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ICHESD
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THE CONTRIBUTION OF MIND GENOMICS ON HEALTHCARE AND EDUCATION SYSTEM: GOING BEYOND THE SURFACE OF CONVENTIONAL THOUGHT

Ermira Jahja
Western Balkans University
Tirana, Albania
ermira.hodo@wbu.edu.al

Petraq Papajorgji
Proinfinit Consulting
Tirana, Albania
petraq@gmail.com

ABSTRACT

Mind Genomics is a recently developed technology used to quantify the social perception of a new product, political decision, or a general phenomenon regardless of its nature. This perception is expressed in terms of mindsets, depicted using complex statistical models, data mining techniques, and clustering technologies. Mindsets group individuals who think alike about the issue under investigation. It has emerged as an innovative surveying approach, where respondents evaluate a mixture of elements simultaneously, rather than the bias-prone, one-question-at-a-time, predefined response mode of questionaries.

Mind Genomics, as an online service, is not confined to the social sciences. Its recent applications in the healthcare system and higher education have the potential to significantly improve the daily encounters in these fields. Identifying meaningful mindsets and suggesting specific approaches offers a robust and quick strategy to support the most vulnerable individuals. While the studies so far have been for research purposes, their potential application in daily healthcare and education systems offers a robust and quick strategy to identify and approach important issues, instilling a sense of optimism and positivity.

This study analyses the current application of Mind Genomics in healthcare and educational system-based research and suggests directions for future studies.

KEYWORDS: Mind Genomics, clustering, mindset, healthcare, higher education

INTRODUCTION

Mind Genomics has emerged as a new science employed in different fields, initially introduced as a marketing method to understand what resonates in the minds of consumers. In the first years of implementation, Mind Genomics combined the science of mathematics, psychology, and economics. However, nowadays, it serves to understand the audience's perceptions of a number of different subject areas, not solely to evaluate marketing-related issues. Via this new science, researchers now try to understand what the audience thinks on a particular topic, address the issue accordingly, and transform the available information into actionable steps. Howard Moskowitz and Alex Gofman first introduced Mind Genomics, and it is now applied in different areas by several research and marketing groups worldwide via a web-based application (https://www.bimileap.com/), which guides the use of this recent technology.

Mind genomics has been applied in areas such as food industry [1-2], psychology [3], law [4], analysis of political and social issues [5] and very recently also in medicine [6] and education [7].

Collecting data from people has been and continues to be done mainly through surveys and questionnaires, which are often used with closed-ended questions. However, this way of surveying might be considered (at least partially) biased since the respondents can easily pick the "appropriate" answer in a "one question-answer at a time" method. New approaches are based on a mixture of ideas to which respondents are exposed at a time and provide an evaluation of the context as a whole. This new method is known as "conjoint measurement" [8]. Apart from being a less biased form of questionnaire, conjoint measurement platforms offer a hypothesis-free method to extract large amounts of data [9-10].

Mind Genomics is used to uncover the mindsets of individuals in a population for a predefined topic. It uses combinations of ideas at once as a context to be numerically evaluated by the respondent [10], after which ordinary least-squares (OLS) regression is applied to evaluate the contribution of each idea or element. Mind Genomics finally analyses the results using the clustering technique [11], to identify similar patterns of thoughts or attitudes toward the topic under discussion, in separate mindsets.

The whole study starts by identifying the topic of interest and defining the four pillars (or silos) which the study would rely on [12]. For each silo, four different elements/statements are determined, from the most positive to the most negative, to cover the whole possible spectrum of thoughts. Using a web-based application such as Bimileap, the respondent is exposed to 24 different vignettes, a combination of 2-to-4 statements from different silos [13], which will offer an evaluation from 1- to 9-point rating scale for respondents, in terms of how much the vignette fits with the perception of the respondent on the topic under study. By regression analysis, Mind Genomics calculates the contribution of each element individually [14], and by clustering method, generates the mindsets of people on the issue under study. Until now, mind genomics has been a science that unravels mindsets. At the same time, as a service, it contributes to serving the target group for classification based on their mindsets and approaching the most vulnerable persons. This analysis can be successfully achieved by using the Personal Viewpoint Identifier (PVI). PVI is an essential attribute of Mind Genomics, which significantly contributes to the application of Mind Genomics in different fields. It serves by introducing the target group to only six vignettes (instead of 24 vignettes in research studies) and assigning each one to one of the already emerged mindsets after a study on a broad number of participants identifies them [2]. This would then better assist individuals with certain mindsets, communicate more effectively with them, and provide adequate social/psychological support.

Mind Genomics is used to address critical issues in education, such as one recent study focusing on the opinion of students and professors on distance learning based on effectiveness, interaction, feasibility, and the future teaching paradigm [15]. The emerged mindsets in this study were: 1) effectiveness and interactivity are the most important issues in distance learning, while the other important mindset was that 2) feasibility and perspectives are the most important issues. The authors concluded that most students and professors preferred distance learning since it offers an effective learning method that could be adapted in time and space.

In addition, another study performed in four different countries, used Mind Genomics to find what people perceive/identify as "corrupt" in the education system [7], whether people thought corruption was present, it was related to money or not, or related to specific students' traits.

Mind Genomics and Healthcare

Mind Genomics studies have very recently given attention to health-related issues. One of the recent studies on Mind Genomics analyzed 200 customers of insurance programs by focusing on the type of insurance program the respondents preferred and how much they would pay for the preferred program [16]. These findings, the authors emphasized, would help develop better health plans and improve the healthcare system and investments in preventive medicine. In another study, the first publication on a genuine health concern, the authors tried to unravel healthy individuals' perceptions on the prospect of cancer [17]. They identified two important mindsets: one group of people thinking of cancer as a chronic disease and the other fearing death because of the disease. Another article included actual patients as participants. The respondents were hospitalized teenagers who were expected to reveal their experience in the hospital [18]. The two emerging mindsets were quite opposite; one group of teens perceived the hospital visit as positive, and the other as unfavourable.

Mind Genomics in Hemodialysis Patients

Our research group recently made a significant contribution to the field of medicine by publishing an article that utilized Mind Genomics to explore the perception of wellbeing among haemodialysis patients [6]. This pioneering study, conducted at three haemodialysis centres in Albania (American Hospital 1, American Hospital 2, and Diavita), involved 219 patients of End-Stage Renal Disease (ESRD) undergoing maintenance dialysis. It measured the perceived well-being of hemodialysis patients based on what they thought about their financial condition, family support, support from the healthcare system and how they felt about their future.

This patient profile was selected as it is one of the most vulnerable patient groups, with a very high morbidity and mortality rate compared to the average population and most patients suffering from other chronic diseases [19].

Numerous studies have focused on assessing the health-related quality of life (HRQoL) of haemodialysis patients, using already existing approaches such as general questionnaires that measure the wellbeing of respondents (e.g., SEIQoL and EQ-5D) [20-21] and the very specific ones used in kidney-disease research, such as Kidney Disease Quality of Life Short Form-36 (KDQoL-SF 36) [22-23].

The significance of this study is considerable as it is one of the very first attempts to apply mind genomics in medical centers, with the premise of applying it in haemodialysis centers' healthcare information systems in the future. It also provides a promising means of communication that offers predictive models in medicine with the premise of better healthcare services and overall improved patient health outcomes. Our study identified three patient mindsets: Mindset 1- Feels optimistic but worried about incomes, Mindset 2 – Feels optimistic because of the family and state support, and Mindset 3 – Feels positive only about money. We observed a general optimism of haemodialysis patients; however, under the surface of these three mindsets, based on the available data retracted from our study, we identified several issues that are important to acknowledge and address for this patient group, considering several socio-economic challenges the population under study (Albanian haemodialysis patients) faces (Supplementary material in [6]).

RESULTS

The performance of the elements under different categories of hemodialysis patients which are grouped based on age, gender and years under dialysis, reveal some important points need to be considered and specifically addressed. If we focus on the gender of hemodialysis patients, men seem to have more family support than women in general (Table 1).

Table 1. Performance of the elements and the gender-based results.

Group (Binary Ratings)	Total	Male	Female
Base Size	219	129	90
Additive Constant	24	22	28
Question C: Family: Do you have family support			
My family strongly supports me	-2	-1	-4
My family supports me most of the time	-1	2	-5
My family supports me only partially	-2	-2	-2
I do not have any support from my family	-2	-2	-2

This study also stratified hemodialysis patients on the age groups. The highest number of hemodialysis patients under this study are over 55 years old (Table 2). This can be considered as normal since there are comparatively less hemodialysis patients of young age [24]. Eventhough there is a low number of young patients under mantainannce dialysis which affects the element ratings, data show that age group 25-34 do have more more family support, while the overall statistics show that age 25-44, which can be considered as the youngest patients under study, are more supported by their families compared to the older patinets (Table 2).

Table 2. Performance of the elements and age-based results.

Group (Binary Ratings)	13 - 17	18 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+
Base Size	0	3	8	20	38	78	72
Additive Constant	0	1	3	13	26	29	26
Question C: Family: Do you have family support							
My family strongly supports me	0	-9	11	5	-3	-6	0
My family supports me most of the time	0	7	6	13	-2	-7	1
My family supports me only partially	0	3	-1	5	-3	-8	1
I do not have any support from my family	0	-9	2	5	-3	-6	0

Another grouping criteria of the hemodialysis study was based on the years of patients under this treatment. Treatment regimens of ESRD patients under dialysis can last even more than 30 years [25-26], evenothough such cases are less common. The highest number of hemodialysis patiens is under 1-5 years of treatment (Table 3). Patients very recently undergoing hemodialysis regimen, seem to be the most optimistic ones on the state healthcare support. On the other hand, patiens being under dialysis for more than 10 years report the lowest satisfaction on the state health system and their support (Table 3).

Table 3. Performance of the elements and years under dialysis.

Group (Binary Ratings)	Years on dialysis: 0 - 1 year	Years on dialysis: over 1 - 5 years	Years on dialysis: over 5 - 10 years	Years on dialysis: over 10 years
Base Size	39	92	62	26
Additive Constant	15	22	30	34
Question B: Medical Support: Are you happy with the medical support				
The state health system covers all my medical expenses	3	-3	-7	-7
The state health system covers most of my dialysis treatment and most of other medical expenses	1	-2	-9	-7
The state health system covers most of my dialysis cost but only few other medical expenses	5	-3	-7	-5
No support is provided by the state health system	-4	-2	-8	0

Based on the emerged data and numericals, researchers can also analyze respondents' perception on the four different silos, to identify which specific patterns of thoughts correspond to which of the classifications (ie. gender, age group, years under treatment). Accordingly, we observe a general pessimism on finances, especially of patients which are eaqual to or more than 10 years under dialysis treatment (Table 4).

Table 4. Performance of the elements and financial condition.

Group (Binary Ratings)	Total	Male	Female	13 - 17	18 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65+	Years on dialysis: 0 - 1 year	Years on dialysis: over 1 - 5 years	Years on dialysis: over 5 - 10 years	Years on dialysis: 10+ years
Base Size	219	129	90	0	3	8	20	38	78	72	39	92	62	26
Additive Constant	24	22	28	0	1	3	13	26	29	26	15	22	30	34
Question A: Economics: How do you describe your financial condition														
I am in a very good financial condition	-4	-3	-6	0	-8	3	-1	-2	-2	-9	0	-3	-5	-9
My financial situation is above average	-2	-1	-3	0	7	1	1	-3	-5	-1	-1	0	-6	-4
I have some economic problems	-1	0	-3	0	3	0	1	-1	0	-4	0	2	-6	-3
Economically I struggle to afford life	-4	-5	-3	0	2	6	-4	-6	-3	-6	-2	-2	-9	-3

DISCUSSION

Mind Genomics offers a very effective and pracal approach to unrevel perception of patient on their health-related wellbeing. Based on the silos included in the study, the study results and the identified problems, researchers from different medical fields can make specific suggestions to improve the healthcare system for the patients under study.

The research conducted by our group clearly noted a general optimism of Albanian hemodialysis patients. This could be due to particular cultural attributes, such as the “obligation” people feel to support the most vulnerable family members, as well as due to the improvements on healthcare policies, such as dialysis reimbursement program [27].

When analysing our published data (Supplementary material in [6]), men seem to have more family support than women in general (Table 1). Considering that this study focuses on the “perceived” rather than the factual and comperative measurement of patients’ wellbeing, it is important to note that men could only be viewing their family support as more enhanced and in a more optimistic way than women under dialysis. Younger dialysis patients seem to be more supported by their families compared to the older patients (Table 2), as age group 25-34 acknowledge having the highest family support. These data suggest that young ages are either more optimistic on family support, or families have the tendency to support more the youngers under dialysis than the family members (under hemodialysis) older than age 44. Patients on their first year under dialysis are the most satisfied, those over 10 years under dialysis are the least satisfied from the state health system, based on the support on their medical treatment (Table 3). This can possible come from the emotional state of patients under prolonged hemodialyss regimens which tend to be more depressive and less optimistic [28]. Indeed, our study reveals that patients on dialysis for more than 10 years are the most pessimistic on their finances, compared to all patient groups (silo-based assessment, Table 4). This could be better explained by the prolonged therapy which obviously does significantly aggreviate the physical condition of patients, thus their abilities to have a stable work and sufficient income [29].

CONCLUSION

Our study and the herein presented results do discover the most vulnerable patients under dialysis: women and patients over age 44, which need more family support; patients over 10 years under dialysis, which need higher medical support from the healthcare system and more financial aid. By applying Mind Genomics in health information systems, these patient groups and those of Mindset 1, could be easily detected and accordingly can be offered adequate assistance and treatment to imporove their wellbeing and health outcomes.

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ACTIVE LEARNING METHODS: INCREASING PERFORMANCE, ENGAGEMENT AND COLLABORATION IN THE CLASSROOM – (LITERATURE REVIEW)

Albana Mehmeti
American Hospital
Tirana, Albania
albana.mehmeti@spitaliamerikan.com

Myzejen Metani Vllacaj
New York High School
Tirana, Albania
enimetani@yahoo.com

Alketa Dervishi
University of Medicine, Faculty of Medical and Technical Sciences
Tirana, Albania

ABSTRACT

Active learning has garnered significant attention in educational research as a pedagogical approach aimed at enhancing student engagement and learning outcomes. This study explores the theoretical underpinnings, practical implementation methods, empirical evidence and implications of active learning in creating excitement and enthusiasm in the classroom.

This study employs a comprehensive literature review methodology to synthesize existing research on active learning. Relevant articles, books, and reports from academic databases such as ERIC, PubMed, and Google Scholar were examined. The review focused on theoretical frameworks, pedagogical strategies, empirical studies, and practical insights related to active learning in educational settings.

Recent studies reaffirm the positive impact of active learning on student engagement, motivation, and learning outcomes across various disciplines and educational levels. Innovative approaches such as flipped classrooms, inquiry-based learning, and collaborative problem-solving continue to gain prominence for their effectiveness in promoting deeper learning and critical thinking skills. Moreover, advances in technology have facilitated the integration of multimedia resources, online platforms, and interactive simulations to enhance active learning experiences both in traditional and digital learning environments.

The review highlights the multifaceted benefits of active learning in fostering student engagement, participation, and excitement in the classroom. Active learning methods such as group discussions, problem-solving tasks, peer teaching, and experiential exercises promote critical thinking, collaboration, and intrinsic motivation

among students. Empirical evidence suggests that active learning leads to improved learning outcomes, including enhanced retention, deeper understanding, and application of knowledge. Furthermore, active learning pedagogies align with constructivist and social learning theories, emphasizing the importance of active engagement, interaction, and reflection in the learning process. Practical strategies for implementing active learning, including faculty development, course redesign, and technology integration, are discussed.

In conclusion, active learning offers a transformative approach to teaching and learning, creating excitement and enthusiasm in the classroom. By shifting from passive to active learning methods, educators can empower students to become active participants in their own education, fostering a culture of curiosity, exploration, and lifelong learning. Moving forward, it is imperative for institutions and educators to invest in professional development, infrastructure, and resources to support the widespread adoption of active learning practices and ensure equitable access for all students. Embracing active learning pedagogies has the potential to enhance student engagement, deepen learning experiences, and prepare students for success in the twenty-first-century workforce.

KEYWORDS: active learning, student engagement, classroom excitement.

INTRODUCTION

In modern and contemporary education, there has been a growing emphasis on enhancing student engagement and participation in the classroom, leading to renewed interest in active learning methodologies. Active learning shifts away from traditional lecture-based pedagogies, focusing instead on placing students at the heart of the educational process. This study will explore active learning both from a theoretical perspective and in terms of its pedagogical significance and transformative potential within university settings.

Active learning encompasses a wide range of instructional methods and strategies aimed at fostering student engagement, critical thinking, and meaningful learning experiences. Rather than passively receiving information, students are encouraged to actively construct knowledge through interaction, inquiry, and reflection. Theoretical frameworks underpinning active learning suggest that learning is an active, constructive process shaped by prior knowledge, social interactions, and personal experiences.

Recent empirical research has provided compelling evidence supporting the effectiveness of active learning in enhancing student outcomes across various disciplines and educational levels. Meta-analyses and studies consistently indicate that active learning improves student achievement, concentration, and critical thinking skills compared to traditional lecture-based instruction.

The integration of active learning pedagogy offers a promising approach to creating dynamic, engaging, and student-centered learning experiences. This presentation will examine the theoretical foundations, practical applications, and implications of active learning in fostering student engagement and learning in the classroom.

Some of the methods employed to promote active learning and encourage student engagement and collaboration include:

I. Group Discussions and Peer Teaching

II. Problem-Based Learning

III. Collaborative Projects and Team-Based Learning

IV. The Inclusion and Integration of Technology in Teaching (Technology Integration)

V. Flipped Classroom Model

VI. Inquiry-Based Learning

VII. Active Learning Assessment Strategies

I. Group Discussions and Peer Teaching

Group discussions and peer teaching are cooperative learning strategies that enhance understanding and mastery of material through peer interaction and knowledge sharing. This approach involves students engaging in small group discussions, where they can actively exchange ideas, clarify concepts, and learn from each other. Such collaborative efforts foster a deeper understanding of the material and allow students to appreciate different perspectives.

In education and self-improvement, peer learning has garnered significant attention, representing a departure from traditional teacher-centered approaches toward collaborative learning among peers.

Peer Learning

Peer learning involves individuals with similar levels of expertise or knowledge engaging in reciprocal exchanges of insights and experiences. Unlike traditional pedagogical approaches, where knowledge transmission is predominantly unidirectional—from teacher to student—peer learning fosters an interactive environment in which learners actively share ideas, experiences, and expertise. This collaborative exchange facilitates a deeper comprehension and retention of knowledge.

Importance of Peer Learning

Peer learning is integral to educational contexts and extends beyond academic settings, contributing significantly to holistic development:

1. **Enhanced Comprehension** When students teach concepts to their peers, they reinforce their own understanding and retention of the material. Simplifying and explaining complex ideas necessitates a deeper grasp of the subject matter, thereby solidifying learners' knowledge.
2. **Promotion of Critical Thinking** Peer discussions encourage collective analysis, questioning, and evaluation of ideas. Through constructive dialogue, students hone their critical thinking abilities and develop a broader appreciation for diverse perspectives.
3. **Development of Collaborative Skills** Central to peer learning is the development of teamwork and communication skills. By collaborating towards common objectives, students cultivate essential collaborative abilities necessary for professional success and the effective navigation of real-world challenges.
4. **Confidence Building** Peer learning provides a supportive environment in which individuals can express their ideas and contribute to discussions without the fear of judgment. This positive teacher-student communication fosters confidence and self-assurance, empowering learners to articulate their thoughts more effectively.
5. **Exposure to Diverse Perspectives** Interaction with peers from diverse cultural backgrounds exposes learners to a wide range of viewpoints and experiences, thereby broadening their intellectual horizons and promoting inclusivity within the learning environment.
6. **Fostering Empathy** Engaging with peers encourages empathy and understanding as individuals gain insight into the challenges and perspectives of others, thus fostering a supportive and empathetic learning community.

Example:

In a class composed of nursing students, radiology technicians, and laboratory technicians, the instructor facilitates engagement and collaboration by assigning a presentation project for the end of the course. Throughout the semester, students explore various concepts related to scientific research.

At the beginning of the learning process, the instructor assigns a specific topic concerning breast cancer and organizes students into groups based on their respective disciplines. Each group is tasked with researching their assigned topic using a range of resources, including university textbooks, scholarly articles, and online databases. They are encouraged to critically analyze the information, identify key concepts, and prepare a concise presentation to share with their peers.

Once the groups have completed their research and prepared their presentations, they reconvene in the classroom for a series of group presentations. During these sessions, each group presents

their findings, discusses how the topic relates to breast cancer, and addresses questions or concerns from other students.

The instructor, after listening to the students' presentations, provides additional insights and encourages further exploration of the topic, fostering a collaborative learning environment. Following the group presentations, the instructor may lead a summarization session where students synthesize the main points discussed and address any areas of ambiguity or disagreement. This session enables students to consolidate their understanding, clarify misconceptions, and reinforce their learning through peer interaction.

When evaluating the benefits of group discussions and peer teaching within educational settings, it is essential to draw upon a substantial body of literature that supports these pedagogical methods. The following review highlights contributions that underscore the advantages of these approaches:

Group Discussions

- **Cognitive and Learning Benefits:** Gokhale (1995) demonstrated that students engaged in group discussions exhibited significantly higher scores on tests of critical thinking skills compared to their peers who did not participate in such discussions. This finding suggests that group interactions enhance critical thinking and promote a deeper understanding of the material. Similarly, Johnson, Johnson, and Smith (1998) examined cooperative learning strategies, including group discussions, and found that these methods improved student achievement and retention. The social dimension of group learning aids in clarifying and reinforcing understanding.

- **Communication and Social Skills:** Michaelsen, Knight, and Fink (2004) emphasized that group discussions contribute to the development of essential communication skills, such as articulating ideas clearly and effective listening. These skills are crucial for professional success and effective collaboration within diverse teams.

- **Engagement and Motivation:** Prince (2004) reviewed the effectiveness of active learning strategies, including group discussions, and found that these methods significantly enhance student engagement and motivation. The interactive nature of group discussions encourages greater investment and interest in the learning process.

Peer Teaching

- Enhancement of Understanding: Topping (1996) conducted a comprehensive review of peer-assisted learning and found that peer teaching not only benefits the learners but also reinforces the peer teacher's own understanding. By teaching concepts to their peers, students consolidate their knowledge and address any misunderstandings.

