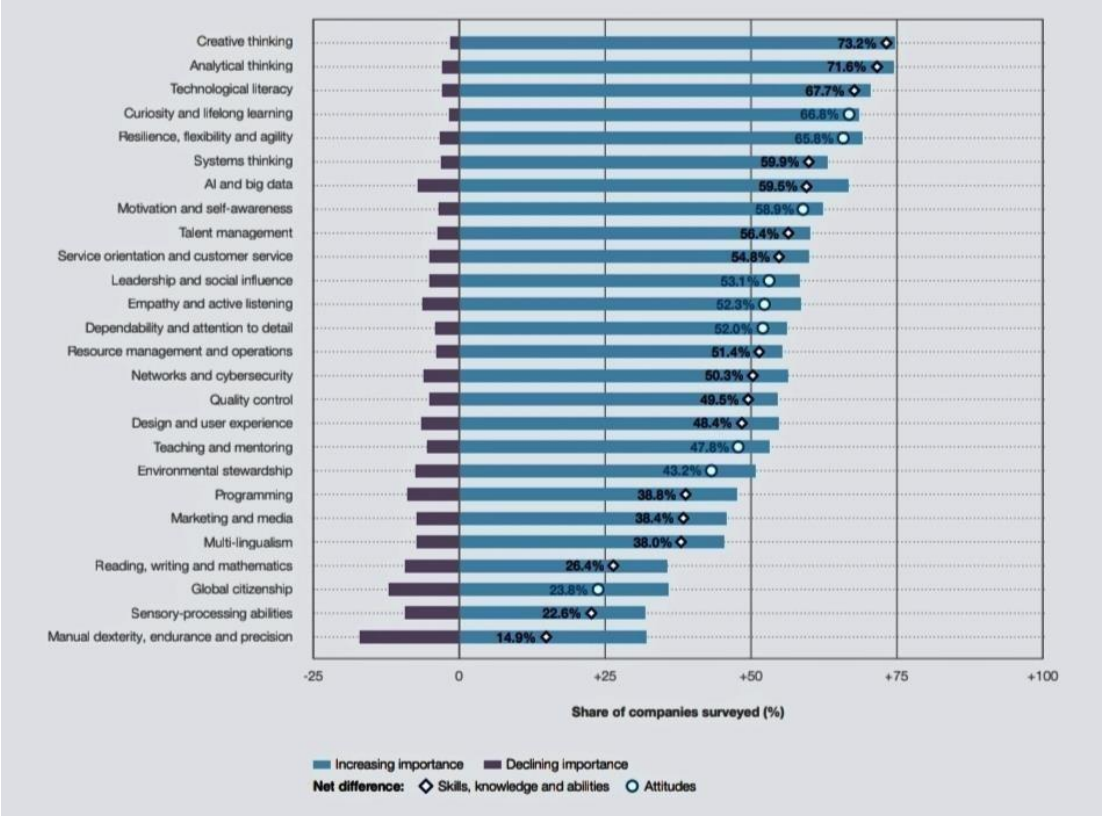


Figure 3
Skill Gaps
Source: Future of Jobs Survey 2020, World Economic Forum 2020.

The above figure indicates the top skills required, according to the World Economic Forum (2020), The Future of Jobs Report 2020. The data from the survey of 2020 and the survey from 2023 indicates that critical and creative thinking will be in much demand for many years to come. The need of the hour is to see that more

focus is given to this development so that learners do not face skill gaps, the future workspaces will require an agile workforce that can keep pace with the evolving needs. Educational institutions can serve as the right channel to bridge the skillgap and find the right employment for each of its learners. The best way forward is to focus on skill-based and application-based teaching/learning methods. The pedagogical practices should be revamped often to keep pace with technological evolutions.

1.2.3 Indian context

India has one of the largest youth populations in the world; therefore, it is more important that universities and colleges produce skilled graduates. Unemployment among youth will be a cause of social unrest as well as a large burden on the economy. The importance of well-developed 21st-century skills in the learner will enable them to be creative and critical thinkers and innovators who can navigate an agile and dynamic work environment. According to the India Survey report 2022 Creativity and Social intelligence are likely to be the most sought-after skills that give the human mind a clear distinction from the machines that are rapidly replacing low and medium-skilled labor. It is crucial to prioritize the enhancement of higher-order thinking skills in education.

Though the Government of India has heightened the focus on skill development, most industries are facing a dearth of skilled workforce. This will be an area of major concern as India has the youngest and largest number of youth for the next twenty years. It is imperative that education keep up with the rapid pace of technological advancements and adequately equip graduates with the necessary skills to enter the workforce with readiness.

1.3 Purpose of Research

To keep up with the ever-changing demands of the workforce, it is important to rethink and update our teaching and learning methods. This will allow students to better navigate the dynamic landscape of the job market. Rapid technological advancements are leading to the displacement of low and medium-skilled workers. Educators must prepare students to continuously improve their skills through lifelong learning. The pedagogy of the 20th century is no longer relevant to today's learners, so it must be revamped to meet the needs of digital natives.

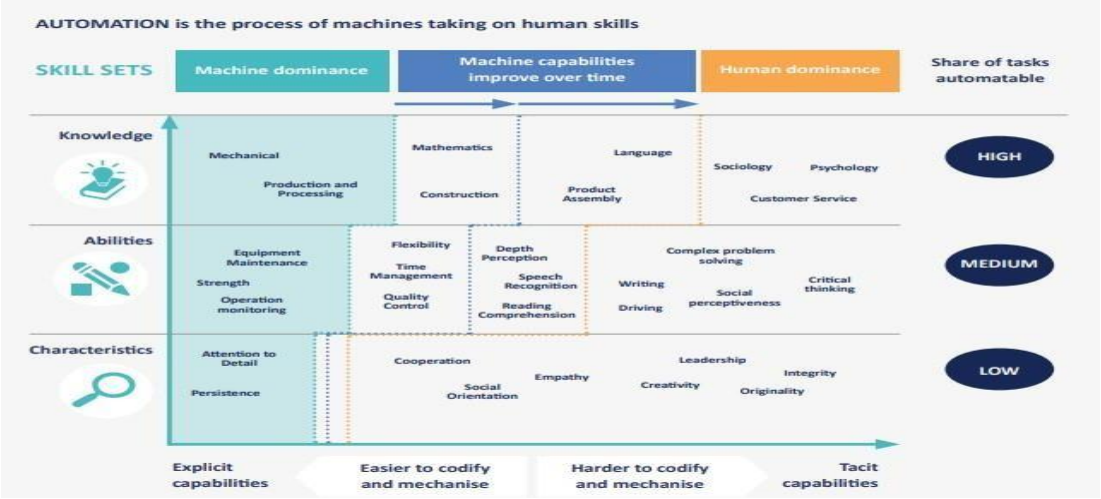


Figure 4
Shift from Human Dominance to Machine Dominance
Source: Future of Jobs Survey 2020, World Economic Forum 2020

The figure above shows that jobs are shifting from human to machine dominance. While machines excel at routine tasks, they struggle with adapting to new situations. With increasing automation and AI, four-year degree programs should adapt accordingly to focus more on the application of knowledge rather than memorization. This skill enhancement program requires educators to evaluate and measure progress. Complex cognitive jobs will be in demand as they are less susceptible to automation. Educators should prepare learners with skills that complement AI technologies. The

traditional method of rote memorization has become obsolete in today's world where machines can provide instant access to information. The way forward is to reduce passive learning assessments and prioritize higher-order thinking skills.

Adopting innovative pedagogy in all classrooms can skill India's large population of youth. Developing higher-order thinking skills in classrooms will make graduates workforce-ready. Educational reforms must keep pace with technological revolutions.

It is imperative to implement innovative pedagogy in all classrooms to effectively upskill India's vast youth population. Graduates must be equipped with higher-order thinking skills to become workforce-ready. Educational reforms must keep pace with technological revolutions to ensure success in the modern world. The rate of skills on the job and the time for onboarding at the entry level of jobs will decrease if graduates develop their skills along with knowledge. Educational institutions should focus on workforce-ready graduates so that large-scale unemploymentcan be reduced. The rise of unemployment and underemployment is due to an education system that is slow to change. Therefore pedagogical practices must be revamped and revised to suit the needs of the digital and automated workspaces.

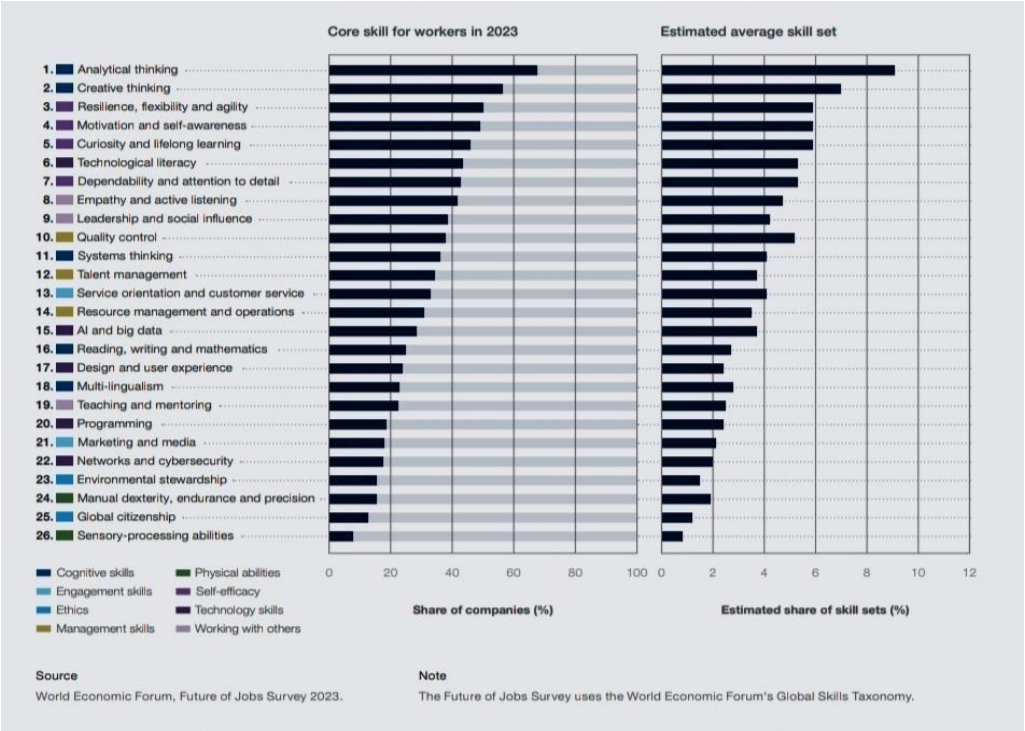


Figure 5
Reskilling and Upskilling 2023 to 2027
Source: Future of Jobs Survey 2023, World Economic Forum 2023

The highest priority for skills training from 2023 to 2027 is analytical thinking which will be 10% of all upskilling initiatives, and the second priority is for creative thinking. (World Economic Forum, 2023).

According to Levin (2015) and Sharp (2014), the instructional systems of the past are outdated and have failed to equip learners with the essential skills necessary for success in today's world. However, significant pedagogical reforms have taken place to ensure educators prepare their students for the age of automation, where machines equipped with intelligence can replace low and medium-skilled labor. The skills required for success in the current workforce have undergone significant changes since the rise of automation. Therefore, educators must deviate from the traditional content-driven approach of the 20th century and prioritize the most sought-after skills that combine cognitive abilities and critical thinking skills Developing 21st-century

skills are crucial for learners to adapt to new technologies and think critically on a global scale. Educators must abandon traditional methods and prioritize the development of higher-order thinking skills in digital natives. We must equip our future generations with the necessary skills to thrive in a constantly evolving world. Educators should prepare workers with the skills required for future workspaces.

1.4 Significance of the Study.

This study highlights strategies to enhance critical and creative thinking in graduates, thereby augmenting the existing knowledge. Bridging skill gaps at the university level is an absolute necessity to ensure that our graduates are highly skilled and can adapt to the ever-changing work environment with agility.

a. Innovation in Pedagogy: Educators must embrace innovative pedagogy to meet the evolving needs of digital natives. Traditional methods like rote learning and content-focused assessments are insufficient for equipping students with the necessary 21st-century skills. To establish a student-centered learning environment that fosters critical and creative thinking, educators must implement new and diverse instructional techniques.

b. Challenges in the Indian Education System: The Indian education system is facing major obstacles, as highlighted by this study. The prevalence of rote learning and knowledge-based assessments can hinder critical and creative thinking. To tackle these challenges, it is crucial to prioritize creativity and critical thinking alongside domain knowledge in the assessment system.

c. Promoting Student-Centered Learning: Prioritizing student-centered learning approaches is imperative as they not only enhance critical and creative thinking abilities but also empower students to take an active role in their education. To ensure the effectiveness of this approach, a comprehensive assessment system must be put in place to evaluate progress in knowledge gained along with critical and

creative thinking skills. A well-designed assessment framework can encourage students to develop these skills throughout their undergraduate studies. The skills that get measured will progress.

The study is expertly structured into six comprehensive chapters, each with its own set of activities. Chapter One serves as an impressive introduction to the research, providing clear and concise information about the background of the study, its scope, and the well-defined research problem. This chapter also outlines the study's aims and objectives, highlighting the evidence of a gap in the literature. Chapter Two exemplifies the theoretical frameworks on which the study is anchored and meticulously analyzes the literature. Chapter Three examines the methodological approach by analyzing the interpretative-qualitative and quantitative approaches, leading to an impeccable research design. It also discusses the data generation techniques with a remarkable case study analysis and observation process. Chapter Four presents the qualitative and quantitative results of the exploratory case study with an unprecedented level of detail. Chapter Five provides a thorough examination of the research's conclusions and recommendations, followed by Chapter 6 highlighting the limitations of the research, examining practical implications, and concluding with well-formulated suggestions for possible future studies.

1.5 Research Purpose and Questions

1.5.1 Research Purpose

The assessment method being developed is aimed at evaluating learners' ability to apply knowledge instead of just memorization. The "flip question" technique allows learners to express their understanding of the subject matter by developing either a white paper or a futuristic fictitious project. Science fiction writing has proven to be an effective tool for enhancing creativity and critical thinking in the classroom, as many of today's technologies were once imagined by science fiction writers.

Satellites, initially proposed by Arthur Clarke in 1945, became a reality within a decade, demonstrating the power of science fiction concepts. Similarly, self-driving cars, predicted in 1964 for the year 2017, have come to fruition. Encouraging learners to develop imaginative ideas based on learned principles fosters critical and creative thinking, rather than mere memorization. This approach cultivates well-rounded and adaptable individuals for a fast-paced work environment, as evidenced by numerous successful entrepreneurs and innovators with limited education or poor grades. The objective of this research is to verify the hypothesis that a novel assessment method can enhance learner performance in the development of creative and critical thinking.

H1. Flip question (white paper project / Science fiction) positively influences the development of Creative Thinking in undergraduate learners

H2. Flip question (white paper project / Science fiction) positively influences the development of Critical Thinking in undergraduate learners

H3. Flexible assessments can be used to measure skill progress.

1.5.2 Research Questions

RQ 1. Can flip question papers (white paper projects /science fiction writing) help improve graduate learners' creative thinking?

RQ 2. Can flip question papers (white paper projects /science fiction writing)help improve graduate learners' critical thinking?

RQ 3. Can flexible assessments be used to improve and measure skill progress?

The primary emphasis of pedagogical advancements must be placed on evaluating the learner's practical implementation of knowledge, rather than mere rote memorization.

CHAPTER II

REVIEW OF LITERATURE

"Science fiction isn't just thinking about the world out there. It's also thinking about how that world might be—a particularly important exercise for those who are oppressed because if they're going to change the world we live in, they—and all of us—have to be able to think about a world that works differently."

- Samuel R. Delany

2.1 Introduction

Reforming higher education from a knowledge-based to a skill-based system is an absolute necessity due to the constantly evolving job and skill requirements. Extensive research has shown that knowledge and skills have a shorter shelf life, making it imperative for institutions to adopt a more skill-oriented approach. However, the lack of literature on developing skills alongside domain knowledge in learning environments and classroom strategies is concerning and needs immediate attention.

It is becoming increasingly evident that the workforce and employers are experiencing skill mismatches due to the emergence of new technologies and Industry 4.0. This industrial revolution is creating new job opportunities for those who are innovative and willing to upskill, while simultaneously disrupting low-skilled jobs. Digital automation has revolutionized all aspects of our daily routines, enhancing work efficiency and precision. Advanced technology, such as automated farming, ATMs, and surgical robots, will inevitably replace low-skilled jobs. These intelligent machines require highly skilled labor and leave no room for those without the necessary skills. The collected references from articles, reports, surveys, and websites

indicate that worldwide institutions do not focus enough on imparting skills, leading to large-scale underemployment and unemployment. Neglecting this issue will cause serious skill gaps, as machines are designed to work faster and smarter during this age of rapid automation, making it difficult for educated youths to find employment that fits their qualifications. There is not much literature available on how educators can improve the skill component and how performance indicators can be introduced to measure the skills developed during the program of study.

The importance of equipping Indian learners with customized skills for workforce readiness has been emphasized by Santandreu and Shah (2016). Yorke (2006) has also emphasized the significance of well-developed skills in addition to a sound academic background, particularly in the current scenario of remote work and smart automation. However, research conducted by Wheebox (2020) has discovered a significant disparity between industry expectations and university education, resulting in employers preferring job-specific skill training. According to The India Survey Report (2022), creativity and social intelligence are expected to be the most sought-after skills, enabling individuals to excel in an agile and dynamic work environment. According to the India Skills Report (2022), educational institutions are not providing adequate guidance for a holistic skill-based approach to higher education. Graduates from various domains who have taken the National Employability Test scored low, indicating a severe lack of necessary knowledge and skills due to an education system that fails to equip learners. It is concerning that graduate and post-graduate programs had percentages ranging from a mere 22% for polytechnics to approximately 55% for engineering degrees. This highlights the urgent need for educational institutions to revamp their approach to education and focus on developing practical skills that are essential for the workforce.

India's human capital index has been rated poorly at 115th among 157 nations, according to the 2018 World Bank report. To prevent underemployment among the country's burgeoning youth population, immediate and decisive action is imperative. Recent studies have highlighted the urgency to introduce skill-based and competency-based education, which unfortunately is lacking in universities. This research provides a detailed roadmap for imparting skills, domain knowledge, and a robust assessment system to track progress. Ignoring these findings will inevitably lead to a continued decline in India's human capital development, as confirmed by the India Skill Report (2021). The unemployment rate is around 54% in 2021 and according to them, it could be improved if employees have better behavioral skill sets which include critical thinking, agility, and a problem-solving approach. These important parameters are missing due to a lack of institutional guidance. These institutions do not keep up with the dynamic needs of the industry and the India Skill report emphasizes the importance of upskilling and updating the course content. The Global Skills report by Coursera denotes a 12-rank overall drop in India „s Proficiency in data Science subjects to get a global rank of 68. This will be a matter of concern as India has the largest number of youth population. Though many skilling programs are not aligned with mainstream education, this will turn out to be a waste of time and effort. Instead, the three-year or four-year degree program should focus moreon skill enhancement along with improving content knowledge. The trend of overeducation and underemployment or unskilled is a case of growing concern to most educators. The rate at which pedagogy is revised is at a slower pace, the numberand diversity of programs have improved exponentially over the years but the teaching-learning practices are evolving at a slower pace.

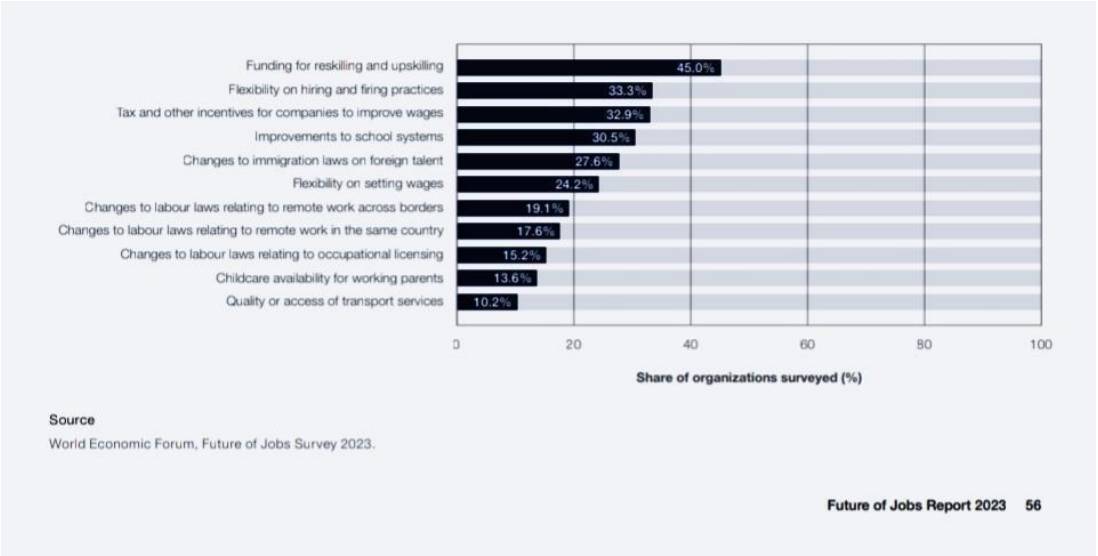


Figure 6
Public Policies to Bridge Skill Gaps
Source: Future of Jobs Survey 2023, World Economic Forum 2023

The figure indicates that funding for skills is the most effective government intervention for connecting talent to employment (World Economic Forum, 2023). Maisiri (2019) asserts that vocational education and training (VET) is crucial in providing skilled workers to industries through education and training. VET helps individuals acquire the necessary skills to venture into entrepreneurship. Despite the emphasis and funding of vocational education and training in developed countries due to globalization, India still largely neglects it. The Indian labor force is vast, yet many workers lack formal education or experience in their chosen fields. In today's ever-changing technological landscape, workers must be open to quick learning to remain relevant. Prioritizing technical and vocational education is paramount in ensuring the long-term growth and expansion of India's economy as well as reducing high rates of joblessness have been on the rise in India. The global economic downturn and the relatively slow growth of businesses have had a significant impact on the creation of new jobs. In the next two years, this upward trend in the unemployment rate is projected to continue.

According to Rosen (2018), prospective college students' motivation is increased when they feel secure in their ability to apply what they have learned in the workplace. Unemployed people with more education are more likely to find work, earn the same or more as they did before they lost their jobs, and find work faster. When one member of the workforce is out of work, it may have a domino effect on the rest of the family and the economy as a whole.

Employers, teachers, legislators, and training groups all across the globe agree that closing the skills gap is crucial. Increased access and completion, as well as adaptation to changing job markets, may assist the nation in addressing the skills gap and position higher education institutions for success in the economy of the future. González-Pérez and Ramírez-Montoya (2022) stated the major critical elements for learners across all forms of education (i.e. general, academic, vocational, and technical) comprise numerous tactics including the learning environment, the teacher and learner interaction, the style of teaching, and other supporting variables. These methods are based in part on the content that has to be taught, and in part on the character of the students themselves as they learn to work together and share knowledge. The importance of respect in the classroom was also highlighted in a study on effective teaching in vocational education and Training. Cents-Boonstra et al. (2021), argued that it is crucial to foster an environment where students are motivated to pursue their goals and succeed, and where they are also given the resources, they need to do so. An author also noted in his study the importance of creating a meaningful and engaging classroom atmosphere. Part of this is making sure there are interesting and engaging displays of student work throughout the room. Learners' motivation may be boosted with the support of these contextual elements, which in turn encourage a feeling of mastery.

2.2 Theory of Reasoned Action

It is proved beyond doubt that the future of work will be significantly different due to the rapid Technological advancements as conveyed (Silkin, 2020). The McKinsey Report on the Future of Work indicates that the recent developments in Automation and Artificial Intelligence will change the skill sets required for the future Workforce. This will require people who can innovate, develop, and adapt to these changes (McKinsey & Company, 2021). The change in Industry Revolution 4.0 is happening at a much faster rate with 3,000 times the impact when compared to the first Industrial Revolution. To reap the economic benefits of these developments the educational transformation should be equally fast-paced. The possibility of technology replacing human labor was predicted in 1930 by John Maynard in his essay "Economic Possibilities for Our Grandchildren". Today as Industry 4.0 advancements have opened a new world, the interaction between man and machine has become more frequent.

Previous research indicates that even if a million jobs are displaced or disrupted, two million jobs could be created by technological advancements and automation (Gregory et al., 2016). At the same time, another group of researchers stated that the pace at which automation is expanding will cause large-scale worker displacement and unemployment (Gordon, 2013; Kristal & Cohen, 2015; Smith & Anderson, 2014).

Recent studies by Malone et al. (2020) prove that we are many decades away from the day when computers have complete human-like intelligence and therefore there is a lesser possibility of machines replacing humans. From the above observations, it is evident that new advancements will require agile and advanced skills to cope with these fast and smart machines.

The studies carried out by Aniket (2018) indicate a skill gap between the education offered and the requirements of the industry. This will be of serious concern as educated people may not find the right employment. Most low-skilled jobs could be executed by intelligent and smart machines created specifically for the job. This will lead to serious economic and social unrest if several youths are educated but underemployed. As a solution, Singh et al. (2022) illustrated that by analyzing the performance and competencies of specific industries certain corrective measures can be incorporated into the observed gaps. As per the solution offered by Yudono et al. (2021), project-based learning could align the skills in line with the relevant industries. According to the Future of Work, Education, and Skills Enterprise Survey, the data collected from 774 companies spread across 14 states indicated about 34% of these companies require new skill sets to handle the rapid automation, and more than 70% of them would up-skill their existing staff.

According to Cappelli (2015), a skill gap is defined as when the skill levels of the existing workforce are insufficient to meet the requirements of the organization. Fisk (2017) aptly points out that a new vision of learning wherein learners identify the source of these skills and knowledge should be incorporated. Studies carried out by González-Pérez et al. (2018) revealed the absence of a suitable educational Framework that develops competencies through the dimension of character and linking active learning teaching strategies for students. The skills required for jobs arising due to rapid automation will differ considerably from the skills imparted by formal education. Advancements in automation and AI technologies create large-scale skill disparity, the fore education should always keep track of in-demand skills. The role of educators should be to impart the required skills and to make learners workforce-ready.

The bulk of the existing skill gap is the result of an education system that primarily assesses the knowledge gained in a program rather than the skills acquired. Li and Herd (2017) convincingly argue that to optimize the changes, education, and training must be in tune with the evolving demands of the workplace. The primary objective of Higher Education should be to enhance core skills along with the traditional method of knowledge sharing. The predicted economic expansion of any country is attained when skilled professionals utilize technology as a tool. Skill shortage can hinder the ability to adapt and work with new technology, thereby causing slow economic progress. The importance of the right skills for the future workforce is reinstated by the World Economic Forum forecast for 2022.

The most valuable asset of any country is the youth and India‟s youth population is about a fifth of the world‟s youth. This demographic dividend opportunity is the longest in the world accessible for 5 decades starting from 2005 to 2055. While the rest of the world will face a scarcity of 47 million and India will have a surplus of 56 million working-age people. The Indian government has made progress in various skilling programs similar to the ambitious SKILL INDIA programs to provide skill training to over 400 million people by 2022. The youth of India are exposed to several programs that impart skill education but many youths do not avail of these programs. The best way to unleash the huge potential of the demographic‟s dividend is to intertwine skill enhancement as an essential pedagogical practice.

According to Malik (2015), it will be an asset if the full potential of this surplus workforce is skilled. This can be achieved if transformations in the educational sector happen at the same pace. These changes for work preparedness require coordinated efforts of policymakers, administrators, teachers, and other stakeholders. It is becoming evident that more learners are investing in shorter-duration skill-based programs, indicating a steady gain in popularity. The traditional four-year degree will

cease to lose its relevance if learners do not develop workforce readiness. It is essential to develop specific skills in the learning program so that workforce readiness is achieved. Technology is rapidly evolving and most of the current developments maynot be included in textbooks, therefore the dynamic landscape of the tech industry requires talented individuals who can contribute their services. The learners who opt for short-term skill-based programs are readily available for the specific tasks. Most tech giants are on the lookout for talent and skills and not on educational background. These shifts in hiring practices indicate that skills and talents can be acquired through a variety of ways not necessarily through formal degree programs. Jobs that require a strong foundation and theoretical knowledge may require a three-year or four-year degree program. The trend of hiring in tech companies is to hire problem solvers and creative thinkers, most of the learners who take short-term skill-based programs tend to be up to date with recent developments. These learners also demonstrate the agility to adapt to agile work environments. The job roles in AI and other machine learning and data science demand expertise that may be found in nicheprograms. This is directing learners into short-term skilled programs that are vocational and job oriented eliminating the need for long-duration theoretical programs. Technology and smart automation make life easier but eliminate the role of low and medium-skilled workers. Tacit knowledge is an area that machines cannot have the ability to handle since it is difficult to codify. Therefore these skills should be developed, practiced, and trained by educators so that graduate learners find the appropriate employment. Talent and skills can be improvised with regular practice andthereby improve the employment scenario.

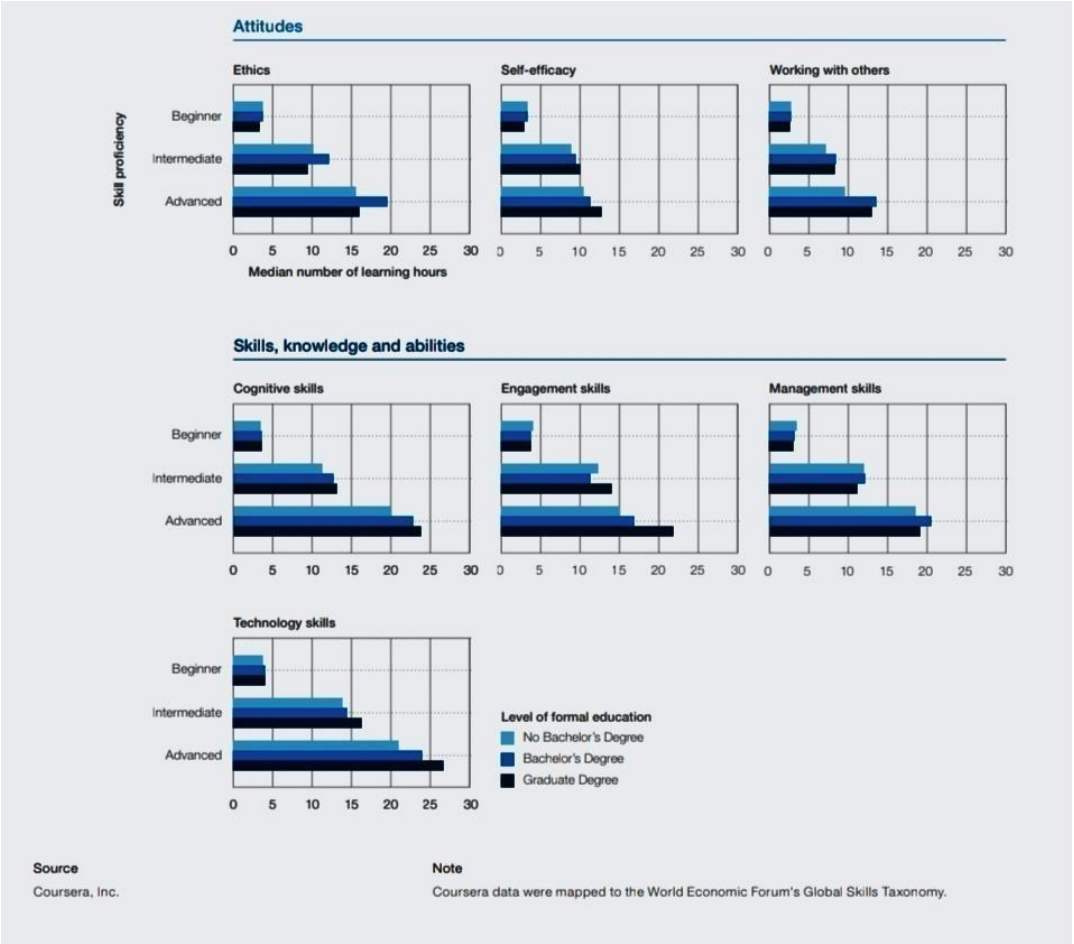


Figure 7
Failure of Formal Education
Source: Coursera

The above data indicates that there is no indication that learners without a degree take longer to achieve proficiency in any skills in the global skills Taxonomy (World Economic Forum, 2023). This is a clear indication that learners may not opt for long-duration programs but instead might choose short-term skill-based programs to enhance their skills.

The reports by OECD, (2019) and Bessen (2020) provide a useful approach by stating that human capital development is the solution to the current wave of automation, and as studies reveal maximum benefit can be reaped if the skilling

happens before employment. Various government surveys indicate that unemployment and underemployment are more common as the educational qualifications increase resulting in youth taking up jobs for which they seem to be over-qualified. This is not in line with the belief that Education will fetch suitable employment. An agile workspace will require creative minds that analyze and put forth strong solutions to adapt to a dynamic work situation.

Patacsil & S. Tablatin (2017) provide a useful approach to improving work skills while at college by providing a compulsory internship program. This will benefit the graduates to experience a real work environment. This argument does not seem to address the issue that the probability of a learner getting an internship is very low. Another noteworthy suggestion is by Gandhi (2014) and Dione Lee (2011) that points toward a strong interaction between academia and industry, wherein the skills and experience of both institutions when frequently shared will build up better relations and help graduates procure the right employment. Misra et al. (2012) have identified that project-based learning is a novel method that can be incorporated into the learning environment so that the learners can offer solutions to real-life problems. This in turn inculcates a habit of lifelong learning, enabling them to respond proactively to real-life situations.

Mohammed (2016) strongly argues that the need of the hour is to upskill the faculty by allowing them to work on industry projects, this will align the faculty in line with the requirements of the industry. Recent research and government policies these days stress the importance of a skill-based education to improve employability, encouraging all institutions to shift importance from theoretical knowledge to more skill-based education.

According to Plocher (2019) Industry 4.0, also known as the Fourth Industrial Revolution (IR 4.0), refers to the shift that makes it possible to collect, evaluate, and

explore data across machines, thereby allowing for quicker, more versatile, and less expensive processes that would allow businesses to produce higher-quality goods at lower costs. It represents an evolution in technology that includes the IoT, Big Data Analytics, computer simulation, and cloud storage. The increased prevalence of high-tech gadgets in daily life has made it imperative for workers to learn how to use them. Many shifts in production and other activities, both inside and external to a given sector, have resulted from the digital transformation of businesses. Industry 4.0, which emphasizes the digitalization of businesses, is argued by some academics to alter the corporate landscape and alter consumers' needs and expectations in several ways.

Shneiderman (2020) stated that workers must be able to operate sophisticated machinery and software and stay abreast of technological developments. As a direct result of entering the brand-new digital age of commerce and industries, it has been more important in recent years for employees and workers to improve and gain their skills and use such technologies. Academia also has a critical role to play in ensuring that students have acquired these abilities before they leave for the workforce. The worlds of academia and business are completely separate, each with its own set of norms and goals. But there is a symbiotic relationship between the two worlds. Graduates from universities are, on the one hand, absorbed by a wide range of sectors. Moreover, industries tend to provide solutions to institutes and universities' problems and concerns, and industries take up the research work facilitated by institutes and universities to produce various goods and services. As a result, many times fresh research questions emerge.

Creative thinking is vital to learners as it enables learners to generate innovative ideas and most importantly approach challenges from new perspectives. The most widely used technique that can develop creative thinking is brainstorming which

involves generating numerous ideas without judgment or evaluation. The goal of brainstorming is to create a pool of ideas that can be explored further. Creative thinking helps in adopting alternative mindsets that can discover unique solutions and break free from conventional thinking patterns. Creative thinking helps in adopting alternative mindsets that can discover unique solutions and break free from conventional thinking patterns. The main differences between creative and critical thinking are that creative thinking develops numerous ideas whereas critical thinking develops and analyses one single idea that exists. The second difference is that creative thinking is divergent and critical thinking is convergent. The third difference is that creative thinking is focused on possibilities and critical thinking is based on probability. The learning process requires that both types of thinking should be developed for a holistic learning outcome.

Guilford's work focused on the structure of the Intellect (SOI) model which suggests that intelligence is composed of multiple intellectual abilities. The SOI model categorizes intelligence into three dimensions firstly operations which refers to memory and content, secondly, products refers to different types of intellectual outcomes and third content refers to various forms of stimuli that intelligence can be applied. SOI model is a theory of multiple intelligence and is a combination of multiple intellectual abilities.

Human beings have almost an unlimited capacity for creativity and their imagination provides them the ability to develop new and innovative ideas. Craft (2001) argues that by fostering creativity in the classroom, students will be enabled to identify and establish a framework for their lives. Additionally, Simpson (2008) reflects on the importance of creative thinking in the classroom by saying that "there is value in using and developing creativity in the classroom. As educators, working to prepare the students of today and tomorrow for the future, we need to

collectively work together to develop their critical thinking skills and their right brain functions".

The Studies by Muneyoshi (2004) indicated that a higher level of creativity can result in higher academic achievement. Pursuing this further, Cotton (1991) recognizes teaching students to become effective thinkers as an immediate goal of education by saying that for students to function successfully in a world of Rapid automation and AI, they should have the ability to lifelong learning and thinking skills necessary to acquire and process information in an ever-changing world. Finally, critical thinking and creative thinking are thought to be skills of vital importance for success at school and in life (Collier et al., 2002 cited in Alagözlü, 2005).

Human creativity is unlimited, and imagination enables new possibilities and innovative ideas. Educators must create lesson plans that encourage students to be creative Rzadkiewicz (2010). "Imagination is more important than knowledge "Albert Einstein makes use of Einstein"s statement to clarify the importance of creativity in education in that creativity is an essential element necessary for learning, and learning itself is a creative process that involves students making information relevant by linking prior knowledge and new knowledge in an individually meaningful format. The reviewed literature indicates the lack of methods by which higher-order thinking skills can be developed in classrooms. Though most of the literature indicates their importance, there is a lack of literature on how these skills can be assessed and evaluated along with domain knowledge.

Mahyuddin (2004) emphasizes the importance of training students to think critically and creatively. This was again demonstrated by Yang (2010) that creative thinking is a crucial skill for understanding.

Another notable theory is Guilford"s Cube of the Structure of Intellect, according to which Divergent Production has various components, such as fluency, flexibility,

originality, and elaboration. Secondly. how these different components contribute to the creative thinking process and help individuals generate unique ideas and solutions. Thirdly, exploring real-life examples or case studies where Guilford's theory has been applied successfully in fields like art, design, innovation, or problem-solving. Lastly, it discusses the significance of measuring divergent production skills recognized by Guilford (1958). Fluency (creating ideas), flexibility (creating ideas of various types or from various perspectives), originality (creating unusual ideas), and elaboration are the divergent components (adding to ideas to improve them).

Another theory is that of Heller (2007) which provides for the distinction between intelligence and creative thinking based on intellectual talents, associated with convergent thinking, and creativity, which is mainly associated with divergent thinking. This consists of four steps, Mastering the essential skills of any domain requires the ability to tackle frustration and ambiguity at the same time, this will develop patience as well as an ability to delay gratification. Thus, it involves the ability to put a problem aside and let it incubate without having an immediate solution. The ability to withstand the upheaval caused by questioning belief systems and assumptions, demands the emotional abilities listed above as well.

Creative thinking is essentially a moral cognitive skill that can serve any purpose as determined by one's sense of moral and ethical behavior, as well as one's emotional needs whether conscious or unconscious. Therefore, emotional intelligence is vital for the development and progress of Creative thinking. This was further stated by Stevens (2000), that some forms of intelligence, such as emotional intelligence, have a clear association with creative thinking since it is vital to creative thinking in various ways. These are the skills that future machines cannot replicate and therefore will remain in the domain of human intelligence.

Mastering a domain of inquiry requires discipline, motivation, tolerance for frustration, ambiguity, and delayed gratification. Problem-solving requires emotional abilities, and creative thinking is a moral cognitive skill that requires emotional intelligence for healthy and productive utilization. Emotional intelligence is crucial for navigating challenges and questioning belief systems. The main difference between critical and creative thinking according to Kanar (2001) is that creative thinking is to think inventively and divergently, on the other hand, critical thinking is the process of logical and convergent thinking.

According to Paul (2008), the difference between critical and creative thought is that creativity masters a process of production /creation while critical thinking is a process of assessment or judgment. The main focus in creative thinking is to develop ideas that are unique and useful and on the other hand, critical thinking examines and clarifies the judgment of others. To produce effective thinking the two should be interwoven together.

Paul and Edler (2005) prove that "at the same time, we think critically and creatively" by saying that "Critical judgment is essential to all acts of construction, and all acts of construction are open to critical assessment. We create and assess; we assess what we create; we assess as we create".

Kitto (1994) remarks that creative thinking skills have the following characteristics: -

- Fluency of thinking is the ease of generating ideas.
- Flexibility denotes the ability to develop new ideas
- Originality means the ability to produce a new idea
- Elaboration which refers to the ability to add extensively to an idea, including divergent thinking.

The studies laid out by Michalko (2001) illustrated that creative thinking strategies have two main parts that are further divided into nine strategies: -

A. "Seeing what no one else is seeing"

Knowing how to see

Making your thoughts visible

B. "Thinking what no one else is thinking

Thinking fluently

Making novel combinations

Connecting the unconnected

Looking at the other side

Looking into other worlds

Looking for the not-so-obvious.

Awakening the collaborative spirit.

Alex Osborn interpreted brainstorming means using the brain to storm a problem saunders (2001).

- Generate as many ideas as possible. Go for quantity, not quality.
- Encourage wild and exaggerated ideas, no matter how crazy, ridiculous, or farfetched the ideas might be.
- Ideas can be clarified but will not involve discussions.
- Ascribe can be assigned to write down every idea.
- Keep a copy of the rules in plain view.
- The brainstorming list should be accessible to everyone.

Knowledge keeps pupils aware of what has come before and helps them to focus on new concepts rather than old ones. Chastain (1988) adds that "for learning to be meaningful, students must have adequate past knowledge to comprehend what they are to learn."

The primary contemporary models of creativity by Dewy 1920 involve five logical steps: -

1. A problem is identified.
2. It is then defined.
3. Many probable solutions are considered
4. The solutions and the consequences and analyze
5. The most probable solution is finalized

The main difference between creative thinking and creativity is that creative thinking leads to a new idea and creativity brings the idea into existence. Adan (2007).

Stir Book and Loo Part (1999) observed that the unique characteristic of creativity is the ability to produce work that is original and one of its kind and at the same time appropriate for a purpose.

The most important aspect is that it is not only important to generate ideas but also to decide the one that is most adequate after the evaluation Craft, (2001) observes the occurrence of two kinds of creativity high creativity and ordinary creativity.

The currents of high creativity are usually amongst very talented people and may be of less relevance. Conversely, the creativity of an ordinary person is more relevant or important in education.

In continuation to this theory, Starco (2010) differentiated high creativity, and ordinary creativity by suggesting the world-famous works as highly creative and the common everyday innovation of daily life as ordinary creativity.

Solomon (2005), viewed the concept of creativity by incorporating the four P of creativity: -

1. Person
2. Process
3. Product
4. Press

Ports (2009) throws more light on Creativity, According to him it cannot be considered a talent, rather, it should be a way of operating and can be taught, It should not be considered confined to artistic abilities but can be considered a way of life. It is not related to IQ; Creative people get into a creative or playful mood to explore ideas. Hamori (2017) illustrated the factors influencing employability among college students. He suggested that find main reason for the gap is curriculum and education system, socioeconomic status, wrong, perceptions about higher education.

According to MPHEQ (2017), graduate employability is a critical challenge for higher education illustrating that college students might be aware of basic skills of employability can also be considered as a responsibility of the employer training, institutions, educational institutions, and potential employers.

According to Vasantha (2018), the actual output of work performed by an unskilled person will never be able to match the output of a skilled person. The projection of skills and competencies will enable workers to attain higher employability status.

Another noteworthy theory is by Sternberg (2009), the ability to achieve goals by focusing on strengths and diminishing weaknesses by effectively interacting with various environments by adopting analytical, creative, and practical abilities can be considered Intelligence. The main observation is that these are traits that can be learned and developed over time. It reinstates the fact that academic intelligence and the power of memorization are not enough in the wake of rapid automation.
The current times witness massive and rapid changes in technological advancements, therefore educational institutions should promote flexible thinking skills and adaptability. These skills are closely connected to creativity and will remain one of the foremost skills crucial for lifelong learning. The examination systems that primarily focus on content and evaluate the power of memorization are relevant

today, as data is stored in the cloud and can be accessed with a simple click of the mouse.

Bano and Shanmugam (2020) explained that the main reason for the employability gap as well as unemployment among Indian graduates is that the skilling program and education system in India work independently. The Government of India has made rapid progress in incorporating a skilling program along with introducing a national Education policy that focuses on a more holistic and skill-based education. These well-thought-out systems do not achieve their full target as they do not work closely with educational Institutions. It was also mentioned that teaching strategies should be student-centered. A skill gap is the difference between the skills that employees require and the skills that the workforce requires. Mpho Phiko and Mdefe (2017) stated that college students might be aware of basic skills of employability but they may not be aware of the critical skills that are essential to the workforce. According to Jeswani (2016), the employability skill gap refers to the gap between skills needed on the job and those possessed by job applicants. Therefore, the employability skill gap is a shortcoming of higher education's inability to realize and deliver employer needs.

2.3 Theoretical Frameworks

ACER creative thinking framework is an approach that enhances creative thinking skills in individuals. It includes a range of principles and strategies to stimulate creative thinking. It draws inspiration from cognitive science and education, creativity involves generating novel and valuable ideas. It emphasizes that creativity is a process that includes problem-solving, testing, and communication.

The first theme of ACER creative thinking framework is Idea generation, this stage focuses on generating a large range of ideas and possibilities. It involves techniques like mind mapping and divergent thinking. The first strand focuses on generating

many ideas. The second theme is idea selection and experimentation with the same, this involves shifting perspectives and creating new knowledge. The third theme is the quality of ideas and this enables one to select the best idea. This research is based on the ACER creative thinking framework. This theory provides a structured and systematic approach to cultivating creative thinking skills.

The Guilford (1950) theory of creativity is a pioneering framework for developing creative thinking. This theory is considered the original framework of creativity. It also has shaped our understanding of intelligence.

The experiential theory developed by David A. Kolb describes how individuals acquire knowledge and develop skills. This theory is based on the fact that learning is a dynamic process and not a static one. It consists of a process that involves four major steps namely concrete experiences, reflective observations, abstract conceptualization, and active experimentation.

The first step is concrete experience CE it involves the learner‟s direct engagement in an activity or learning experience and it forms the foundation for the learning experience.

The second step is reflective observation RO after the concrete experience the learner reflects on the experience and observes it from a different perspective.

The third step is abstract conceptualization AO, In this stage, the learner attempts to create meaning from the experience by forming generalization. This is the concept from which a fictitious work can be created by reflection and further can be evaluated for skills.

In active experimentation, the learner takes the insights gained from previous stages and puts them into action. This involves applying the newly acquired knowledge and testing the theories in the real world. Through the experiment the learner gains new experience and the learning cycle begins.

The P 21 Framework is one of the most popular theories in skill development; this was formulated by the US Department of Education along with global companies. The focus was to integrate skills into the teaching of key academic subjects. The main disadvantage of the P21 century skills framework is that the content knowledge is not given adequate weight to age and it was critiqued by Ananiadon and Claro (2009). Another observation by Janet J. (2015) is that 21st-century skills are most important for better employment. Braila et al. (2017), also provided adequate information to prove that education can be improvised if creativity, collaboration, and complex problem-solving skills are included in the classroom. The 21st-century skills differ from traditional academic skills and they are associated with deeper learning which focuses on mastering analytical and complex problem-solving skills.

A theory called The Community of Inquiry (COI) is based on the model of inquiry to develop experiential learning and was developed by Dewey in 1938 and Vygotsky in 1997 (Ord, 2009). The only way to construct one‟s knowledge is through individual experience. Though this theory does not hold validity for digital natives since most of the knowledge and data are readily available in digital form, it could be developed to improve the learning experience. The global framework for core skills incorporates 19 core skills that are part of the P21 Framework.

According to Levy (1999), differentiated learning is a pedagogical strategy that is used to design teaching according to the readiness of the student interests and abilities of each learner. Previous studies by Harbott (2017) and Dupleuis (2019) suggested that educators these days see large student diversity in many aspects such as cultures, learning habits, and academic abilities. DI is a pedagogical plan that is used to design the teaching according to the readiness of student interests and abilities of each learner. The studies by Tappier and Haugley state that DI provides an equitable learning opportunity for all students including the priority learners to higher achieving

learners. The studies by Tomlinson (1999) explained that DI offers a variety of options so that each student can learn fast as well as thoroughly. The studies by Reis and Ren Zulki (2018) informed that there are five principles

1. Curriculum content based on learners‟ academic abilities and interests.
2. Content Differentiation is based on learning styles.
3. Learning environment
4. The product which stands for assessment in DI
5. The teacher is the most critical aspect

Differentiated learning and assessment serve as helpful indexes to assess the exceptional talents of each learner. Exceptional learners may not conform to the standard definition of intelligence and may tend to be sidelined in regular assessments; the typical case study is that of Thomas Edison, who had to drop out of school due to inadequate academic performance despite being very intelligent.