- Confidence and Relatability: Goodlad and Hirst (1989) discussed how peer teaching can enhance student confidence. The role of peer teacher promotes ownership of learning, which can lead to increased self-efficacy. Additionally, peer explanations are often more relatable to learners, facilitating a better grasp of complex material.

- Immediate Feedback and Active Learning: Falchikov (2001) highlighted the significance of immediate feedback in peer learning contexts. The ability to quickly address questions and provide clarifications enhances the learning experience. Peer teaching also promotes active engagement from both the teacher and the learners, leading to improved retention and understanding.

Integration and Application

- **Student-Centered Learning and Development of Soft Skills:** Huba and Freed (2000) emphasized the transition to student-centered learning, where students take an active role in their education. Group discussions and peer teaching are central to this approach, fostering the development of vital soft skills such as communication, leadership, and teamwork. Kuh (2008) discussed the importance of engaging pedagogies, including group work and peer-led learning, noting that these methods not only improve academic outcomes but also prepare students for real-world scenarios requiring collaboration and effective communication.

- **Inclusivity and Diversity:** Lave and Wenger (1991) introduced the concept of "communities of practice," illustrating how group learning environments can create inclusive spaces where diverse perspectives are valued. Group discussions and peer teaching thus contribute to a sense of belonging and respect for varied viewpoints.

- **Flexibility and Adaptability:** Boud, Cohen, and Sampson (1999) examined the adaptability of peer learning methods, noting their applicability across various educational contexts, from formal classroom settings to informal learning groups. This flexibility makes peer teaching and group discussions valuable across a range of disciplines and educational levels.

The literature consistently supports the benefits of group discussions and peer teaching in fostering deeper understanding, critical thinking, and the development of communication and collaboration skills. These methods enhance academic performance and prepare students for professional and real-world challenges by developing essential soft skills and promoting an inclusive learning environment. Integrating these approaches into educational practices aligns with the broader movement toward student-centered learning and active engagement in the learning process.

II. Problem-Based Learning

Problem-Based Learning (PBL) provides a dynamic, student-centered approach to education, emphasizing active engagement and practical problem-solving. By focusing the learning process on complex, real-world problems that lack definitive solutions, PBL encourages students to develop critical thinking, collaboration, and self-directed learning skills.

In PBL, students work in collaborative groups to identify the knowledge and skills necessary to address a given problem. They engage in self-directed learning (SDL), applying their newly acquired knowledge to the problem and reflecting on both their learning and the efficacy of their problem-solving strategies. In this model, the instructor's role transitions from a traditional knowledge provider to a facilitator who supports and guides the learning process.

The objectives of PBL include fostering:
- Flexible Knowledge: The ability to apply knowledge across various contexts.
- Effective Problem-Solving Skills: Proficiency in analyzing and addressing complex issues.
- Self-Directed Learning (SDL) Skills: The capability to independently seek out and utilize information.
- Effective Collaboration Skills: Competence in working effectively with others.
- Intrinsic Motivation: A deep-seated drive to engage in and persist with learning activities.

Benefits of PBL:

Overall, PBL serves as a powerful pedagogical tool that, when implemented effectively, significantly enhances the learning experience. It equips students to confront real-world challenges by integrating theoretical knowledge with practical application. This approach not only promotes deeper learning but also cultivates essential skills necessary for future success, making it a valuable method in contemporary education.

Example:
Problem: A patient presents with a constellation of symptoms indicative of multiple potential diagnoses. Students are required to ascertain the accurate diagnosis and formulate an appropriate treatment plan.

Process:

1. Presentation of the Problem: Students are provided with a detailed case study involving a patient exhibiting symptoms such as chronic cough, fever, and fatigue.
2. Research and Investigation: Students engage in research to identify potential conditions that align with the presented symptoms, considering possibilities such as pneumonia, tuberculosis, or chronic bronchitis.
3. Analysis and Discussion: In collaborative groups, students analyze their findings, assess relevant diagnostic tests, and review the patient's medical history to develop a comprehensive understanding of the case.

4. Solution Development: Based on their analysis, students propose a diagnosis and develop a treatment plan, substantiating their decisions with evidence gathered during their investigation.
5. Feedback: The facilitator provides constructive feedback on the proposed diagnosis and treatment plan, highlighting strengths and suggesting areas for further refinement.

III. Collaborative Projects and Group Engagement

Collaborative projects and group engagement are pedagogical strategies that significantly enhance student learning through peer interaction and knowledge sharing. This methods involves students participating in small group discussions and activities where they actively exchange ideas, clarify concepts, and learn from one another. Such collaborative methods foster a deeper comprehension of the material and expose students to diverse perspectives and to working together to achieve common goals, share knowledge, and support each other's learning. Such approaches not only enhance understanding of the subject matter but also promote the development of critical soft skills.

Benefits of Collaborative Projects and Group Engagement:

1. Enhanced Learning and Understanding:

- Johnson, Johnson, and Smith (1998) argue that collaborative projects enable students to engage in deeper cognitive processing. Working in groups allows students to explore multiple perspectives and engage in discussions that clarify and deepen their understanding of complex topics.
- Gokhale (1995) found that group-based learning strategies improve students' critical thinking and problem-solving abilities, as the interactive nature of group work necessitates active engagement with the material.

2. Development of Communication and Collaboration Skills:

- Michaelsen, Knight, and Fink (2004) emphasize that collaborative projects enhance communication skills. Through regular interactions, students learn to articulate their ideas clearly, listen to others, and negotiate solutions. These skills are essential for effective teamwork in both academic and professional contexts.
- Slavin (1995) highlights that collaboration fosters teamwork and cooperation, as students must coordinate their efforts and leverage each other's strengths to complete a project successfully.

3. Increased Engagement and Motivation:

- Prince (2004) reviewed various active learning methods, including collaborative projects, and found that these approaches significantly increase student engagement and motivation. The sense of shared purpose and responsibility in group work often leads to higher levels of participation and interest in the subject matter.
- Freeman et al. (2014) support these findings, showing that active learning techniques, including group-based activities, contribute to improved student performance and retention.

4. Critical Thinking and Problem-Solving:

- Boud, Cohen, and Sampson (1999) discuss how collaborative projects encourage critical thinking and problem-solving. Students engage in complex tasks that require them to analyze information, debate different viewpoints, and develop well-reasoned conclusions.
- Webb (2009) found that peer interactions in group settings promote cognitive development and higher-order thinking, as students must justify their ideas and consider alternative perspectives.

5. Inclusivity and Diverse Perspectives:

- Lave and Wenger (1991) introduced the concept of "communities of practice," highlighting how group work creates inclusive learning environments where diverse viewpoints are valued. Collaborative projects allow students from different backgrounds to contribute unique insights and learn from each other.
- Vygotsky (1978) emphasized the role of social interaction in learning, arguing that collaboration with peers exposes students to a range of perspectives and helps bridge gaps in understanding.

6. Flexibility and Adaptability:

- Huba and Freed (2000) note the flexibility of collaborative learning approaches, which can be adapted to various educational contexts and subject areas. This adaptability makes collaborative projects valuable for a wide range of disciplines and learning environments.
- Biggs and Tang (2007) highlight that collaborative projects can be designed to accommodate different learning styles and objectives, enhancing their effectiveness in diverse educational settings.

Collaborative projects and group engagement offer numerous benefits, including enhanced understanding of content, development of communication and collaboration skills, increased student motivation, and promotion of critical thinking. The literature consistently supports the effectiveness of these approaches in fostering a more dynamic and interactive learning environment. By integrating collaborative methods into educational practices, instructors can facilitate deeper learning and better prepare students for real-world challenges.

Example:
In a multidisciplinary course comprising nursing students, radiology technicians, and laboratory technicians, the instructor utilizes group work to bolster student engagement and cooperation. At the outset of the course, students are divided into groups and assigned a specific topic related to breast cancer for an end-of-term presentation. Over the semester, students acquire various concepts related to scientific research.

Initially, each group is tasked with researching their assigned topic using a combination of university texts, scholarly articles, and online resources. Students are encouraged to critically analyze the information, identify essential concepts, and prepare a concise presentation to share with peers from different disciplines.

Once the research and presentation preparations are complete, groups reconvene in the classroom for a collaborative lecture session. During this session, each group presents their findings, elucidates how their topic relates to breast cancer, and addresses questions or concerns from other students. The instructor, having listened to the presentations, guides the groups towards more comprehensive knowledge, thereby promoting further cooperation among group members.

Subsequent to the group presentations, the instructor facilitates a discussion segment where students summarize the key points, address any ambiguities, and resolve disagreements. This reflective discussion allows students to consolidate their understanding, rectify misunderstandings, and reinforce their learning through peer interaction.

IV. The Inclusion and Integration of Technology in Teaching (Technology Integration)

Technology Integration involves the strategic incorporation of technological tools and resources into educational practices to enhance teaching and learning. When effectively integrated, technology can significantly bolster active learning by providing innovative avenues for student engagement and interactive experiences. Below is an exploration of the role of technology in active learning environments:

1. Enhancing Engagement through Digital Tools

- Interactive Platforms: Digital platforms such as online discussion boards, educational applications, and virtual classrooms facilitate real-time interaction and collaboration. Tools like Kahoot!, Quizlet, and Padlet promote interactive learning and reinforcement of academic content.
- Multimedia Resources: The utilization of multimedia, including videos, podcasts, and animations, enables the presentation of complex concepts in an engaging manner, thereby accommodating diverse learning styles and making abstract concepts more accessible.

2. Facilitating Collaborative Learning

- Cloud-Based Collaboration: Technologies such as Google Docs, Microsoft Teams, and Slack enable collaborative work by allowing students to co-edit documents, provide instantaneous feedback, and engage in group discussions irrespective of geographical constraints.

- Virtual Simulations and Labs: Technologies including virtual reality (VR) and simulation software provide immersive experiences that allow students to conduct experiments and explore scenarios in a virtual setting, which is particularly beneficial for disciplines requiring hands-on practice.

3. Supporting Personalized Learning

- Adaptive Learning Technologies: Systems like DreamBox and Knewton offer adaptive learning experiences tailored to individual students' needs, adjusting content and difficulty levels based on students' proficiency and learning pace.
- Learning Analytics: Data analytics tools collect and analyze information on student performance and learning behaviors, enabling educators to tailor instructional strategies and provide targeted support based on empirical evidence.

4. Encouraging Active Participation

- Gamification: The incorporation of game-like elements, such as points, badges, and leaderboards, into educational activities can enhance student motivation and engagement. Platforms like Classcraft and Duolingo leverage gamification to create interactive and stimulating learning environments.
- Interactive Whiteboards and Clickers: Tools such as smartboards and audience response systems (clickers) facilitate real-time polling, quizzes, and interactive lessons, making the learning experience more dynamic and participatory.
- Online Resources and MOOCs: Massive Open Online Courses (MOOCs) and other online resources provide expansive access to educational materials and expert knowledge beyond the constraints of traditional classroom settings, promoting continuous and self-directed learning.

The integration of technology into teaching, when aligned with active learning principles, offers significant advantages by enhancing student engagement, facilitating collaborative learning, supporting personalized educational experiences, and expanding learning opportunities. Effective use of technological tools creates a more interactive, inclusive, and effective learning environment, addressing diverse student needs and preparing them for success in a technologically advanced world.

According to Johnson (2015)[1], integrating technology creates an engaging and inclusive learning environment that leverages the power of interactive simulations to facilitate students' understanding of complex concepts. Furthermore, the inclusion and integration of technology in teaching promote learning, collaboration, and research-based critical thinking skills, enabling students to become active participants in their own learning process.

Practical Example: Integrating technology into an anatomy class

Topic: Skeletal System

Learning Objectives:
- Students will identify and name the main bones of the human body.
- Students will understand the different functions of the skeletal system.
- Students will learn about the connections and articulations between bones.

Inclusion and integration of technology:
Anatomage[2] - the digital Anatomy table is the most advanced technological tool of visualization and virtual dissection of 3D anatomy for teaching anatomy and physiology and has been a part of it since the beginning of the University. The operating table form factor combined with Anatomage's renowned radiology software and clinical content separates the Anatomage Table from any other imaging system on the market. Anatomage Table 10 is the current version of the Table software

1. Presentation on Smartboard:
The teacher uses a smartboard to display an interactive diagram of the human skeleton. Using the smartboard tools, the teacher can zoom in on specific areas of the skeleton, label the names of the bones, and explain the functions of each part.

1 The Exploring Strategy Framework, adapted from Johnson et al. (2015)
2 Anatomage – Digital Desk has been featured in TEDTalks, PBS, Fuji TV and many other magazines for its innovative approach to presenting digital anatomy.

2. Virtual exploration:
Students use a virtual reality application (such as Human Anatomy VR) to explore the human skeleton in 3D. They can rotate and zoom in on the model to see the details of the bones and joints.

3. Educational video:
Educational videos from a reliable source (such as YouTube) that explain the structure and functions of the skeletal system are shown. The video contains animations that show how the bones join and move.

4. Online quiz/test:
After the presentation and virtual exploration, students participate in an online quiz through a platform such as Google Forms, etc. Questions include identifying bones on a diagram and the different functions of bones and joints.

5. Online group project:
Students break into groups and use a Google Classroom learning platform to create a presentation about a specific set of bones (eg, skull bones, upper limb bones). They use online resources to do research and share their findings with the class through a virtual presentation.

6. Interactive simulation:
Students use a simulation application (such as Anatomy & Physiology Revealed) that allows the body's layers to be separated to see how different body systems, including the skeletal system, interact with each other.

V. Flipped Classroom Model

The Flipped classroom model represents a pedagogical approach wherein traditional classroom instruction and homework assignments are reversed. In this model, students engage with new content at home through pre-recorded lectures, readings, or other online resources, and utilize classroom time for interactive activities, discussions, and collaborative work. This methodology is designed to enhance student engagement and deepen comprehension through active participation.

Key Features of the Flipped Classroom Model

1. Pre-Class Education:

- **Video Lectures:** Students access pre-recorded video lectures provided by the instructor or other educational sources to familiarize themselves with new concepts prior to attending class.
- **Online Readings and Materials:** Students are assigned online readings, articles, and additional resources to prepare for in-class activities and discussions.
- **Pre-Lesson Quizzes and Assessments:** Brief quizzes or assessments may be used to gauge students' preliminary understanding of the material covered outside of class.

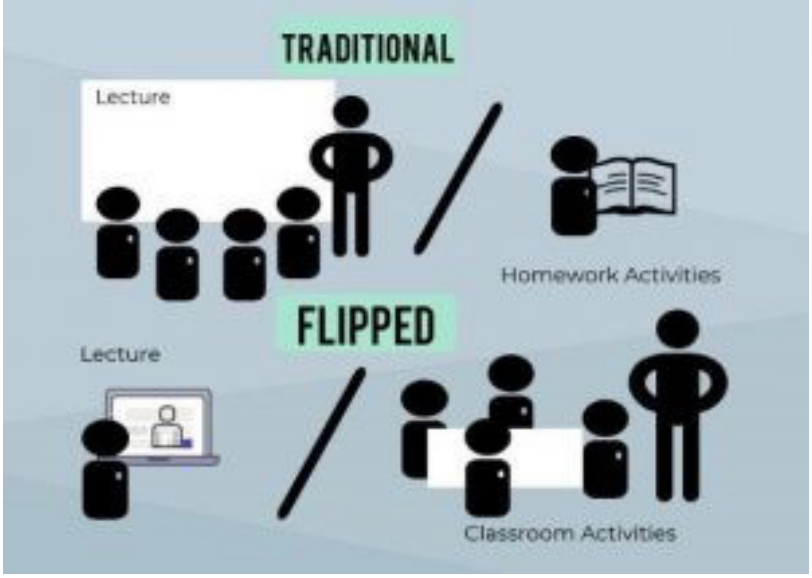
2. Classroom Activities:

- **Discussions and Debates:** Class time is dedicated to discussing and debating the concepts learned at home, which fosters deeper cognitive engagement and critical thinking.
- **Group Work:** Students collaborate in groups to address problems, develop projects, or conduct experiments, thereby applying their acquired knowledge in practical contexts.
- **Practice and Application:** Hands-on activities and interactive exercises are employed to facilitate the application of theoretical concepts to real-world scenarios.

3. Continuous Feedback:

- **Individual Support:** The flipped classroom model allows instructors to allocate more time to provide individualized support and address specific student needs during class sessions.
- **Instant Feedback:** Students receive immediate feedback during classroom activities, which aids in the refinement of their understanding and facilitates timely adjustments to their learning strategies.

3 A flipped classroom is one that inverts the typical cycle of acquiring and applying content so that: students acquire the necessary knowledge before class, and. lecturers guide students to actively and interactively clarify and apply that knowledge during class.



Overall, the flipped classroom model reconfigures traditional instructional paradigms to create a more interactive and student-centered learning environment, where the focus shifts from passive reception of information to active and applied learning experiences.

Example

Context: Medical School – Introduction to Pharmacology

Topic: Understanding Drug Mechanisms and Side Effects

Flipped Classroom Activity:

1. **Pre-Class Preparation:**
   - **Video Lectures:** Students watch pre-recorded video lectures on the mechanisms of common pharmacological agents, such as antibiotics, antihypertensives, and analgesics. The videos explain how these drugs work at the molecular level and their common side effects.
   - **Online Readings:** Students read assigned chapters from a pharmacology textbook or scholarly articles related to drug interactions and therapeutic uses.
   - **Pre-Class Quiz:** Students complete a short online quiz to test their understanding of the material covered in the videos and readings. This quiz includes questions on drug mechanisms, classifications, and side effects.
2. **In-Class Activities:**
   - **Case-Based Discussions:** In class, students are divided into small groups and given case studies involving patients who are prescribed various medications. Each case study requires students to analyze the appropriateness of drug choices, consider potential side effects, and suggest alternative therapies if needed.
   - **Role-Play:** Students engage in role-play exercises where they simulate interactions between a physician and a patient. One student plays the physician, while another plays the patient experiencing side effects from a medication. The group discusses how to address these side effects and adjust treatment plans.
   - **Interactive Exercises:** Students participate in interactive activities such as creating flowcharts or diagrams to illustrate the pathways of drug action and side effect profiles. They use these tools to visually represent their understanding of how different drugs affect the body.

3. Continuous Feedback:

- **Group Presentations:** Each group presents their findings and recommendations from the case studies to the class. They discuss their reasoning and answer questions from peers and instructors.
- **Instructor Feedback:** The instructor provides immediate feedback on the presentations, highlighting key points and offering additional insights into drug mechanisms and side effects.

4. Reflection:

- **Post-Class Reflection:** Students write a brief reflection on what they learned from the case studies and role-play exercises. They discuss how their understanding of pharmacological concepts has evolved and identify any areas where they need further clarification.

This example of the flipped classroom model in a medical school context illustrates how students can benefit from engaging with pre-class materials at their own pace and then using class time for interactive, hands-on activities. By applying their knowledge to case studies and role-play exercises, students enhance their understanding of pharmacology and develop practical skills for patient care.

VI. Inquiry-Based Learning

Inquiry-based learning is a pedagogical method that emphasizes the process of inquiry and exploration to foster critical and independent thinking among students. This method encourages students to develop questions, conduct research, collect and analyze data, and draw evidence-based conclusions. It is applicable across various disciplines and educational levels (Brinkmann, 2014).

Process of Inquiry-Based Learning:

1. Probing Questions and Problems:
The inquiry process begins with the introduction of open-ended and challenging questions or problems that require solutions. These questions stimulate deep engagement and encourage students to explore complex issues (Schwab, 1962).

2. Research and Data Collection:
Students engage in research activities, including literature reviews, experiments, surveys, and data analysis, using various information technologies and resources to gather and discover new information (Banchi & Bell, 2008).

3. Analysis and Evaluation:
Students analyze and evaluate the collected information, applying critical thinking skills to differentiate between reliable and unreliable data and to formulate accurate conclusions. This process enhances their ability to critically assess evidence (Kuhn, 2005).

4. Knowledge Construction:
Rather than passively receiving information from instructors, students construct knowledge actively through their inquiry and exploration. This hands-on approach facilitates deeper understanding and retention of material (Hmelo-Silver, 2004).

5. Presentation and Reflection:
Students present their findings through presentations or group discussions and reflect on their research process. This reflection helps them assess their learning, identify areas for improvement, and understand their cognitive development (Gijselinckx, 2012).

Benefits of Inquiry-Based Learning:

1. Fosters Critical Thinking and Independence:
Inquiry-based learning promotes the development of critical thinking skills and independence, preparing students for future academic and professional challenges (Dewey, 1938).

2. Active Involvement in the Learning Process:
By transforming students into active participants in their educational journey, inquiry-based learning enhances engagement and comprehension, making the learning process more interactive and meaningful (Brinkmann, 2014).

3. Development of Research and Problem-Solving Skills:
The method helps students acquire essential skills in scientific research, data analysis, and problem-solving, which are crucial for academic success and professional development (Banchi & Bell, 2008).

4. Increased Awareness of the Scientific Process:
Inquiry-based learning helps students understand and appreciate the scientific process and the importance of evidence in constructing knowledge. This awareness is fundamental to developing a rigorous approach to learning and inquiry (Schwab, 1962).

Inquiry-based learning is an effective pedagogical strategy that engages students in active knowledge construction, fostering critical thinking and independent problem-solving skills. By involving students in the research and inquiry process, this approach prepares them for future academic and professional challenges, ensuring they are equipped with essential skills for success across various fields.

Example

Context: Medical School – Introductory Clinical Skills Course
Topic: Diagnosing a Common Respiratory Condition
Inquiry-Based Learning Activity:

1. Introduction of Probing Questions:

- **Problem Statement:** A patient presents with a persistent cough, shortness of breath, and mild fever. Students are tasked with diagnosing the condition and suggesting a management plan.
- **Research Questions:**
  - What are the potential diagnoses for these symptoms?
  - What diagnostic tests might be necessary?
  - What are the common treatments for these conditions?

2. Research and Data Collection:

- **Patient History Review:** Students review a brief case summary that includes the patient's symptoms, medical history, and any previous treatments.
- **Diagnostic Tests:** Students decide which tests to order, such as a chest X-ray, blood tests, or sputum analysis, and interpret the results.
- **Literature Review:** Students look up information on common respiratory conditions such as bronchitis and pneumonia using medical textbooks or reliable online resources.