The most crucial feature of DL is that it maximizes the growth of all students. Though it serves to develop individual learners, it is not commonly used by educators as most educators teach the way they are taught and do not want to try new methods. The second reason is that it requires more preparation time and impacts the teacher's inability to treat students as individuals. Most educators focus more on completing the portion allotted than on what the learner has understood. The differentiation processes in teaching and assessment enable both educator and learner to appreciate the learning process. The class is a group of individuals who require personalized attention from time to time. This varied attribute of the learner cannot be evaluated and assessed if standard assessments are the usual method; it is essential to develop assessments that showcase the uniqueness of each learner. The assessment should align and be in tune with learners ' learner's abilities and strengths. A learner-centered program requires differentiated assessments to foster individual engagement and

foster creativity. This is a method to develop multiple intelligences, an essential skill in the world of rapid automation as most machines will have intelligence embedded in them. AI-automated machines will have the ability to know embedded in them, but as of now, they will lack the ability to have creative and critical thinking embedded in them. Therefore, these turn out to be the essential skills required for future workspaces. It is important to understand the fact that learners are different and therefore each learner must differentiated methods of assessment. If the learning styles and strengths of each learner are different, then a standardized assessment cannot bring out the learning outcome of individual learners. Most of the literature reviewed indicated project-based learning which could be a good source of differentiation. Most educators in India largely follow a standard method of assessment that fails to gauge the progress and the unique abilities of each learner. The concept of an open book as a form of differentiated assessment fails in a digital world comprising AI tools that assist learners in generating large chunks of information. Therefore, tests that bring out individual creativity can become more commonplace than standard assessments. Most educators follow differentiated teaching practices but the concept of differentiated assessments is not mentioned in the reviewed literature. Differentiated assessments allow educators and learners to assess

their strengths and areas for development.

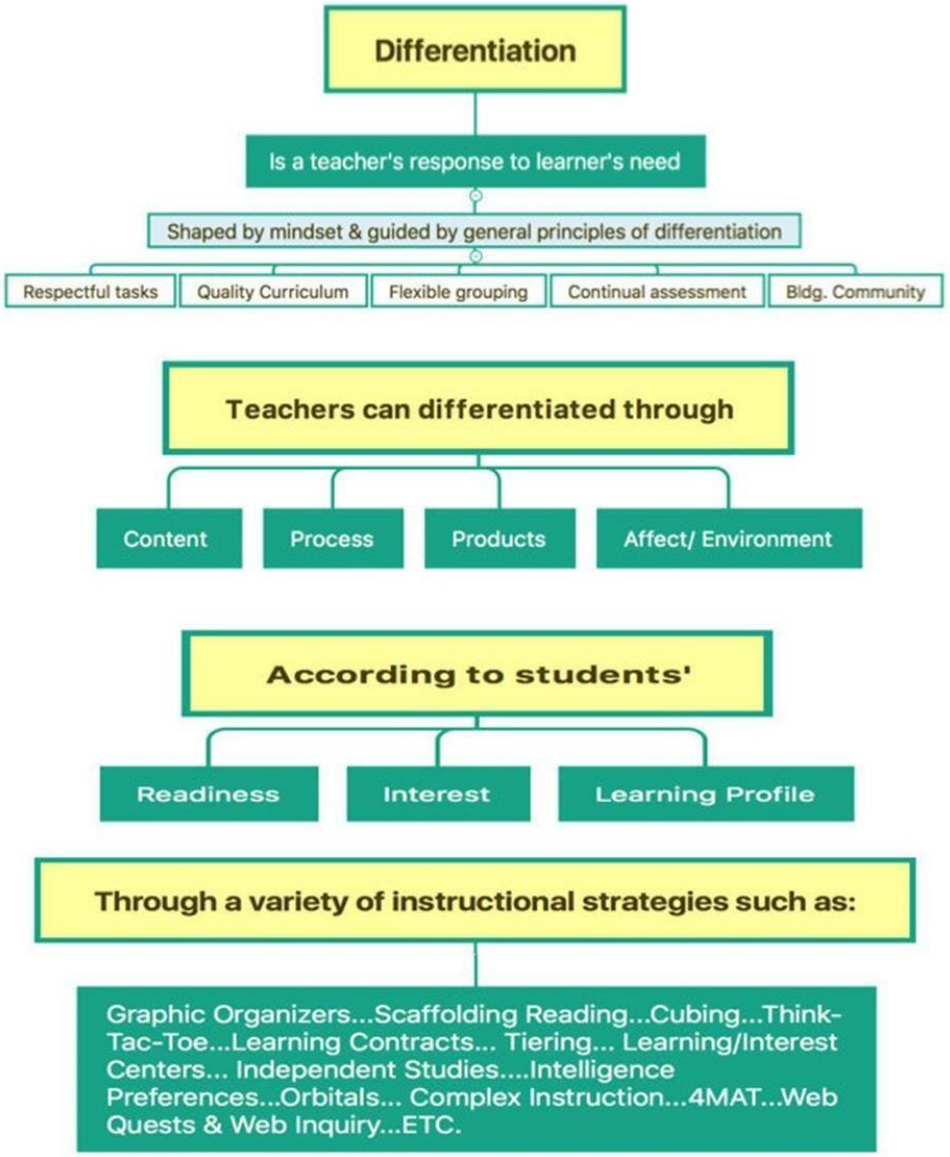


Figure 8
Differentiated instruction flow chart from Tomlinson (1999, 2008)

The concept of Flip question is an offshoot of the flip classroom, and it has four differentelements: -

F stands for a flexible environment

L stands for learning culture, mainly the shift from a teacher-centered to a student-centered approach.

I stand for intentional content, the shift to create fluency, and last

P stands for professional Educator. The responsibility of Flip classroom educators is more than that of the standard traditional approach. The research by Bergman and Over (2011) suggested that the most important factor to facilitate a flip class approach is theeducator. The primary criteria are creating the learning condition based on questioning, secondly instead of transferring knowledge directly to facilitate the learning process, and thirdly the most important one is to make interactions with students and personalize the experience. This concept can be extended to the assessment mode too. The learner creates her assignment instead of answering traditional and standard question papers. This becomes a student-driven assignment where the learning is assessed and not the lack of knowledge. The main advantage of this concept is that each learner can avail of a differentiated assessment. The concept of standardized assessment can be used to check not less than 50% of the subject knowledge. The process of assigning the remaining 50% ownership to the learner makes them creative and critical thinkers.

The more relevant theory to help learners move from states of not knowing to the level of being skilled is the Instructional theory for Skill Development. The literature survey throws light on one observation, that skill shifts are happening much faster, and education is not gearing up for these changes. The available information also indicates there is no metric or measurement of the progress of skills while in college. Most students do not pay much attention to the development of these skills since it is not recorded in any marks card, especially in the Indian context. The primary data from analyzing the questionnaire handed over to the final-year students indicated that 65% lacked work preparedness, 56% had low communication skills, 28% displayed

an inclination for innovation, and 35% displayed strong analytical and problem-solving skills.

Way back Greenston (2012) found that the annual real rate of return to investment in a bachelor‟s degree is much higher than corporate bonds, gold, or treasury bills. This trend continues as more and more learners are taking up short-term skill-based programs required for the industry. Recent trends indicate that global employers like Google have also started hiring skills not degrees pointing out that considerable evidence supports the notion of over-qualification in the labor market. The literature review indicates that in most universities‟ knowledge is still given much more weight age than skills and this research will enable future researchers to devise methods where skill enhancement can become part and parcel of everyday classroom education.

2.4 Conclusion

Higher Education institutes would face a lot of criticism and maybe lose their relevance if adequate thrust is not given to imparting skills and domain knowledge. The future of workspaces is dynamic and evolving at a rapid pace, requiring learners to upskill and reskill to be employed, and workforce transitions are happening much faster than educational reforms. Also, the overall employability skills of most graduates do not match the industry requirements. These trends have made government agencies and policymakers implement theories like competency-based education which could be viable solutions to improve employability. The survey of the literature indicates that suggestions are given to improve skills but not much data is available on methods by which skills can be imparted. There is a clear lack of literature that indicates that skill is not measured and quantified as a metric in any mark sheet. Most students do not focus on skills as it is not quantified to show progress over the study period. Many countries are facing an “invisible

underemployment “which refers to a situation where an individual is unable to find a job in line with their educational qualifications and secures a pay much below the expected industry standard. The current lockdown and the technological shift have further escalated this issue. This means that any skill set comprising even a small share of tacit capability will remain the domain of humans because tacit skills cannot be codified. Automation has so far been most successful in areas where a task can be converted into explicit instructions that a computer understands. The primary source of data for this research will be got from a questionnaire handed over to various stakeholders like recruiters and employers to gauge the most sought-after skills for employment. This data will enable us to understand the skill gaps and thereby devise strategies to improve them. The research aims to explore and measure the progress of 21st-century skills during a program after the strategies have been implemented.
The chapter reviewed the ACER creative thinking framework and many other theories advocating the development of higher-order thinking. The study also indicated the importance of bridging skill gaps so that the learners find relevant employment. The reviewed literature indicated that there is a lack of research on how higher-order thinking skills can be assessed in the classrooms.

The reviewed literature indicated the importance of higher-order thinking but not much study was done on how it could be made part of pedagogical practices. The current employment trend indicates that machines are replacing low and medium-skilled labor. The chapter‟s review also indicated that higher education institutes offering three- and four-year degree would lose their relevance if they did not focus on bridging the skill gaps. More learners would prefer to learn short-term skill-based programs rather than invest in three- or four-year undergraduate programs.

CHAPTER III

METHODOLOGY

"Science fiction is the literature of ideas that change the world."

- Arthur C. Clarke

3.1 Overview of the Research Problem

Future workspaces will be dominated by machines that can perform low and medium-skilled work. The survey of the respondents further highlighted the top skills required in the current scenario as critical thinking and creative thinking. The responsibility of 21st-century educators should be to reinvent the pedagogy to suit the literacy needs of digital citizens. Most educators still prefer the 20th-century educational practices to instruct the digital natives who access and consume vast amounts of knowledge from various platforms across the globe. It is observed that education reformations are slow and almost two generations behind technological revolutions. According to (Kivunja, 2014; Tompkins, 2014; Wallender, 2014) the purpose of education in the 21st - century should be to prepare the learner to navigate society‟s demands and make a substantial contribution to the workforce. India‟s workforce comprises a very small percentage of high skill.

This research aims to establish that educators should move from a knowledge-based assessment system to innovative methods that can assess skills required for future workspaces. The focus of educational institutions should be to develop a highly skilled workforce that can work alongside machines that do repetitive and low-skilled jobs. This research aims to explore a novel assessment method based on the ACER creative thinking framework. Educators should be able to utilize the findings to develop more creative methods to assess skills that will be required for future workspaces. Though Guilford (1950) suggested the importance of the formal

measurement of creativity there is still very little information on the type of assessmentapproaches and tools that could be used. The ACER definition of creativity involves both originality and usefulness. If learners are encouraged to develop an imaginary concept based on the principles learned it will develop critical and creative thinking.

This will discourage the need for rote learning of concepts that are readily available on the internet and instead will focus on creating new ideas. This to a larger extent will diminish the fear of Examination and will develop more balanced and creative individuals who can adapt to a fast-evolving and agile work environment. Common trends observed in many countries is that successful entrepreneurs and Innovators have a history of school or college dropouts or even clearing their programs with low grades. This further indicates that college grades do not assess the skills of creativity and critical thinking.

3.2 Operation of Theoretical Constructs

3.2.1 Flip Question Paper

A Flip question paper can be defined as a novel assessment method an alternative to the standardized assessment which gives the learner flexibility. Flip-the-Question is a strategy for students to uncover their thinking. It can be used both to raise the cognitive demand of a problem and to provide information to a teacher about the depth of a student‟s understanding. The knowledge assimilated could be used to create a futuristic product, or they could visualize the knowledge to write a paragraph of science fiction. The answer can be in the form of a white paper project or Science fiction. Though standardized assessments are clear indicators of the route learning done, they lack the space to exhibit creativity, critical thinking, and agility. The more creative people may not have time to engage with route learning and, therefore, might score lesser in standardized assessment methods. This idea will encourage more

creativity in the answers and can be used as a source of knowledge creation rather than knowledge repetition.

A Flip question paper can be defined as a novel method of assessment that gives flexibility to the learner. The knowledge assimilated could be used to create a futuristic product or they could visualize the knowledge to write a paragraph of science fiction. The answer can be in the form of a white paper project or Science fiction. Though standardized assessments are clear indicators of the route learning done they lack the space to exhibit creativity, critical thinking, and agility. The more creative people may not have time to engage with route learning and therefore might score less in standardized assessment methods. This idea will encourage more creativity in the answers and can be used as a source of knowledge creation rather than knowledge repetition.

3.2.2 Critical Thinking

ACER defines critical thinking as the systematic evaluation and interpretation of information, reasoning, and situations using truth and logic to generate insightful knowledge, hypotheses, and beliefs. Critical thinking encompasses the subject‟s abilityto process and synthesize information in such a way that it enables them to apply it judiciously to tasks for informed decision-making and effective problem-solving.

3.2.3 Creative Thinking

According to ACER, Creative thinking is the capacity to generate many kinds of ideas, manipulate ideas in unusual ways, and make unconventional connections to outline novel possibilities that have the potential to elegantly meet a given purpose.

3.2.4 Acer Creative Thinking Model

The method of conducting research will be a qualitative exploratory case study method. This method is used as prior knowledge about the correlation between science fiction writing and developing critical and creative thinking is unavailable.

The Qualitative case study method enables a researcher to closely observe the themes and trends, enhancing perception (Merriam & Tisdell, 2016). According to Creswell (2013), this research method uses inductive reasoning skills and has a flexible nature for data collection in the naturalistic setting. The case study method helps in creating information for future research. Therefore, the data insights of several participants can give credible and trustworthy findings. Exploratory research is inexpensive and usually has no predefined structure though it enables the researcher to acquire information in situations where prior information is not available. The primary data will be obtained from content analysis. To improve the findings the control group can be 36students and the experimental group can be 18 students.

The five themes chosen are knowledge creation, experimentation, logic, novelty, and the quality of ideas generated. The works of the group were evaluated and the post-test scores after six trials were compared with the pretest score. The rubric used for both groups is based on the Acer creative thinking framework. The results were quantified and a statistical method was used to analyze the results. According to Patton (1990) and Yin (2003), the case study method enhances the data credibility since it uses multiple data sources.

1. Knowledge creation

The first theme of ACER creative thinking framework is knowledge creation. This theme acknowledges the importance of the production of many different ideas called ideation fluency (Guilford, 1950). This theme indicates if more ideas are generated the greater the probability of generating a creative idea. The wider range of ideas indicates more distinct and less similar ideas.

2 Experimentation

The second theme is the willingness to actively shift perspective and consider new approaches to redefine the problem context or in other words to think outside the box.

The ability to renegotiate the boundaries opens up new possibilities. This theme identifies the ability to consider alternatives suspend judgment and tolerate uncertainty. The learners with higher levels of creativity can test multiple pathways even those that seem unlikely.

3 Quality of ideas

The third theme is the quality of ideas with sub-theme logic, novelty, and elaboration. The ideas generated should be functional as well as appropriate (Sternberg & Lubart, 1999). This theme acknowledges that creative thinking has a purpose and the product must have value. The second subtheme is the novel nature of the product, according to Smith and Smith (2010) an idea that is new to the learner, even if it is not new in an absolute sense can be considered creative. The third subtheme is the elaboration of an idea that illustrates the richness of its potential to meet a given purpose. This subtheme gives substance to an idea and acts to support its fitness for purpose. This demonstrates an ability to present ideas effectively, coherently, and elaborately.

3.3 Research Purpose and Questions.

The reviewed literature indicated that future workspaces will require highly skilled workforces. The objective of this research is to develop a new method of assessment and evaluate the progress of skills that will be largely required in future workspaces. It will also highlight the fact that educational reforms need to be fast-paced to keep in tune with the growing demands set by the advancements in technology. This research aims to draw attention to the fact that rigid instructional and assessment systems failed to develop the essential skills required for future workspaces.

Research Questions

RQ 1. Can flip question papers (white paper projects /science fiction writing) help in improving creative thinking in graduate learners?

RQ 2. Can flip question papers (white paper projects /science fiction writing) help in improving critical thinking in graduate learners?

RQ 3. Can flexible assessments be used to improve and measure skill progress?

The study hypothesized that flexible assessment methods namely a concept called Flip questions enable creative expression when compared to standard assessments. TheFlip question paper could improve creative and critical thinking, the most wanted skills in future workspaces.

3.4 Research Design.

The study used an exploratory case study method by analyzing the written work of the fifty-four students over a longitudinal time frame of six months. According to (Creswell, 2006), the qualitative exploratory case study method is chosen as not much data is available on similar studies. The survey was conducted to understand current trends in education and skill gaps amongst 112 respondents of varied professions.

1. The learners are given the freedom to choose the type of assessment, out of the 54 students enrolled eighteen of them chose the new method showing an eagerness to try out new methods, and the remaining thirty-six continued with the standard assessment.
2. This was conducted at the end of a few chapters of the study, the learners were given one day of learning before the assessment.
3. The experimental group and the control group were given general instructions after which the experimental group was given specific case studies where science fiction has turned into reality was explained for all 6 trials, namely of satellite communication, Google Glass, flying cars, self-driving cars,

and the concept of credit cards which originated as the figment of the imagination of science fiction writers before becoming a reality

4. The written work of both groups was analyzed for themes and sub-themes of the ACER creative thinking framework, namely knowledge creation, experimentation, and quality of ideas. The sub-themes of quality of ideas are logic, novelty, and elaboration of ideas.

5. The presence of each attribute or characteristic under the themes and subthemes is given 1 point each to quantify the same. The scores are tabulated and checked for progress over the study period.

6. The inductive approach is used as it is best suited for exploratory research.

3.4.1 Assessment Rubric for the Creative and Critical Thinking

Knowledge creation is the first theme to be analyzed under the ACER creative thinking framework. This is achieved by generating many ideas and, most importantly, synthesizing the learners' existing knowledge. This is totally in synchronization with Guilford‟s (1950) concept of fluency of ideas. This is an essential step to develop creativity and creative thinking. The first step of knowledge creation is the generation of multiple ideas, the rubrics for assessment consisted of five characteristics namely prior knowledge depth of knowledge, accuracy, expertise, and cognitive readiness. The presence of one characteristic indicates that the learner is a beginner or Novice, with time if all five are strongly developed the learner becomes an expert.

Another aspect of experimentation is the process of testing out new ideas to discover potential applications. This requires a methodical approach and a constant effort to shift perspectives. This is a crucial element of the creative thinking framework that enables individuals to consider different viewpoints and solutions.

This practice of education, when done routinely, equips learners with the skills necessary for future workspaces, such as critical and logical thinking. The assessment rubric included verbal reasoning, examples created by learners, ambient conditions for experimentation, logical sequence of steps, and factual correctness. Here again, if all five variables are present learner develops from a novice to an expert stage.

Let's take a look at the third theme which focuses on the quality of ideas. There are three sub-themes within this area: novelty, elaboration, and logic. It is imperative to emphasize that creative and critical thinking can only be fostered through top-notch ideas that offer a groundbreaking shift to existing concepts. Without such high-quality ideas, practical application remains impossible. The first sub-theme under the quality of ideas is logic and the assessment rubric had the following characteristics namely convergent thinking, verbal reasoning sound argument, persuasion, and objective judgment. A high-quality idea must be backed by ample reasoning and remain objective. Learners should develop the ability to make quick and objective judgments based on evidence. Effective decision-making is a crucial skill in any agile work environment. Guilford (1950) stresses the importance of both convergent and divergent thinking when it comes to creative product development. The second subtheme is the novelty of the ideas as well as the product created. This theme has the following five characteristics a stimulating environment, creative thinking, engaging, depth of exploration, and critical thinking. These characteristics can be developed if learners spend less time memorizing facts.

The third subtheme under the quality of ideas is Elaboration. This theme has the following five characteristics coherence of ideas, Inquiry, problem-solving ideas, critical and divergent thinking. Assessments for creativity should be planned to be unique, they cannot be standardized in a pattern as a one-size-fits-all approach. The main

reason why these skills are not assessed is that they can become subjective, time-consuming, and difficult to assess accurately.

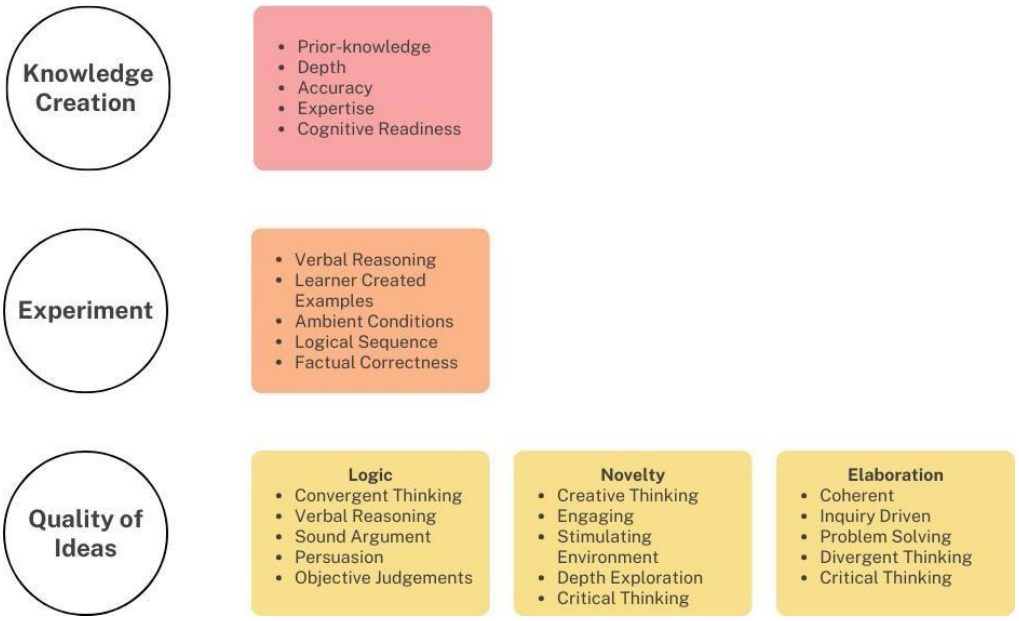


Figure 9
Rubric for Assessment

3.5 Population and Sample

The exploratory case study was conducted on a group of 54 final-year students. The population of the study comprised the final year graduating class from a women‟s college. The learners were all 21 years old except for two of them at 20 years old and belonged to South India. Thirty-six students who chose the standard question paper were the control group and eighteen students who decided to take up the white paper project were the experimental group. Table 3.1 illustrates the nature of samples in both experimental and control groups based on their marks in the qualifying exams of the second year.

Table 1.

The Nature of Students in Control and Experimental Groups

Nature of Students Based on Marks of the Qualifying Exams	*N*
Experimental Groups	
Average	6
Above Average	10
Distinction	2
Total	18
Control Groups	
Average	11
Above Average	15
Distinction	10
Total	36

3.6 Participation Selection.

The selection of participants was chosen to be the final year students of a women's college in Bangalore. The final-year students are the right participants because they will have to be ready with skill sets that get them the placement. The learners were given the flexibility to choose the assessment, since this work was creative no compulsion was done to change their decisions. The students of both groups had varied abilities from average scores to higher scores in previous assessmentmethods.

3.7 Instrumentation.

The answer scripts of all the volunteers were evaluated for patterns corresponding to themes and subthemes. The quantitative data were further analyzed for any statistical significance. The written assignments were evaluated throughout six trials.

The assignments were conducted at the end of each topic in the naturalistic setting of the classroom. The assignment was given with a day‟s gap so that it gives the learner time to revise as well as prepare for the task.

3.8 Data Collection Procedure.

The assessment was done after each unit and the entire class of 54 students was given the assessment. The answers of the control group and the work of the experimental group were evaluated using the Acer creative thinking framework. The attributes of the two themes knowledge and experimentation along with the three subthemes under quality of ideas namely logic, novelty of ideas, and elaboration were analyzed and data was collected and tabulated. The rubric served to assess the fifteen attributes under the three themes.

3.9 Data Analysis.

The qualitative data were analyzed to determine the five themes in the content and evaluated out of a maximum score of 5. Thematic analysis is a method used to identify, analyze, and report the patterns (themes) emerging from data‟(Braun & Clarke, 2006). Comparatively, qualitative thematic analysis is the one that is dependent on the recognition of themes in qualitative data through codification (Seale, 2011). The main themes of ACER creative thinking framework are knowledge, experimentation, and quality of ideas. The third theme quality of ideas is subdivided into 3 main subthemes logic, the novelty of ideas, and elaboration. Each of these themes and subthemes was evaluated with the respective attributes and tabulated

based on the scores and generated the quantitative data. These pre and post-test scores of each theme were then compared using the Wilcoxon Signed Ranks Test based on the normality assumption. It is used as a non-parametric test equivalent to the paired sample t-test. It is an appropriate test for a repeated measure design study where two measures are taken from one sample under different conditions. The purpose of this test is to conduct a paired difference test of repeated measurements on a single sample to assess whether their population mean ranks differ. By using the Shapiro-Wilk normality assumption test in this case, it is found that the quantitative data violated the normality assumption. Hence instead of a paired sample t-test (Parametric test), the Wilcoxon Signed Rank Test (equivalent non-parametric test) was used.

3.10 Research Design Limitation.

The main limitation is that research was conducted on a small sample size of women, secondly, the qualitative nature of data may not yield the right conclusions. This is a novel method of assessment therefore many learners were not keen on taking part and preferred the standardized assessments. The qualitative nature of the data is subjective and therefore the assessment might vary from person to person.
More accurate information could have been obtained if a second evaluation was done byanother evaluator.

3.11 Conclusions

This chapter outlines the research objective, questions, hypothesis, and methodology used to conduct the qualitative research. The findings from this study could help develop new methods to assess higher-order thinking skills in graduates. The rationale and reasoning to support the study are discussed in this chapter. The next chapter is the results of the chosen methodology.

The chapter discussed the qualitative analysis process and the rationale for using qualitative case studies as necessary to analyze the lack of creative assessment at the

undergraduate level. The chapter outlined the exploratory case study's methodology and research design. The study also used various statistical methods to derive quantitative information. The validity and reliability of the research findings improved due to the quantitative analysis. The next chapter introduces the findings obtained from the exploratory case study.

CHAPTER IV

RESULTS

"The most exciting phrase to hear in science, the one that heralds discoveries, is not 'Eureka!' but 'That's funny..."

- Isaac Asimov

The future workspace will be dominated by machines that can handle low and medium-skilled jobs; according to the World Economic Forum about fifty-eight percent of the jobs will be done by machines. This trend can be mitigated if educators focus on developing higher-order thinking skills that machines do not easily replicate. Most educators still prefer This exploratory case study hypothesizing that a concept called flip question will give the learner the ability to create his or her knowledge. It could be Science fiction writing or a white paper project that can be used as an effective tool to improve and assess creative and critical thinking in graduates. This study is anchored on the ACER creative thinking framework that lays out the development of creative thinking, focusing on abilities that can be measured. This involves a generative process. The first part of the study focussed on the survey of onehundred and twelve respondents from various organizations. This enabled us to throw light on recent trends. The program was piloted with 54 students in the final year batch, and the initial assignment found about 36 students opted out of the task and chose the standardized assignment, and the remaining eighteen preferred to explore and try out the novel method of assessment. These numbers indicate that most learners are hesitant to take up new assessment methods and prefer routine assessments.

4.1 Survey Results

"Electricity is not only present in a magnificent thunderstorm and dazzling lightning, but also in a lamp; so also, creativity exists not only where it creates great historical works, but also everywhere human imagination combines, changes, and creates anything new."

Lev Vygotsky, 1930

The results of the survey of a hundred twelve respondents from various professions and educational backgrounds are indicated as a graphical representation in this chapter along with the case study conducted on 54 final-year graduate women learners.

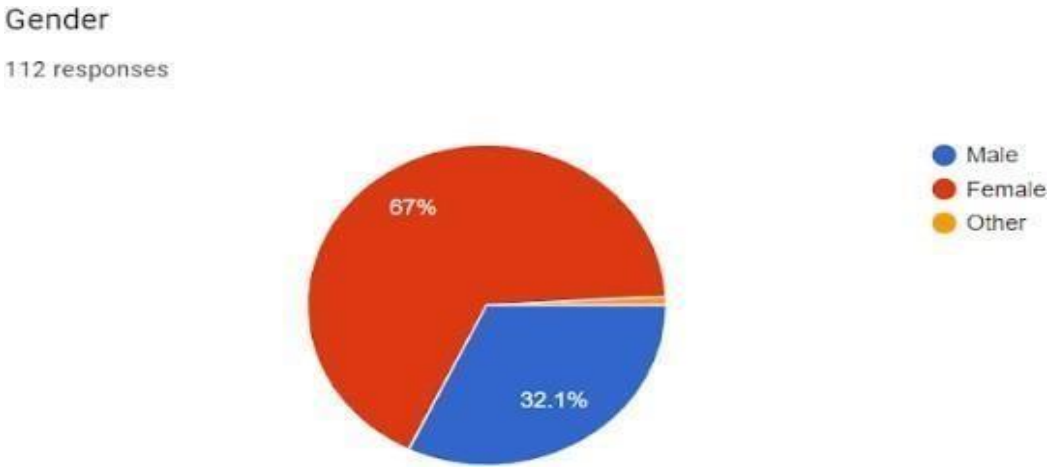


Figure 10
Gender of Survey Respondents

Out of the 112 survey respondents, the majority of the respondents were female, and it counted to seventy-five (67 %). The remaining males were 36 (32.4 %), and the others were one(0.1%). Though there were one hundred and twelve respondents not all

questions were answered by everyone since the questions were optional, therefore eachquestion of the same survey has different number of respondents.

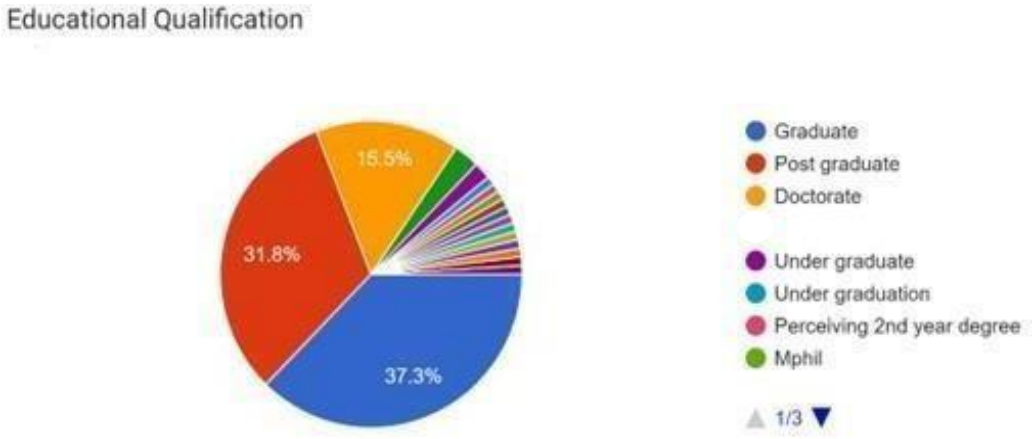


Figure 11
Educational Qualification of Survey Respondents

Out of the 112survey respondents, a varied response was received. The above figure indicates the educational qualifications of the respondents. Overall, 87.3% of respondents had completed their graduation or higher, 41 were graduates (37.3%) 35 were postgraduates (31.8 %) 3 with an MPhil degree (2.7 %) 17 with a doctorate (15.5 %) Few of the respondents have not completed their education or were pursuing open school type of education (12.7%).

Out of the the112 survey respondents, 43 respondents (38.4 %) were working in Private Sector, 27 respondents (24.1 %) were unemployed, nine respondents (9.8%) were in Government Sector, one respondent (.9 %) government aided sector, ten respondents (8.9 %) self-employed, 1 (0.9 %) is in social enterprise after 37 years in Government sector and few students were in the first year of work. Though the survey had people from diverse sectors and years of experience, they had common

perceptions about skill gaps and trends of future workspaces. The open-ended question also captured the same ethos as the close-ended question.

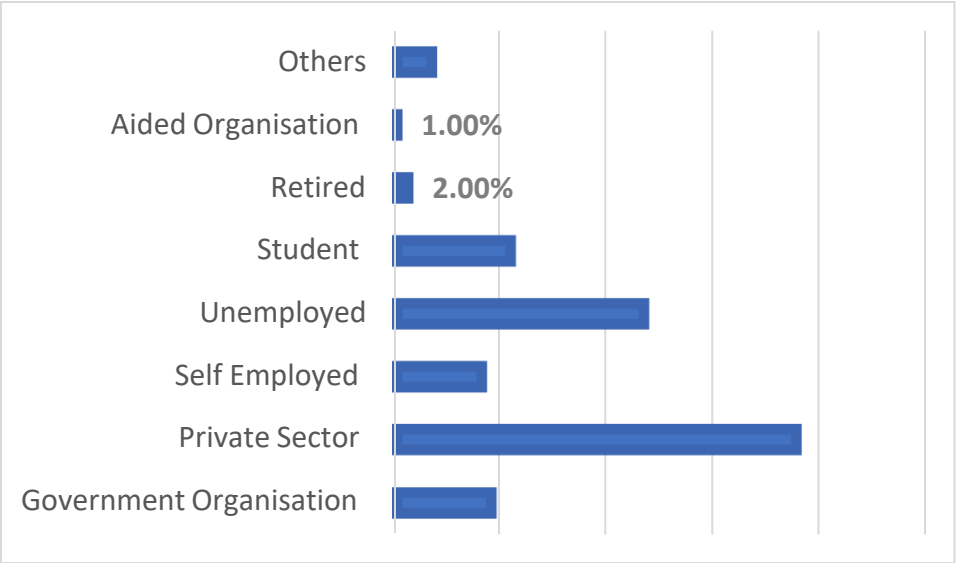


Figure 12
Job Sector of Survey -112 Respondents

Out of the 112 survey respondents, 94 respondents (83.9%) were working in the Southern Region of India, 12 of them (10.84 %) were working in North India and about 6 of them (5.4 %) were working abroad. Most of the respondents belonged to South India as the research was based in South India. The survey got responses from various regions in India and few of them were from abroad.

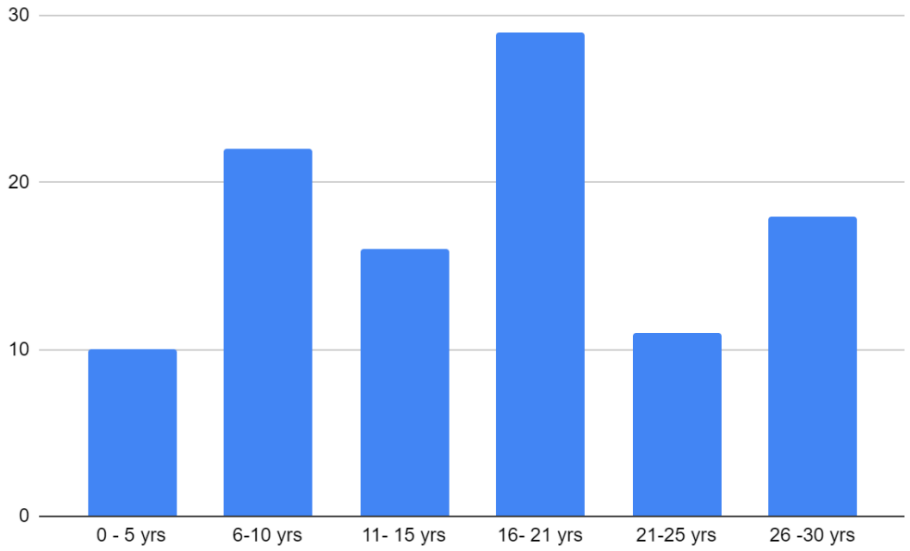


Figure 13
Work Experience of Survey Respondents

The number of respondents with less than 5 years is 10 (38 %) and 22 respondents had an experience between 6 to 10 years, 16 respondents had an experience between 11 to 15 years and 29 respondents had a work experiencebetween 16 and 21 years, 11 respondents with experience 21 to 25 years and 18 of them had experience between 26 and 30 years.

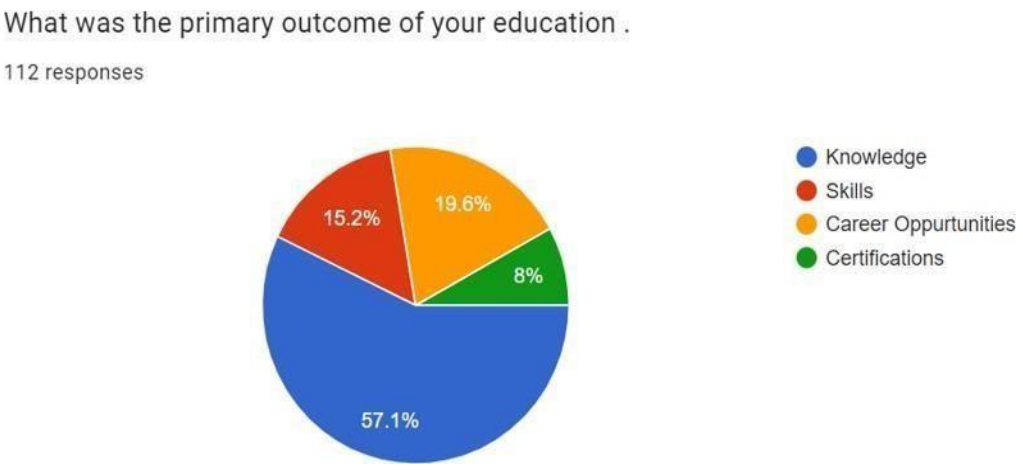


Figure 14
Primary Outcome of Education of Survey Respondents

Out of the the112 survey respondents, sixty-four participants (57.1 %) indicated that the primary contribution of education was in acquiring knowledge, 22 respondents (19.6 %) indicated that they were able to secure career placements primarily with theireducation the remaining 17 (15.2 %) indicated that their education enabled them with skills and the remaining 9 (8%) indicated that their education enabled them with certifications.

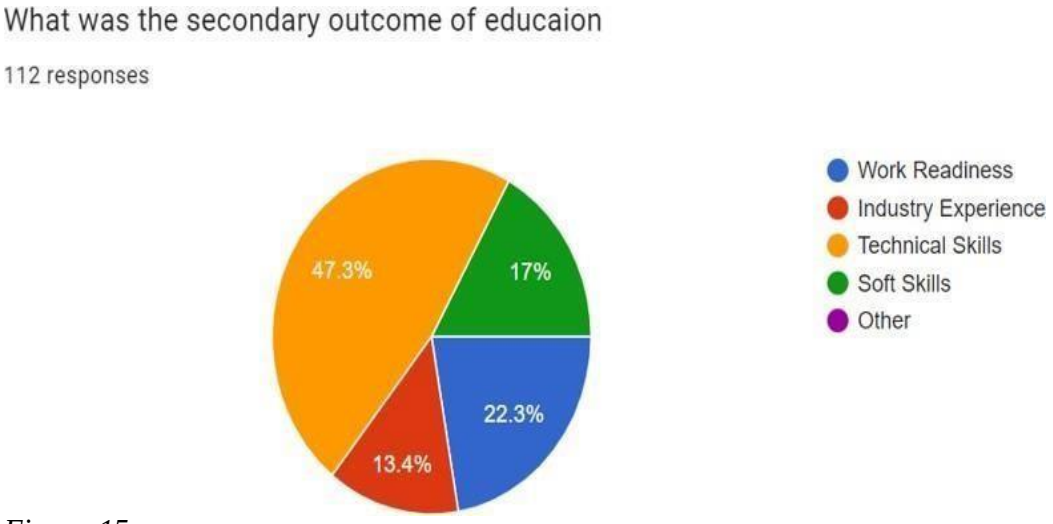


Figure 15
Secondary Outcome of Education of Survey Respondents

Out of the 112 survey respondents, most of the respondents fifty-three of them (47.3 %) responded that they developed technical skills at college, fifteen of them (13.4 %) responded that industry exposure was obtained through education, (22.3 %) informed they secured work readiness through education, and 19 of them (17 %) developed soft skills through education.

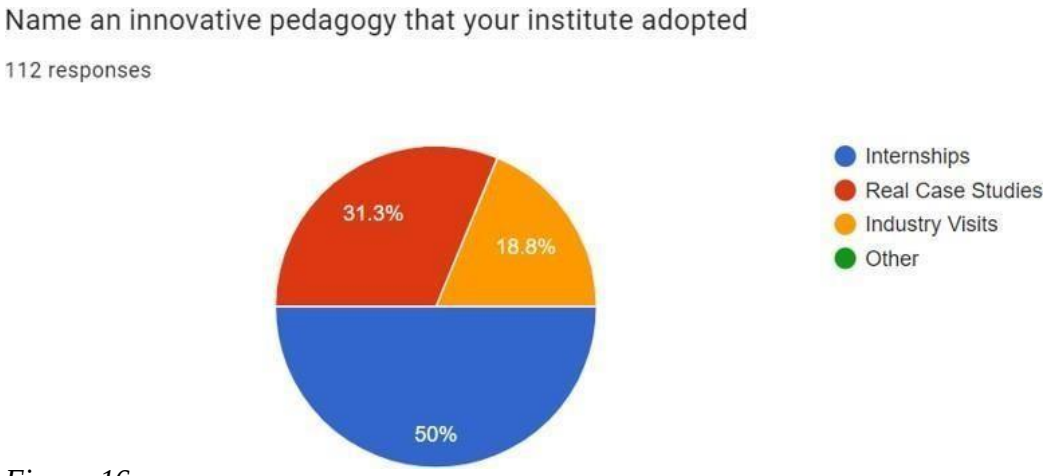


Figure 16
Innovative Pedagogy Adopted by Institute of Survey Respondents

Out of the 112 survey respondents, About fifty-six respondents (50 %) indicated that they had exposure to Internships while at college, thirty-five respondents (31.3 %) had exposure to Real case studies and the remaining twenty-one (18.9%) had industry visits.

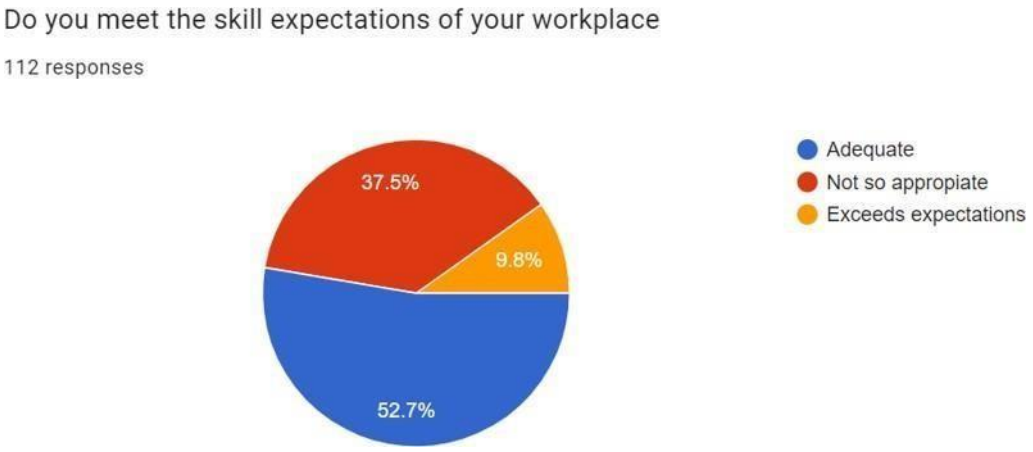


Figure 17
Skill Expectation in the Place of Survey Respondents

Out of the112 survey respondents, most of the respondents fifty-nine (52.5%) indicated that they were in jobs related to their abilities, forty-two respondents (37.5%) suggested that they had lesser ability than their job required and 11 responses (9.8%) responded that they were more skilled than their job demanded.

Out of the 112 survey respondents, the greatest number of respondents 88 (78.6%) occasionally lacked certain abilities at their workplace and sixteen (14.3%) always lacked and eight (7.2%) never lacked abilities at their workplace.

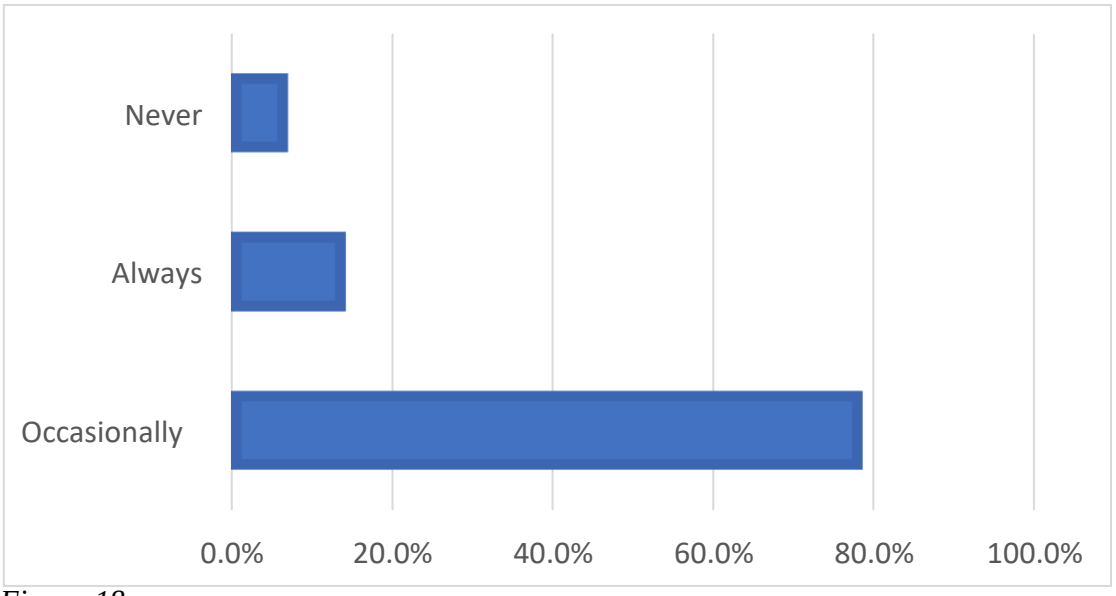


Figure 18
Have you experienced skill gaps in the workplace -112 respondents?

Out of 112 survey respondents, most of them, one hundred out of the 112 responses respondents 89.2% took part in skill enhancement training and 12 (10.8%) have not taken part in any kind of training in the past year.

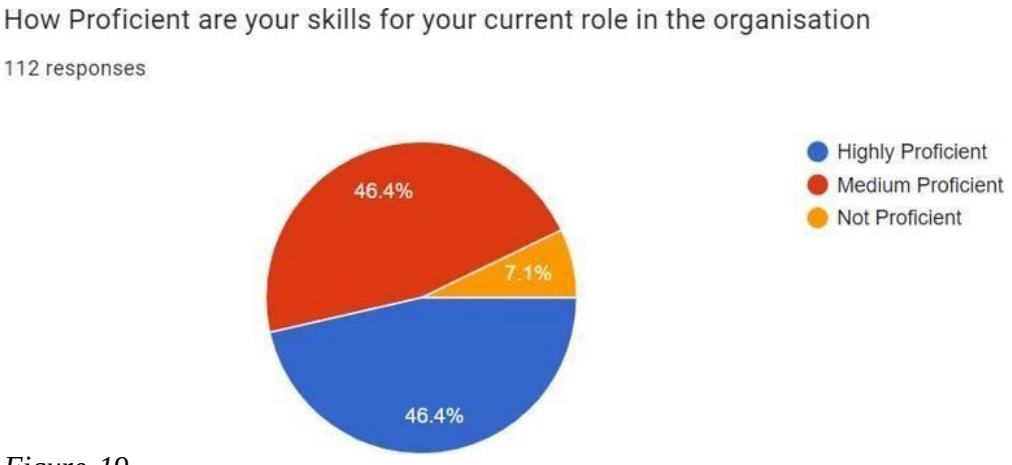


Figure 19
Skill Proficiency in the Current Role of Survey Respondents

Out of the112 survey respondents, fifty-two (46.4 %) indicated that they were highly proficient in their current role in the organization, whereas another fifty-two (

47.7 %) indicated medium proficiency in their skills and the remaining eight (7.1%) indicated that they were not proficient.

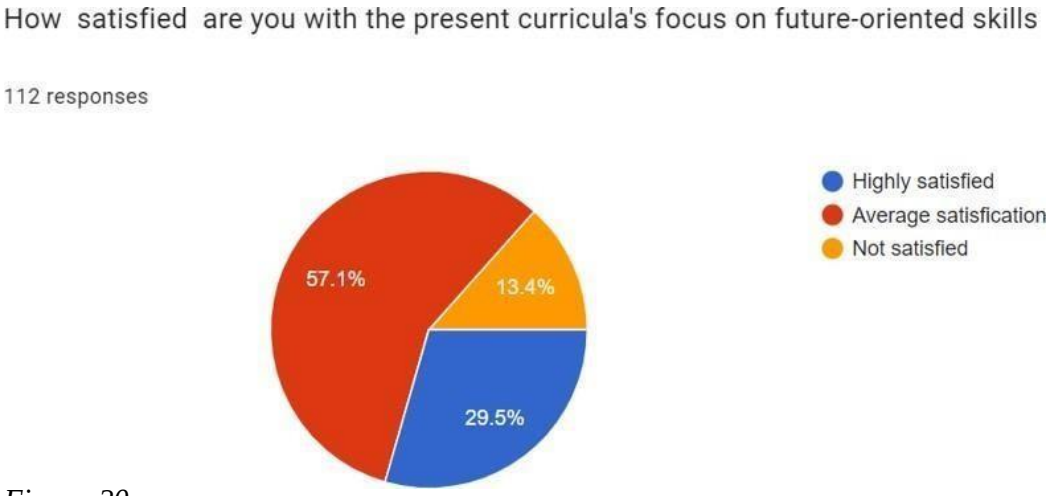


Figure 20
Satisfaction of Skills in Current Curricula of Survey Respondents

Out of the 112 survey respondents, A maximum number of respondents sixty-four (57.1%) indicated that they are adequately satisfied with the present curriculum focus on future-oriented skills, thirty-three (29.5%) which is 33 respondents indicated that they were highly satisfied with the curriculum, and fifteen which is (13.4 %) indicated that they were not satisfied with the curricula orientation to future skills.