3. Analysis and Evaluation:

- **Data Synthesis:** Students combine the information from the patient history, test results, and literature to create a list of possible diagnoses.
- **Critical Evaluation:** They evaluate the likelihood of each diagnosis based on the available evidence and decide which diagnosis fits best with the patient's symptoms.

4. Knowledge Construction:

- **Diagnosis and Treatment Plan:** Students formulate a diagnosis and create a treatment plan. For instance, if they determine the patient has bronchitis, they might recommend rest, fluids, and possibly antibiotics or cough medicine.
- **Justification:** Students justify their choices based on the evidence gathered and current medical guidelines.

5. Presentation and Reflection:

- **Presentation:** Students present their diagnosis and treatment plan to their peers and instructors in a brief discussion or presentation format.
- **Reflection:** After the presentation, students reflect on the process, discussing what they learned about diagnosing and managing respiratory conditions and how they can improve their diagnostic skills.

This simple example of inquiry-based learning demonstrates how medical students can engage with clinical cases through investigation and problem-solving. By diagnosing and managing a common respiratory condition, students enhance their clinical skills and apply their theoretical knowledge in a practical setting.

VI. Active Learning Assessment Strategies

According to Freeman et al. (2014), active learning assessment strategies encompass a diverse array of methods designed to:

- **Evaluate the effectiveness of active learning activities**
- **Enhance student performance**

These strategies involve various techniques for collecting and analyzing data on student engagement and progress. Key assessment methods include:

1. Classroom Assessment Techniques (CATs):
Summarization and Clarification: At the conclusion of a class, students are asked to write brief summaries of their learning or list questions they have. They also identify the most unclear aspects of the lecture or material studied. This technique helps instructors gauge students' comprehension and areas needing further clarification (Angelo & Cross, 1993).

2. Tests and Short Quizzes:
Frequent Assessments: Regular short tests or quizzes are used to monitor student progress and identify concepts that require additional focus. These assessments provide immediate feedback and help instructors adjust their teaching strategies based on student performance (Freeman et al., 2014).

3. Peer Review and Reevaluation:
Student Evaluation: Students evaluate each other's work, providing constructive feedback and learning from their peers' perspectives. This method promotes collaborative learning and critical thinking (Topping, 1998).

4. Projects and Practical Tasks:
Application of Knowledge: Students create projects or complete practical tasks that require the application of acquired knowledge in real or simulated situations. This approach helps bridge the gap between theoretical learning and practical application (Boud & Falchikov, 2006).

5. Performance Evaluation:
Formative Assessment: Continuous assessment throughout the course is employed to monitor student progress and adapt teaching methods to meet student needs. Formative assessments are integral for providing ongoing feedback and supporting student development (Black & Wiliam, 1998).

6. Competency-Based Assessments:
Skill Evaluation: Assessments are designed to evaluate specific skills through tasks that require practical use of knowledge. This method focuses on demonstrating competencies rather than merely testing theoretical understanding (Spady, 1994).

Benefits:

- **Immediate Feedback:** Students receive prompt feedback, enabling them to make timely improvements and better understand the material.
- **Enhanced Performance:** Regular assessments and feedback contribute to improved student performance and learning outcomes.
- **Increased Engagement:** Active involvement in assessment processes enhances student engagement and motivation in the learning process.

Freeman et al. (2014) emphasize that integrating these assessment strategies into active learning frameworks is essential for optimizing educational experiences. Such integration fosters a more interactive, reflective, and effective learning environment, contributing to the achievement of educational objectives.

Faculty Training and Support

Faculty training and support encompass activities and resources designed to enhance the skills, knowledge, and effectiveness of academic staff in teaching, research, and administration. These initiatives help faculty meet high educational standards and engage in continuous professional development. Essential components include:

1. Orientation Programs:
Institutional Familiarization: Orientation programs introduce new faculty members to the institution's culture, administrative policies, and available resources for teaching and research (Meyer & Land, 2006).

2. Pedagogical Training:
Modern Teaching Methods: Faculty training includes workshops and seminars on contemporary teaching methods, such as flipped classroom models, inquiry-based learning, and active learning strategies. These programs aim to enhance teaching effectiveness and student engagement (Prince, 2004).

3. Research Skill Development:
Research Workshops: Training sessions focus on improving research skills, including scientific research methodologies, academic writing, grant writing, and publishing in scientific journals (Boote & Beile, 2005).

4. Mentoring Programs:
Guidance and Support: Mentoring programs pair less experienced faculty with senior mentors who provide support in teaching, research, and professional development (Zachary, 2000).

5. EPIK Program:
Work Experience and Employment: The EPIK program offers students practical work experience starting in their first semester, aiming to provide 20 hours per week of work experience. Graduates are guaranteed employment with partner companies where they completed internships (Western Balkans University, 2024).

6. Technological Innovations:
Training in Technology: Faculty receive training in the effective use of new educational technologies, such as online learning platforms, digital libraries, and communication tools like the SMART System and Google Classroom (Kirkwood & Price, 2014).

7. Feedback and Evaluation:
Feedback Systems: Systems are implemented for collecting feedback from students and colleagues through questionnaires. This feedback is used to enhance teaching practices and Western Balkans University (2024). EPIK Program Overview. [Institutional document].

RESULTS

Increased Student Engagement: Active learning strategies, including group discussions, problem-solving tasks, and hands-on experiments, have led to a notable increase in student engagement compared to traditional lecture-based methods. Students have actively participated in discussions, collaborated with peers, and exhibited enthusiasm for learning, demonstrating a shift from passive to active involvement in the learning process (Freeman et al., 2014).

Enhanced Student Participation: The implementation of active learning strategies has resulted in greater student participation in class activities and discussions. Students have reported feeling more comfortable expressing their opinions, asking questions, and sharing ideas within a supportive and interactive learning environment. This increased participation has fostered a more dynamic and inclusive classroom atmosphere.

Improved Conceptual Understanding: Active learning activities have facilitated a deeper conceptual understanding of course material. Students have engaged in critical thinking, applied theoretical concepts to real-world scenarios, and established connections between different topics within the discipline. Consequently, students have demonstrated higher levels of mastery and retention of content knowledge.

Positive Student Feedback: Feedback from students regarding their experiences with active learning has been overwhelmingly positive. Students have appreciated the variety of engaging activities, hands-on learning opportunities, and collaborative environments created through active learning strategies. Many students have reported increased motivation, confidence, and excitement about their learning experiences.

Higher Academic Achievement: Academic performance metrics, including exam scores, assignment grades, and course evaluations, indicate improved learning outcomes as a result of active learning. Students engaged in active learning activities have shown higher levels of academic achievement and overall satisfaction with the course compared to cohorts taught using traditional instructional methods.

Long-Term Impact on Learning: Active learning strategies have promoted the long-term retention of course material and the transfer of learning to new contexts. Students have reported applying knowledge and skills acquired from the course to other academic pursuits, research projects, and real-world situations, illustrating the enduring impact of active learning on their educational trajectories.

Overall, the results from implementing active learning strategies, as supported by Freeman et al. (2014), highlight the effectiveness of these methods in enhancing student engagement and learning outcomes. Active learning not only boosts student motivation and participation but also fosters deeper understanding, improved academic performance, and long-term retention of knowledge and skills.

CONCLUSION

The diverse teaching methods and strategies discussed offer substantial benefits to both students and faculty, including:

- **Increased Student Engagement and Cooperation:** Active learning techniques enhance student involvement and collaborative interactions.
- **Development of Communication Skills:** Students improve their ability to articulate ideas and engage in effective dialogue.
- **Advancement of Critical Thinking:** Active learning fosters critical analysis and problem-solving skills.
- **Acquisition of Practical Knowledge:** Students gain hands-on experience and apply theoretical concepts in practical settings.
- **Enhanced Research and Problem-Solving Skills:** Active learning activities contribute to the development of essential research and analytical skills.
- **Personalized Learning and Resource Access:** These methods allow for tailored learning experiences and access to diverse resources.
- **Boosted Self-Esteem and Academic Performance:** Increased engagement and effective learning strategies improve student confidence and academic success.

- **Faculty Skill Improvement:** Enhanced teaching practices and faculty development contribute to better educational outcomes.
- **Support and Mentoring for Professional Development:** Training and mentoring opportunities help faculty grow professionally and refine their teaching methods.

Integrating these methods into educational practice can significantly improve the quality of education and better prepare students for academic and professional challenges. The application of active learning methodologies, informed by Freeman's insights, has led to transformative changes in lesson development and student learning experiences. By incorporating interactive activities such as group discussions and hands-on experiments, educators have created environments where students actively engage in knowledge construction rather than passively receiving information.

The effective use of acquired knowledge, positive academic performance evaluations, and constructive student feedback unequivocally demonstrate the benefits of active learning. Continued advancement in teaching practices and the refinement of active learning strategies will contribute to a paradigm shift in education, focusing on the development of 21st-century skills and fostering a culture of inquiry and collaboration. To sustain and enhance these benefits, it is essential for institutions to support and reinforce active learning initiatives through ongoing professional development and strategic planning.

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ASSESSING FIRST-YEAR HEALTH STUDIES STUDENTS' PERCEPTIONS AND EXPECTATIONS OF HEALTH CARE MANAGEMENT EDUCATION

Argus Marko
Western Balkans University
Highway Tiranë-Durrës, KM 7, Kashar, Tirana , Albania
a.marko23@wbu.edu.al

Arba Golemi
Western Balkans University
Highway Tiranë-Durrës, KM 7, Kashar, Tirana , Albania
a.golemi23@wbu.edu.al

ABSTRACT

Healthcare management is a new and innovative program in the ever-changing field of medicine. Previously this position was held by doctors themselves, but the need for more specialized individuals in this industry arose in the last decade. Unfortunately, with it being a new field of study and not in the market for a long time, many students do not have the needed information about it.

This research aims to assess the level of awareness among first-year students about healthcare management as a field of study. Also, the research seeks to explore the perceived importance of healthcare management education in the medical curriculum. The instrument used is a cross-sectional survey designed to collect data from first-year students, collected through an online form distributed to them.

Based on the data collected and descriptive statistics, it was made possible to summarize participants' responses. The results were surprising and helpful in proposing initiatives to raise awareness toward healthcare management education. Expectations and preferences were also collected and presented as a need-based result of the research.

KEYWORDS: Health care management, Students, Perceptions, Education, Curricula.

INTRODUCTION

In recent years, the healthcare sector has undergone significant changes for many reasons, such as evolving patient demographics, new technology, and even changes in the policies surrounding healthcare. These changes require quality management and coordination, and as a solution the field of "Healthcare Management" was created, aiming to resolve these issues with efficacy and efficiency.

Healthcare management as a field focuses on 3 main concepts: Effectiveness, Equity, and Efficiency. These pillars are necessary for maintaining and running a successful healthcare system, whether a small clinic or a large hospital. A couple of key core functions that a manager must have are planning, organizing, staffing, controlling, risk management, etc.

We, as students in this field, were interested in learning more about the perceptions and expectations students in the healthcare field might have about healthcare management, so we conducted this research to inquire more about it. The results we gathered from the questionnaire were qualitative and gave us a different perspective on how our field can impact their personal views. For example, 50% of the participants agreed that learning about healthcare management will assist future doctors in their line of work.

Methodology

This research used a cross-sectional survey design to collect data from first-year WBU students enrolled in health-related study programs. The total number of participants was 60, with 43 of them being female and 17 male. The data was collected via an online survey which was distributed to first-year students. Frequencies, tables, percentages, and graphs were used to summarize the responses.

Discussion

This study has provided insights into first-year undergraduate health students' perceptions of what Healthcare Management is, and also their expectations regarding the incorporation of this training into their fields of study. The information gathered helps to understand the students' familiarity with the subject and their overall views on the future of the profession.

Firstly, data collection and interpretation revealed that 87% of the participants were familiar with the field of Healthcare Management, while the remaining 13% were not. This was a surprising and very positive finding, given that this was the first year that Healthcare Management was introduced as a field of study in Albania.

Another key question in the survey was about the importance of healthcare management to medical students. The results showed that 50% of the students agreed and around 25% strongly agreed. It can be said that students consider healthcare management to be important for their healthcare profession as it is related to many elements of their daily work but also to their performance.

Looking at the answers to the following question, it is understandable that this research had other interesting results. When given several topics related to healthcare management and asked which one they would like to learn more about during their studies, the two most selected were quality improvement in healthcare and leadership and management in healthcare organizations. This shows that they have a good understanding of the importance of healthcare management and the role it will play in their future careers.

Another important element of this study was the impact of healthcare management education on the student's future. For example, medical students emphasized improving leadership skills, efficiency and quality, better financial management, focus on patient-centered care, etc. Nursing students felt that their overall working conditions would improve and that there would be a better hospital hierarchy. Other programs focused on economic benefits, integration of different innovations, and learning about strategic planning and implementation of new technologies, and biotechnology students in particular expressed the need for advice on ethical behavior in different clinical trials.

Finally, key findings from this research include the fact that further information on the subject will enhance skills, that this area of study will help them practice management which will be of great help in their future, and that healthcare management education equips students with vital leadership and system navigation skills.

CONCLUSION

In conclusion, the main point that emerged from this research was the need to develop a dedicated Healthcare Management course to address the growing interest among health sciences students. This course should cover both fundamental and advanced topics to ensure a comprehensive understanding of the field. It could start at the beginning as an elective course and later on be integrated fully into the curriculum. Additionally, fostering student engagement through interactive learning methods, such as case studies and guest lectures from industry professionals can enhance their understanding and interest

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APPENDIX 1

Questionnaire:

Age:

a) 18
b) 19
c) 20+

Gender:

a) Male
b) Female

Academic Program: (open-ended)

How familiar are you with the field of Healthcare Management?

a) Not at all familiar
b) Slightly familiar
c) Moderately familiar
d) Very familiar

Do you believe that Healthcare Management education is important for medical students?

a) Strongly disagree
b) Disagree
c) Neutral
d) Agree
e) Strongly agree

Which of the following topics related to Healthcare Management would you like to learn more about during your medical education? (Select all that apply)

a) Health care delivery systems
b) Health policy and advocacy
c) Health economics
d) Quality improvement in health care
e) Leadership and management in health care organizations
f) Health informatics
g) Other(Please Specify)

How do you think Healthcare Management education can benefit you in your future medical practice? (open-ended)

Do you have any additional comments or suggestions regarding Healthcare Management education for medical students? (open-ended)

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CHALLENGES ENCOUNTERED BY HUMAN RESOURCE MANAGERS IN THE HOSPITALITY AND TOURISM SECTOR

Elta Derri
Buze Boutique Hotel
Street Butrinti, Lagja nr 1, Saranda, Albania
buzehotel@gmail.com / eltaliksenaj92@hotmail.com

ABSTRACT

Hospitality sector relies heavily on labor and is a service-oriented industry, therefore hotels are determined to hire and keep skilled staff members as they are essential to their success and the profitability of the hotel industry. Service experiences, which are intangible and depend on close interaction between clients and staff, are the industry's products. Albania is a developing nation with high emigration rates, inadequate training in the hospitality sector, and a shortage of qualified workers. This has presented HR managers with serious, unprecedented obstacles in the hospitality and tourism industry. This study examines the difficulties encountered by human resource (HR) managers in Albanian hotels, as well as their coping mechanisms. Semi-structured interviews were conducted with HR managers of Saranda four- and five-star hotels.The research paper identified several themes regarding the difficulties HR managers encounter when hiring, selecting, training, onboarding, and retaining employees. There is a discussion of the coping mechanisms employed by HR managers. The study's recommendations are made to HR managers to help them deal with difficulties in the hotel sector. Some of these suggestions involve creating educational policies in collaboration with academic institutions, universities, and hospitality centers, or signing procedures for cooperation with nearby hotels. It is possible to reverse the unfavorable trends by enhancing employment conditions and benefits. The paper concludes by acknowledging the limitations of the research and offering recommendations for more study, examining different human resource management practices and their adaptability to the Albanian hospitality sector.

KEYWORDS: Albania, hotels, human resource management, skilled workers,obstacles

1. INTRODUCTION

The tourism industry in Albania includes a wide variety of activities and actors, which interact within the value chain to create a satisfying experience and to generate more income and employment for local residents and businesses. Although Albania is a relatively new tourist destination, it offers opportunities for a wide range of tourism activities, such as hiking, biking, rafting, and many other activities in the categories of rural tourism, sports and adventure tourism, nature tourism, coastal tourism, etc. Albania has more than 2000 popular tourist spots and objects considered cultural monuments. Four of these – Butrinti, Berati, Gjirokastra and the Ohrid-Prespa Transboundary Biosphere Reserve (as part of the UNESCO World Network of Biosphere Reserves) – have been declared World Heritage centers and are protected by UNESCO. There are many prospects for a rich and diverse product mix because of those abundant possibilities, the diversity, the striking physical proximity of the various landscapes, and the pleasant, moderate temperature. Since the tourism business is service-oriented, it is assumed that human resource development is fundamental. Offering a wide range of different professions in training is necessary to ensure a high level of services, since the current offerings have failed to live equal to the standards set by industry requirements and visitor expectations. While excellent interpersonal skills and a warm welcome are frequently praised, there is a lot of criticism in Albania regarding the attitudes and abilities of the service people employed in this industry. Businesses have indicated that there is a shortage of workers with the necessary capabilities during their fieldwork. Businesses have noted that two major barriers to performance and development during their fieldwork are the scarcity of workers with the necessary basic skills and the restricted availability of professional training. Chef (culinary) skills, customer service skills, and management abilities are among the prioritized shortages in competencies that have been identified and need to be addressed to support the sector's expansion. Through four objectives, this study aims to explore the difficulties faced by HR managers and the best strategies they have used to address these difficulties in Albanian hotels. Firstly, to look into the issues and difficulties that human resources face on a regular basis. The second step is to investigate the best HR approaches to handle HR issues. Third, to create useful tools for professionals and make recommendations for further study for scholars. The fourth goal is to enhance HR procedures in Albania's hotel sector.

2. THEORETICAL BACKGROUND

The most important human resource function is recruitment because it assists the company bring in qualified workers who are interested in joining the team and also enables it to choose the best candidates. Recruitment also helps the business make a good impression in the mind of potential employees. Also, because the hospitality sector pays less than other businesses, which results in a lack of educated or competent workers, parents oppose their children opting for it. In the labor-intensive sector, this presents a new obstacle. The desire of hotel staff to leave the sector and work in other businesses, particularly when they are favored in other industries, is one of the key causes that exacerbate the shortage of skilled workers. Many individuals think that jobs at hotels are short-term and concentrate more on their physical abilities than cognitive talents. HR managers will consequently have to reduce the number of positions that need to be filled.The aptitudes and abilities required to work in the hospitality business were only possessed by a tiny fraction of graduates. These include interpersonal and language abilities, but regrettably, the graduates lack a service mindset. In order to maintain its employees, the hotel needs to be dedicated to sustainable practices and go beyond just the bottom line. Additionally, hotels must implement creative hiring and selection practices.

2.1 Training

Effective training programs are necessary for hotels to address the lack of competent workers, particularly for four- and five-star establishments that seek to enhance the performance efficiency of their workforce. Workers aspire to work for organizations that offer cutting-edge training programs for professional advancement. In a labor-intensive economy, the hospitality sector primarily relies on service quality as a competitive advantage to win over new clients. Training programs therefore have an impact on the quality of services. Hotels ought to spend money on training initiatives to raise staff productivity. In a similar a direction, training initiatives increase employee satisfaction, improve effectiveness, and decrease layoff intentions. On the other hand, inadequate training results in inadequate work performance and insufficient knowledge of job responsibilities among employees, which adversely impacts their ability to interact with customers and ultimately causes displeasure among them. Some businesses, controversially, believe that the training process is a waste of time and resources. Training programs are expensive to fund for small hotels. High staff turnover is a result of underfunding human resources. In order to satisfy the demands of the hospitality industry, training programs

must be made more readily accessible because the sector draws immigrants from rural areas who lack the necessary competencies.

2.2 Employee turnover

The number of job openings in the hotel industry has been rising each month and has surpassed pre-pandemic levels. Businesses in this industry are more than twice as likely as any other to face difficulties hiring employees. A significant labor shortage has resulted from rising minimum wages, companies closing their doors permanently, and financial incentives for former industrial workers to stay at home and not return to work. Although there is a tight labor market everywhere, the hospitality sector is where it is most felt, as pre-pandemic hiring was already difficult. As a result, the sector is demonstrating a greater interest in contactless technologies, robotics, and, when appropriate, artificial intelligence. AI chatbots, for example, are frequently used in recruitment to expedite employment in the hotel industry. But not every job in the hospitality sector can be handled by technology, as customization is essential. HR managers in the hospitality sector deal with employee turnover because workers may leave for other lodging options in search of higher wages, benefits, and opportunities for advancement. It has been found that workers in the hospitality sector leave for other industries in search of greater compensation, perks, and opportunities. Younger generations yearn for status and wealth. It takes several years for employees in the hospitality sector to progress in their careers. The industry's drawbacks include the compromise of personal time, intrusive work schedules, and extended working hours, all of which increase employee turnover and result in the loss of skilled workers. Similarly, Deery and Jago reported that unclear roles and responsibilities were the main reasons males left their positions, whereas work-life conflict and low progression chances were the main reasons women left their jobs. As a result, they recommend that retention strategies takes into account aspects related to work and life balance. Furthermore, a high turnover rate is caused by inadequate training and the seasonal nature of the occupation. The employee turnover rate at isolated and rural hotels increases. The need to resign is influenced by a number of factors, including traditional and religious beliefs, work-family conflict, work-leisure conflict, and excessive workload at workplace. Overload prevents talented individuals from being retained in personnel. The hotel's resources should be used by HR managers to satisfy the employees, boost organizational commitment, and lower turnover.