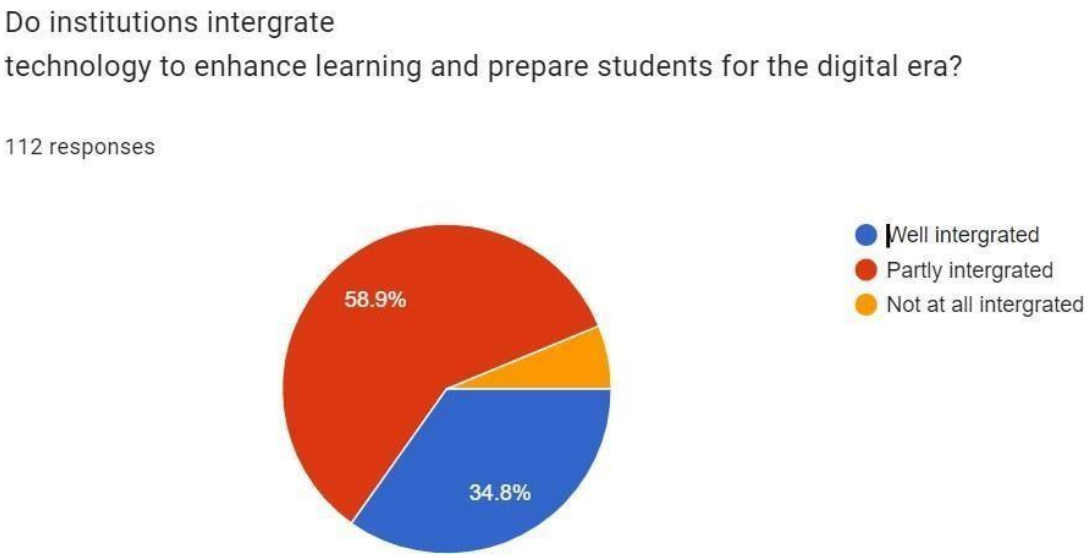


Figure 21
Integration of Technology to Enhance Learning

Out of the112 survey respondents, most of the participants namely about sixty-six (58.9 %) indicated that technology is not completely integrated into the learning, thirty-nine (34.8 %)indicated that technology is well integrated and the remaining seven (6.3 %) indicated that it is not at all integrated. The percentage of people who indicated better integration of technology into education is very high at 65%.Most of the colleges still use chalk and talk to conduct classroom teaching.

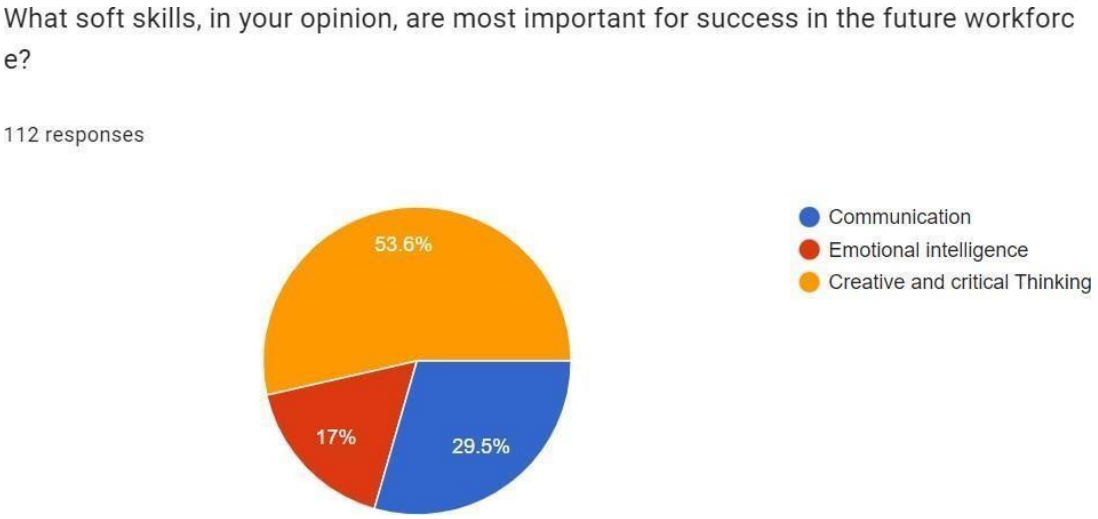


Figure 22
Future Essential Workplace Skills according to Survey Respondents

Out of the 112 survey respondents, most of them, sixty of them (53.6%) indicated that the most important soft skills for success in future workspaces are Creative and Critical thinking, followed by thirty-three respondents (29.5%) indicated Communication and nineteen respondents (17 %) indicated Emotional Intelligence. The choice of answer was fixed at three to understand which of the following are most importantly according to the respondents of the survey, this question is followed byan open-ended question to enable a clear discussion.

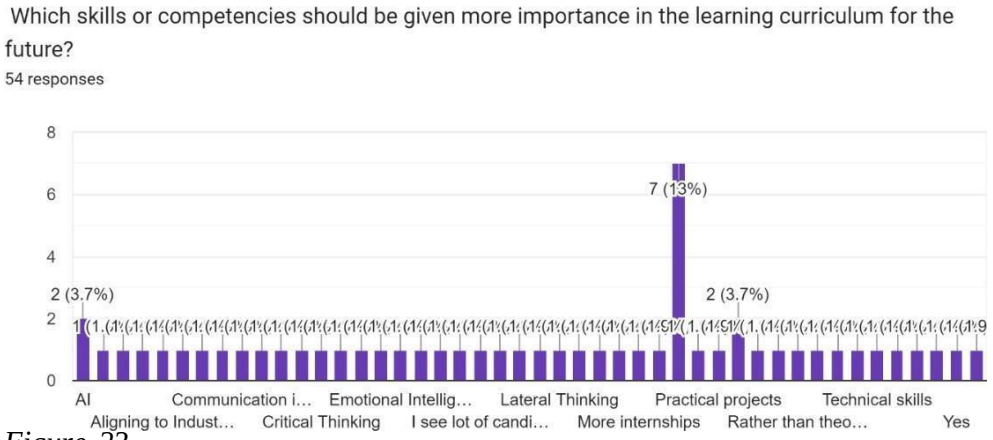


Figure 23
Other Required Skills according to Survey of Respondents

Though the survey was conducted on 112 respondents, the last answer was taken up by only 54 respondents. The respondents indicated many competencies that can be given importance like practical projects, technical skills, lateral thinking, alignment to industry requirements, more internships, and more practice-based knowledge.

Discussion of the Results of the Case Study of fifty-four women graduates learners.

The case study was conducted on fifty-four women learners in the final year graduating class.

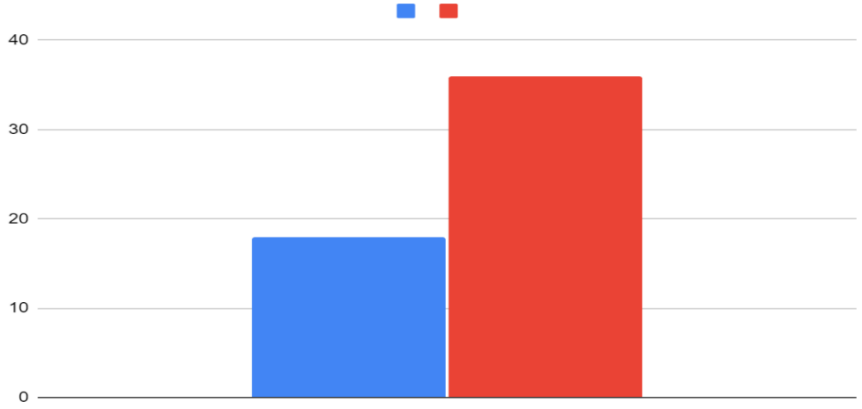


Figure 24
Students in Control and Experimental Groups

The above chart indicates that only eighteen out of fifty-four graduate learners have taken up the new assessment method, therefore constituting the experimental group. This indicates that most learners prefer standardized assessment methods and are not open to any change in patterns. This indicates most of the learners were hesitant to explore new methods.

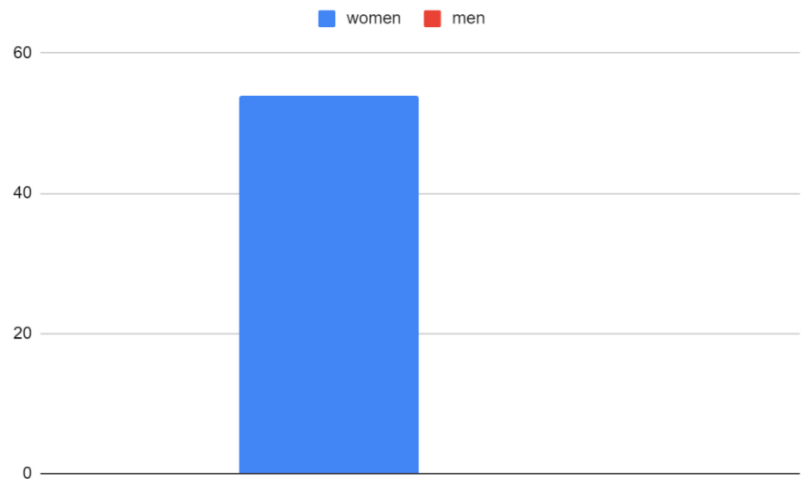


Figure 25
Gender-wise Distribution of Students

This exploratory case study was conducted on 54 women graduate learners, this homogenous group of women was considered because at times Science and Science fiction is considered male-dominated field. The all-women group also gives a safe and supportive environment for the learners to explore new domains and unchartered waters. The third reason is that women's colleges are a common feature in India and the study was conducted in a women‟s college.

To be successful in the 21st century requires information literacy along with mastery of critical thinking skills. It also requires that educators reform pedagogical practices to prepare learners for career readiness (Shearer & Luzzo, 2009).

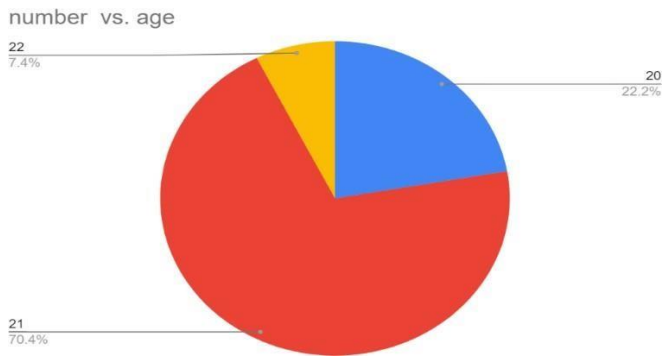


Figure 26
Age-wise Distribution of Students

Most of the graduate learners (70 %) are 21 years old, about 22% are 20 years old and about 7% are 22 years old. These are the final-year students of a graduating class who will be required to be workforce-ready after the examination. Most learners after graduation seek jobs, therefore this is the ideal group to conduct the research

4.2 Results

4.2.1 Theme 1 Knowledge Creation

The first theme of Acer s creative thinking framework is knowledge creation, it throws light on the ability to analyze and sort information to construct new conceptual relationships (Fisher & Scriven, 1997). Knowledge creation is possible only if the learner has understood the concepts and can generate multiple solutions to a single problem. The ability to break away from conventional practices is also a form of creative thinking. Future workspaces require innovative thinkers who can generate multiple solutions to complex problems. This is an essential skill that machines cannot replicate fast. The results of theme 1 knowledge creation were quantified by evaluating the content.

The pattern of codes indicating Prior Knowledge, Depth, Expertise, Accuracy, and cognitive readiness was checked for progress throughout six trials. The first

assessment score corresponded to the pretest score of knowledge and the sixth assessment was considered as the post-test score. Knowledge creation is a prerequisite for developing a creative solution. The larger the range of ideas generated the more likely one or more to be a creative product (Han, 2003). The white paper projects /Science fiction writing /standard assessments were evaluated to identify the various categories or labels that comprise knowledge creation. The five codes identified were prior knowledge, depth of knowledge, Accuracy, expertise, and cognitive readiness. These labels were chosen since the work is abstract and the presence of anyof these labels was marked. Most of the graduate learners scored a 3/5 for all the assessments and the labels that were not easy to identify under knowledge creation were expertise and cognitive readiness. These are the labels that machines will find difficult to replicate and therefore an in-demand skill for future workspaces.

The pre-test and post-test scores of knowledge creation of the eighteen students of the experimental group are indicated in chart 4.4 and knowledge creation of the 36 students in the control groups are indicated in chart 4.5. Most of the graduate learners in the experimental namely twelve out of eighteen about sixty-seven percent showed marked improvement in the post-test scores. Though all learners exhibited prior knowledge depth and accuracy of the knowledge assimilated, the distinction in the score was due to the presence or absence of cognitive readiness. This indicated the mental preparedness for adaption to rapidly emerging and unforeseen challenges. The post-test scores of the control group indicated that most of them maintained the same levels as the pretest scores indicating that the response to new and agile environments is not evident in the learners who took the standardized tests.

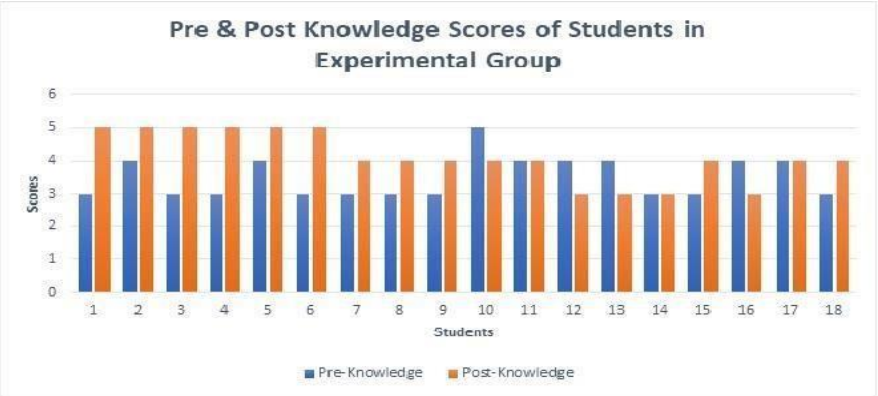


Figure 27
Pre-test and post-test Scores of Knowledge of each Student in the Experimental Group

Learners 1, 2, 3, 4, 5, 6, 7, 8, 9, 15, and 18 showed marked and steady development in their skills at knowledge creation. Learners 11,14 and 17 showed almost the same levels at pre and post-test. Interestingly learner numbers 10, 12, 13, and 16 showed a decrease in their ability at the post-test score of knowledge creation. All learners secured a score of 3 indicating that prior knowledge, accuracy, and depth of knowledge were attained, the scores improved if they could play with ideas and generate unique information out of it.

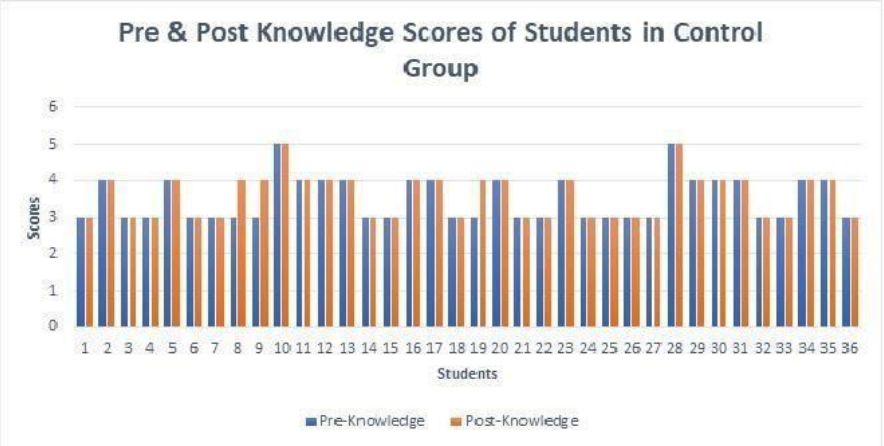


Figure 28
Pre-test and post-test Scores of Knowledge of each Student in the Control Group

Almost all the learners in the control group retained the same level at the post-test similar to the pre-test indicating the lack of idea generation, 2/36 learners i.e. less than about 10% showed a subtle increase in post-test compared to the pre-test.

These results also show that Ten of the eighteen samples in the experimental group received a score of three on the pre-test, seven received a score of four, and one received a score of five. Students in the experimental group saw a rise in their post-test Knowledge creation scores: four received a score of 3, eight received a score of 4, and six received a score of 5.

These are a few of the extracts of the participants indicating their ability to create new knowledge.

- I have a lesser fear of exams, and this concept gave me a relaxed mind, therefore, was able to create
- I tend to listen more to the lectures and I keep visualizing all the time what I should write for my assignment
- I strongly feel that I have and can take ownership of my learning and it is my responsibility to showcase what I could do with it.
- The previous days of the exams are no longer days of stress instead it is made me enter into a flow state where I feel I am at my creative peak.
- I also feel a strong urge to appear for the exam since I do not have any information overload.
- I feel free of the judgments of my teachers as my work will be unique and it cannot be graded as lacking textual knowledge, I used to get mixed up with my learning as I always found it difficult to memorize large chunks of data. The assignment days now give me a lot of confidence to explore

- This method gives me the breadth and width to expand my understanding of the lessons taught.
- Though the initial assignment didn‟t go so well, I am getting more confident with regular practice.

The learners who showed a decline mentioned boredom as the main reason and cited enthusiasm for the task in the initial stage.

4.2.2 Theme 2 Experimentation

The second theme of ACER Creative thinking framework is Experimentation, which is basically to consider different perspectives. The following codes or labels of verbal reasoning, learner-created examples, ambient conditions logical sequence, and factual correctness were used to identify the second theme of experimentation which determines the depth of critical thinking in the graduate learner.

Critical thinking is one of the essential in-demand skills of future workspaces according to McKenzie reports and is a skill that machines will not replicate as of now. Critical thinkers will be able to contemplate what may seem unlikely to experiment according to Lucas (2016) They should have an open mind to explore new possibilities.

The pattern of codes indicating verbal reasoning, learner-created examples, ambient conditions logical sequence, and factual correctness was checked for progress throughout six trials. The first assessment score corresponded to the pretest scoreof experimentation and the sixth assessment was considered as the post-test score. Experimentation is a prerequisite for developing critical thinking. The white paper projects /science fiction writing /standard assessments were evaluated to identify the various categories or labels that comprise knowledge creation. These labels were chosen since the work is abstract and the presence of any of these labels wasmarked. Most of the graduate learners scored a 3/5 for all the assessments and the

labels that were not easy to identify under experimentation were logical sequence and factual correctness. These are the labels that machines will find difficult to replicate and therefore an in-demand skill for future workspaces.

The post-test scores of experimentations of the eighteen students of the experimental group are indicated in chart 4.6 and the control group is in chart 4.7. Some of the graduate learners in the experimental namely six out of eighteen about thirty-three percent showed marked improvement in the post-test scores. Though all learners exhibited strong verbal reasoning depth and accuracy of the knowledge assimilated, the distinction in the score was due to the presence or absence of logical correctness. This indicated the mental preparedness to experiment with rapidly emerging and unforeseen challenges. The post-test scores of the control group indicated that most of them maintained the same levels as the pretest scores indicating that the response to new and agile environments is not developing in the learners who took the standardized tests.

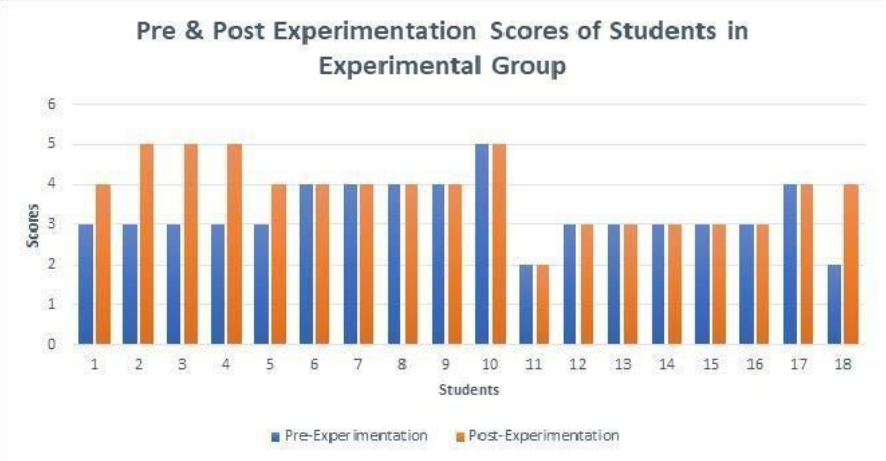


Figure 29
Pre-test and post-test Scores of Experimentations of each Student in the Experimental Group

Learners 1, 2, 3, 4, 5, and 18 showed marked and steady development in their skills at experimentation. Learners 6, 7, 8, 9, 10, 11, 12, 13,14 and 17 showed almost the same levels at pre and post-test.

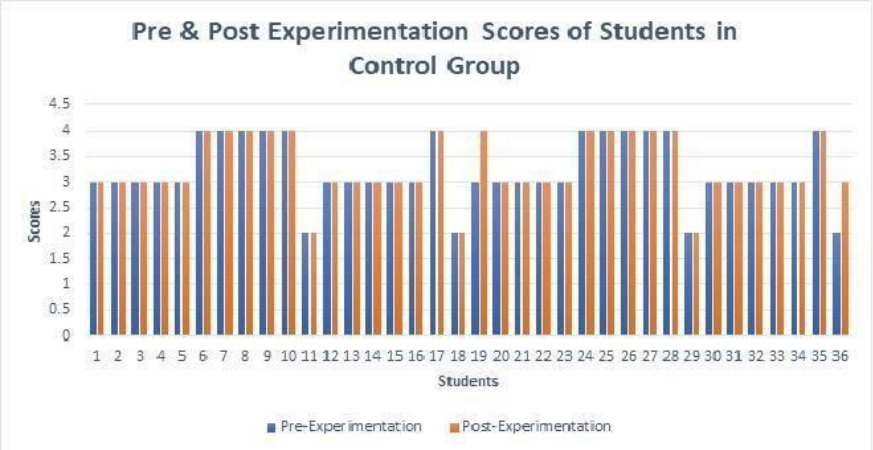


Figure 30

Pre-test and post-test Scores of Experimentations of each Student in the Control Groups

Most of the learners maintained the same level of experimentation in their pre and post-test scores except for learners 19 and 36 who showed some amount of improvement in scores.

In the pre-test among 18 samples in the experimental group, two students secured two, ten students obtained three, five students secured four, and one student got five. While the post-test experimentation scores of students in the experimental group increased, one student got one, five got a score of three eight students scored four, and four students got a score of five.

These are a few of the extracts of the participants indicating their ability to experiment with facts.

- I feel so privileged that I can critically analyze the learning to create new situations.

- I feel confident in manipulating ideas and analyzing situationsthrough different perspectives
- New dimensions appear more often as I sit down to do my assignments.
- I can push the limits of my learning
- I can consider alternatives quickly with each trial
- I can manage uncertainty and am not anxious about new situations.
- This assessment was more of a critical analysis of what I learned; it was never about remembering what I studied.
- I was able to change the ambient condition, and I thought of making this device work on Mars and other unexplored areas of space.
- Changing the sequence of the experiment though it seemed illogical made me own my way of experimentation.

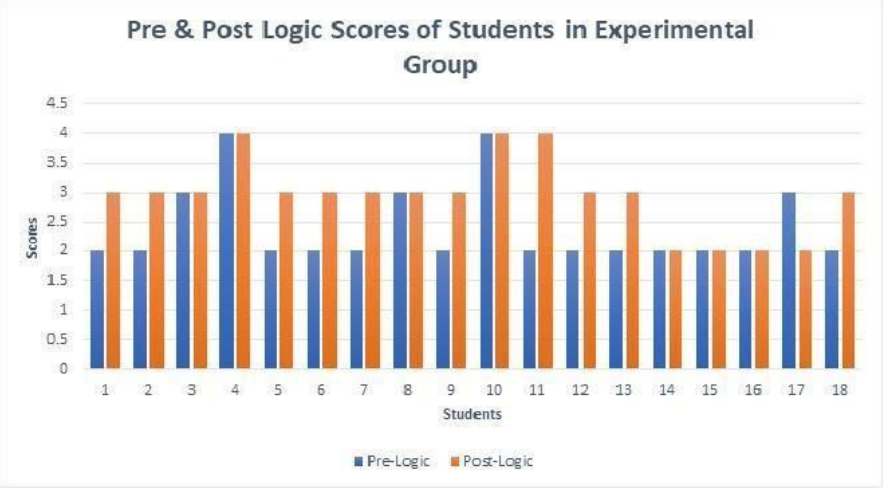
4.2.3 Theme 3 Quality of Ideas.

The third theme of Acer s creative thinking framework is the quality of ideas with sub-themes of logic, novelty, and elaboration. The quality of ideas of creative and critical thinking is analyzed based on the three subthemes. The 5 codes or labels under these three subthemes of logic novelty and elaboration are evaluated. Future workspaces require innovative thinkers who can generate good quality ideas that are functional and relevant. This is an essential skill that machines cannot replicate fast. The results of the three qualities of ideas were quantified by evaluating the content for novelty, logic, and elaboration.

The white paper projects /science fiction writing /standard assessments were evaluated to identify the various categories or labels comprising the quality of thoughts. This is the most important theme since the quality of ideas should be fit for

a purpose and function. The labels that were chosen to identify the quality of thoughts namely novelty are innovative, engaging, stimulating environment, depth of exploration, and creative thinking. The codes used to determine logic are convergent thinking, verbal reasoning, sound argument, persuasion, and objective judgments. Since the work is abstract the presence of any of these labels determinesif the idea is coherent, logical, and can be elaborated. These are the labels that machines will find difficult to replicate and therefore in-demand skills for future workspaces.

Figure 31



Pre-test and post-test Scores of Logic of each Student in the Experimental Groups

All eighteen learners of the experimental group showed a marked increase in their logical thinking except for learners 3,4,8,10,14,15,16, for whom the score remained the same. An interesting observation was learner 17 in the experimental group showed a decline.

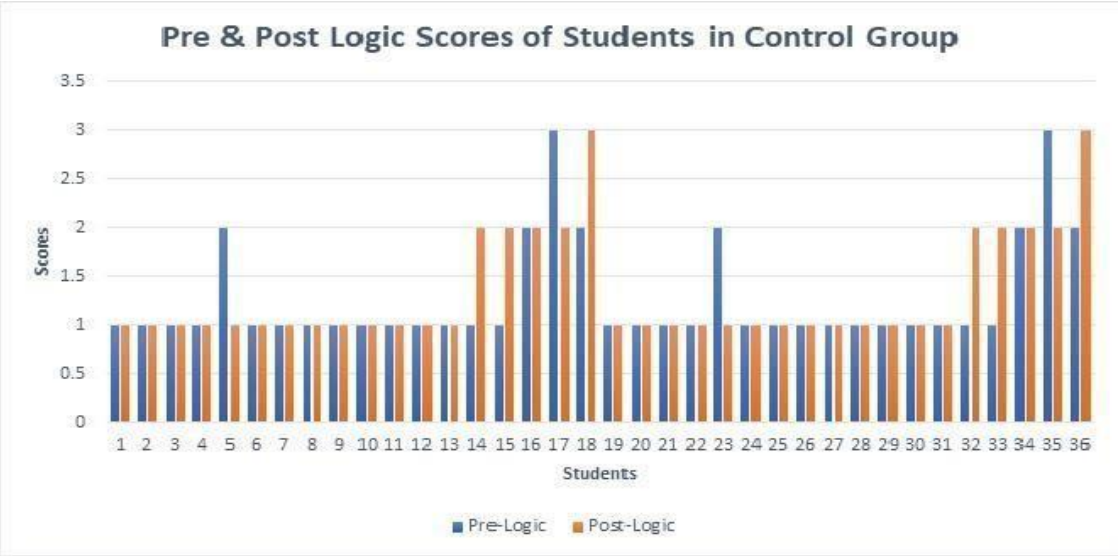


Figure 32
Pre-test and post-test Scores of Logic of each Student in the Control Group

Learners 14, 15, 18, 32, 33, and 36 showed a marked improvement in the development of logical thinking which is about 18 percent of the total number of learners in the control group. Learner 23 and Learner 35 showed a marked decline in their logic scores.

In the pre-test among 18 samples in the experimental group, thirteen students secured two, three students obtained three, and two students secured four. While the post-test experimentation scores of students in the experimental group increased, four students got two, eleven students secured three, and three students got a score of four. The second subtheme of quality of thoughts is Novelty, the labels or codes used to assessthe level of novelty are innovativeness, engagement with the topic depth of exploration, stimulating environment, and creative thinking. The novelty of the product is a clear indication of the intrinsic motivation, creative agility and the expertise of the domain knowledge gathered.

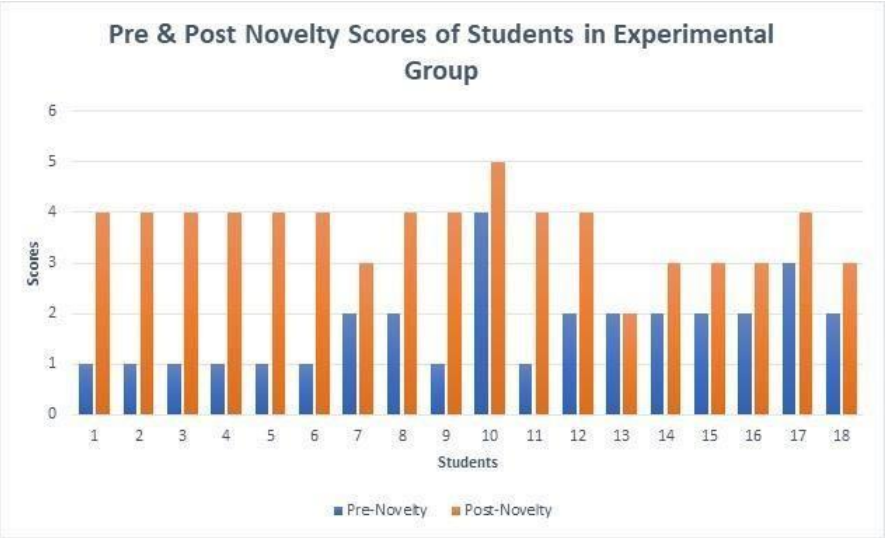


Figure 33
Pre-test and post-test Scores of Novelty of each Student in the Experimental Group

All eighteen learners showed marked improvement in this subtheme of novelty under ACER third theme of Quality of ideas.

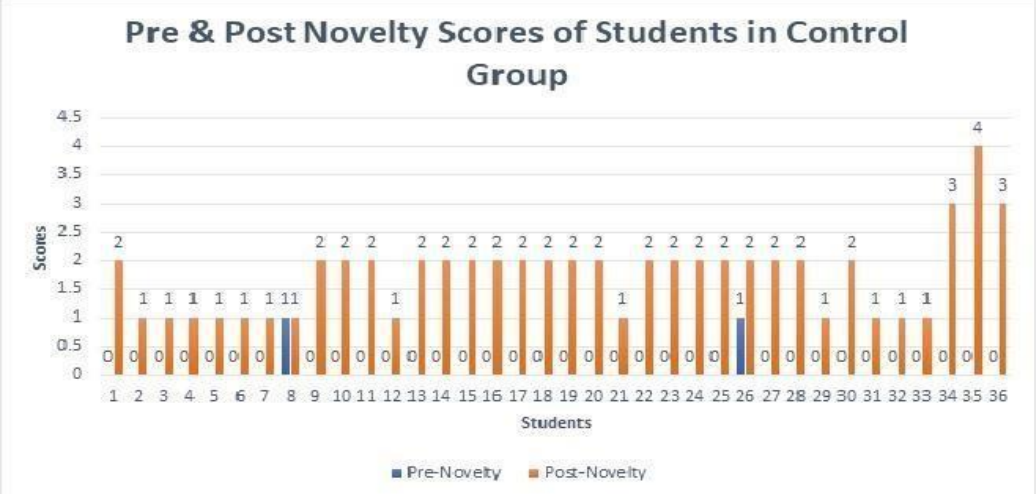


Figure 34
Pre-test and post-test Scores of Novelty of each Student in the Control Group

Most of the learners namely 34/36 about 94 %had a low score of novelty and after six trials the post-test increased to about 2 indicating a marginal increase.
In the pre-test among 18 samples in the experimental group, eight students scored one, eight students obtained two, and one student secured three. While the post-test scores of logics in the experimental group increased one student scored two, five students secured three, eleven scored four and one student scored five.

The third theme of ACER creative thinking framework is the quality of ideas and its third subtheme is elaboration. The third sub-theme elaboration was evaluated on labels like inquiry-driven, divergent thinking, coherent, challenging, and problem-solving. These codes were given a marking of 1 point to indicate their presence.

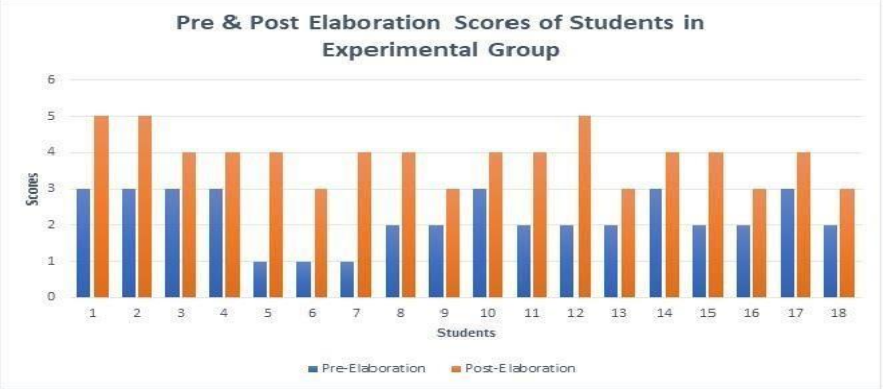


Figure 35
Pre-test and post-test Scores of Elaborations of each Student in the ExperimentalGroup

All eighteen learners in the experimental group showed a marked improvement in the ability to elaborate logically. Learners 5 and 7 showed marked improvement in this skill at the end of six trials.

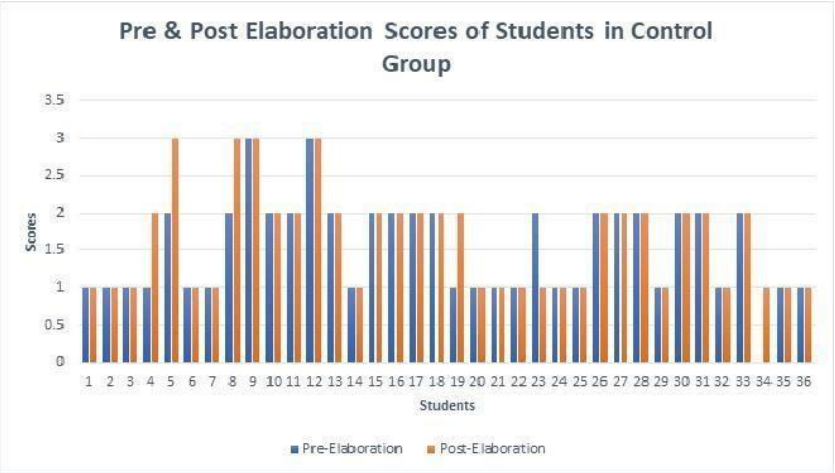


Figure 36
Pre-test and post-test Scores of Elaborations of each Student in the ExperimentalGroup

Most learners in the control group had the same pretest and posttest scores except learners 5, 8, and 19. Learner 23 showed a decline in the score for elaboration. In the pre-test among 18 samples in the experimental group, three students got a score of one, eight students obtained two, and seven students got three. While the post-test elaboration scores of students in the experimental group increased, five students got three, while ten scored four, and three students secured five.

These are the extracts of the learners to indicate how they were able to play with ideas and make full use of their learning: -

- Though I was able to generate ideas and the number as well as the quality of ideas improved; I do not think I was able to generate a workable type of device.
- The ideas didn‟t seem coherent but am doubtful if they will be functional
- The ideas seemed unreal and irrelevant.
- I can tolerate uncertainty and still focus on my task.

- The ideas carried different elements of novelty.
- I was unable to balance logic and novelty
- At times I had doubts if the idea was logical and can it be implemented.
- I was confident of the quality of my ideas and I felt proud to submit my assignments
- I did understand gaps in my learning
- The ideas seemed new and practical but I had an element of doubt about how it could be implemented in real life.
- The learners from the control group slowly started to appreciate the easy-going method by which their peers were doing their assignments.
- The standard assessments got more rigorous and more chunks of data had to be memorized.

4.3 Additional Findings Based on Quantitative Analysis

The obtained scores of each theme in both control and experimental groups were statistically analyzed using descriptive and comparative analysis. The following tables and graphs show the mean score of pre-test and post-test scores of 5 themes in both experimental and control groups.

The descriptive analysis of pre-test and post-test scores of 5 themes among students in the control group found that the mean post-test scores of each theme are slightly higher than the mean pre-test scores. Similarly, the median score was also slightly higher in the post-test score compared to the respective pre-test score except for the theme experimentation and logic.

4.3.1 Pre-test and Post-test Analysis of Themes in Control Group

Table 2.

Descriptive Statistics of 5 Themes in Control Group

Variables	N	Mean	Std. Deviation	Median
Pre-Knowledge	36	3.50	0.609	3
Post-Knowledge	36	3.58	0.604	4
Pre-Experimentation	36	3.22	0.637	3
Post-Experimentation	36	3.28	0.615	3
Pre-Logic	36	1.28	0.566	1
Post-Logic	36	1.33	0.586	1
Pre-Novelty	36	.06	0.232	0
Post-Novelty	36	1.75	0.692	2
Pre-Elaboration	36	1.53	0.654	1
Post-Elaboration	36	1.64	0.683	2

This figure indicates the positive relation between the three hypotheses stated in Chapter1 and the results of the study.

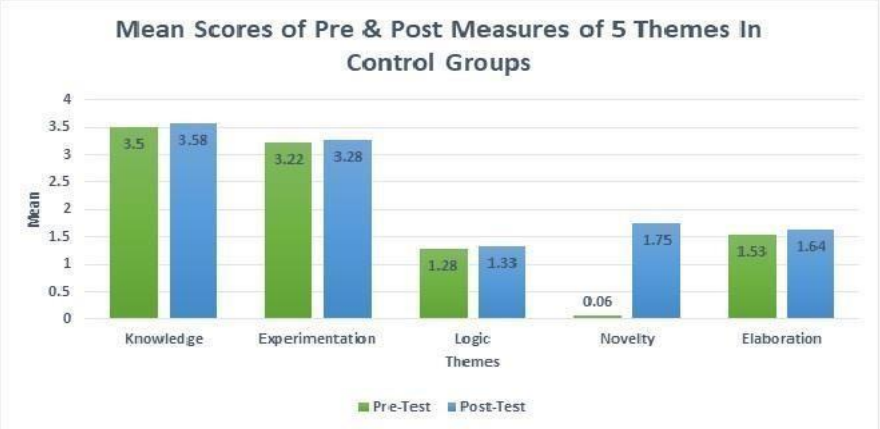


Figure 37
Mean Score of Pre-test & Post-test of 5 Themes in Control Group

The pre-test and post-test scores of 5 themes in the control group were compared using the Wilcoxon Signed Rank Test. The results of the same are given below. Table 3 illustrates the results of the Wilcoxon signed rank test on pre and post-test scores of 5 themes knowledge, experimentation, logic, novelty, and elaboration among 36 students in the control group. The results found that for the control group (N=36):-

Table 3.

Comparing Pre-test and Post-test Scores of 5 Themes in the Control Group using theWilcoxon Signed Rank Test

Ranks				Wilcoxon Signed Ranks Test		Effect Size
		N	Mean Rank	Test Statistic[a]	*p*-value	*r*
Post-Knowledge - Pre-Knowledge	Negative Ranks[b]	0	.00	-1.732	0.083	-0.204
	Positive Ranks[c]	3	2.00			
	Ties[d]	33				
	Total	36				
Post-Experimentation - Pre-Experimentation	Negative Ranks[b]	0	.00	-1.414	0.157	-0.167
	Positive Ranks[c]	2	1.50			
	Ties[d]	34				
	Total	36				
Post-Logic - Pre-Logic	Negative Ranks[b]	4	5.50	-.632	0.527	-0.074
	Positive Ranks[c]	6	5.50			
	Ties[d]	26				
	Total	36				
Post-Novelty - Pre-Novelty	Negative Ranks[b]	0	.00	-5.295	< 0.05	-0.624
	Positive Ranks[c]	35	18.00			
	Ties[d]	1				
	Total	36				
Post-Elaboration - Pre-Elaboration	Negative Ranks[b]	1	3.50	-1.633	0.102	-0.192
	Positive Ranks[c]	5	3.50			
	Ties[d]	30				
	Total	36				

Note. [a] Wilcoxon Signed Rank Test Statistic is based on negative ranks, [b] Post-test score < Pre-test score, [c] Post-test score > Pre-test score, [d] Post-test score = Pre-test score

1. The post-test score of knowledge (*Mdn = 4*) is not significantly higher than the pre-test score of knowledge (*Mdn* = 3) with a small effect size, T = -1.732, p = 0.083, r = -0.204.

2. The post-test score of experimentation (*Mdn = 3*) is not significantly higher than the pre-test score of experimentation (*Mdn* = 3) with negligible effect size, T = -1.414, p = 0.157, r = -0.167.

3. The post-test score of logic (*Mdn = 1*) is not significantly different from the pre-test score of logic (*Mdn* = 1), T = -.632, p = 0.527, r = -0.074. The post-test score of novelty (*Mdn = 2*) is significantly higher than the pre-test score of novelty (*Mdn* = 0) with a medium effect size, T = -5.295, p < 0.05, r = -0.624.

4. The post-test score of elaboration (*Mdn = 2*) is not significantly higher than the pre-test score of elaboration (*Mdn* = 1) with a negligible effect size, T = -1.633, p = 0.102, r = -0.192.

4.3.2 Pre-test and Post-test Analysis of Themes in Experimental Group

Table 4.
Descriptive Statistics of 5 Themes in Experimental Groups

Variables	N	Mean	Std. Deviation	Median
Pre-Knowledge	18	3.50	0.618	3
Post-Knowledge	18	4.11	0.758	4
Pre-Experimentation	18	3.28	0.752	3
Post-Experimentation	18	3.83	0.857	4
Pre-Logic	18	2.39	0.698	2
Post-Logic	18	2.94	0.639	3
Pre-Novelty	18	1.72	0.826	2
Post-Novelty	18	3.67	0.686	4
Pre-Elaboration	18	2.22	0.732	2
Post-Elaboration	18	3.89	0.676	4

The descriptive analysis of pre-test and post-test scores of 5 themes among students in the experimental group found that the mean post-test scores of each theme are higher than the mean pre-test scores. Similarly, the median score was also higher in the post-test score compared to the respective pre-test score of each theme.

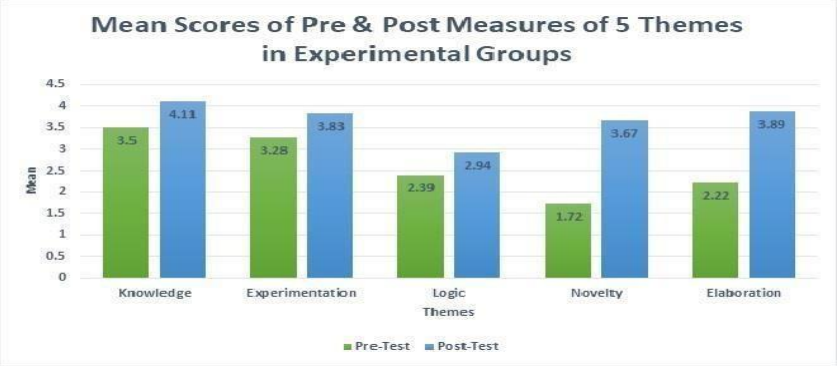


Figure 38
Mean Score of Pre-test & Post-test of 5 Themes in Experimental Group

The pre-test and post-test scores of 5 themes in the experimental group were compared using the Wilcoxon Signed Rank Test. The results of the same are given below.Table 5 illustrates the results of the Wilcoxon signed rank test on pre and post-test scores of 5 themes knowledge, experimentation, logic, novelty, and elaboration among 18 students in the experimental group. The results found that for the experimental group (N=18),

Table 5.

Comparing Pre-test and Post-test Scores of 5 Themes in the Experimental Group using the Wilcoxon Signed Rank Test

	Ranks		Wilcoxon Signed Ranks Test			Effect Size
		N	Mean Rank	Test Statistic[a]	*p*-value	*R*
Post-Knowledge - Pre-Knowledge	Negative Ranks[b]	4	6.00	-2.147	< 0.05	-0.358
	Positive Ranks[c]	11	8.73			
	Ties[d]	3				
	Total	18				
Post-Experimentation - Pre-Experimentation	Negative Ranks[b]	0	.00	-2.271	< 0.05	-0.379
	Positive Ranks[c]	6	3.50			
	Ties[d]	12				
	Total	18				
Post-Logic - Pre-Logic	Negative Ranks[b]	1	5.50	-2.673	< 0.05	-0.446
	Positive Ranks[c]	10	6.05			
	Ties[d]	7				
	Total	18				
Post-Novelty - Pre-Novelty	Negative Ranks[b]	0	.00	-3.695	< 0.05	-0.616
	Positive Ranks[c]	17	9.00			
	Ties[d]	1				
	Total	1				
Post-Elaboration - Pre-Elaboration	Negative Ranks[b]	0	.00	-3.796	< 0.05	-0.633
	Positive Ranks[c]	18				
		0				
	Total	18				

Note. [a] Wilcoxon Signed Rank Test Statistic is based on negative ranks, [b] Post-test score < Pre-test score, [c] Post-test score > Pre-test score, [d] Post-test score = Pre-test score

1. The post-test score of knowledge (*Mdn* = 4) is significantly higher than the pre-test score of knowledge (*Mdn* = 3) with a small effect size, $T = -2.147$, $p < 0.05$, $r = -0.358$.

2. The post-test score of experimentation (*Mdn* = 4) is significantly higher than the pre-test score of experimentation (*Mdn* = 3) with a small effect size, $T = -2.271$, $p < 0.05$, $r = -0.379$.

3. The post-test score of logic (*Mdn* = 3) is not significantly different from the pre-test score of logic (*Mdn* = 2) with a small effect size, T = -2.673, $p < 0.05$, r = -0.446.

4. The post-test score of novelty (*Mdn* = 4) is significantly higher than the pre-test score of novelty (*Mdn* = 2) with a medium effect size, T = -3.695, $p < 0.05$, r = -0.616.

5. The post-test score of elaboration (*Mdn* = 4) is significantly higher than the pre-test score of elaboration (*Mdn* = 2) with a medium effect size, T = -3.796, $p < 0.05$, r = -0.633.

The pre-test and post-test analysis of scores of 5 themes in the control group and experimental group indicate that all 5 themes have obtained significantly higher scores in the experimental groups validating the hypothesis. In the control group, only novelty among the five themes has a significant difference between pre-test and post-test scores. Any new knowledge will be novel information. The effectsize is also comparatively greater in experimental groups for each pair-wise analysis. This indicates that the Acer creative thinking model has a significant influence on students‟ performance.

4.4 Summary of Findings

The exploratory case study was conducted on fifty-four female undergraduate learners in the age group twenty to twenty-two. The experimental group consisted of eighteen students and the control group consisted of thirty-six students. The first assignment was considered as the pretest and the sixth assignment score was the post-test. The exploratory case study focused on developing skills that are usually not quantified in assessments of most universities. Pedagogical reforms should keep pace with Technological advancements to prevent skill gaps. ACER creative thinking framework was used to determine the progress of the Themes. The themes and

subthemes that were explored 1. Knowledge creation 2. Experimentation 3. Logic 4. Novelty and 5. Elaboration. Showed marked improvement in the experimental group. These are skills that are not assessed as a regular practice in most educational institutions. Future workspaces require more holistic education patterns that evaluate and grade skills and not just the knowledge content.

4.5 Conclusions

This chapter highlights the results of the survey along with a qualitative exploratorystudy throughout the study. It explores the need to devise pedagogical reforms todevelop and assess higher-order thinking skills in graduate learners. The surveyed literature indicated that skill gaps exist and most educational institutions still dependon outdated practices. The next chapter highlights the discussion of the research questions.

The learners of the experimental group showed marked progress in all three themes of the ACER creative thinking framework indicating that the results support the hypothesis. The themes and codes of the qualitative data were analyzed to generate quantitative metrics to achieve the validity of the hypothesis. The integration of qualitative and quantitative data provided a more comprehensive view The findings ofthese results provided strong support for the positive hypothesis. The next chapter highlights the discussion of the findings and the correlation of the findings to the conceptual framework.

CHAPTER V

DISCUSSION

"Science fiction is the genre of possibilities, where we can explore the endless potential of the human mind and the universe itself."

- Philip K.

5.1 Introduction

This chapter presents the discussions of the results of the exploratory case study of fifty-four graduate learners over a longitudinal study of six months and the discussion of the one hundred and twelve survey respondents. The World Economic Forum reinstates the importance of the right skills for the future workforce since technological advancements and automation are replacing low and medium-skilled labor (Gordon, 2013; Kristal & Cohen, 2015; Smith & Anderson, 2014). Recent studies by Malone et al. (2020) prove that we are many decades away from the day when computers have complete human-like intelligence and therefore there is a lesser possibility of machines replacing humans. The above observations show that new advancements will require agile and advanced skills to cope with these fast and smart machines. The studies carried out by Aniket (2018) indicate a skill gap between the education offered and the requirements of the industry. This will be of serious concernas educated people may not find the right employment. Most low-skilled jobs could be executed by intelligent and smart machines created specifically for the job. This will lead to serious economic and social unrest if several youths are educated but underemployed. As a solution, Singh et al., (2022) illustrated that by analyzing the performance and competencies of specific industries certain corrective measures can be incorporated to bridge the observed gaps.

According to Cappelli (2015), the skill gap is defined as when the existing workforce‟s skill levels are insufficient to meet the organization's requirements. Fisk (2017) aptly points out that a new vision of learning wherein learners identify the source of these skills and knowledge should be incorporated. Studies carried out by Icela and Soledad (2018), clearly revealed the absence of a suitable educational Framework that develops competencies through the dimension of character and links active learning teaching strategies for students. The bulk of the existing skill gap is the result of an education system that primarily assesses the knowledge gained in a program rather than the skills acquired.