2.3 Employee retention

One data-driven approach to determine how many employees are leaving the organization and for what reasons is to monitor employee turnover rates. Turnover, which encompasses both voluntary and involuntary resignations, is the complete withdrawal from a company. People who voluntarily departed the organization to pursue other possibilities, retire, take up a new career, or for personal reasons are represented by the term "voluntary turnover." People fired due to conduct or performance problems, as well as those involved in a seasonal layoff or force reduction, are all included in the category of involuntary turnover. Increased voluntary turnover, when interpreted in relation to industry norms, is typically regarded as an undesirable key performance indicator. It indicates an organization is losing quality workers, perhaps to rival companies. The company's culture, benefits and compensation plan, career path and training, management, and many other issues are among the causes. High voluntary turnover has an effect on both customer happiness and profitability. On a practical note, hiring new employees is expensive. Recent studies on the expense of hiring new employees have found that it typically costs between $4,000 and $5,000; for executives, that amount nearly triples.Conversely, a company's ability to retain exceptional personnel is greatly influenced by its positive brand image.Increased recruiting, selection, and hiring expenses are a result of employee turnover. Additionally, it lowers output. In order to boost production and save labor expenses, the company should implement efficient retention programs. Training, hiring, promotions, awards, employee recognition, and remuneration are just a few of the employee-retention strategies that HR professionals successfully push for. Simultaneously, additional researches contended that employee retention is significantly impacted by the salary level. Employees may switch hotels in looking for better job offers, chances for professional growth, and career advancement. In addition, staff turnover is reduced by awards, training, and development opportunities. Other research examined the connection between the incentive plan and the turnover rate and found that organizations that provide incentives programs have fewer employees leaving.

3. METHODOLOGY OF RESEARCH

This study aims to investigate the HR issues encountered by HR managers in Albania and the strategies they implemented to surmount such challenges. In order to uncover the unknown knowledge empirically, it was used a qualitative approach. When there is little knowledge in the research field, qualitative research is advised. The

study looked at HR managers' practical experience that either directly or indirectly supports HR management procedures in the hotel sector. To create theoretical knowledge, there were analyzed primary and secondary data. In order to gain a comprehensive and thorough understanding for additional analysis and a deeper assessment of the HR management difficulties and HR management practices, the researcher conducted in-depth interviews with HR managers. As a result, the study uses purposive and random sampling techniques to choose its subjects.One of the main selection criteria for the current study was that the participants had to be full-time HR managers with experience working in four- and five-star hotels, where good HR management practices were evident, and they had to be between the ages of 25 and 60. The purpose of the established criteria is to enhance the variety of information. Comprehensively, semi-structured interviews were designed in order to carry out this study. First, by providing an overview of the study's purpose, the warm-up section assisted in establishing a relaxed, trustworthy, and comfortable atmosphere. Afterwards, the development stage was an in-person interview in which the researcher inquired extensively about everyday challenges facing HR management, including the lack of skilled workers, training and development, and turnover rate. The methods used by the participants to get beyond these challenges were also investigated. Lastly, the section that closed with words of appreciation for voluntary involvement encouraged participants to offer any more comments pertaining to the difficulties facing HR management. When the tape recorder was turned off, it was quite successful and resulted in more efficient responses. The in-depth interviews could last up to an hour long. Twenty in-depth interviews were carried out for the current research.

4. FINDINGS

4.1 Difficulties in Hiring

Most HR managers noted that underqualified workers afflict operational divisions like food service, laundry, engineering and maintenance, stewarding, housekeeping, and kitchen. However, other HR managers brought up the point that there are unqualified workers in every hotel area, especially in the front office and sales divisions. The hotels have difficulty hiring competent staff. This was in line with other earlier studies conducted in all nations, even industrialized ones like the UK, Germany, Spain, and others. HR managers use strategies, like selecting ambitious candidates, articulating the career path, and offering training programs, to address previously identified difficulties. The HR managers overcame the lack of qualified workers by implementing efficient procedures. Most HR managers determined the importance of financial and ethical incentives in addition to enhancing the workplace, especially for occupations requiring physical labor.

4.2 Shortage of staff members

The operational departments—such as stewards, cleaning, and laundry—are the most adversely affected by staff shortages, according to the majority of HR managers. This is due to the physical laborious nature of the work, the low salary, and the lengthy career ladder that leads to upper management. In order to overcome these obstacles, all HR managers raised the pay scale for these positions and clarified the possibility of moving to different departments, such as housekeeping employees' potential to move to the front office departments or steward employees' potential to move to the kitchen. Ninety percent of the HR managers mentioned the need for open and honest communication and awareness development regarding career paths, possibilities for advancement, and positive turnover. For entry-level staff members like stewards and housekeepers, the high cost of employment documents presents a new challenge, according to more than half of those surveyed. Most HR managers utilize the salary survey to figure out what each job's compensation should be. In the hospitality business, where passion cannot be acquired through training, more than half of HR managers stated that they dismiss applicants who lack it. Most HR managers offer favorable wages, comprehensive benefits packages, career planning, growth and development possibilities, and internal transfer opportunities to other departments through effective training initiatives in order to keep their staff members on board. For the hotel sector, the current study offers insightful managerial implications. The consequences will provide hospitality executives with useful tools to hire and retain talented, experienced workers, which will increase employee happiness and increase productivity, both of which boost hotel businesses' bottom lines. Three main aspects are involved in these implications: repositioning the industry, retention, and recruitment (specifically, employee shortages).

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THE ROLE OF FOURTH-GENERATION UNIVERSITIES IN CULTIVATING FUTURE LEADERS FOR SUSTAINABLE DEVELOPMENT GOALS

Irma Gjana
Western Balkans University
Tirana, Albania
irma.gjana@wbu.edu.al

ABSTRACT

In the context of the Sustainable Development Goals (SDGs) set forth by the United Nations, there is a need to explore the crucial role that 4th Generation (4G) universities can play in advancing sustainable development agendas. As catalysts for innovation and drivers of societal progress, 4G universities are uniquely positioned to contribute to achieving the SDGs through their commitment to excellence in education, research, and community engagement.

4G universities are dedicated to providing a comprehensive educational framework that surpasses traditional academic boundaries. Through a holistic approach to education, these institutions provide students with a broad understanding of sustainability challenges and equip them with the skills necessary to address them effectively.

Moreover, 4G universities serve as hubs of research and innovation, generating knowledge and solutions that contribute to attaining the SDGs. Through collaborative research projects and partnerships with governments, industry, and civil society, these institutions drive technological advancements, policy innovations, and sustainable business practices that promote economic growth, social equity, and environmental stewardship. Community engagement is another keystone of the 4G university model, as these institutions actively seek to leverage their expertise and resources to address pressing social and environmental challenges at the local, national, and global levels. Whether through service-learning initiatives, outreach programs, or capacity-building projects, 4G universities demonstrate their commitment to creating positive social impact and advancing the SDGs in partnership with diverse stakeholders.

This paper focuses on the importance of 4G universities in shaping future leaders dedicated to advancing sustainable development and fulfilling the United Nations Sustainable Development Goals (SDGs). It aims to underscore how 4G universities are instrumental in fostering a holistic educational environment, integrating both curricular and extracurricular activities, to equip students with the necessary skills and knowledge to address sustainability challenges effectively.

KEYWORDS: 4G Universities, SDGs, Higher Education, Sustainable development, Leadership

1. INTRODUCTION

In today's world, humanity faces numerous challenges that impact us all, including issues related to sustainable development. Addressing these challenges requires well-considered and systematic action from each of us.

The United Nations reports on the global problems humanity is facing and the steps needed to achieve sustainable development are crucial. These issues must be addressed seriously by everyone and across all sectors of society.

Higher education must place greater emphasis on these aspects. As we move into an era of fourth-generation (4G) higher education institutions, the focus on sustainable development and the goals outlined in the United Nations 2030 Agenda should be a priority.

Higher education cannot merely focus on educating and preparing professionals in specific fields. These institutions must integrate knowledge about sustainable development into their curricula, meaningful research, extracurricular programs, and core values. This approach will help "inject" the right knowledge into the new generation, shaping future leaders who will drive real change and integrate continuous development into their lives and professions. Higher education institutions have a responsibility to evolve continually and contribute to the formation of a generation equipped with the sensitivity and knowledge needed to create a better and safer world for everyone.

Institutions of higher education, regardless of their size or level of development, should collaborate and share best practices for continuous development and achieving sustainable goals. By doing so, they can become the driving force behind significant, positive changes.

2. OBJECTIVES OF THE STUDY

The objectives of this study are:

1. To identify the role of fourth-generation universities and education in promoting sustainable development and sustainable development goals.
2. To highlight the need for preparing future leaders to effectively drive change and achieve the United Nations' sustainable development goals.

3. THEORETICAL BACKGROUND AND LITERATURE REVIEW

3.1. Fourth Generation (4G) Universities

Higher education has evolved significantly over time, reflecting broader changes in society. Initially, universities were first-generation (1G) institutions focused solely on education. This evolved into second-generation (2G) universities, which, in addition to education, began engaging in scientific research. The evolution continued through the emergence of third-generation (3G) universities that not only educate and conduct research but also emphasize the practical application of acquired knowledge.

According to Wissema [1], we are currently in the era of third-generation (3G) universities. However, some researchers argue that we have transitioned into the fourth generation (4G). These universities go beyond education, research, and application of knowledge by playing a more active role in economic development through innovation [2] [3].

Fourth-generation (4G) universities are designed to have a significant impact on social development. They foster collaboration with industry, government institutions, and civil society [2]. Fourth-generation (4G) universities aim to contribute to social transitions by influencing economic enrichment through innovation. With an interdisciplinary and holistic approach, these universities aim to address global challenges, enhance societal values, invest in human capital, and engage proactively in both global and local ecosystems [3].

Fourth-generation (4G) universities are dedicated to providing a comprehensive educational framework that surpasses traditional academic boundaries. Through a holistic approach to education, these institutions provide students with a broad understanding of sustainability challenges and equip them with the skills necessary to address them effectively.
Moreover, fourth-generation (4G) universities serve as hubs of research and innovation, generating knowledge and solutions that contribute to attaining the SDGs. Through collaborative research projects and partnerships with governments, industry, and civil society, these institutions drive technological advancements, policy innovations, and sustainable business practices that promote economic growth, social equity, and environmental stewardship.

Community engagement is another keystone of the fourth-generation (4G) university model, as these institutions actively seek to leverage their expertise and resources to address pressing social and environmental challenges at the local, national, and global levels. Whether through service-learning initiatives, outreach programs, or capacity-building projects, 4G universities demonstrate their commitment to creating positive social impact and advancing the SDGs in partnership with diverse stakeholders.

This focus on broader societal impact makes fourth-generation (4G) universities particularly sensitive to global issues and continuous development challenges.

3.2. Sustainable Development and Sustainable Development Goals

The 1987 Brundtland Commission Report defined sustainable development as “progress that satisfies current needs without hindering the ability of future generations to fulfill their own needs.” [4] [5]

Global development, while offering numerous benefits, has also introduced various problems and challenges for humanity. These issues have prompted international efforts to pursue sustainable development goals aimed at improving quality of life, ensuring a safer future, and fostering global peace [6].

Sustainable development seeks to enhance living standards by addressing environmental, social, and economic factors. Initially, economic growth was often pursued with little regard for its negative impacts on the environment and society. However, this perspective has shifted, recognizing that sustainable development cannot be achieved without considering environmental and social well-being alongside economic progress.

The concept of sustainable development is detailed in the 2030 Agenda, adopted by the United Nations in September 2015. This agenda includes 17 Sustainable Development Goals (SDGs), which encompass interconnected areas of economic growth, social advancement, and environmental protection [7].

The SDGs are as follows: (1) eradicate poverty; (2) end hunger; (3) ensure health and well-being for all; (4) provide quality education for everyone; (5) achieve gender equality; (6) ensure clean water and sanitation; (7) guarantee affordable and clean energy; (8) promote decent work and sustainable economic growth; (9) build resilient infrastructure and foster innovation; (10) reduce inequalities; (11) create sustainable cities and communities; (12) promote sustainable consumption and production; (13) take urgent climate action; (14) protect marine life; (15) safeguard terrestrial ecosystems; (16) promote peace, justice, and inclusive institutions; and (17) strengthen global partnerships for sustainable development [6] [7].

Our article specifically examines the fourth Sustainable Development Goal set by the United Nations, which centers on education. We also argue that this goal is deeply interconnected with and influences nearly all the other goals in the agenda.

3.3. Education for Sustainable Development

In her speech directed to the United Nations Assembly in 2015 Irina Bokova, former Director-General of UNESCO, emphasized the need for a fundamental shift in how we view education's role in global development. She argued that education has a crucial influence on individual well-being and the future of our planet. According to Bokova, education must align with 21st-century challenges and goals, promoting values and skills that drive sustainable and inclusive growth and foster peaceful coexistence [9].
To achieve the United Nations' sustainable development goals, a fundamental shift in our thinking and actions is essential. Nelson Mandela famously stated that "education is the strongest weapon to change the world," highlighting its critical role in shaping individuals with the knowledge, values, and skills necessary for driving change. Fourth-generation (4G) universities must instill in students a commitment not only to economic well-being but also to social development and environmental sustainability.

Education for sustainable development emphasizes the need for education systems to focus on sustainability. Researchers have identified various successful approaches to educating the new generation about the United Nations' Sustainable Development Goals (SDGs) through quality and forward-looking education [10] [11] [12]. Higher education institutions and fourth-generation (4G) universities play a crucial role in promoting a culture of sustainability among students. They equip students with the skills to engage in sustainable solutions, despite the challenges. Additionally, fostering soft skills and critical thinking will prepare future generations to tackle the current and future challenges of sustainable development.

Boeren [7] argues that education about sustainable development goals must occur at all educational levels: micro, meso, and macro. At the micro level, the focus is on parents and family as the primary educators of children. The meso level involves the entire education system, from kindergarten through university and into the workplace. The macro level encompasses the procedural, legal, and administrative changes directed by governing bodies. Real and sustainable change can only be achieved by addressing all these levels.

Education for sustainable development extends to various facets of education. For a fourth-generation university to effectively contribute to the implementation and advancement of sustainable development goals, it must first align its mission with these goals. Achieving this requires thorough planning to integrate sustainable development principles at every level and across all institutional areas.

Key steps include allocating finances and investing in both curricular and extracurricular programs that foster sensitivity to sustainable development in students. Integrating sustainable development programs into all university curricula, preparing academic staff with the necessary knowledge, and monitoring and evaluating the entire process are all essential components. These actions are crucial for ensuring that education for sustainable development is comprehensive and effective [11] [12] [13].

A key element of education for sustainable development is preparing future leaders. Fourth-generation (4G) universities, as hubs of innovation and progress, play a crucial role in advancing the Sustainable Development Goals (SDGs) through their dedication to excellence in education, research, and community involvement. To reach these objectives, it is vital to engage students, as future sustainability leaders, in activities that are coordinated with industry, government, and civil society.

3.4. Educating the Leaders of the Future

A primary goal of Education for Sustainable Development (ESD) is to incorporate the sustainable development paradigm into teaching and learning, thereby empowering current and future generations to fulfill their needs [12] [14].

According to a citation of Griswold [15] formal education for scientists, engineers, and other professionals is a crucial route for cultivating leaders and decision-makers with a sustainability focus. However, technical and content knowledge must be complemented by leadership skills to drive the social and cultural transformations needed for building sustainable societies.

UNESCO's Education for Sustainable Development sourcebook [5] outlines five pillars of education, highlighting necessary changes:

1. Learning to know: This involves acquiring essential knowledge and skills for life.
2. Learning to do: Focuses on gaining practical and applied skills.

3. Learning to live together: Emphasizes the importance of social skills, respect for diversity, and cultural understanding in our globalized world. Exchange programs and inter-university projects are excellent opportunities used by modern universities to develop future leaders for sustainable development.
4. Learning to be: Involves internalizing and embodying learned values.
5. Learning to transform oneself and society: Represents the culmination of knowledge, skills, and values, preparing individuals to lead and inspire meaningful change.

Fourth-generation (4G) universities, as a catalyst for positive change, should follow these pillars through integration, continuous improvement, and practical application to engage and empower young generations, aiming to fulfill the United Nation's Sustainable Development Goals (SDGs) [16] [17].

These pillars are also emphasized in the work by Bart et al. [14], which underscores that modern education focused on sustainable development should establish a "whole person" education system. This approach aims to equip students with essential sustainable competencies, representing a crucial investment in the common good and supporting the achievement of continuous development goals.

4. METHODOLOGY

This study is an exploratory research that utilized an integrative review of the literature. The research was focused on the collection and elaboration of different articles related to the topic and reports of international institutions about sustainable development and education for sustainable development.

5. LIMITATIONS

The author is aware of the limitations of this research. The quantity of articles and documents related to the topic is limited. A broader qualitative and quantitative research can be included in further research work on this topic.

6. CONCLUSIONS

Based on the information presented, the author emphasizes that fourth-generation (4G) universities play a crucial role in achieving sustainable development goals. Beyond providing education, conducting scientific research, applying knowledge, and fostering economic development, these institutions should take concrete, measurable actions and invest in sustainable development. Engaging and empowering young people in this process is considered the most valuable and impactful investment for society and humanity.

To advance sustainable development, institutions should integrate sustainability into the curriculum and promote related research. They need to implement sustainability practices in both curricular and extracurricular activities and provide training programs for faculty and staff. Engaging students in sustainability initiatives is crucial, as is incorporating sustainability into the institution's mission, administration, and strategic planning. Building regional, national, and international partnerships and enhancing interactions with the community are also essential steps.

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THE GLOBALIZATION OF HIGHER EDUCATION: TRENDS, IMPLICATIONS, AND CHALLENGES: THEORETICAL APPROACH

Jonida Kalani
Western Balkans University
Tirana, Albania

ABSTRACT

The article provides an overview of the trends, implications, and challenges associated with the globalization of higher education.

In today's world, the widespread expansion of education is a trend, influenced by a range of factors, like technological progress, economic connections between nations and the growing movement of people across borders. This article gives an insight into the patterns, consequences, and obstacles linked to the globalization of education.

The article addresses the challenges accompanying the globalization of higher education, such as issues of quality assurance and accreditation across borders, the potential commodification of education, and concerns regarding brain drain and the concentration of academic resources in certain regions. It stresses the importance of teamwork, among those involved in handling the benefits and obstacles that come with this trend.

KEYWORDS: Higher Education, Globalization, Challenges, Albania, Theoretical Approach

INTRODUCTION

In the intricate tapestry of global interconnectedness, few sectors have transformed as profoundly as higher education. Globalization has not only reshaped the landscape of academia but has also catalyzed a myriad of trends, implications, and challenges reverberating across borders and cultures. The globalization of higher education is a multifaceted phenomenon encompassing the internationalization of student bodies, the proliferation of transnational academic partnerships, and the emergence of global knowledge networks.

The globalization of higher education is a multifaceted phenomenon encompassing the internationalization of student bodies, the proliferation of transnational academic partnerships, and the emergence of global knowledge networks. As universities and colleges increasingly engage with the global arena, they are confronted with a host of opportunities and complexities. The cross-pollination of ideas, cultures, and perspectives enriches academic discourse, fosters innovation, and enhances the quality of education. Yet, it also presents challenges related to cultural sensitivities, equity, and the preservation of academic integrity.

This research endeavor aims to bridge this knowledge gap by delving into the relationship between innovation and the Albanian Higher Education. By utilizing a framework that integrates insights, from innovation studies and public policy domains this study seeks to shed light on how globalization shapes higher education practices, policies, and outcomes within Albania.

The cross-pollination of ideas, cultures, and perspectives enriches academic discourse, fosters innovation, and enhances the quality of education. It presents challenges related to cultural sensitivities, equity, and the preservation of academic integrity. This research seeks to delve into the multifaceted nature of the globalization of higher education, examining its implications for academic institutions, individuals, and societies at large. By shedding light on the transformative forces at play, we endeavor to unravel the complexities of this phenomenon and chart a course toward a more inclusive, equitable, and sustainable global higher education landscape.

The theoretical study presented in this chapter will cover the organizational dynamics, the rule-making mechanisms, and the economic and sociological components that drive the dissemination and implementation of the advances in higher education in Albania. Critically evaluating, governmental policies, collaboration of industries, and the partnerships of international will be the very first points we will research to answer to what are the factors that may vary the use of educational innovation in Albania.

LITERATURE REVIEW

Globalization in Higher Education: Trends

Scholars have identified several key trends shaping the globalization of higher education. One prominent trend is the internationalization of student bodies, characterized by the increasing mobility of students seeking educational opportunities abroad. This trend is driven by factors such as economic globalization, the pursuit of quality education, and the desire for cross-cultural experiences (Altbach & Knight, 2007).

Another trend is the proliferation of transnational academic partnerships, including joint degree programs, research collaborations, and branch campuses. These partnerships facilitate knowledge exchange, foster innovation, and enhance institutional prestige (Deardorff, de Wit, Heyl, & Adams, 2012).
The emergence of global knowledge networks has transformed the production and dissemination of knowledge in higher education. Digital technologies enable instantaneous communication and collaboration among scholars worldwide, leading to the creation of transnational communities of practice (Marginson, 2016).

IMPLICATIONS:

The globalization of higher education carries significant implications for academic institutions, individuals, and societies. One implication is the diversification of campus demographics, which enriches the learning environment and promotes intercultural understanding (Kondakci & Wells, 2013).
Moreover, the internationalization of higher education has economic implications, as universities compete for talented students, faculty, and research funding on a global scale (Van der Wende, 2009). This competition drives institutions to enhance their academic offerings, infrastructure, and services to attract stakeholders from diverse backgrounds.

The globalization of higher education has geopolitical implications, as nations vie for influence and soft power through educational diplomacy and international partnerships (Altbach & Knight, 2007). This trend underscores the interconnectedness of higher education and broader geopolitical dynamics.

CHALLENGES

Appreciating the forces Despite the opportunities afforded by globalization, higher education also faces a myriad of challenges. One challenge is the tension between internationalization and the preservation of academic integrity and quality standards (Marginson, 2016). As institutions seek to attract international students and forge partnerships, they must ensure rigorous academic standards and uphold ethical practices.

Another challenge is the issue of cultural sensitivity and inclusivity in a globalized learning environment. Diverse student populations bring unique perspectives and experiences to the classroom, but also necessitate greater attention to cross-cultural communication and support services (Kondakci & Wells, 2013).

Furthermore, the globalization of higher education exacerbates existing inequities in access to educational opportunities, as students from marginalized backgrounds may face barriers to mobility and participation (Marginson, 2016). Addressing these disparities requires a concerted effort to promote equity, diversity, and inclusion in higher education policy and practice.

METHODOLOGY

Literature Review: A comprehensive educational review of such sources as academic journals, books, policy reports, and conference materials will be conducted to clarify crucial theoretical models and empirical research related to higher education. The literature review will cover not only traditional faculties of innovation studies, but also economics, public policy, and higher education.