The qualitative exploratory study hypothesized that flexible assessment methods, namely a Flip question, enable creative expressions when compared to standard assessment methods practiced in India. The Flip question paper improves creative and critical thinking and most importantly allows the learner to work in an agile environment. This allows the learner to create, experiment, and generate varied ideas regarding the knowledge gained during the coursework. The motivation for this study comes from the fact that most of the technological revolutions of today namely satellite communication, Google Glass, and self-driving cars were all figments of the imagination of science fiction writers. These ideas were taken up by scientists to develop the concept into a workable product.

The references to previous literature indicate that pedagogical reforms are not aligned with technological advancements. To bridge this skill gap, educators must reinvent pedagogical practices to prepare the learner for future workspaces. The pedagogical transitions are the need of the hour as workforce skill sets are evolving. These are the competencies that learners require to navigate the demands of future workspaces. The focus of this research is to explore a transformational change so that all learners develop higher-order thinking skills along with domain knowledge. The

findings of this research indicate a positive development in the three themes of knowledge creation, experimentation, and quality of ideas (sub-themes of novelty, logic, and elaboration).

The themes of knowledge creation, Experimentation, and quality of ideas increased considerably in the learners who took up the novel method of assessment. The findings of these eighteen learners displayed strong evidence of an increase in competencies like critical thinking and creative thinking. This method of assessment was a transformative experience for all eighteen learners as they effectively managed all assignments. The qualitative content analyzed over the longitudinal period of the study indicated progress. Therefore, it can be stated that the concept of a flip question paper enables flexibility for the learner, thus allowing creative expression of the content. These results support the hypothesis that flip questions in the form of a white paper project/science fiction writing have a positive influence on creative thinking, critical thinking, and the quality of ideas.

Most participants felt more confident after each trial, as it focused on what they knew and not what they did not understand from the lesson. This assignment also enabled a differentiated form of assessment that gave the learner the confidence to take ownership of the learning The rubric for assessment was designed in a manner to identify the progress of the theme from a novice to an expert state. The usual rubric for assessment allots a mark for each piece of information present in the text whereas this rubric evaluates the presence and growth of higher-order thinking skills.

The digital natives require the integration of creativity as an educational practice and the incorporation of assessments that gauge the progress of 21st-century skills. An interesting study by Smith (2020) stated that engaging with failure is essential for success, and the reluctance to inculcate failure in learning may sabotage the ability of learners to be creative. The rigid and standardized assessment so commonly followed

never fosters failure for a student well prepared with memorization of the content. Though flexible assessment methods can seem like a failure regarding the memorization of content it prepares the learners for flexible environments. Another area of concern is that these skills are open-ended in nature and therefore it is difficult to evaluate and assess. The main dichotomies that exist regarding these assessments are psychometric versus behavioral, process versus product finally Individual versus group. The above-mentioned reasons hinder the assessment of higher-order thinking skills. Therefore, most universities and educators find it difficult to quantify these skills.

5.2 Discussion of Survey Results

The results indicated that 64 respondents out of the one hundred and twelve respondents mainly 57.7 % of the survey suggested that Knowledge is still the primary outcome of education. Though the respondents belonged to a varied heterogeneous group with work experience ranging from less than 5 years to above 30 years. The surveyed respondents also belonged to different locations across India and a few of the participants were from abroad. This diverse group of one hundred and twelve participants considered knowledge to be the most common outcome of education, followed by career opportunities skills, and then certifications.

Even though the respondents in the survey had educational qualifications ranging from first-year college students to Ph.D. holders, almost 50 percent still reported that technical knowledge was the second most important outcome of their education. This was followed by work readiness, soft skills, and industry experience. This again suggests that the primary focus of most educational institutions is to impart knowledge and the lack of skill-based training.

About 48% of respondents with less than five years of work experience found internships as an innovative pedagogy source, followed by real case studies and industry experience.

The majority of the respondents informed that the skill expertise matched or was adequate for the current job roles whereas the remaining 44.8 % indicated that they were either more skilled for the job roles or less skilled. This trend of not finding the right employment or in other words underemployed is also a disturbing scenario.This can happen in cases where people are over-educated but less skilled.

A very small percentage of respondents 7.2 % indicated that they have never experienced a lack of skills at their workplace, this number incidentally corresponds to the 7 % of the survey respondents who had more than 30 years of experience. An alarming percentage of 93 % indicated that they had either occasionally experienced a skill shortage or have always experienced the same.This is a strong indication that education is not providing the skills required and strong measures of skilling and upskilling should be taken to bridge this gap.

Fifty-two respondents at 47.7 % indicated medium skill proficiency and another fifty-two respondents at 47.7 % indicated high proficiency, this indicates that 104 respondents had core competencies varying from medium to high and still lacked expertise and skills in certain areas. The skill gap could be in thinking abilities, team work or it could be project management. Highly proficient people could also experience skill gaps in an agile work environment in various other domains.

Thirty-three respondents 30.3 % informed that though Education has slight drawbacks the overall picture of education and educational institutions is that it provides a curriculum that caters to future workspaces, 63 of the respondents felt that it is providing average requirements of the future workspaces, and the remaining 13 at

11.9 % responded that education is not providing the right content for future workspaces.

Ninety-nine respondents out of the 112 (88.3 %) indicated that they had engaged in skill training in the previous year, this clearly shows that most people understand the constant need for upskilling and do take serious steps to bridge skill gaps even after many years of work experience. This is interestingly one of the most obvious types of evidence of the survey, that skill-based training happens throughout life to keep one up to date with knowledge.

The last question had only fifty-four responses as it was not a multiple-choice question, respondents usually do not like writing answers in a survey and few of them suggested certain innovative ideas to make the learning relevant. Many competencies that can be given importance like practical projects, technical skills, lateral thinking, alignment to industry requirements, internships, and more practice-based knowledge can be embedded in the curriculum for a more skill-based outcome from education.

5.3 Discussion of the Numbers

The assessment was open to all fifty -four learners of the final year, but when the choice was given only Eighteen learners from the fifty-four chose the novel assessment indicating that less than thirty-five percent of the learners are open to new experiences. This is primarily due to the fear of the unknown, lack of motivation or interest, and mainly fear of failure. Most learners were comfortable with standard assessments and the learners who chose the novel method of assessment showed lesser and lesser stress as the number of trials increased.

The assessment was done on a group of fifty-four women learners to create a homogenous group. This is creative work and the ability to work ina safe place away from all distractions is required and the whole women's group was able toachieve it. In India, there are many women-only colleges and many women scientists,

but not all women are interested in science, therefore more attention should be given to women so that they can develop their inherent strengths.

5.4 Discussions of the Literature.

Previous research by Dilley et al. (2015) indicated that students should be able to think critically and make rational judgments by synthesizing information from multiple streams of information. Though the importance of critical thinking is emphasized not much literature is available on assessing the progress of these skills. The most promising and oldest assessment method by Guilford (1950) indicates criteria for creativity as fluency, flexibility, elaboration, and originality of ideas. The ACER creative thinking framework also is developed on these lines. The reviewed literature indicated the need for the development of higher-order thinking skills and it also established the fact that most universities in India still depend on assessments that evaluate the memorization of facts. There is not much evidence in the reviewed literature about assessment rubrics to check the progress of higher-order thinking skills. The grade sheets of most universities display the knowledge content and not the skills developed during the program. Though some universities are depending on open examinations with chatbots and other AI tools it is proving to be a setback since authentic learning cannot be evaluated. Imagination is the source of all creativity and schools and universities must equip learners to think beyond textbooks. Universities should develop unique individuals and not mass followers with no original spirit of inquiry.

This background requires that the education system brings out individuals with highly developed thinking skills to adapt to an agile world. Seldon and Abidaye (2018) in a carefully researched book “The Fourth Education Revolution analyze the role of AI and the changes that they see as inevitable in our education system. The Future of Education and Skills 2030 OECD project proposed an initial

framework. designed to address 2 questions What knowledge skills activities and values will today‟s students need to live and shape their world?

According to Tucker (2017) prepare people for the anticipated change in their lives we must ensure that our education and training are tuned to the new demands of the workplace. Authors like Garden (2007) and Luckin (2018) have offered alternative ways of conceptualizing intelligence into 5 separate domains namely Disciplinary Mind, Creative Mind, Ethical Mind, Respectful Mind, and Synthesizing Mind.

5.4.1 Correlation to Conceptual Framework Theme.

According to Acer, the definition of creative thinking is the capacity to generate many kinds of ideas, manipulate ideas in unusual ways, and make unconventional connections to outline novel possibilities that have the potential to elegantly meet a given purpose. According to Education Scotland (2013), Creativity is at the heart of the philosophy of the Curriculum of Excellence and is fundamental to the definition of a successful Leader.

According to Mikdashi (1999), creativity is considered a principal term and it can be divided into three types either creating something new or combining things. Houran and Ference (2006) stated that creativity can be seen as a mental process that produces novel and useful concepts or ideas, it could also be seen as a process of introducing innovative relationships between existing ideas or concepts. In the literature reviewed creativity is defined as a principle of problem-finding and problem-solving and therefore requires several skills and talents and is considered to be unconventional (DiLiello & Houghton, 2008). The ability to capture ideas from all around enables learners to take different perspectives.

Theme 1 relates to the knowledge creation of the conceptual framework since creative thinking is a generative process. This is also synchronized with the importance of the production of many different ideas or in other words ideation

fluency as mentioned by Guildford (1950). The findings suggest that most learners in the experimental group were able to generate ideas more fluently with time. The inclusion of knowledge creation helped the learners create more ideas and consequently the generation of creative ideas.

Theme 2 relates to the experimentation strand of the conceptual framework and it involves the ability to open new boundaries in the context of the problem. The findings suggest that experimentation and shifting perspectives improved the learners in the experimental group. The future workspaces will require agile and adaptable thinking, therefore shifting perspectives and experimentation help in developing this skill. According to Peng et al., (2014), creativity can be improved if pupil-centered instruction is followed rather than teacher-led instruction. This further proves the point that assessments should also be student-driven and not instructed by teachers or governing bodies.

Theme 3 relates to the quality of ideas and this forms the third strand of the conceptual framework. A flexible and conducive climate is fit for exploration and risk-taking which improves the adaptability to new situations. The learners of the experimental group were able to generate ideas of good quality and fit for a purpose, whereas the learners of the control group remained almost at the same level throughout the entire longitudinal study.

5.4.2 Discussion of Hypothesis

5.4.2.1 Discussion of Hypothesis from the Literature.

According to Hirose (1992), most learners from college lack the experience as well as the basic skills to function effectively when they enter the workforce. Studies by Belkin (2017), have indicated that many senior managers scored at basic or below basic levels indicating that assessments do not gauge or evaluate attributes that are vital for workspaces. Tung and Chang (2009), illustrate that one of the major causes is

that most assessments focus on large-scale memorization-orienting activities, secondly most teachers lack the guidance required to be creative mainly due to time constraints. Most classrooms focus on collective responses and not differentiated and varied responses. According to Paul and Elder (2007), critical thinking is self-directed, self-monitored, self-disciplined, and self-correcting thinking.

This study hypothesized that a flexible assessment method like Science fiction writing/white paper project can be evaluated to determine the progress of creative and critical thinking. According to Siaj and Farran (2018), fiction is interesting and it increases learners‟ motivation and therefore can be considered a viable method to explore. The best method to implement creative and critical thinking skills into the learning process is to enable students to employ these skills rather than teach these skills. According to Grey (2016), critical, and creative thinking is a skill vital to surviving in the present economy of constant change and disruption.

5.4.2.2 Discussion of Hypothesis from Real-life Case Studies

This hypothesis is based on the following real-world cases of various science fiction concepts that have now become a reality. Science fiction has often inspired real-world inventions and technological advancements. Here are some examples of science fiction concepts that have become a reality:-

1. Communicators: The concept of handheld communication devices used in "Star Trek" became a reality with the invention of flip phones in the 1990s.
2. Voice-activated cars: The car K.I.T.T. from the 1980s TV show "Knight Rider" had voice-activated controls and advanced surveillance technology. While fully autonomous cars are still being developed, voice-activated and autonomous features are being tested in modern vehicles.

3. Video phones: The idea of video phones, depicted in movies like "Metropolis" (1927), became a reality with the development of two-way videophones demonstrated in the 1930s and later in the 1960s and '70s.
4. Prosthetic limbs with artificial sensations: Inspired by Luke Skywalker's prosthetic hand in "Star Wars," researchers are developing electronic skin substitutes that can help amputees feel with artificial limbs.
5. Space stations: Edward Everett Hale's 1869 novella "The Brick Moon" featured the concept of a space station. Decades later, America sent astronauts to the moon using the command module Columbia, resembling the idea of a space station.
6. Augmented Reality Glasses: The film "Minority Report" depicted characters using gesture-controlled augmented reality (AR) interfaces. Today, AR glasses allow users to access information and interact with digital elements in their surroundings.
7. Voice-activated assistants: Voice-activated assistants like Siri, Alexa, and Google Assistant, which respond to spoken commands, were inspired by the voice-controlled computer systems seen in "Star Trek." These assistants have become integral parts of our daily lives.
8. In 1999 Disney Channel telecast a movie called The Smart House, which can be considered a pioneer for current-day smart homes.
9. In 1964, the World Fair was published in Modern Electronics Magazine 1911 the concept of the picture phone was published, and now this is a reality.
10. Star Trek virtual display device now Google Glass, cards as currency were introduced by Edward Bellamy way back in 1888, and Wireless appliances were predicted way back in 1964 by Scientist Isac.

Science fiction writing opened up the participants to a varied level of experimentation, with no rules and boundaries for the creation of knowledge few of the participants displayed a very high level of creativity. They demonstrated an eagerness to alternate pathways and models to ignite their imagination. Machines cannot still shift perspective to redefine a problem and generate new solutions. The research participants displayed wide and varied ideas of experimentation as a process to get the product of their imagination. This ability to shift perspectives enables them to tolerate uncertainty and devise methods to adapt. This ability enables them to see existing knowledge in new ways thereby considering alternatives. Experimentation with ideas allows them to venture into new and varied thought processes. The Future workspaces require people who can navigate the uncertainties and the routine and structured work will be handled by machines.

5.4.2.3 Discussion of Hypothesis from Results

These discussions of visionary speculative writing formed the foundation of various student-led assessments over six months. The study was able to support the hypothesis that alternative assignments like flip question papers can improve creative and critical thinking in graduate learners. The embedding of critical and creative thinking throughout the learning and assessment process enables learners to engage in higher-order thinking. The use of logic and imagination makes learners able to select from a range of ideas and strategies. These assignments were challenging, and engaging and maintained a fun approach for the learner to develop various alternatives and seek new knowledge. These assignments though flexible and the concept‟s developed imaginary were evaluated for quality as well as for correctness. Intelligence and creativity should be measured from a multidimensional perspective

and intelligence always is composed of different abilities than a single attribute. The hypothesis proves that the learners who engage in this type of assessment were able to integrate their ideas and expand their understanding to develop new insights, the concept of divergent and convergent thinking for the same assignment enables the learners to generate multiple ideas and finally choose the best of these ideas. The fluency of ideas comes forward with the depth of knowledge and it is directly proportional to the growth of knowledge. Integrating ideas enables a generation of new insights. The standard assessments of the control group never allow them to develop their knowledge rather it enables them to memorize and repeat the knowledge. The future machines will be experts at repetitive jobs and will find it difficult to manage new jobs, therefore learners must develop an innate ability to create new ideas from the knowledge learned.

Experimentation is the idea of changing one‟s point of view by adopting a different mindset to see things from a new angle. Creative thinking always involves divergent thinking which involves developing multiple perspectives for the same concept. It also allows an element of risk-taking to foster innovation and problem-solving skills since every new product is developed after experimentation. Therefore, it is essential that learners play with and generate ideas and experiment to develop new concepts.

The third and most important theme of the ACER creative thinking framework is the quality of ideas consisting of logic, novelty, and elaboration. It is not only important that the number of ideas is large. It is equally important that the quality of ideas should be relevant. Novelty is also an important attribute of the quality of ideas and the last Sub-theme is elaboration This proved to be a differentiated assessment and was able to evaluate the performance of each learner uniquely.

5.4.3 Discussion of the Assessment Rubric for Creative & Critical Thinking

5.4.3.1 Theme 1 Knowledge Creation

The existing information of the learner plays a significant role in the learning process. A strong foundation of prior knowledge helps learners build upon existing and new knowledge. This also enhances the success of the learners. Activating prior knowledge helps students establish connections faster. Learners with a strong foundation of prior knowledge can retain and comprehend knowledge faster. Therefore, the motivation of the learners increases leading to new learning outcomes. Learners with strong prior knowledge will have fewer learning gaps. Prior knowledge is the foundation for building new knowledge and helps learners make connections between previous and new information. The overall learning experience is thereby enhanced.

The depth of knowledge framework provides a common language for assessing the degree to which cognitive engagement translates into learning opportunities and tasks. The depth of knowledge framework provides student growth and positive academic outcomes. The depth of knowledge assists educators in creating assessments that align with the desired level of cognitive engagement and depth of understanding. deeper understanding at appropriate cognitive levels happens with a higher depth of knowledge. The learners with higher levels of skills were identified by the depth of their knowledge. Though the fluency of ideas indicates the ability to think creatively, not all learners can generate factually correct ideas. Successful outcomes are possible when the data is accurate, only the learners with a depth of knowledge can create relevant ideas.

The last characteristic to determine knowledge creation was cognitive readiness. The future workspaces will require the agility of thought and people who are quick to

adapt to rapidly emerging and unforeseen challenges. This is also a sign of creativity and should be of special relevance. These are the new-age characteristics that educators and educational institutions should be gauging and not the content knowledge memorized by the digital natives.

5.4.3.2 Theme 2 Experimentation

The first characteristic to be assessed in this theme is the ability to comprehend and effectively reason out the knowledge gained. This ability stands in good stead in future workspaces where information is dynamic and the outcomes are unpredictable. Therefore, learners who can verbally reason out new situations will be in demand rather than the learners who memorize all the data that is readily available on digital platforms.

1. Learner-created examples

This is a highly evolved skill wherein the learners could create examples out of their learning. This is an effective method by which deeper and more meaningful learning can happen. Learners with well-developed higher-order thinking skills can optimize their learning and create new and varied examples that are relevant to the context. This is a skill that future workspaces will require to evolve and these are the skills that cannot be codified into machines.

2. Ambient conditions

This is a fast method of developing and experimenting with knowledge. The variables of the experiment can be changed and new products can evolve. This enables fast manipulation of raw data but in different conditions. The concept of static conditions does not exist anymore the half-life of knowledge is decreasing at an alarming rate. Automation can work only in specific conditions therefore the learners who can adapt to varying situations will be required for future workspaces. Rote learning and memorization condition the mind not to be versatile and dynamic.

3. Logical sequence

A new experiment can be done at random but if someone else has to repeat the experiment it has to be in a logical sequence. This indicates the ability to think clearly and develop a systematic progression of thoughts. The organization of data and the sequence involved should be logical.

4. Factual correctness

Though learners may have the ability to generate any number of ideas the factual correctness of these ideas is a very important parameter. This attribute will differentiate human intelligence and machine intelligence. Most machines work as programmed; they have no inherent ability to check the verity of any information.

5.4.3.3 Theme 3 Quality of ideas

Sub-theme Logic

The presence of convergent thinking is an important attribute indicating problem-solving skills. It also demonstrates the ability to select and refine ideas, this is also a trait that cannot be easily codified in machines. Those learners who have a well-developed ability to think and form decisions quickly will be required in an age of rapid automation.

Sound Argument

Learners who have deductive reasoning can put forth sound arguments with a logical structure. Individuals can enhance their creative thinking if they have stronger and more persuasive creative ideas and solutions.

Objective Judgment

Learners who can take objective judgment are highly valued. A well-thought-out idea isthe result of the right judgments.

Sub-theme Novelty

This is the ability to analyze and break down complex issues, which enables effective decisions. It can be gauged by engaging content, which can ignite the interest of the reader. The unique nature of the idea should also display a visual appeal. The environment should be stimulating to provide an abundance of information. This provides a rich and diverse range of stimuli. This can happen only if the learner has made connections and has actively processed the knowledge gained.

Creative thinking is the ability to analyze and break down complex issues, this enables effective decision-making and problem-solving. Critical thinking allows for innovative problem-solving and idea generation, which in turn fosters creativity. The ability to analyze and evaluate information to form well-reasoned judgments is a workforce skill that machines cannot replicate.

Sub-theme Elaboration

The coherence of thoughts is assessed for the logical flow, this metric is also subjective. Inquiry-driven search for learning is an active form of learning. The ability to engage in divergent thinking is also a metric that enables learners to have elaboration.

The learning outcomes that were analyzed and evaluated under knowledge, experimentation, and quality of ideas are.

1. Prior knowledge
2. Depth of information.
3. Accuracy
4. Expertise
5. Cognitive Readiness.
6. The ability for verbal reasoning

7. Learner-created examples
8. Ambient conditions for experimentation
9. Logical sequence so that the experiment can be replicated.
10. Factual correctness.
11. Convergent thinking
12. Verbal reasoning
13. Sound argument
14. Persuasion
15. Objective judgment
16. Creative thinking
17. Engaging
18. Stimulating environment
19. Depth of exploration
20. Critical thinking.
21. Coherence of thoughts
22. Inquiry of thoughts.
23. Problem-solving capability
24. Ability to incorporate Divergent thinking.
25. Critical Thinking.

Since these are not the parameters that standard assessments evaluate and therefore fail to evaluate certain attributes. These are the attributes or characteristics that will be difficult to embed in machines. Most examinations focus on the content knowledge to a very large extent and this indicates the memorization of the subject content. This ability of memorization takes up a lot of time and valuable time for learners. The age of digitalization gives the learner the ability to access information at the click of a button. The assessment patterns should be such that skills competencies

and knowledge competencies get equal weightage to bring out the right balance. The above twenty-five metrics were assessed for progress throughout the study.

5.4.4 Discussion of Results

5.4.4.1 Theme 1 Knowledge Creation.

The research participants in the experimental group displayed marked improvement in the generation and range of ideas indicating a strong possibility of knowledge creation and adaptability to new work environments. The initial time and hesitation to write a page were considerably reduced over subsequent trials. All participants showed more enthusiasm for the task whereas the learners who opted for the standard form of the assessment showed occasional fear of the question paper and seemed under stress while writing. The probability of generating a creative idea increases with the number of ideas generated. The method of learning vast amounts of information is primarily a hindrance to the development of creative thinking. The assessment methods of most schools depend heavily on convergent thinking which narrows down the scope of creativity. On the other hand, divergent thinking is conducive to creativity and allows the learners to wonder about what was taught. Creative people are more open to new experiences and therefore this is a primary markof creativity.

This case study focused on an assessment system that evaluated competencies rather than knowledge. The key benefit of this assessment is the development of their intrinsic motivation to achieve their best performance. This may be due to the learner competing with her understanding of the lessons taught and not comparing with her peers. In contrast, the learners of the control group were more anxious in comparing the grades of their peers. This tendency made them anxious and introduced certain doubts about their abilities. The experimental group enjoyed their assessments as a play method of acquiring knowledge. The rubric for assessment of knowledge

creation was the ease with which prior knowledge was intertwined into the product, depth of knowledge, the accuracy of facts stated, and most importantly the expertise and cognitive readiness. The learners in the experimental group demonstrated a higher level of cognitive readiness when compared to their counterparts in the control group, this indicated their readiness to work in agile work environments. The machines of the future will be able to do routine work but adapting to agile and dynamic work situations will be difficult. Therefore, these are the skills that learners should develop more rampantly than memorizing large chunks of data that are available at the click of a mouse.

The results can be discussed under three conditions: -

Case 1 Improvement

The pre and post-test scores of the experiment group indicated that about eleven out of the eighteen graduate learners (61 %) showed a marked improvement from being a novice to an expert in knowledge creation. The literature reviewed indicated that if learners can develop knowledge, this gives them the ability to handle new information. This implies that learners improved in the range and fluency of ideas and it is a trait that machines cannot replicate easily. This infers that the learners who develop this ability will have higher levels of creativity. The assessment rubric indicated a score of 5/5 for learners who mastered cognitive readiness which is an indication of their ability to perform successfully in complex and unpredictable environments. This ability to manipulate and create new information will remain a strong human characteristic that cannot be codified as intelligence. Knowledge creation happens in most of the learners indicative of a positive outcome of the hypothesis.

Case 2 Improvement.

The pre and post-test scores of the experiment group indicated that about three out of the eighteen graduate learners (16%) showed no improvement in knowledge creation. The main reason is that these learners have lost interest in the task and constant imagination and generation of ideas became an arduous task. This fact also suggests that not all workers can continue to keep a spark of imagination throughout any task. Few of the learners continue to perform in the same manner irrespective of any external stimuli.

Case 3 Decline

The pre and post-test scores of the experiment group indicated that about four out of the eighteen graduate learners (22%) showed a decrease in their performance. The main reason is that the motivation and imagination displayed at the pre-test by these learners was their best effort and they were unable to think of more diverse ideas. The thirty-six students who opted to take the standardized assessment proved that they were not so open to challenges. Two out of the thirty-six learners showed some progress with theme 1 of knowledge creation (5 %), indicating that they were able to expand their ideas a bit more.

Theme 1 of ACER creative thinking framework can enable learners to adapt to the rapidly changing and agile work environment. This is an important theme to be inculcated along with subject knowledge so that all learners develop their inherent ability to innovate. Most machines will be able to work with existing knowledge but creating new knowledge and ideas will remain a human characteristic as of now. Assessments in the education sector should generate unique individuals who take ownership of their learning and most importantly enjoy what they do. The learners who took the standardized assessments showed anxiety as well as a lack of confidence whenever assessment dates were announced. The anxiety and fear of performance is

a major setback to any individual, on the other hand, the learners of the experimental group looked forward to their creative expression.

5.4.4.2 Theme 2 Experimentation.

The second theme of ACER creative thinking framework is experimentation. Science fiction writing opened the participants to a varied level of experimentation, with no rules and boundaries for the creation of knowledge few of the participants displayed a very high level of creativity. They demonstrated an eagerness to alternate pathways and models to ignite their imagination. Machines cannot still shift perspective to redefine a problem and generate new solutions. The research participants displayed wide and varied ideas of experimentation as a process to get the product of their imagination. This ability to shift perspectives enables them to tolerate uncertainty and devise methods to adapt. This ability enables them to see existing knowledge in new ways thereby considering alternatives. Experimentation with ideas allows them to venture into new and varied thought processes. The Future workspaces require people who can navigate the uncertainties and the routine and structured work will be handled by machines. According to the World Economic Forum, the top two skills that will be in demand in workspaces are complex problem-solving skills and critical thinking. The literature related to critical thinking considered it an important tool for tackling challenges in the workplace.

Case 1 Improvement

The pre and post-test scores of the experiment group indicated that about six out of the eighteen graduate learners (33 %) showed a marked improvement from being a novice to an expert in experimentation. This implies that the learner improved in actively shifting their perspective to consider new ways of visualizing. The assessment rubric indicated a score of 5/5 for learners who were able to create relevant examples with factual correctness. This ability to critically analyze

information and providing verbal reasoning for experimentation will be a privilege of human intelligence. Machines usually do repetitive tasks and find it difficult to navigate agile environments. The graduate learners who secured 5/5 could be considered to have transitioned from a novice stage to an expert stage at experimentation. The ability to experiment with ideas increases substantially with this method of assessment more than the standard assessments. The results indicated that the theme of experimentation had a positive outcome on the hypothesis for about 33 percent of the learners.

Case 2 No improvement

The pre and post-test scores of the experiment group indicated that twelve out of the eighteen graduate learners (66 %) showed no progress in experimentation. This implies that most of the learners could not progress with verbal reasoning and factual correctness. This ability to critically analyze information and provide verbal reasoning for experimentation will be a privilege of human intelligence. Machines usually do repetitive tasks and find it difficult to navigate agile environments.

The above observation regarding the second theme of ACER creative thinking framework namely experimentation may not be in total line with the hypothesis suggested. Experimentation with ideas requires much more intense practice than just generating an idea. On the other hand, knowledge creation was all about generating varied and novel ideas which most learners found easy while actual experimentation was at a slightly more difficult level.

5.4.4.3 Theme 3 Quality of Ideas.

The third theme is the Quality of ideas. The most important theme of the ACER creative thinking framework is the quality of ideas and this was demonstrated in the learners who took science fiction writing, most of the ideas generated had a novelty but some of them could not embed logic. Initial ideas were not so practical and

effective but with practice, the participants were able to generate coherent and effective thoughts justifying a purpose. The learners who practiced the standard assessment repeated the information from the textbooks with little or less novelty. Future workspaces will have unavoidable disruptions that require learners who have strong skill management practices. Most companies that adopted massive automation have had a strategic advantage over the other companies. The background machines replace human labor and lead to large-scale layoff, the need of the hour is to improve creative and critical thinking skills while at school and college.

The three subthemes under the quality of ideas are logic, Novelty, and Elaboration.

Logic Subtheme 1

Case 1Improvement

Ten learners out of the eighteen about 56 % showed a marginal increase in the level of logical thinking after a span of six trials. These learners were able to provide sound arguments for their ideas and that differentiated them from the rest of the learners. Though these learners showed marginal improvement they were unable to attain a 5/5. This indicates that more practice or slightly more engaging sessions are required to develop all learners to their full potential. This indicates a positive hypothesis test.

Case 2 No progress

Seven out of the eighteen 38 % of graduate learners demonstrated the same level of logic after six trials indicating that the development of logic is slightly more time-consuming and might require a larger time frame of three to four years, these learners could also show a marked improvement. The attributes of persuasion and sound arguments of the conceived ideas can happen only with rigorous and extensive practice. The possible reason why the subtheme of logic didn‟t improve is that it requires consistent efforts for a longer duration of time.

Case 3 Decline

One learner out of the eighteen about 5% showed a decline in the post-test and while discussing the results, she informed that she was unwell and was unable to focus on the task. She also informed me that she was engaged with the work for all the tests and she too was under the impression that her logical thinking skills were on the rise.

Subtheme 2 Novelty

All learners of the experimental group showed marked improvement in this subtheme, indicating that all of them were able to develop novel ideas with time. The pre-test values of the learners in the experimental group were much higher than the pretest value of the experimental group. This indicates that the learners of the experimental group had a higher level of novelty even at the beginning. On comparing with the results of the experimental group all these learners showed higher levels of post-test values too.

Subtheme 3 Elaboration

All learners, eighteen of them who engaged in the experiment, showed marked improvement in the subtheme of elaboration. According to Acer creative thinking framework the detailed elaboration of the idea describes the utility as well as the functionality of the idea. Elaboration of an idea provides the richness of an idea for a given purpose. The fore this result means that learners engaged in science fiction writing develop their ability to develop an idea. This is an important concept as this is an ability that machines cannot replicate so easily. The learners in the experimental group demonstrated progress throughout six trials indicating they could generate an idea and most importantly give substantial elaboration for the same. The learners of the control group on the other hand showed less growth regarding elaboration, only three out of the thirty-six learners could elaborate on the knowledge gained.

In Summary, it can be stated that all themes of ACER creative thinking framework showed marked improvement for the experimental group. Most learners do well when they can gather their data and take ownership of their learning. The next chapter is the summary of the research.

5.4.5 Discussion of Failure of Standard Assessments.

There is a clear lack of literature that indicates that skill is measured and quantified as a metric in any mark sheet. Most students do not focus on skills as it is not quantified to show progress over the study period. Many countries are facing an "invisible underemployment "which refers to a situation where an individual is unable to find a job in line with their educational qualifications and secures a pay much below the expected industry standard. The current lockdown and the technological shift have further escalated this issue. This means that any skill set comprising even a small share of tacit capability will remain the domain of humans because tacit skills cannot be codified. Automation has so far been the most successful in areas where a task can be converted into explicit instructions that a computer understands
There are several examples of individuals who did not perform well in traditional educational settings but went on to become successful inventors and entrepreneurs. Here are a few notable examples that prove the use of standardized assessments is not a good predictor of student achievement.

1. Thomas Edison: Thomas Edison, the renowned American inventor, struggled academically and was deemed "difficult" by his teachers. However, he went on to invent several groundbreaking technologies, including the practical electric light bulb, the phonograph, and motion picture cameras.
2. Albert Einstein: Einstein, one of the most influential scientists of all time, faced challenges in school and had difficulty conforming to the traditional educational

system. He was even expelled from school at one point. Despite his struggles, Einstein revolutionized the field of physics with his theory of relativity.

3. Steve Jobs: The co-founder of Apple Inc., Steve Jobs, dropped out of college after just six months. He pursued his passion for technology and design, eventually co-founding Apple and playing a pivotal role in the development of iconic products like the iPhone, iPad, and Macintosh.

4. Richard Branson: Branson, the founder of the Virgin Group, struggled with dyslexia and had academic difficulties throughout his schooling. Despite his challenges, he built a successful business empire, which included companies in various sectors such as music, airlines, telecommunications, and more.

5. Mark Zuckerberg: Zuckerberg, the co-founder of Facebook, was a prodigious programmer from a young age. However, he faced academic challenges during his time at Harvard University. Nevertheless, he dropped out to focus on developing Facebook into one of the most influential social media platforms worldwide.

These individuals demonstrate that success in the field of innovation and entrepreneurship is not solely dependent on academic performance but also on factorssuch as creativity, and problem-solving.

5.5. Conclusion

According to the findings of the case studies it can be stated that pedagogical reforms can develop higher-order thinking skills. The goal of education should be to develop new ideas from the knowledge and not just memorize them. The system of education should focus more on what to do with the learning and not just repeat and memorize large chunks of data. This flexible method of assessing knowledge enables learners to curate their prior knowledge into useful ideas. The ideas that resonate with one learner may not be the same as her peers. In comparison, with standardized assessment methods, the learner develops the freedom to express his /her creativity.

This ability will develop cognitive readiness and expertise to develop their unique creative ideas. The last job that can be automated will be that of tacit knowledge.

The second theme of the framework enables learners to experiment with various perspectives of the information. The learners who have developed enough examples or had deeper experience can fluently change perspectives. These ideas develop the brain into a thinking tool rather than a tool for memorization.
Experimentation involves the divergence of ideas and finally the convergence of ideas into a product. One of the most difficult tasks for machines is to interpret information and therefore learners who develop this ability will remain highly skilled in the time of rapid automation.

The third theme of the framework develops inner intuition and the creative mind. Digital natives face an overload of information but usually do not have time to contemplate the information that resonates with them. The next chapter highlights the summary of the research

This chapter highlighted the importance of providing alternative assessments in the form of white paper projects or Science fiction writing to improve the ability to think creatively and critically. This assessment method also provided the context for learners to navigate an agile environment. The themes of knowledge creation, experimentation, and quality of thought were analyzed for the experimental and control groups over six months. The results proved that there was a positive outcome of the hypothesis, thereby opening up new avenues to check the development of creative and critical thinking. The only way to develop skill is to foster an environment where skill can be measured. The dependence on flexible assessments over standard assessments developed creative and critical thinking. The hypothesis was validated as most of the learners in the experimental group showed gradual progress in the development of higher-order thinking skills. The results of the study

indicated that the hypothesis was not just a theoretical construct but could be evaluated practically, thereby indicating a positive outcome. The third hypothesis of quantifying skill progress is a novel method by which transcripts can change to display the skill imbibed during a program along with content knowledge gained. The study can be concluded by stating that a positive outcome was achieved for all three hypotheses.

In conclusion, it can be stated that the alternative assessment method validated the hypothesis with most learners in the experimental group showing gradual progress in developing their critical as well as creative thinking. The study was able to quantify skill progress, thereby allowing transcripts to display skill as well as knowledge gained. The study also highlighted the importance of alternative assessments to align with the dynamic needs of the current workforce. This study's findings enriched the education landscape by providing a differentiated assessment system.

CHAPTER VI

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

"Science fiction is the fiction of ideas." - Ursula K. Le Guin

6.1 Introduction

This research is an exploratory case study to understand the effect of a flip-question paper namely in the form of a science fiction writing / white paper project on the development of higher-order thinking skills in undergraduate learners. Most educators especially in India still focus on outdated pedagogy, and this seems irrelevant to the digital natives of the 21st century who are surrounded by large amounts of data. The review of the literature indicated that creative and critical thinking as both inherently important in future workspaces, therefore it is essential that classroom assessments be designed to measure student development of the required skills.

The measurement of creative and critical thinking is a demanding task as these skills represent a broad and abstract process. Most of the rubrics developed indicate either the presence or absence of these thinking skills. The drawback of this is that it does not enable the learner to improve their skills or measure their progress. Therefore, educators must devise innovative assessment methods to gauge the progress of higher-order thinking skills. This will equip the learners to have essential skills for future workspaces. This research anchored on ACER creative thinking framework and Guildford‟s (1950) definition of creative thinking was developed as a solution framework. The themes of knowledge creation can be compared to the fluency of ideas, experimentation is compared to the flexibility of ideas, and the quality of ideas can be compared to the originality of ideas. These themes and the five

rubrics of assessment were developed in this research to measure the progress of higher-order thinking skills in the learners.

The unique potential of a learner can unfold if he/she is allowed the freedom to develop their understanding of the learning. Most educational institutions depend on standardized tests to evaluate mainly the knowledge content and power of memorization. The data from the learners in the experimental group indicated positive outcomes, all five themes showed remarkable progress. Analysis of the content alongside the rubric for six months yielded data for quantitative analysisas well. The striking feature of this assessment was that the learners were completely relaxed and eager to experiment with their thought processes.

6.2 Implications

6.2.1 Implications for Learners

The findings of this study indicate a positive result in the development of 21st-century skills this pedagogical transition is essential for learners to realize the fact that they need to be aware of the evolving skill sets. The assessment though different from the standardized one enabled complete freedom for the learner to explore. The learners found the assessment challenging yet completely flexible. This reduced stress levels considerably and therefore the learners in the experimental group were able to perform better than the experimental group. These flexible assignments allow learners to develop a spirit of inquiry and a quest for knowledge creation. It can be used as a business model to identify the key strengths of the learner, and this will equip the learnersto analyze their strengths and weaknesses. This transcript can be used as an objective assessment indicating learner proficiency in a particular skill, it enables learner progress tracking of skills. It also enables goal setting and a means of differentiated assessment for the learners.

6.2.2 Implications for Administrators

These findings should motivate bringing out changes in administrative policies of assessments. The concept of open-book assignments may seem futile as chatbots can curate information and write assignments much faster. This can be used as a pilot research project by other educators to develop more relevant and novel methods of assessment. This model can be used as a measure of the ROI of the training and can be used to check if the training imparted is in line with organizational goals. It can be used to check teacher performance as well as learner performance. These types of transcripts can be used to allocate the candidate for the right onboarding process. This will save time for future employers as graduates have skill metrics indicated in their transcripts. The screening process at most interviews is for less than a couple of hours therefore identification of the right candidate for jobs can become easier if skill metrics are indicated in transcripts. This can be a perfect model for administrators and future employers.

6.2.3 Implications for Educators

The findings of this study enhanced the educator‟s ability to implement a pedagogical transformation. This can be used as a pilot research project by other educators to develop relevant and new methods of assessment. The rubric used in this research was able to evaluate the skills with level one as a novice and level five as an expert. The role of the educator is to develop learners who are capable of flexible and adaptable skills that enable them to navigate future workspaces. Effective teaching is about making pedagogical shifts to prepare learners not just to memorize content but to develop future workforce skills. The educators of today should understand the fact that basic skills of memorization will cease to be relevant in an age in which all data

is stored in the cloud and intelligence is embedded in machines. Educators should develop diversified and distinct learners and unique classroom cultures. The concept of learning is slowly evolving into a learner-directed model, in a similar way, assessment should also be student-driven. Educators should instill a disposition that enables the learners to take responsibility for their learning. Educators can become change makers and develop higher-order thinking in the learners; this will help to bridge skill gaps. All educators need to move from 20th-century practices to a more evolved 21st-century shift to bring about a change in the way education is imparted.

6.3 Recommendations

This research focused on reinventing an assessment and creating a rubric to evaluate the five themes and to improve 21st-century skills. This research focused on a group of women learners in a college in Bangalore. To generalize these findings a greater number of participants of mixed gender is required, this is a first step toward generating novel methods of assessment.

The 2nd point to be highlighted in this research included evaluating the written content by a single evaluator. Therefore, the findings may vary due to human error and negligence. If more evaluators are assigned, a more balanced scorecard can be generated. As a further action, the learners themselves could also do peer evaluation of the assignments so that for the same assignment, the learners get the collective information of their peers too. This research mainly focused on graduate learners of Science and can be extended to other branches of Science and Arts.

This research can be recommended for learners of the Arts stream as well as the engineering stream to understand and evaluate their entry and exit-level performance. This can be developed as a business model to evaluate the skills and therefore onboarding process at companies can be fine-tuned according to individual requirements. This model can give insights into the effectiveness of the teaching-

learning program. It can also be used by administrators to check the quality of teaching.

Future research can be conducted for the entire duration of the program instead of six months as this will determine the accurate exit and entry-level of skillseach learner. The results can be improved if a team of evaluators are assigned the task. This will depict a better analysis of the results. The results can be improved further if the rubric for assessment can be developed further to include more parameters and a higher score of 20 for each theme. This will provide a detailed analysis of the three themes and provide a better analysis of creative and critical thinking.

Future studies can be undertaken to design transcripts to denote the skill component of the learner. this will give a fair analysis of the teaching /learning outcomes for the learners. This will be a good initiative to understand the core strengths of the learners. These transcripts will depict the area of work that the learner can explore and it would be a useful indicator for future employers to recruit the right candidate. These transcripts will help learners identify their core strengths to make informed career choices. These findings if developed further can serve as a
These research findings can be fine-tuned by administrators to understand the outcome of the teaching/learning process and could be a good metric to check teacher effectiveness. The learning outcome will be higher if teachers are more effective. Administrators can use this as an effective tool to gauge teacher effectiveness.

6.4 Strengths and Weakness of the Study

These are the key strengths of the research study. This innovative assessment enabled complete freedom for the learner to create his understanding of the knowledge learned. It eliminated the need for route learning and memorization which is a total waste of time for the digital natives. These assessments were able to quantify

the progress of the three themes under the ACER creative thinking framework. Diversestudents of varied abilities cannot be evaluated on a standard assessment, this studyenabled differentiated assessments. This provided for a more holistic and learner-centered method which reduced the anxiety and fear of ex

The main drawback of this research is that it is an exploratory case study method. Case studies usually have a small sample size and it might be difficult to generalize in the body broader sense. It cannot be applied to an entire group of students until further research is accomplished, second drawback is the subjectivity of the researcher‟s views and bias can influence the data collection, analysis, and interpretation process.

This case was studied by a single researcher and therefore the preconceived notions and perspective of the researcher might have not yielded the correct results. The researcher‟s decision seems to be final in this case and there was no method by which a second researcher could have done a review, this could have improved the reliability and validity of the data. If more researchers evaluate the same case and this study is spread across different universities and different groups of students more generalized form of data can be generated. This research could be carried out on more diverse groups of varying age groups and gender. These can be considered as future scope for the research.

6.5 Conclusions

This study aimed to determine whether flexible assessment methods could improve higher-order thinking in learners. The age of automation and artificial intelligence has replaced many low-skilled and entry-level jobs, previous studies indicate the need for the development of higher-order thinking skills at universities. Not much data is available on how these key skills could be developed and measured

for progress. Most educational institutions still focus on knowledge-based content and not the improvement of skills.

The chapter discussed the themes raised by the research question findings. The findings proved that student-led assessments like science fiction writing /white paper projects develop higher-order thinking skills. The learners of the experimental group showed progress in the three themes over the longitudinal period of study. The next chapter summarizes the implications and recommendations for future research.
This research was able to offer solutions to the following challenges faced by the education system

An Innovation in Pedagogy. Most educational institutes and educators fail to measure the progress of creative and critical thinking skills as these methods are time-consuming and relevant rubrics are not present but this research was able to develop aunique rubric for the assessment of these skills. The concept of creative assessments should be taken up more seriously by all educational institutes so that the skill gaps can be bridged.

B Indian assessment system. Most institutes still depend on the memorization of facts and lesser importance is allotted to the development of higher-order thinking skills. The concept of an open book to enable learners to develop and curate content seems unreliable in the days of rampant AI tools. This research was able to offer a promising solution to this system by suggesting flip questions that enabled a learner-driven unique method of instruction.

C Promoting student-centered learning and assessment. No two learners are the same therefore the entire assessment cannot be standardized for a whole class of students. Each learner must develop their thinking and ability. This research was able to cut the stereotype of assessment that one size fits all. The learners of the experimental group

developed versatile skills and were able to create knowledge rather than memorize the same.

If educators and institutions do not focus on developing skills on a larger scale, most learners would prefer short-term skill-based programs rather than four-year degree programs that have outdated pedagogical practices. The primary focus of educational institutions should be to develop workforce readiness in graduate learners.

Education should develop learners for work environments that do not exist today. Educators and educational institutions should serve as the bridge between institutes and Industry. The pedagogical practices of yesteryears may not hold good forthe future, since the in-demand jobs of today were non-existent ten years back. The findings of the study suggest that learner-centered assessments developed creative thinking and critical thinking. Educators all around the world need to develop pedagogical practices that are required for the 21st-century workforce.

A good strategy to develop higher-order thinking skills is to allow varied assessment methods to assess the progress of these skills. These methods may be difficult to implement on a large scale and rapidly as all changes in assessments will be taken with a lot of opposition. The tagline here is to adhere to a policy that encourages educators and learners to pursue measures to develop inherent and dormant qualities in learners. The focus of the educator should be to improve his/her creativity and introduce as much creativity in the deliverance of lessons as well as assessments. A culture of creativity will encourage the learners to ignite and develop their creative and critical thinking. The results of the survey indicated that skills are not incorporated in the current examination pattern, especially in the Indian context and most university transcripts all over the world do not indicate the skill progress. The fast adaptations to new and varied situations will make the learner evolve into a much better version. To be workforce-ready and to get the required ROI on three to

four years of education, the learners should have the skill sets for the future workforce, namely the skills that machines cannot replicate. Therefore, future transcripts must contain learners' skill metrics along with expertise in domain knowledge.

APPENDIX A

INFORMED CONSENT

I, ...agree to participate in the research conducted by Mary Cruz as part of her Doctorate studies. I have been told of the confidentiality of information collected for this research. I agree to participate in one or more sessions for this research. I agree to submit my responses to the primary questions in the classroom. I also willingly agree to participate in the interview session for the secondary questions which will be a face-to-face in-person meeting. I understand that such interviews and related materials will be kept completely anonymous and that the results of this study may be published in any form that may serve its best. I agree that any information obtained from this research may be used in any way thought best for this study.

APPENDIX B

SURVEY CONSENT AND QUESTIONS

Education ,Skill gaps and Future Work Spaces .

Education and future workforce skills . This survey is part of my DBA journey and I request your cooperaion for the same . I, Mary Cruz am doing my research from the Swiss School of Business to analyse the skills required for future workspaces .
This questionaire is totally voluntary and by answering the questions you give your consent to participate . The responses will be used for the analysis and not for any personal use .
I look forward to your valuable outlook on the current situation in the feild of Education (This questionnaire is developed to understand how Universities prepare learners for future workspaces)

1. Email *

Untitled Title

2. WORK EXPERIENCE

Mark only one oval.

- ◯ Less than 5 years
- ◯ Between 6 and 10
- ◯ between 11 and 20
- ◯ between 21 and 30
- ◯ Above 30

3. Gender

Mark only one oval.

- ◯ Male
- ◯ Female
- ◯ Other

4. Place of Work

Mark only one oval.

- ◯ South india
- ◯ North India
- ◯ Outside India

5. Job Sector

Mark only one oval.

- ◯ Government organisation
- ◯ Private Sector
- ◯ Self Employed
- ◯ Unemployed
- ◯ Other: _____

6. Educational Qualification

Mark only one oval.

- ◯ Graduate
- ◯ Post graduate
- ◯ Doctorate
- ◯ Other: _____

7. What was the primary outcome of your education .

Mark only one oval.

- ◯ Knowledge
- ◯ Skills
- ◯ Career Oppurtunities
- ◯ Certifications

8. What was the secondary outcome of educaion

Mark only one oval.

- ◯ Work Readiness
- ◯ Industry Experience
- ◯ Technical Skills
- ◯ Soft Skills
- ◯ Other

9. Name an innovative pedagogy that your institute adopted

Mark only one oval.

- ◯ Internships
- ◯ Real Case Studies
- ◯ Industry Visits
- ◯ Other

10. Do you meet the skill expectations of your workplace

Mark only one oval.

- ◯ Adequate
- ◯ Not so appropiate
- ◯ Exceeds expectations

11. Have you taken the initiative in the last year to seek out chances to improve or expand your skillset? (Yes/No)

Mark only one oval.

- ◯ Yes
- ◯ No

12. Have you experienced skill gaps in workplace

Mark only one oval.

- ◯ Occassionally
- ◯ Always
- ◯ Never

13. How Proficient are your skills for your current role in the organisation

Mark only one oval.

- ◯ Highly Proficient
- ◯ Medium Proficient
- ◯ Not Proficient

14. What soft skills, in your opinion, are most important for success in the future wor kforce?

Mark only one oval.

- ◯ Communication
- ◯ Emotional intelligence
- ◯ Creative and critical Thinking
- ◯ Other: _____

15. How satisfied are you with the present curricula's focus on future-oriented skills

Mark only one oval.

- ◯ Highly satisfied
- ◯ Average satisfication
- ◯ Not satisfied

16. Do institutions intergrate technology to enhance learning and prepare students for the digital era?

Mark only one oval.

- ◯ Well intergrated
- ◯ Partly intergrated
- ◯ Not at all intergrated

17. Which skills or competencies should be given more importance in the learning curriculum for the future?

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