Conceptual Framework Development: The incorporation of relevant literature findings will assist in the construction of a conceptual framework that is meant to direct the process of theoretical inquiry related to higher education in Albania. The framework (structure) will outline the key dimensions, concepts, and relations relevant to discovering the mechanisms, determinants, and results of this kind of innovative process in the Albanian higher education context.

Theoretical Synthesis: Knowledge will be increased by analyzing innovation theories like the theory of innovation diffusion, systems thinking, institutional theory, and resource-based view, to be offered explanations for innovations in the Albanian higher education system. Yet, these frameworks shed light and give nuance to different mechanisms that play a role in the process of innovation and knowledge diffusion.

Critical Analysis and Interpretation: A critical survey of the theoretical literature is mandatory to identify a theme that has recur, contradictions, and gaps in our current views of higher education. Practical application will follow the literature summary with suggestions on what can be empirically researched as well as what policy analysis is needed.

By adopting this theoretical frame of reference, the study aims to advance the perspective on the nexus between globalization and the higher education sector in Albania, reaching scientific conclusions that can be used to determine research agendas, policy discussions, and strategic deliberations in the context of striving to achieve education magnitude and the worth of society.

CONCLUSION

Finally, to conclude, the globalization of higher education is a dynamic and multifaceted phenomenon that has profoundly transformed the landscape of academia. Trends such as the internationalization of student bodies, the proliferation of transnational partnerships, and the emergence of global knowledge networks underscore the interconnectedness of higher education in an increasingly globalized world. These trends reflect a growing recognition of the importance of cross-cultural exchange, collaboration, and mobility in fostering innovation, diversity, and excellence in higher education.

The globalization of higher education presents a host of challenges. Issues such as maintaining academic integrity, ensuring cultural sensitivity and inclusivity, and addressing disparities in access and equity require careful attention and concerted action. Navigating these challenges necessitates a commitment to upholding ethical standards, promoting diversity and inclusion, and fostering equitable access to educational opportunities for all.

The globalization of higher education presents both opportunities and challenges for institutions, individuals, and societies. By embracing the opportunities for collaboration, innovation, and cross-cultural learning while addressing the challenges of equity, integrity, and inclusivity, stakeholders in higher education can harness the transformative potential of globalization to create a more interconnected, equitable, and sustainable future for higher education worldwide. This requires a commitment to collaboration, dialogue, and continuous reflection on the evolving dynamics of higher education in a globalized world. Through collective effort and shared vision, we can navigate the complexities of globalization and build a more inclusive and resilient higher education ecosystem for generations to come.

Policy Implications and Recommendations:

The theoretical findings that will be drawn from the analysis will be transferred to the practical sphere and suggest implications and recommendations for policymakers, practitioners as well as business owners in Albania. This will be done by an expert evaluation that will offer guidance regarding the policy creation, strategy, and interventions that would help in creating an amiable environment for healthcare innovation and enhancement.

Limitations and Future Directions:

The theoretical limits and avenues for future research will be discussed as well in the analysis to respect the scope and the boundaries of theoretical inquest. Investigations on methods and an analysis of empirical studies are suggested to move on with the work regarding the globalization on higher education in Albania and the policy and practice implications.

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TWO-DIMENSIONAL IMAGE NOISE CANCELLATION BY DISCRETE FOURIER TRANSFORM, K-SPACE FILTERING AND Z-SPACE FILTERING

Carlo Ciulla
Western Balkans University,
Faculty of Economics, Technology and Innovation,
Highway Tiranë-Durrës, KM 7, Kashar, Tirana, Albania.
carlo.ciulla@wbu.edu.al; cc998@njit.edu

Marsilda Qyli
Western Balkans University,
Faculty of Economics, Technology and Innovation,
Highway Tiranë-Durrës, KM 7, Kashar, Tirana, Albania.
marsilda.qyli@wbu.edu.al

ABSTRACT

This research presents results obtained using techniques for noise removal from two-dimensional (2D) images. The techniques are three k-space filters, three Z-space filters, and the Discrete Fourier Transform (DFT). The filters are calculated in k-space and Z-space using Bessel, Butterworth and Chebyshev polynomials. The noise patterns are calculated using two different approaches. One approach is the repeated multiplication of the 2D image by the Sinc function. For these experimental sessions the Sinc function is purposely misused to corrupt the image. The other approach uses well-defined mathematical formulae to determine noise patterns and to channel them into the Sinc function and to multiply the images by the noise so as to obtain corrupted images. The results of this research are: 1. k-space filters, and Z-space filters are effective to restore the image when the noise is generated by purposely misusing the Sinc function. 2. DFT fails to reconstruct the image when the noise is generated by well-defined mathematical formulae. Indeed, when the Sinc function accepts as argument the noise generated by well-defined mathematical formulae, DFT fails to reconstruct the signal, and k-space filters and Z-space filters succeed in 11 cases out of the total of 18 different noise patters. After noise cancellation, k-space filters and Z-space filters provide smoothing effect or edge sharpening effect. The advantage of the frequency domain filters over the DFT is the noise cancellation achieved using noise generated by well-defined mathematical formulae. Both image space and frequency domain of the reconstructed image are not exact replicas of the departing image. These techniques show potential for specific noise cancellation from 2D images.

KEYWORDS: k-space filtering, Z-space filtering, noise cancellation, image reconstruction.

INTRODUCTION

Recently, the literature reports of signal denoising techniques based on the Discrete Fourier Transform (DFT) [1, 2]. Along this line of thought, this paper presents the study of aptitude of DFT, k-space filters and Z-space filters for the removal of specific noise from 2D images. The k-space filters and the Z-space filters are Bessel, Butterworth, and Chebyshev [3, 4]. The number of filters is 7, and they are: the DFT and 6 frequency domain filters; 3 in k-space and 3 in Z-space. The paper reports two types of analysis. In the first type of analysis is presented the feasibility of DFT and 6 frequency domain filters to remove noise generated by repeated multiplication of the signal by the Sinc function. In these experiments the Sinc function is used as multiplicative factor that corrupts the images. The image is sampled, and as a result, the image is largely corrupted with noise by repeated multiplication of the image pixel by the Sinc function. DFT, k-space filters and Z-space filters remove the noise in such cases. It is also presented the feasibility of noise removal for the noise pattern introduced in images of theoretical nature. In this latter case, DFT fails but the 6 frequency domain filters do not fail. In the second type of analysis, a noise study is designed to calculate noise patterns with well-defined math equations. The results of this study indicate that DFT does not remove the noise. Instead, k-space filters and Z-space filters may remove the noise when the corrupting function is a Sinc function. More specifically, when a well-defined mathematical formula is used as noise factor, and the noise is channelled to the Sinc function (the noise becomes the argument of the Sinc function), the resulting noise (the Sinc function of the well-defined mathematical formula) is multiplied by the signal value so as to corrupt the image. This process yields to unsuccessful noise removal by the DFT, but the noise can be removed by the frequency domain filters. However, not systematically. Indeed, of the eighteen mathematical functions that were used, in 11 cases out of 18, the Sinc based noise corrupted image was restored by the frequency domain filters.

MATERIALS AND METHODS

The Whittaker-Shannon interpolation formula was used for the following purposes. 1. To reconstruct the image in accordance to the Nyquist theorem (see Fig. 1d). 2. To sample the sinogram (see Fig. 1b). 3. To purposely corrupt the signal by repeated multiplication of the pixel brightness times the Sinc function (see Fig. 2c). The first experimental session serves to verify signal reconstruction by means of Sinc sampling within the Whittaker-Shannon interpolation formula when fulfilling the Nyquist theorem. The second experimental session is conducted at the aim to determine the sinogram of the MRI by the use of the Sinc function as interpolator at the pixels' grid. The result of this experiment is showed in Fig. 1b, Fig. 1c. Fig. 1d shows the reconstruction when the Whittaker-Shannon interpolation formula is used in obeyance of the Nyquist theorem. The third experimental session wants to highlight that if the Sinc function is not used properly within the formation of the sinogram, then it becomes as source of corruption for the image. To this extent, Fig. 2a and Fig. 2b show the value of the Sinc functions, however, sampling of the sinogram is not correct (purposely) and this yields to the image corruption visible in Fig. 2c. The signal and the noise become barely distinguishable, however, DFT restores the image (see Fig. 2e), and k-space filtering and Z-space filtering restores the image too as showed in Fig. 2d, Fig. 4, and Fig. 6. This latter aspect of the present research is the main focus of this paper as it wants to propose k-space filtering and Z-space filtering as the means of signal restoration consequent to noise cancellation. In this paper, k-space filtering and Z-space filtering are compared to the Discrete Fourier Transform (direct and inverse DFT) to establish if also the DFT is able to remove the noise. Simulations were conducted using theoretical image data (see Fig. 3), and real-life Magnetic Resonance image data (see Fig. 5).

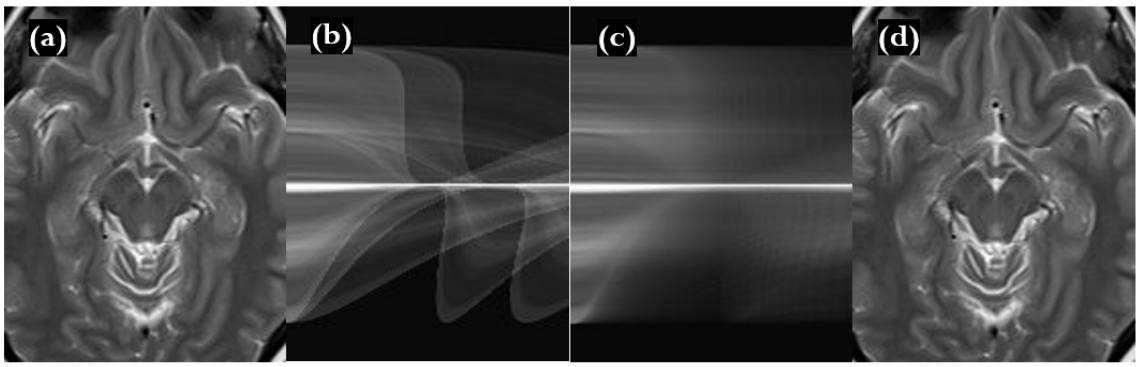

Fig. 1. Magnetic Resonance Image (MRI) in (a). The sinograms of the MRI in (b) and in (c) were obtained using 10 and 30 angles respectively. The MRI reconstruction in (d) was obtained using the Whittaker-Shannon interpolation formula in obeyance to the Nyquist theorem

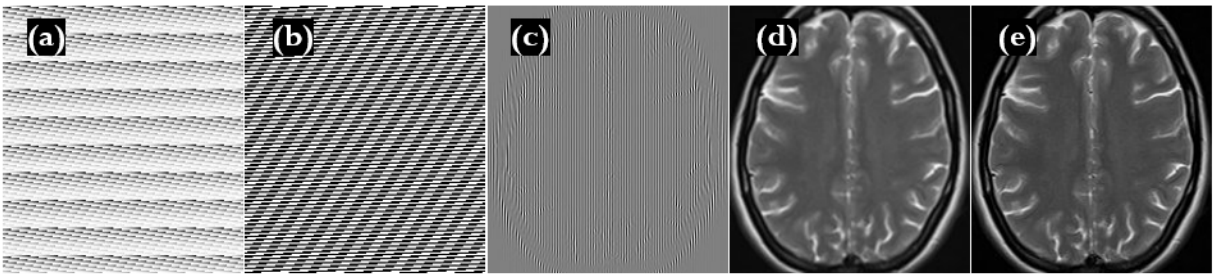

Fig. 2. Noise corruption and removal by k-space filtering. Sinc(x) and Sinc(y) functions are showed in (a) and in (b) respectively. Corruption of the image using the repeated multiplication by the term Sinc(x) · Sinc(y) is showed in (c). (d) Noise cancellation after Bessel k-space filtering. (e) Noise cancellation after DFT (direct and inverse). The image is nicely restored both in (d) and in (e).

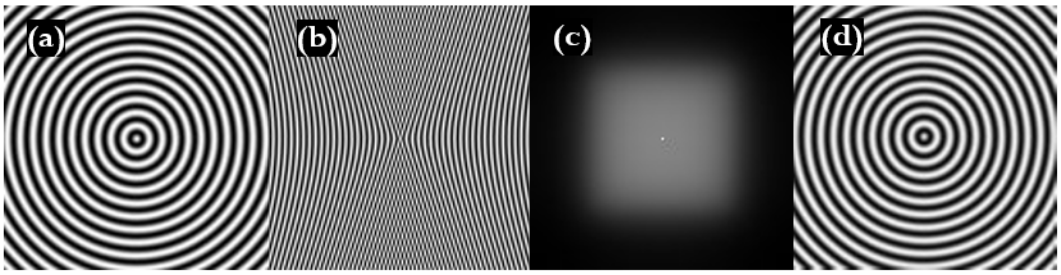

Fig. 3. Theoretical image in (a), corrupted image in (b), Bessel k-space filter in (c) and image reconstruction with noise cancellation by Bessel k-Space filtering.

RESULTS

The main results of this research are: 1. DFT is able to reconstruct the images after corruption with the repeated multiplication of the pixel brightness and the Sinc function. This result is confirmed using real-life MRI images but not theoretical images. 2. Both k-space filters and Z-space filters (Bessel, Butterworth and Chebyshev) can reconstruct corrupted theoretical images and corrupted MRI. The most effective filter is the Bessel both in k-space and in Z-space, then the Butterworth filters and the Chebyshev filters (which were the least effective of the three). 3. When the noise is generated using well-defined math formulae (see Fig. 4 and Fig. 5), k-space and Z-space filters successfully remove it in 11 out of the total of 18 cases.

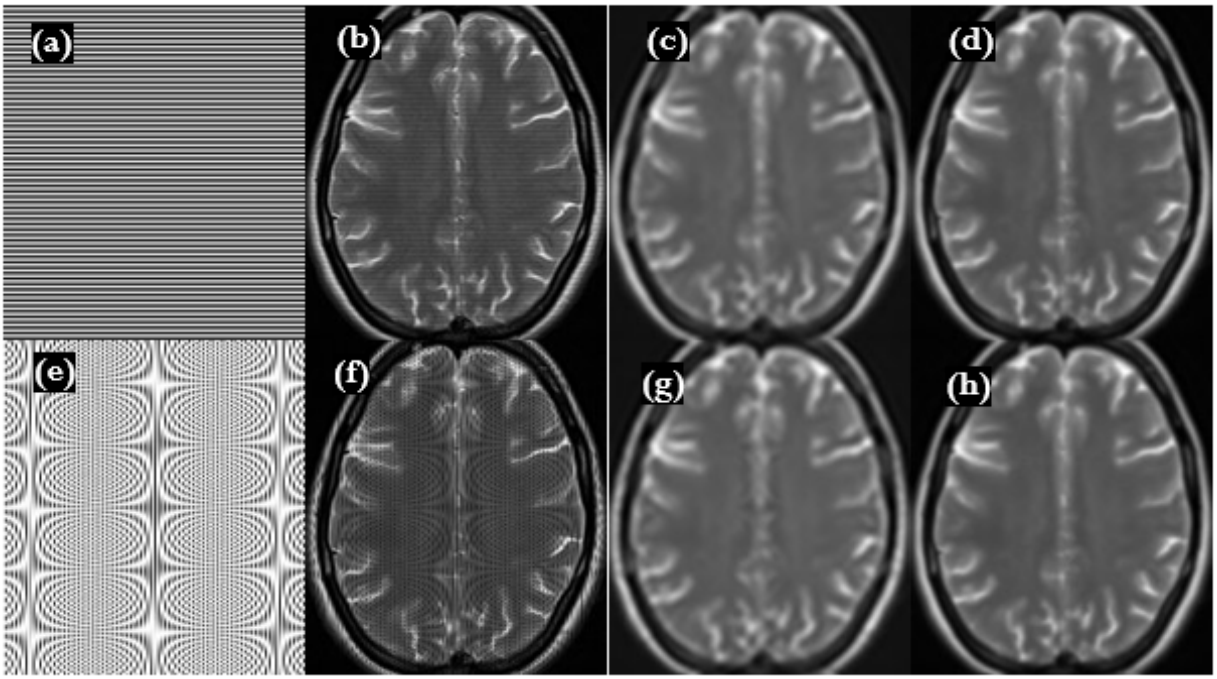

Fig. 4. Study conducted using well-defined mathematical formulae to characterize the noise. The noise is in display in (a) and (e). The image is then multiplied by the noise pattern and its corrupted version is showed in (b) and (f). Image reconstruction and noise cancellation by means of k-space filtering in (c) and in (g). Image reconstruction and noise cancellation by means of Z-space filtering in (d) and in (h).

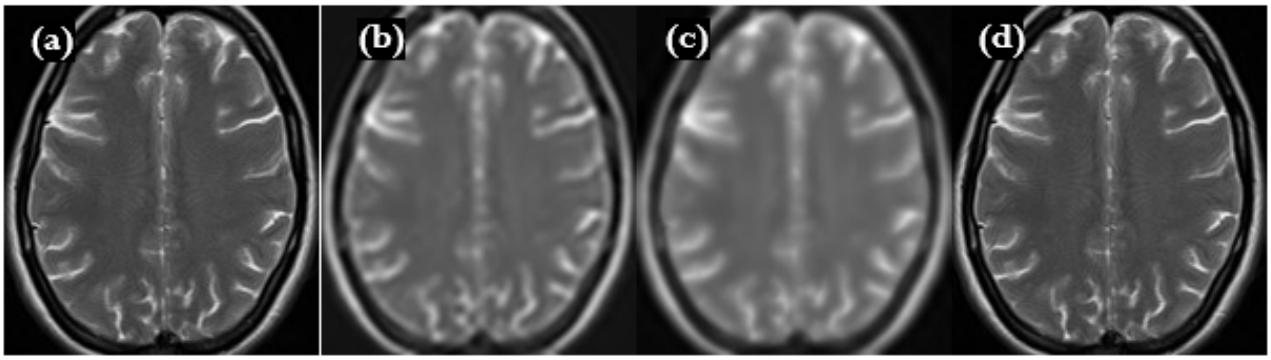

Fig. 5. Comparison with DFT. Image with noise in (a). Removal of the noise by Butterworth k-space and Butterworth Z-space filtering in (b) and in (c). The image after DFT (direct and inverse) in (d) still shows the noise pattern, hence demonstrating that the noise characterized by well-defined formulae still persist after the DFT denoise attempt.

The common denominator of the experiments showed in Fig. 4 and Fig. 5, is that the noise is channelled (becomes the argument) of the Sinc function before k-space filters and Z-space filters remove it. The hypothesis is: if the noise generated through well-defined mathematical functions is the argument of the Sinc function then it can be removed by k-space filtering and Z-space filtering. This hypothesis is disconfirmed in 7 cases out of the total of 18. Hence, the hypothesis cannot be confirmed in full. Whereas, when the noise is obtained by repeated multiplication of the pixel brightness times the Sinc function, k-space filters and Z-space filters remove it.

Two studies were conducted. First, theoretical images (see Fig. 3a for a sample) were corrupted (see Fig. 3b). DFT fails to restore corrupted theoretical images. The k-space filters and the Z-space filters do not fail (see Fig. 3d for a sample). Second, 18 noise patterns were generated artificially using well-defined math formulae and the noise was channelled to the Sinc function. The results of these experiments that use artificially using well-defined math formulae show that DFT fails to restore the image, whereas the k-space filters and the Z-space filters succeed, in restoring the image and cancelling the noise, in 11 cases out of the 18 cases.

DISCUSSION AND CONCLUSION

The Sinc function can be used to calculate the sinogram. This was showed in Fig. 1b. The purposed misuse of the Sinc function determines the corruption effect on the MRI. In such purposed misuse, the Sinc function becomes a multiplicative factor that determines corrupted images like the ones showed in this paper (see for instance Fig. 2c). These corrupted images can be restored (the noise can be successfully cancelled) by Discrete Fourier Transform (DFT), by the k-space filters and by Z-space filters (see Fig. 5 and Fig. 6).

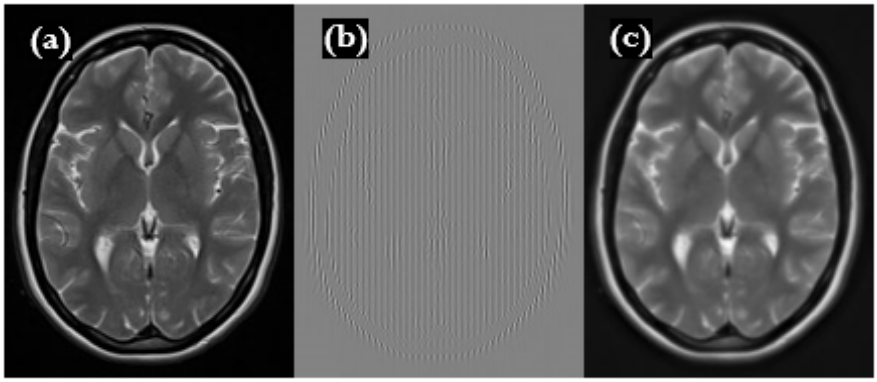

Fig. 6. Sample results obtained using to remove the noise using Chebyshev k-space filtering. The image in (a) is corrupted by successive multiplication times the Sinc function (see (b)), and it is nicely reconstructed after noise cancellation by means of the Chebyshev k-space filtering (see (c)).

In conclusion, as far as regards noise cancellation, k-space filters and Z-space filters are superior to the DFT. However, k-space filters and Z-space filters still fail to remove the noise in some of the cases for which the noise pattern is artificially generated by well-defined math formulae. Fig. 4 shows some successful cases. On

the other hand, k-space filters and Z-space filters successfully restore the image when the noise is determined by repeated multiplication of the image with the Sin function. This aspect is showed in Fig. 4 and in Fig. 6. Overall, the k-space filters and Z-space filters can remove specific noise patters and they are superior to DFT. This paper makes a contribution to the specialized literature [1, 2]. However, results presented in this paper do not fully bring forth light on the reason as to why DFT, k-space filters and Z-space filters remove the noise from the Sinc corrupted 2D images.

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ENHANCING MEDICAL EDUCATION THROUGH CASE-BASED LEARNING: A COMPREHENSIVE REVIEW AND ANALYSIS (CASE OF ALBANIA)

Albana Halili
Department of Medicine, Western Balkans University
Tirana, Albania
albana.halili@wbu.edu.al

Adora Hima
Department of Medicine, Western Balkans University
Tirana, Albania
adora.hima@wbu.edu.al

Ketrina Ceka
Department of Medicine, Western Balkans University
Tirana, Albania
k.ceka23@wbu.edu.al

Jonilda Kulaj
Department of Medicine, Western Balkans University
Tirana, Albania
jonilda.kulaj@wbu.edu.al

Migena Kaceli
Department of Medicine, Western Balkans University
Tirana, Albania
m.kaceli23@wbu.edu.al

ABSTRACT

Case-Based Learning (CBL) is a learning method where students apply their knowledge to real-world scenarios, promoting higher levels of knowledge retention. During a CBL, students typically work in groups and discuss on pre-written and well-structured case studies under the guidance of a facilitator. CBL involves a guided inquiry and is grounded in constructivism. Among CBL advantages, the use of collaborative learning methods, development of intrinsic and extrinsic motivation to learn, integration of knowledge and practice, enhancement of learning skills and critical thinking take place.

This study provides first a comprehensive review of the advantages of using case-based learning in medical education and also involves some qualitative and quantitative data. Questionnaires were shared with medical students and healthcare faculty members to understand and measure the impact of CBL on student engagement, motivation, and knowledge retention. The advantages discussed in this paper include the promotion of critical thinking and problem-solving skills, the enhancement of clinical reasoning abilities, the development of teamwork and communication skills, and the application of theoretical knowledge to real-world scenarios. By examining the benefits of case-based learning, this article aims to emphasize the importance of

incorporating for the first time in Albania, at Western Balkans University, this innovative pedagogical approach into medical education curricula to prepare better healthcare professionals for the clinical practice complexities. Learning with CBL provides the students a dynamic learning experience.

In summary, case-based learning (CBL) is an effective educational approach in medical education and it provides a dynamic learning experience for students.

KEYWORDS: CBL, medical education, critical thinking, student engagement

INTRODUCTION

Case-based learning (CBL) has emerged as a prominent educational method in medical training, drawing attention for its proven effectiveness in cultivating vital skills such as critical thinking, problem-solving abilities, and clinical reasoning among students. This teaching approach involves presenting students with actual or hypothetical patient cases, encouraging them to analyze the clinical scenario, generate hypotheses, and device management strategies using the provided information. The attractiveness of CBL stems from its capacity to replicate genuine clinical experiences, offering learners a contextually immersive setting to translate theoretical understanding into real-world scenarios.

Case-Based Learning (CBL) is a pedagogical approach that holds promise in transforming medical education by associating theoretical knowledge with practical application through real-world scenarios. CBL engages students in active learning where they collaborate in groups to analyze and discuss pre-written case studies under the guidance of a facilitator. This method enhances knowledge retention and fosters students' critical thinking, problem-solving skills, and clinical reasoning abilities (Thistlethwaite JE, Davies D, 2012).

The advantages of CBL are manifold, encompassing the promotion of teamwork and communication skills, integration of knowledge and practice, and case analysis (H Wang, 2021). In the context of medical education, where the ability to apply theoretical knowledge to complex clinical scenarios is paramount, CBL emerges as a pivotal tool for preparing future healthcare professionals.

Despite its recognized benefits, the implementation of CBL in medical curricula varies across different educational settings. This study aims to contribute to the existing literature by providing a comprehensive review of the advantages associated with CBL in medical education. Specifically, the research explores its impact on student engagement, motivation, and knowledge retention by administering questionnaires to medical students and healthcare faculty members.

In summary, this paper underscores the effectiveness of Case-Based Learning (CBL) as a transformative educational approach in medical education, emphasizing its potential to provide students with a dynamic and holistic learning experience.

METHODOLOGY

This study explores the advantages of Case-Based Learning in medicine from the perspective of 55 first-year medical students. By assessing their perceptions and recommendations through a structured questionnaire, this research seeks to emphasize the importance of incorporating Case Based Learning for the first time in Albania, at Western Balkans University.

First year medicine students of WBU were asked to complete an online questionnaire. This method was chosen because questionnaires are a great tool for data collection from a large number of participants. In the context of studying perceptions and recommendations of first-year medical students, this method enables researchers to gather insights within a relatively short time frame.

By using standardized questions, a questionnaire ensures consistency in the data collection process. Participants may feel more comfortable providing more honest responses while answering the questionnaire. This study uses a mixed-method research approach to comprehensively explore the advantages of Case-Based Learning in first year students of medicine. The quantitative component involves administering a

structured questionnaire to first-year medical students, to quantitatively measure students' perceptions of CBL, including their satisfaction levels, perceived effectiveness, and preferences for specific aspects.

The questionnaire includes Likert scale items to assess students' agreement or disagreement with statements about CBL. In addition to quantitative responses, participants provided open-ended comments. These comments invited students to elaborate on their experiences with CBL, offer suggestions for improvement, and provide qualitative data on their perceptions that may not be captured by quantitative scales.

By integrating both quantitative and qualitative data, this approach allows for a comprehensive exploration of the advantages of CBL. It provides a richer understanding of students' perceptions, preferences, and experiences.

Overview of existing studies on Case-Based Learning in medical education

Within medical education research, numerous studies have delved into the efficacy and impact of CBL across various domains. These investigations span assessments of its effectiveness compared to traditional didactic methods, exploration of its influence on long-term knowledge retention and clinical reasoning abilities, evaluations of student satisfaction and engagement, investigations into optimal implementation strategies, and examinations of its utility in fostering interprofessional collaboration. Additionally, a growing body of research examines integrating technology-enhanced CBL modalities, such as virtual patient simulations, into medical curricula. Overall, these studies collectively contribute to our understanding of the role of CBL in medical education and offer insights into best practices for its implementation.

To gain a comprehensive grasp of the CBL methodology, we must explore the previous studies conducted on it and analyze their outcomes. By examining these studies, we can identify key characteristics and benefits that would greatly enhance our understanding and application of this approach.

A great first example of an insightful study would be BEME Guide No. 23. The study conducted by Thistlethwaite JE, Davies D, Ekeocha S, et al. and published in Medical Teacher in 2012 provides a comprehensive examination of the effectiveness of case-based learning (CBL) within health professional education. This systematic review, known as BEME Guide No. 23, encompasses an array of health professions, with a particular focus on its application in medicine. By synthesizing evidence from diverse sources, including empirical research studies, the review offers valuable insights into the impact of CBL on learning outcomes, knowledge retention, and clinical skills development among students in various healthcare disciplines. Through rigorous analysis and synthesis of existing literature, this study contributes to our understanding of the efficacy of CBL as a pedagogical approach in preparing future healthcare professionals for clinical practice. [3] Complementing these findings, Schmidt, H. G., Norman, G. R., and Boshuizen, H. P. wrote an article named, 'A cognitive perspective on medical expertise'. Importantly, the research discusses the role of case-based learning (CBL) as a pedagogical tool in bolstering cognitive processes. Through the presentation of authentic patient cases, CBL provides learners with opportunities to engage in active problem-solving, hypothesis generation, and decision-making—mimicking the real-world challenges encountered in clinical practice. Thus, this study underscores the transformative potential of CBL in honing the clinical reasoning abilities of future healthcare professionals, thereby enriching medical education and enhancing patient care outcomes. [4]

However, it is important to not only analyze CBL as a methodology, but also try to comprehend this approach through the eyes of a student. To this, the study conducted by Dolmans DHJM et al: 'Solving problems with group work in problem-based learning: hold on to the philosophy', is incredibly important. The study delves into the realm of student perceptions regarding group work within problem-based learning (PBL) settings. Recognizing the parallels between PBL and case-based learning (CBL) in their emphasis on student-centered, small-group methodologies, the research offers valuable insights applicable to both pedagogical approaches. Through a meticulous exploration of student experiences and attitudes towards collaborative problem-solving activities, the study unveils the multifaceted dynamics of group work in fostering engagement and satisfaction among learners. Importantly, the study underscores the importance of preserving the foundational principles of student autonomy and active learning inherent in both PBL and CBL methodologies. Through its nuanced examination of student perspectives, this study enriches our understanding of the intricate interplay between group dynamics, learning outcomes, and student satisfaction in student-centered educational environments. [5]

Although exceptionally helpful, CBL is not yet a perfect methodology. The study authored by Azer SA, published in Medical Teacher in 2005, delves into the challenges encountered by tutors facilitating problem-based learning (PBL) sessions, offering invaluable insights applicable to the broader context of small-group, case-based learning (CBL). While the primary focus is on PBL, the study's findings resonate with educators involved in facilitating similar student-centered, collaborative learning experiences, such as CBL. Through a systematic examination of the obstacles faced by tutors, the research sheds light on the common barriers that impede effective facilitation of small-group sessions. These challenges encompass a myriad of factors, including group dynamics, learner engagement, time management, and the balance between guidance and autonomy. By identifying these hurdles, the study equips educators with a deeper understanding of the complexities inherent in facilitating student-centered learning environments. Furthermore, the research offers practical tips and strategies for tutors to navigate these challenges successfully, enhancing their effectiveness in guiding meaningful discussions and fostering productive learning experiences. Thus, while rooted in the context of PBL, this study provides valuable insights into the universal challenges faced by tutors facilitating small-group, case-based sessions, thereby informing efforts to optimize the facilitation of CBL within medical education. [6]

Comparison of Case-Based Learning with traditional lecture-based methods

In the ever-changing world of education, the choice of teaching methodologies plays a vital role in shaping students' learning experiences and outcomes. Among the many approaches available, two methods stand out as the most commonly used and impactful: case-based learning (CBL) and traditional lecture-based methods. Both approaches offer distinct advantages and have been essential components of educational practices across various disciplines. Understanding the distinctions of each method and their implications for student learning is integral for educators as well as educational policymakers alike.

The traditional teaching method focuses on lecture-based instruction, with the primary emphasis on delivering the syllabus and explaining concepts. In traditional teaching, the professor explains theoretical concepts whereas the students tune in and take notes, often without actively engaging with the material. This approach can be particularly difficult for students in medical education world, as the content is usually dense, lengthy, and requires significant memorization, which can lead to decreased motivation and inadequate self-study skills. Research indicates that traditional methods are often less effective than alternative teaching strategies in developing practical application and critical thinking skills. [14]

Case-based learning (CBL) is a dynamic learning procedure, student-centered approach that emphasizes active learning. Case-based promotes a community-based, student-focused exploration of real life scenarios. Students concentrate on the patient's case, engage in self-directed learning, logical request and collaboration with peers. This enhances their critical thinking and clinical problem-solving abilities while integrating theoretical knowledge with practical application. CBL offers a practical framework that helps students connect academic knowledge to professional practice.[14]

In contrast to traditional educational methods, Case-Based-Learning (CBL) offers a few advantages. Firstly, CBL engages students more actively in their learning process, whereas traditional teaching methods may result in passive participation and reduced attention in class. Furthermore, CBL enhances the application and integration of knowledge, encourages collaboration with peers, and develops problem-solving skills opposed to merely delivering content in a teacher-centered approach. Additionally, the CBL format facilitates feedback on case studies and opportunities for discussions with experts, which is often lacking in traditional lectures that provide minimal feedback on student comprehension. Additionally, CBL is recognized for its ability to encourage a more profound grasp of material and advanced learning. Unlike traditional lectures, which often involve rote memorization, CBL enables students to better understand and apply knowledge to new and diverse contexts. Overall, these benefits highlight how CBL offers a more dynamic and effective approach to education, fostering active participation, critical thinking, and practical application of knowledge compared to traditional didactic methods.

Discussion of the benefits of case-based learning in developing clinical reasoning and problem-solving skills

Clinical Reasoning is one of the key skills to be taught before the transition into the clinic. Diagnostic error rates continue to be high and reflect deficits in both knowledge and reasoning skills. Training in clinical reasoning improves students' capability to apply theoretical knowledge to practical clinical issues, which is essential for effective teamwork in clinical settings. It would be highly beneficial to implement a transition-stage teaching

approach that simultaneously addresses both weaknesses. It has been reported that some forms of CBL have been found to be more beneficial than didactic teaching because it engages students and promotes the development of reflective thinking and motivation. Training students to approach problems with a clinical perspective before they begin their clinical placements, creates opportunities for both vertical and horizontal curriculum integration, ultimately supporting the development of competencies needed for professional practice. [15]

Another advantage of CBL is deeper learning. This type of learning is more in line with behavioral changes, evidence of critical thinking, or the capacity to generalize learned concepts to other situations than it is with merely knowing the right answers. This CBL feature was covered in a few papers. One paper was conducted at the Mayo Clinic, a tertiary care facility, as a teaching model for quality improvement and patient adverse event prevention. The course was postgraduate or continuing education, and the students were clinicians. Three cases that illustrate the most typical patient adverse event type in internal medicine were included in an online CBL module developed by writers from the departments of quality improvement, information technology, and medical education.

The research utilized Kirkpatrick's outcomes hierarchy to evaluate the level of critical thinking following the CBL intervention. While measuring behavioral changes is more challenging, it was assessed through a survey designed to gauge the depth of critical reflection among physicians participating in the Quality Improvement course. The survey included questions to determine their level of reflection, from routine actions to more profound changes based on the cases studied. The findings indicated that physicians had the lowest scores in achieving higher levels of reflective thinking, although their reflection scores were linked to their perceptions of the cases' relevance and generalizability. This study was the first to assess physicians' reflections after a CBL module on adverse events, suggesting that deeper learning is more likely to result in behavioral changes. [16]

Examination of the impact of Case-Based Learning on student engagement and motivation

The impact of CBL on student engagement and motivation has been a focal point of numerous research in the educational field, because of the potential it holds to completely transform the way that we teach. Unlike traditional teaching methods, which often leave students as passive listeners, CBL gets students actively involved in solving real-world problems. This hands-on approach has been found to significantly boost engagement. When students dive into practical scenarios, they aren't just soaking up information; they're actively participating in their learning journey. This level of involvement leads to a genuine interest in the material, making students more connected to what they're learning and keeping their motivation high throughout the course.

Research conducted by Raza, S. A., Qazi, W., and Umer, B. in 2019 is particularly relevant to these claims. The research findings revealed that learning through case studies boosts student engagement. Statistically significant and positive correlations were found between case-based learning and all four types of engagement, i.e. behavioral, emotional, cognitive and agentic engagement. According to the findings, case-based learning help students grasp classroom concepts, develop skills and enhance their motivation to learn. [17]

Another study done by Nana Sartania, Sharon Sneddon, James G. Boyle, et al. in 2022, showed that both students and facilitators responded favorably to the transition to case-based collaborative learning (cCB). The study revealed that this approach boosted student participation and improved the consolidation and integration of broader subject matter. Additionally, participants noted that cCBL sessions increased discussions and encouraged deeper learning. Facilitators found the more structured cCBL sessions the easier were to facilitate. [10]

Review of evidence supporting the effectiveness of Case-Based Learning in improving knowledge retention and application

The debate about how best to help students remember and apply what they learn is ongoing, but case-based learning (CBL) is emerging as a powerful tool in this area. Unlike traditional lectures, where students often passively absorb information, CBL throws students into real-life scenarios where they must use what they've learned to solve problems. This hands-on approach not only helps students understand the material more deeply but also seems to make it stick better over time. In this review, we'll dive into the evidence showing how CBL enhances knowledge retention and application, offering a closer look at why this method might be a game-changer for effective learning.

The study conducted by Yaying Zhao, and Wenfang Liu in 2021 is particularly relevant to our discussion as it provides an analysis of the CBL teaching method in the aspect of the rate of achievement, practical ability, and psychological effect.

This study evaluates the clinical case-based learning (CBL) teaching method by examining its impact on achievement rates, practical skills, and psychological effects. Eighty-six medical students were randomly assigned to either the CBL group or a control group, with the control group receiving traditional instruction and the CBL group participating in case-based learning. The study compared changes in practical skills at three stages: early (T1), middle (T2), and late (T3) learning. Teachers assessed students' psychological quality through their movements and expressions during practice. Following the instruction, a questionnaire was administered to gauge students' future planning, career readiness, and teamwork skills. After the internship, the compliance rates were evaluated, showing a higher compliance rate in the CBL group (90.70%) compared to the control group (72.09%) ($\chi^2 = 4.914$, P=0.027). Both groups showed poor practical skills before the practice, but improvements were noted post-instruction ($P < 0.05$). The CBL group demonstrated significantly better time management skills in the middle and late stages compared to the control group ($P < 0.05$). Significant differences were observed between the two groups in terms of vocational assistance, role development, clinical practice skills, and team spirit ($P < 0.05$). The findings suggest that the CBL teaching model effectively enhances medical students' success rates, clinical practice abilities, psychological quality, resilience in professional roles, and team cooperation. [1]

Another study providing evidence to support the effectiveness of case-based learning was conducted by Ekta A. Dalal and Rama Kaja in 2019. This study concluded that in data analysis, there was significant improvement in the average marks secured by the CBL group when compared to the traditional group ($p<0.001$). Feedback of students suggested that CBL sessions were more useful for confidence and retention of knowledge (94%). Feedback of faculties suggested that CBL did not increase their workload and should be useful for other topics in pediatrics. The present study concludes that the CBL method generates interest in students to learn new things. Learning and remembering the subject is much easier when you link it to real-life patient cases and get confidence for clinical practice. [2]

The findings suggest that CBL is associated with improved knowledge retention and application compared to traditional lecture-based methods. Several studies reported higher scores on post-intervention assessments among students exposed to CBL. Additionally, students expressed a preference for CBL due to its interactive nature and relevance to clinical practice.

However, it is important to note that the effectiveness of CBL may vary depending on factors such as case complexity, facilitator expertise, and institutional support. Future research should explore optimal strategies for implementing CBL and assess its long-term impact on clinical performance.

Advantages of Case-Based Learning in Medical Schools

Previous research has revealed significant benefits of case-based learning (CBL) and problem-based learning (PBL) approaches in developing critical clinical reasoning and problem-solving skills among medical students.

The small group format and dedicated facilitators in CBL are advantageous for student learning and participation as compared to large team-based learning (TBL) classes. In the CBL setting, the continued guidance and feedback from clinical experts help students identify knowledge gaps and enhance their clinical reasoning abilities around real-life clinical cases. In the smaller groups, students seemed more motivated to participate and discuss their thought processes, which was not always the case in the larger classes. [7].

Regarding the benefits of the PBL approach, it's important to note that PBL has significantly improved students' problem-solving skills. [8]. Comparing PBL to traditional teaching, the former has been far more successful in developing students' critical thinking and problem-solving abilities, while the latter has been more successful inimproving content knowledge acquisition. The complementary nature of these approaches suggests using a balanced approach, integrating both PBL and traditional teaching methods [9].

CBL is found to increase student engagement and motivation, improve communication and collaboration skills, enhance the application of knowledge to real-life scenarios, and increase the attention span of students. The interactive and contextual nature of CBL and PBL approaches can provide medical students with valuable

opportunities to develop their critical thinking, problem-solving, and communication skills. As a result, these students will be well-prepared for clinical practice. [10-13].

RESULTS

The questionnaire comprises both quantitative and qualitative data components aimed at gaining deeper insights into students' perspectives on case-based learning (CBL). Specifically, Likert scale items are incorporated to gauge students' agreement or disagreement with statements about CBL. When queried about their familiarity with case-based learning on a scale ranging from 1 to 5, results indicate that 5.5% of respondents were not familiar, 3.6% were slightly familiar, and 7.3% held a moderate level of familiarity. Notably, 20% of students indicated a substantial familiarity, while the majority (60%) reported being highly acquainted with CBL, as illustrated in Figure 1.

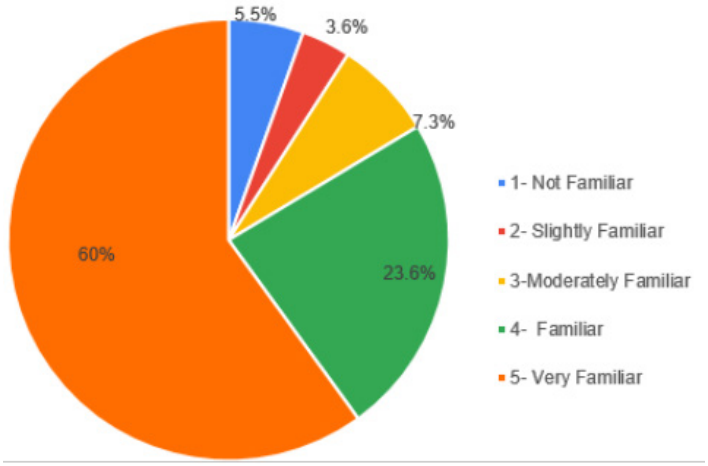

Fig. 1. Familiarity with Case Based Learning: Likert Scale Responses.

The survey sought to assess the perceived impact of case-based learning (CBL) on critical thinking skills within medical education. Responses indicate a strong consensus among participants regarding the effectiveness of CBL in this regard. Specifically, 45% of respondents expressed a strong agreement with the notion that CBL enhances critical thinking skills, while an additional 44% agreed to a somewhat lesser extent. A small proportion, comprising 7%, remained neutral on the matter, suggesting a balanced perspective. Only 4% of respondents disagreed with the proposition that CBL contributes positively to the development of critical thinking skills. These findings highlight a widespread belief among respondents in the educational value of CBL for fostering critical thinking abilities in medical education contexts.

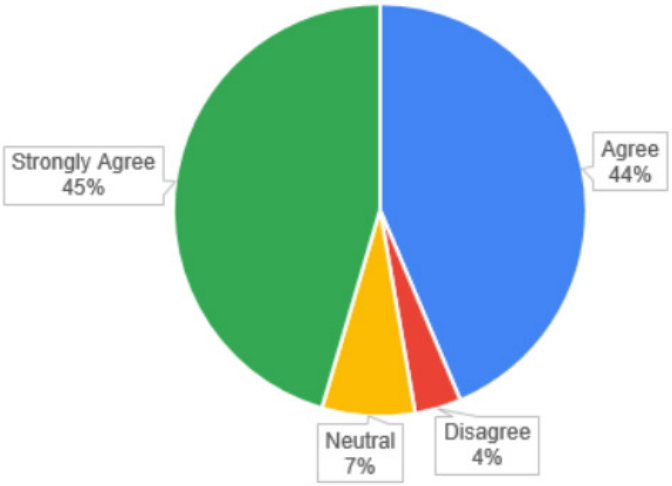

Fig. 2. Student Views on the Impact of Case-Based Learning

Figure 3 presents the distribution of students' opinion regarding the key advantages of using case-based learning in medical education compared to traditional lecture-based approaches. According to the data a significant majority of respondents 76.4% identify that a key advantage of using Case-Based Learning is teamwork. Additionally, 74.5% of respondents acknowledge critical thinking, while 70.9% highlight clinical reasoning and problem-solving capabilities. Furthermore, 65.5% underscore the importance of enhanced communication skills facilitated by CBL, with 80% emphasizing its efficacy in fostering knowledge application.

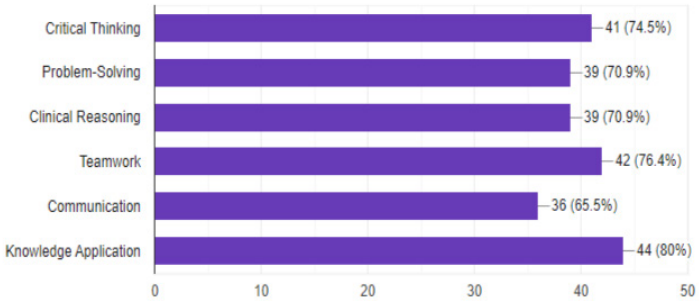

Fig. 3. Distribution of students' opinion on key advantages of Case-Based Learning.

When asked about their engagement in learning through case-based learning (CBL) compared to other teaching methods, respondents indicated varying degrees of preference. A significant majority, comprising 71% of participants, expressed feeling more engaged with CBL. Another 22% responded with a more ambivalent stance, suggesting that their engagement levels may vary depending on context or specific factors. Conversely, a minority of 7% reported feeling less engaged with CBL compared to alternative teaching methods. These findings underscore the perceived benefits of CBL in fostering higher levels of student engagement, with some variability in individual responses.

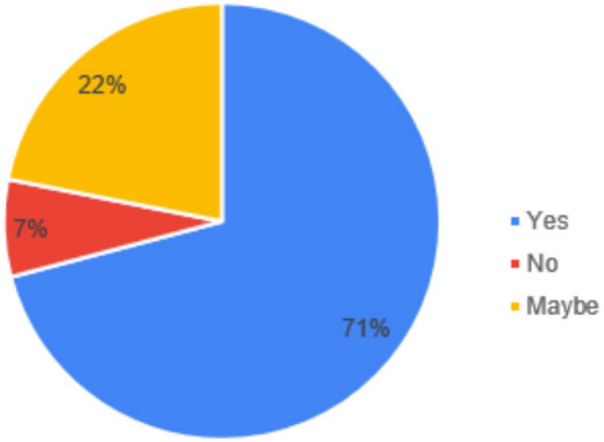

Fig. 4. Engagement in learning through Case-Based Learning

In summary, case-based learning (CBL) stands out as a transformative approach in medical education, offering a dynamic and interactive platform for students to integrate and apply theoretical knowledge in practical contexts. By fostering critical thinking, enhancing clinical reasoning, and bridging the gap between classroom learning and real-world application, CBL not only enriches the educational experience but also better prepares future healthcare professionals for the complexities of clinical practice. As medical education continues to evolve, embracing and optimizing case-based learning can significantly contribute to the development of competent, adaptable, and reflective practitioners, ultimately advancing the quality of patient care and outcomes.

Photos of students taking part in Case-Based Learning

The photographs show students actively engaged in the process of case-based learning (CBL). Each image captures moments where students are deeply involved in analyzing clinical cases, discussing potential diagnoses, and collaboratively exploring treatment strategies. In one photograph, a group of students gathers

around a whiteboard, brainstorming and debating various aspects of a medical case study. Another image shows students engaged in animated discussions, gesturing and pointing at relevant data on their laptops. These snapshots vividly illustrate the dynamic and interactive nature of CBL, showcasing its role in fostering critical thinking, teamwork, and clinical reasoning among future healthcare professionals.

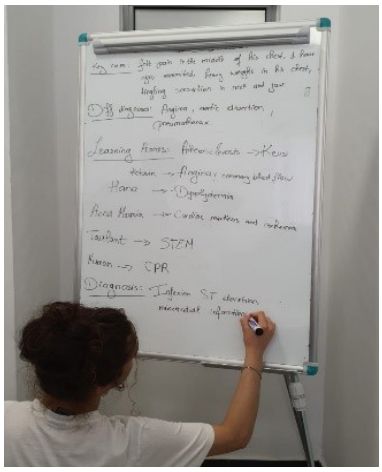

Fig. 5, 6, 7. Photos of students taking part in Case-Based Learning

CONCLUSION

Case-Based Learning (CBL) has emerged as a highly effective and transformative pedagogical approach in medical education, providing a dynamic and interactive framework for students to integrate theoretical knowledge with practical application. This study, incorporating both qualitative and quantitative data, elucidates the substantial benefits of CBL, including enhanced critical thinking, improved clinical reasoning, and the cultivation of essential teamwork and communication skills.
By engaging students in real-life scenarios requiring the application of their knowledge to solve complex problems, CBL significantly deepens their understanding and promotes better long-term retention of the material. Recent evidence underscores CBL's efficacy in augmenting knowledge retention, fostering critical thinking, and refining clinical reasoning skills.

The survey results reveal strong support for CBL's role in fostering deeper engagement and motivation among students, with a significant majority acknowledging its advantages over traditional lecture-based methods. A substantial majority of respondents recognize CBL's advantages over traditional lecture-based methods, highlighting its effectiveness in creating a more engaging learning environment.

By incorporating CBL into the medical education curriculum at Western Balkans University in Albania, we can better equip future healthcare professionals to navigate the complexities of clinical practice with greater competence and confidence. The findings emphasize the value of CBL in preparing students to meet the demands of modern healthcare environments, ultimately contributing to improved patient care and outcomes.

The advantages of CBL extend beyond individual learning gains; it fosters essential skills such as teamwork, communication, and problem-solving, which are crucial for effective clinical practice.

Overall, integrating CBL into medical curricula represents a strategic advancement in the development of competent, adaptable, and reflective healthcare professionals. As medical education continues to evolve, leveraging the strengths of CBL will enhance the preparedness of practitioners and contribute to better patient care and outcomes, marking a significant evolution in medical training methodologies.

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ASSESSING THE IMPACT OF FOURTH-GENERATION UNIVERSITIES ON HIGHER EDUCATION: A MULTI-DIMENSIONAL FRAMEWORK

Edlira Mali
Beder University
Rr. Jordan Misja, Tiranë, Albania
emali@beder.edu.al

ABSTRACT

Fourth-Generation Universities represent a paradigm shift in higher education, characterized by a strong emphasis on innovation, entrepreneurship, and community engagement. This paper proposes a novel multi-dimensional framework to assess the effectiveness of Fourth-Generation Universities in cultivating these critical skills and contributing to societal progress. The framework encompasses five key dimensions:

1. Entrepreneurial Curriculum & Pedagogy: How the curriculum and teaching methods are designed to equip students with entrepreneurial skills and knowledge.
2. Entrepreneurial Ecosystem & Student Support: The resources and support structures provided by the university to help students develop their entrepreneurial ideas and ventures.
3. Research & Innovation: The focus of research on addressing regional challenges and fostering innovation that benefits the region.
4. Industry Collaboration & Knowledge Transfer: The partnerships with industry partners to ensure the curriculum is relevant and research findings are translated into practical applications.
5. Community Engagement: The university's active participation in initiatives that address the social and economic needs of the local community.

By integrating these elements, the framework offers a holistic understanding of Fourth-Generation Universities' impact, enabling a comprehensive evaluation of their performance. This research contributes to the ongoing dialogue on effective higher education models, providing a valuable tool for universities to assess and refine their strategies to foster a new generation of innovative and entrepreneurial graduates.

The study aims to identify the key components of each dimension, examine their interrelationships, and assess their impact on student outcomes and institutional performance. Ultimately, the framework will serve as a benchmark for universities seeking to excel in the fourth generation of higher education.

KEYWORDS: Fourth-Generation Universities, Multi-Dimensional Framework, Entrepreneurship Education, Social Innovation, Innovative Pedagogy, Inclusive Education, Industry Collaboration words

INTRODUCTION

The traditional role of universities as isolated repositories of knowledge has undergone a significant transformation in recent decades. The emergence of the 'multiversity' model, characterized by a diversification of activities beyond teaching and research, marked a pivotal shift in higher education. This evolution has been driven by societal and economic changes, as outlined in the 'New Economics of Higher Education' (Clark, 2003). The subsequent emphasis on the 'knowledge economy' and the 'triple helix' model (Etzkowitz, 2016) further accelerated the transformation of universities into engines of innovation and economic growth.

Building on these foundations, the concept of the fourth-generation university has emerged to capture the evolving role of higher education institutions. These universities are characterized by a strong emphasis on societal impact, entrepreneurship, and innovation. Fourth-generation universities are characterized by a strong emphasis on societal impact, entrepreneurship, and innovation. They extend beyond the traditional boundaries of academia, engaging with industry, government, and the community to create value and drive change. These institutions prioritize student-centered learning, experiential education, and the development of entrepreneurial skills. Moreover, they play a crucial role in addressing societal challenges and contributing to sustainable development. However, despite the growing interest in fourth-generation universities, there is a lack of a comprehensive framework for assessing their impact.

This paper aims to address this gap by proposing a multidimensional framework for evaluating the performance of fourth-generation universities. By examining key dimensions such as entrepreneurial curriculum and pedagogy, entrepreneurial ecosystem and student support, innovative research, industry collaboration, and community engagement, this study seeks to provide a holistic understanding of these institutions' contributions to society.

The framework will be developed through a combination of literature review, expert interviews, and case studies. By analyzing the existing body of research and gathering insights from key stakeholders, this study will identify the critical factors that contribute to the success of fourth-generation universities. Ultimately, this research seeks to inform policymakers, university administrators, and other stakeholders in their efforts to enhance the performance of higher education institutions.

METHODOLOGY

Given the exploratory nature of the research aimed at developing a multidimensional framework for assessing fourth-generation universities, a mixed-methods approach is employed. This approach combines quantitative and qualitative research methods to provide a comprehensive understanding of the complex phenomenon under investigation.

While the primary focus of this paper is on framework development, quantitative data include analysis of publications related to fourth-generation universities, entrepreneurial universities, and university impact in addition to analysis of existing university databases for relevant information on student outcomes, research output, and industry partnerships.

On the other hand, qualitative data include extensive literature review on fourth-generation universities, entrepreneurial universities, and university impact assessment frameworks, expert inputs from academics, industry representatives, and policymakers involved in higher education, document analysis of university policies, strategies, and reports related to innovation, entrepreneurship, and community engagement.

The proposed multidimensional framework will be developed through a systematic literature review and expert consultation. The framework will be refined based on emerging themes and patterns identified in the data. To ensure the validity and reliability of the framework, expert feedback will be sought.

This study primarily focuses on conceptual framework development rather than large-scale empirical testing. While illustrative data may be incorporated to support the framework, its core purpose is to provide a theoretical foundation for future research. Future research should focus on empirical testing of the framework to assess its predictive validity and utility for policymakers and university administrators.

By combining literature review, expert input, and preliminary data analysis, this study aims to develop a robust and comprehensive framework for assessing fourth-generation universities.

Conceptual Overview of the Fourth-Generation University

The concept of the fourth-generation university has emerged as a response to the evolving demands of society and the economy. Characterized by a strong emphasis on innovation, entrepreneurship, and societal impact, these institutions are redefining the role of higher education.

The concept of university generations is a useful framework for understanding the evolution of higher education. While the notion of a fourth generation is relatively new, studies by Zuti and Lukovics (2017), and Bajmócy, Lukovics, & Vas (2009) provide foundational insights into the key characteristics of these institutions.

Oztel (2020) highlights the critical role of fourth-generation universities in achieving the United Nations Sustainable Development Goals. By operating as open environments that foster collaboration between diverse stakeholders, these universities can address complex global challenges. Efinov & Lapteva (2017) further emphasize the importance of the fourth-generation university as a platform for communication, research, and innovation, extending beyond traditional boundaries.

A cornerstone of the fourth-generation university is its commitment to co-creation. By collaborating with communities, businesses, and policymakers, these institutions can develop innovative solutions to local and global challenges. This approach, as highlighted by Oztel (2020), requires interdisciplinary collaboration and the integration of sustainability principles across all university operations.

Central to the realization of the fourth-generation university model is a fundamental shift in assessment practices. Traditional methods, often reliant on summative examinations, are increasingly recognized as inadequate for capturing the breadth and depth of student learning outcomes. Knight and Drysdale (2020) advocate for a paradigm shift towards more authentic and ongoing assessment methods that align with the competencies required for success in the 21st century.

The evolution of the university from its traditional role as a teaching and research institution to a more entrepreneurial and community-engaged model is reflected in the work of scholars such as Etzkowitz and Leydesdorff (2016) with the concept of ‘Triple Helix of innovation’, Elias G. Carayannis and David F.J. Campbell (2009) with the concept of ‘Quadruple Helix’, Slaughter and Rhoades (2010) and Zuti and Lukovics (2015). While these foundational works provide insights into the commercialization of university research and the impact of neoliberal policies, more recent studies by Marginson (2018) and Charles, Ahoba-Sam, Manrique, & Nieth (2021) offer nuanced perspectives on the role of universities in the knowledge economy and regional development.

Assessing the impact of fourth-generation universities requires sophisticated methodologies. This concept has significantly evolved since the early works of Benneworth and Knight. Recent studies have emphasized the need for comprehensive and context-specific impact assessments. (Arroyo, 2016) and Bain & Cummings (2021) analysis of the challenges and opportunities in assessing the impact of higher education in the knowledge economy highlights the complexities involved.

Community engagement is increasingly recognized as a critical component of higher education. Universities are moving beyond their traditional role of knowledge creation and dissemination to become active participants in community development. By collaborating with local stakeholders, institutions can contribute to addressing societal challenges, fostering economic growth, and enhancing the quality of life for residents. (Bernstein, 2023; Hedin, 2009)

By integrating these perspectives, it is evident that fourth-generation universities are complex entities that require a multifaceted approach to assessment. The following sections will delve deeper into the key dimensions of these universities and explore their implications for higher education policy and practice.

Introducing the Multi-Dimensional Framework for Fourth-Generation Universities impact assessment

This study proposes a multi-dimensional framework that considers five key areas:

- **a**. Entrepreneurial Curriculum & Pedagogy: How the curriculum and teaching methods are designed to equip students with entrepreneurial skills and knowledge.
- **b.** Entrepreneurial Ecosystem & Student Support: The resources and support structures provided by the university to help students develop their entrepreneurial ideas and ventures.
- **c.** Research & Innovation: The focus of research on addressing regional challenges and fostering innovation that benefits the region.
- **d.** Industry Collaboration & Knowledge Transfer: The partnerships with industry partners to ensure the curriculum is relevant and research findings are translated into practical applications.
- **e.** Community Engagement: The university's active participation in initiatives that address the social and economic needs of the local community.

A comprehensive assessment of fourth-generation universities requires a multidimensional framework that captures the complexity and interconnectedness of their key features. This framework aims to provide a holistic understanding of Fourth-Generation Universities' performance by examining five core dimensions. The selection of these dimensions is grounded in the extensive literature on higher education, entrepreneurship, and regional development. Each dimension represents a critical aspect of fourth-generation universities and contributes to their overall impact. The framework is designed to be flexible and adaptable to different institutional contexts and national settings. By examining these dimensions, we can we can comprehensively understand the multifaceted ways fourth-generation universities contribute to positive change.

By focusing on these dimensions, the framework provides a structured approach to evaluating the performance of Fourth-Generation Universities and identifying areas for improvement.

a. Entrepreneurial Curriculum & Pedagogy: How the curriculum and teaching methods are designed to equip students with entrepreneurial skills and knowledge.

The integration of entrepreneurial skills and knowledge into the curriculum is fundamental to cultivating a culture of innovation and enterprise within universities. This dimension encompasses a holistic approach that encompasses various pedagogical strategies and assessment methods.
To foster a broad-based entrepreneurial mindset, universities must embed entrepreneurial thinking across diverse academic disciplines. This involves integrating entrepreneurial modules or courses into existing curricula, such as incorporating business planning into engineering programs or design thinking into humanities courses. By infusing entrepreneurial concepts into core subjects, institutions can equip students with a holistic understanding of the entrepreneurial process.

Practical experience is indispensable for developing entrepreneurial competencies. Universities should provide ample opportunities for students to apply their knowledge through internships, co-op placements, and industry projects. Experiential learning initiatives, such as live projects, case studies, and business simulations, can create immersive learning environments where students can develop problem-solving, decision-making, and teamwork skills.

Beyond skill development, universities must foster an entrepreneurial mindset among students. This involves creating a culture that encourages risk-taking, creativity, and innovation. Mentorship programs, entrepreneurial clubs, and competitions can provide students with the support and inspiration needed to pursue entrepreneurial endeavors. Furthermore, incorporating design thinking principles into the curriculum can enhance students' ability to identify opportunities and develop innovative solutions.

To measure the effectiveness of entrepreneurial education, universities should employ a variety of assessment methods. Traditional exams may not adequately capture the full range of entrepreneurial competencies. Alternative assessments, such as portfolios, pitch competitions, and business plan competitions, can provide a more comprehensive evaluation of students' entrepreneurial abilities. Additionally, peer assessment and self-assessment can foster critical reflection and self-directed learning.

By integrating entrepreneurial education into the core curriculum, providing experiential learning opportunities, and adopting innovative assessment methods, universities can equip students with the necessary skills and mindset to become successful entrepreneurs or innovative leaders in various fields.

b. Entrepreneurial Ecosystem & Student Support: The resources and support structures provided by the university to help students develop their entrepreneurial ideas and ventures.

A thriving entrepreneurial ecosystem is essential for nurturing innovation, creativity, and risk-taking among students. It encompasses a complex interplay of resources, infrastructure, and cultural factors that support the development of new ventures. Universities play a pivotal role in shaping this ecosystem by providing the necessary support services and infrastructure to foster student entrepreneurship.

At the core of a successful entrepreneurial ecosystem are robust support networks, which play a crucial role in building capacity, sharing knowledge, and fostering adaptability within and across regions. These networks facilitate the transfer of best practices and enhance responsiveness to local needs. (Ginger, 2024)

Mentorship programs, which pair students with experienced entrepreneurs and industry professionals, offer invaluable guidance and support. These programs can be structured formally, with assigned mentors, or informally, through networking opportunities. Additionally, the presence of entrepreneurial role models within the university community can inspire students to pursue their ventures.

Incubators and accelerators are essential components of a vibrant entrepreneurial ecosystem. These programs provide physical space, resources, and mentorship to help student start-ups grow and develop. By offering access to shared office space, equipment, and networking opportunities, incubators, and accelerators create a collaborative environment that fosters innovation.

Financial support is crucial for early-stage ventures. Universities can play a role in providing seed funding, grants, and angel investment opportunities. Furthermore, establishing connections with external investors and venture capitalists can help students secure the necessary capital to scale their businesses.

Student organizations dedicated to entrepreneurship play a vital role in creating a supportive community. These organizations can organize workshops, competitions, and networking events, allowing students to learn from peers and build relationships with potential collaborators.

To maximize the impact of the entrepreneurial ecosystem, universities must offer a range of support services. Career counseling, entrepreneurial education, and psychological support are essential for addressing the challenges faced by student entrepreneurs. By providing comprehensive support, universities can increase the likelihood of student success.

Assessing the effectiveness of the entrepreneurial ecosystem requires the use of appropriate metrics, which may include: the number of student-founded startups, the amount of funding raised by student ventures, the job creation impact of student ventures, the number of students participating in entrepreneurial activities, student satisfaction with the entrepreneurial ecosystem. By carefully monitoring these metrics, universities can evaluate their support programs' effectiveness and identify improvement areas.

Ultimately, a thriving entrepreneurial ecosystem is essential for cultivating a culture of innovation and creating a pipeline of future entrepreneurs. By investing in the development of this ecosystem, universities can contribute to regional economic growth and societal development.

c. Research & Innovation: The focus of research is on addressing regional challenges and fostering innovation that benefits the region.

This dimension is fundamental to fourth-generation universities, highlighting their ability to generate new knowledge, commercialize research findings, and contribute to societal progress. Research is the foundation of innovation, and these universities excel in conducting cutting-edge research that addresses global challenges and creates new opportunities. They engage in a variety of research activities, including fundamental research, applied research focused on solving specific problems or developing new products and services, interdisciplinary research that involves collaboration across different disciplines to tackle complex challenges, and industry-sponsored research in partnership with businesses to align with their needs.

Effective research often requires collaboration among diverse stakeholders. Universities should actively seek partnerships with industry, government, and other research institutions to enhance research impact. Collaborative research output between academia and industrial partners stands as a key measure of a university's ability to bridge theoretical knowledge with practical applications, thereby fostering innovation and technological advancements. This synergy not only enhances the relevance and applicability of research findings but also plays a role in driving economic growth and addressing societal challenges. (Malkov, Dmitrii; Dumoulin, Max; Westernbrink, Renee;, 2024)

To fully leverage the benefits of research, universities need effective mechanisms for transferring knowledge and technology to the market. This involves setting up technology transfer offices, licensing intellectual property, and fostering the creation of spin-off companies. By commercializing research outcomes, universities can generate revenue, create jobs, and stimulate economic growth. (Ferreira, 2018)

Investing in cutting-edge research infrastructure is vital for high-quality research. This includes well-equipped laboratories, advanced research facilities, and access to the latest technologies. Additionally, providing comprehensive support services, such as research grants, technical assistance, and mentorship, is crucial for enabling researchers to excel.

Encouraging interdisciplinary collaboration is essential for addressing complex challenges. By bringing together researchers from different fields, universities can generate innovative solutions and create new knowledge. Interdisciplinary research can foster a culture of creativity and problem-solving. Research excellence should drive collaboration. Universities should maintain their independence while collaborating with industry. Instead of simply following industry demands, they should lead the way, balancing challenge-based research with open academic inquiry. (Ryhevkina, Anna; Pringle, David;, 2024)

To measure the impact of research, universities should develop robust evaluation frameworks. By tracking research outcomes, universities can demonstrate their contribution to the public good and identify areas for improvement. One of the examples may include percentage of articles or research papers co-authored by academia with industrial partners. (Fowler, 2024)

Attracting and retaining top research talent is essential for maintaining a strong research profile. Universities should invest in faculty development, mentorship programs, and competitive salaries to create a supportive research environment. By nurturing the next generation of researchers, universities can ensure a continued pipeline of talent and innovation by involving students in research projects and investing in their advancement.

d. Industry Collaboration & Knowledge Transfer: The partnerships with industry partners to ensure the curriculum is relevant and research findings are translated into practical applications.

At the core of this dimension lies the establishment of robust industry partnerships. These collaborations can take various forms, including joint research projects, consultancy services, technology licensing, and spin-off creation. By working closely with industry, universities can ensure that their research aligns with the needs of the market, leading to the development of innovative products and services and graduates will be working in ecosystems where communication and teamwork are critical. (Smits, 2024)
Joint research projects and internships provide students with invaluable real-world experience and enable them to gain the opportunity to work on cutting-edge research projects alongside industry professionals, tackling real-world problems and developing practical solutions.

Through industry collaboration, universities can offer faculty development programs that equip professors with the latest industry knowledge and trends. These programs ensure faculty remain current in their fields and can effectively integrate industry best practices and case studies into their teaching, providing students with a well-

rounded and relevant educational experience. By encouraging faculty and students to engage with industry partners, universities can foster a pipeline of talent and create new business opportunities.

Knowledge transfer is a critical component of industry collaboration. Universities should possess effective mechanisms to disseminate research findings and technologies to industry partners allowing them to be translated into new products, services, and solutions that benefit the region's economy. This involves the creation of technology transfer offices, which play a crucial role in protecting intellectual property, negotiating licenses, and supporting spin-off companies, and industry liaison officers - individuals who build relationships with industry partners and identify opportunities for collaboration.

Additionally, universities can organize knowledge exchange activities such as conferences, workshops, and seminars to facilitate the transfer of expertise in addition to open innovation platforms, which are online platforms for connecting researchers with industry partners.

To assess the effectiveness of industry collaboration and knowledge transfer, universities must employ a range of metrics. These include research income, patent filings, licensing revenue, spin-off company performance, and student employment outcomes. By tracking these indicators, universities can demonstrate the value of their partnerships and identify areas for improvement.

In conclusion, industry collaboration and knowledge transfer are essential components of fourth-generation universities. By fostering strong partnerships, facilitating knowledge exchange, and commercializing research findings, universities can create a positive impact on society and contribute to economic growth.

e. Community Engagement is a hallmark of fourth-generation universities, signifying a deep commitment to societal impact and regional development. It transcends traditional outreach efforts, encompassing a reciprocal relationship between the university and its community.

At the core of community engagement lies the establishment of strong partnerships. Universities must cultivate relationships with local organizations, government agencies, and community groups to identify shared goals and develop collaborative initiatives. These partnerships can take various forms, including social responsibility initiatives by addressing critical issues within the local community, such as poverty reduction, environmental sustainability, or education inequality, joint research projects, service-learning programs, and capacity-building initiatives. (Bernstein, 2023)

A crucial aspect of community engagement is the integration of service learning into the curriculum. By involving students in community-based projects, universities can foster civic responsibility, develop leadership skills, and create a sense of belonging. Service learning not only benefits the community but also enriches the educational experience for students.

Outreach programs are essential for disseminating knowledge and building awareness of the university's resources and expertise. By organizing workshops, seminars, and public lectures, universities can share their knowledge with the community and address local needs. Additionally, offering continuing education programs can contribute to the professional development of community members.

To maximize the impact of community engagement, universities must prioritize collaboration and co-creation. By involving community members in the research process and decision-making, universities can ensure that their work is relevant and responsive to local needs. This approach can also lead to the development of innovative solutions to community challenges. In addition, creating platforms for dialogue and collaboration between the university and the community is another important aspect of enhancing community engagement.

Assessing the impact of community engagement is crucial for demonstrating the university's contribution to societal development. By utilizing appropriate metrics and evaluation methods, universities can measure the outcomes of their engagement efforts and identify areas for improvement. These performance indicators can include number of community partnerships, participation rates in service-learning programs, community satisfaction with university programs and services, economic impact of university-led initiatives, and social impact of community engagement projects.

Ultimately, community engagement is a dynamic and ongoing process that requires sustained commitment from the university. The potential benefits of strong community partnerships are significant, including enhanced reputation, increased student engagement, and positive social change. By building strong partnerships, integrating service learning, and measuring impact, universities can create a positive and lasting legacy in their communities. (Bernstein, 2023)

How do the five dimensions interact with each other?

The five dimensions of the framework for assessing fourth-generation universities – Entrepreneurial Curriculum and Pedagogy, Entrepreneurial Ecosystem and Student Support, Innovative Research, Industry Collaboration and Knowledge Transfer, and Community Engagement – are intricately interconnected, forming a complex and dynamic system.

Universities are increasingly recognized as central hubs in the knowledge economy. They bridge the gap between fundamental research, applied knowledge, and practical implementation. By connecting education, research, and innovation, universities play a vital role in driving economic growth and societal development. This interconnected approach enables the seamless transition of ideas from the laboratory to the marketplace. (Bjornmalm, 2024)

The entrepreneurial ecosystem serves as a foundation for the other dimensions. It provides the necessary resources, infrastructure, and support for students to transform their ideas into reality. A robust ecosystem, enriched by industry partnerships and strong community engagement, can significantly enhance the impact of entrepreneurial curriculum and pedagogy. Moreover, successful entrepreneurial ventures often spin off new research directions, creating a virtuous cycle of innovation and growth.

Innovative research is the lifeblood of a fourth-generation university. It not only contributes to new knowledge but also fuels entrepreneurial activity. By identifying new opportunities and developing cutting-edge technologies, research can inspire students to create new ventures. Additionally, research findings can be transferred to industry through collaborations, leading to the commercialization of innovations and economic growth.

Industry collaboration serves as a bridge between the university and the external world. It provides students with real-world experience, access to mentors, and potential job opportunities. Partnerships with industry can also lead to the identification of research priorities and the development of new products and services. Moreover, industry collaborations can help universities to better understand the needs of the community and tailor their programs accordingly.

Community engagement is essential for creating a positive and sustainable impact. By addressing societal challenges and building strong relationships with the community, universities can enhance their reputation and attract talented students and faculty. Community engagement can also inspire research projects and provide opportunities for students to apply their knowledge in real-world settings.

At the heart of this interconnected system is the student. A successful fourth-generation university empowers students to become active participants in the entrepreneurial ecosystem. By providing students with a strong entrepreneurial foundation, access to resources, and opportunities to engage with the community and industry, universities can cultivate a new generation of innovative and socially responsible leaders.

Technology plays a crucial role in facilitating the interactions between the five dimensions. Online platforms, digital tools, and virtual collaboration can enhance knowledge sharing, networking, and access to resources. By leveraging technology, universities can create a more connected and efficient ecosystem that supports innovation and entrepreneurship.

In conclusion, the five dimensions of the framework are interconnected and mutually reinforcing. By fostering synergies among these elements, fourth-generation universities can create a dynamic and impactful environment that drives innovation, economic growth, and social progress.

Implications for student outcomes

The interplay of the five dimensions within a fourth-generation university significantly impacts student outcomes. When these elements are effectively integrated, students benefit from a holistic educational experience that equips them with the knowledge, skills, and mindset to succeed in an increasingly complex and competitive world.

A curriculum that integrates entrepreneurial thinking and skills, coupled with opportunities for practical experience through internships and industry collaborations, prepares students for the demands of the modern workforce. By developing a strong foundation in innovation, problem-solving, and critical thinking, students become more attractive to employers.

Exposure to an entrepreneurial ecosystem, including mentorship, funding, and networking opportunities, cultivates a risk-taking and innovative mindset among students. This mindset is essential for both entrepreneurship and employment, as it fosters adaptability, creativity, and problem-solving abilities.
Community engagement initiatives provide students with opportunities to address societal challenges and develop a sense of social responsibility. These experiences enhance students' empathy, critical thinking, and leadership skills, making them well-rounded citizens.

The integration of research, innovation, and industry collaboration exposes students to the dynamic nature of knowledge and the importance of lifelong learning. By developing the ability to adapt to change and acquire new skills, students become more resilient and adaptable in their careers.
A focus on international collaboration and community engagement broadens students' perspectives and prepares them for a globalized world. By interacting with people from different cultures and backgrounds, students develop intercultural competence and a global mindset.

Measuring the Impact of Interconnected Dimensions
Evaluating the effectiveness of fourth-generation universities requires a comprehensive approach to measuring the impact of the five interconnected dimensions. This involves developing a robust assessment framework that captures the complex relationships between these elements. By employing a mixed-methods approach, researchers can gather both quantitative and qualitative data to assess the performance of universities in achieving their goals.

As stated by Nick Fowler, the aim is to create a comprehensive dashboard of performance indicators that accurately measures the impact of each dimension and reflects the multifaceted nature of fourth-generation universities. While the dashboard should offer a standardized framework, it's essential to acknowledge the unique strengths and priorities of individual institutions. Rather than imposing a one-size-fits-all approach, the dashboard should empower universities to tailor their strategies based on their specific context and goals. Collaborative efforts to aggregate data can enrich the dashboard and identify emerging trends within the sector. (Fowler, 2024)

These indicators include student outcomes through graduation rates, employment rates, entrepreneurial activity rates, and social impact metrics; research output through publications, patents, and industry collaborations; community impact through partnerships, grants, and community engagement initiatives; financial performance through revenue generation, fundraising, and return on investment; institutional reputation through rankings, awards, and media coverage.

To gain insights into the perceptions and experiences of students, faculty, staff, and industry partners, surveys and questionnaires can be administered. These instruments can measure satisfaction levels, perceived impact, and areas for improvement.

In-depth case studies of successful initiatives can provide valuable insights into the interplay of the five dimensions. By examining specific examples, researchers can identify best practices and lessons learned.
To understand the complex interactions between the five dimensions, advanced statistical techniques such as structural equation modeling can be employed that combines both quantitative and qualitative methods. By analyzing the relationships between variables, researchers can identify the most critical factors influencing student outcomes, institutional performance, and societal impact. Measurement should focus on the university's primary objectives and long-term impact. (Ginger, 2024)

Ultimately, the goal of impact assessment is to inform decision-making, identify areas for improvement, and demonstrate the value of the fourth-generation university model. By regularly evaluating performance and making necessary adjustments, universities can optimize their strategies and achieve their mission.

The Case of Albania: Albania's Higher Education in the Context of Fourth-Generation Universities

Albania's higher education landscape is undergoing significant transformation in response to evolving labor market demands and national development goals that aligns with the broader trends shaping global higher education. The overarching objective is to establish a high-quality, competitive higher education system that is aligned with the country's strategic priorities. (Papadhopulli & Miço, 2018)

In this regard, the emphasis on competition, integration of teaching and research, and internationalization are key features that resonate with the concept of fourth-generation universities. (Karafili, Aliaj, Sula, & Tafaj, 2024) The emphasis on competition among Albanian higher education institutions mirrors the fourth-generation university model's focus on performance-based accountability and continuous improvement. By fostering competition, the Albanian system aims to drive innovation and enhance the quality of education.

A cornerstone of this higher education reform is the integration of teaching and research. Universities are expected to cultivate an environment where academics excel in both domains, contributing to both knowledge creation and knowledge dissemination. Albania's emphasis on combining teaching and research aligns with the core principles of fourth-generation universities. This integration is crucial for producing graduates with strong research and critical thinking skills, as well as for generating new knowledge and addressing societal challenges. (Papadhopulli & Miço, 2018)

To foster competition and drive quality improvement, the Albanian higher education system emphasizes the importance of institutional autonomy. Universities are encouraged to develop distinct profiles and specializations, catering to specific market needs and student preferences. This approach aims to create a diverse and dynamic higher education landscape.

Furthermore, Albania recognizes the significance of internationalization. Efforts are underway to enhance cooperation with higher education institutions in the region and beyond, facilitating student and staff mobility, joint programs, and research collaborations. This outward orientation is seen as crucial for preparing Albanian graduates for the global job market.

Albania's focus on international cooperation and student mobility is consistent with the global orientation of fourth-generation universities. By participating in international networks and programs, Albanian institutions can enhance their reputation, attract foreign students, and contribute to knowledge exchange. (EMA, 2019)

In line with global trends, Albania is placing a strong emphasis on developing digital competencies among students. The integration of digital technologies into higher education curricula is seen as essential for equipping graduates with the skills needed to thrive in the digital age. (National Strategy on Education 2021-2026, 2021) By implementing these reforms, Albania aims to create a higher education system that is responsive to the needs of the labor market, internationally competitive, and focused on student success.

While Albania is making progress towards a fourth-generation university model, several challenges remain including limited financial resources which can hinder universities' ability to invest in research infrastructure, faculty development, and student support services; stronger collaborations between universities and businesses are needed to enhance knowledge transfer and commercialization; quality assurance by implementing robust quality assurance mechanisms is essential to ensure the consistency and relevance of higher education programs. (EMA, 2019)

Despite these challenges, Albania has the potential to become a leading example of a fourth-generation university system in the region. By building upon its existing strengths and addressing the identified challenges, Albania can create a higher education landscape that is innovative, responsive to societal needs, and globally competitive.

Case Study: Bedër University - A Decade of Success (2014-2024)

This paper presents a case study of Bedër University in Albania, which has implemented reforms in its marketing education program to align with the Fourth-Generation University model, with a focus on social impact alongside economic considerations. The curriculum has been revamped to incorporate industry-standard tools and methodologies that consider both economic and social/environmental impact.

This approach equips students with important skills such as taking initiative, project management, decision-making, critical thinking, and a results-oriented mindset, all while fostering a sense of social responsibility.

Since its inception in 2014, the course Campaign Conception and Management has facilitated student involvement in a series of successful marketing campaigns. These campaigns addressed various social issues and provided students with valuable practical experience. The following is a list of the campaigns undertaken, showcasing the range of social causes Bedër University students have addressed:

- 2014-2015: “Libri është i vetmi kopsht që mbillet për të tjerët” (A Book is the Only Garden that Harvests for Others) - This campaign promotes the love for literacy and the willingness to help different age groups and social groups to have the opportunity to approach books and reading.
- 2015: “Unë refuzoj të hesht. Bëje dhe ti. Voto!” (I Refuse to Be Silent. Do it too. Vote!) - This campaign encouraged youth voter participation in the national elections.
- 2015-2016: “Një fije floku për më shumë buzëqeshje” (A Hair Strand for More Smiles) - This campaign raised awareness about childhood cancer by helping some families afford medical treatments for their sick children.
- 2016-2017: “Një shtëpi, një mburojë për trashëgiminë kulturore” (A Home, a Shield for Cultural Heritage) - This campaign advocated for the appreciation, preservation and respect of cultural heritage sites.
- 2017-2018: “Një libër më shumë për Preshevën” (One More Book for Preshevo) - This campaign supported educational initiatives in the Preshevo region.
- 2018-2019: “Ruaj Traditën, Festo Shqip! (Preserve Tradition, Celebrate in Albanian!) - This campaign raised awareness and promoted the preservation and inheritance of national cultural and artistic values among the youth in Albania.
- 2019-2020: “Njih tokën tënde, vizito Shqipërinë!” (Get to Know Your Land, Visit Albania!) - This campaign promoted domestic tourism in Albania.
- 2020-2021: “Dritarja e Mundësive” (Opportunity Window) - During this campaign, the students created and managed an online platform dedicated to young Albanians, where they could find opportunities for professional development and employment, professional practices, trainings, workshops, seminars and many other activities targeting the needs of young people.
- 2021-2022: “Dhuro Arsim - Dhuro të Ardhme” (Donate Education – Donate the Future) – These campaigns raised awareness among state institutions and various individuals to contribute to the creation of educational opportunities for orphaned youth, to ensure their academic and professional growth.
- 2022-2023: “Aty për ju” (There for You) - This campaign focused on helping single mothers with job opportunities, qualification courses, schools for children, etc.
- 2023-2024: “Planeti nuk është tavëll” (The Planet is Not a Playground) - This campaign addressed the challenges of environmental protection.

The success of these student-driven initiatives over ten years demonstrates the potential of FGUs to empower students and foster a culture of social responsibility. Universities can play a crucial role in supporting such initiatives by providing resources, mentorship, networking and opportunities for collaboration with external partners.

Bedër University offers a compelling case study of a higher education institution implementing elements of the fourth-generation university model. Through a comprehensive curriculum reform and the establishment of student-led initiatives, the university has demonstrated a commitment to practical education, student empowerment, community engagement, and has increased opportunities for student interaction with marketing professionals who champion social and environmental responsibility.

These initiatives demonstrate how a traditional university program can be transformed to embrace the Fourth-Generation University model and foster a more entrepreneurial and industry-oriented learning environment, prioritizing both economic success and positive social and environmental impact. In addition, they showcase the ability of students to apply their knowledge to real-world challenges and contribute to positive social change. This case study provides valuable insights into the key elements of a successful fourth-generation university model's emphasis on student-centered learning and the development of a strong entrepreneurial mindset. By focusing on curriculum reform, student engagement, and community impact, the university has demonstrated a strong commitment to preparing graduates for the challenges of the 21st century. By replicating and adapting these strategies, other institutions can strive to achieve similar outcomes.

CONCLUSION

The fourth-generation university represents a significant departure from traditional higher education models. Characterized by a strong emphasis on innovation, entrepreneurship, and societal impact, these institutions are poised to play a pivotal role in addressing global challenges.

The case study of Bedër University demonstrates the potential of this model in practice. By integrating industry-relevant curriculum, fostering student engagement, and prioritizing community impact, the university has achieved notable success. However, realizing the full potential of fourth-generation universities requires a concerted effort from policymakers, higher education institutions, and other stakeholders.

To guide this transformation, a multidimensional framework for assessing the impact of fourth-generation universities is essential. This framework should encompass a range of indicators, including economic, social, and environmental outcomes. By regularly evaluating performance and sharing best practices, we can optimize the potential of these institutions.

A national strategy for fostering fourth-generation universities in Albania is crucial. This strategy should prioritize investments in research, innovation, and infrastructure, while also emphasizing the importance of collaboration between universities, industry, and government. By working together, we can create a higher education ecosystem that drives economic growth, social progress, and individual development.

Ultimately, the success of fourth-generation universities depends on our ability to adapt to the changing landscape of higher education. By embracing innovation, fostering collaboration, and prioritizing societal impact, we can create a brighter future for both our institutions and our communities.

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WHAT'S THE IMPACT OF RAPID FLOW OF INFORMATION FOR THE MODERN ACCOUNTANTS?

Agim Mamuti
Western Balkans University (WBU)
Tirana, Albania
agim.mamuti@wbu.edu.al

ABSTRACT

The rapid flow of information has revolutionized the field of accounting, transforming the way professionals work and the services they provide to clients. This research paper explores the impact of the swift dissemination of information on modern accountants, focusing on the various advantages and challenges it presents.

The study begins by examining how advancements in technology and communication systems have enabled the rapid flow of information in accounting. Information is no longer confined by physical boundaries and can be shared instantly across different platforms and devices. The paper then delves into the benefits this quick access to information brings to accountants.

One significant advantage is the ability to gather real-time data, allowing accountants to make faster and more informed decisions. With access to up-to-date financial information, accountants can analyze trends, identify risks, and recommend strategies to optimize financial performance.

The rapid flow of information also facilitates efficient collaboration among accountants and other stakeholders, enabling them to work together seamlessly regardless of geographical locations.

Moreover, the paper explores how the rapid flow of information has paved the way for automation and Artificial Intelligence (AI) technologies in accounting. Accountants can now rely on intelligent systems to automate routine tasks such as data entry, report generation, and reconciliation. This not only saves time and minimizes errors but also frees up accountants to focus on higher-value activities, such as strategy development and client advisory services.

Overall, this research paper highlights the significant impact of the rapid flow of information on modern accountants. It underscores the advantages of real-time data access, automation, and collaboration, while also acknowledging the challenges of information security, overload, and ethical considerations. By understanding and harnessing the opportunities and addressing the potential pitfalls, accountants can leverage the rapid flow of information to enhance their profession and provide superior services to clients in the digital age.

KEYWORDS: information, accounting, technology, innovation, artificial intelligence

INTRODUCTION

The research on the rapid flow of information is important in several ways. First, time is an unrecoverable resource once it is wasted and therefore the need to minimize time wastage. Loss of time can only be avoided if all the processes which the modern accountants are involved in are done as fast as possible, and this requires a rapid flow of information from one stakeholder to another within the organization. The topic will, therefore, provide the much-needed knowledge on the rapid flow of information, what it involves and how it can be achieved to minimize time wastage.

Secondly, analysis of the rapid flow of information will make it possible to understand how rapid flow of information impacts the modern accounting profession. The differences created by the use of the rapid flow of information in the profession will be enumerated to bring out what it does to the modern accountants clearly. Finally, rapid flow of information is still a new topic in which not much research has been conducted. It still has a lot of unconfirmed mysteries that require a lot of studies to reveal. The study is, therefore necessary for proper understanding of the concept of rapid flow and how it impacts on the profession of the modern accountants. The main objective of the study is to analyze the rapid flow of information and what it does to the modern accountants. Meanwhile, the specific objectives are:

1. To find out the meaning of rapid flow of information.
2. To find out what rapid flow of information entails.
3. To find out the impact of the rapid flow of information on modern accountants.

LITERATURE REVIEW

The rapid flow of information is the ability to receive data from various sources and send information to a different destination within the shortest time possible. It also entails tracing data about different transactions while taking the least time. The rapid flow of information has been made possible through the use of information and communication technology together with the use of the internet. The concept has developed over time since the commercialization of the internet and continues to grow through the discovery of new technologies. One of the professions which have gained from the development of rapid flow of information is accounting (Taipaleenmäki & Ikäheimo, 2013). The accountants are normally charged with the responsibility of preparing financial statements from the various transactions carried out by an organization during a particular. A modern accountant is defined by their tools of the trade such as computers equipped with relevant and updated software. The capability of the accountants to apply information and communication technology and the internet to send and receive information is another important determinant factor. Timely preparation of the financial records and quick remittance of the document to their destinations require a rapid flow of information. Reliability and comparability are also enhanced by the repaid flow of information (Lim, 2013).

The rapid flow of information is desirable for quick communication between the various stakeholders of an organization. The interest of the stakeholders is to ensure that the performance of a business improves and hence increase its profitability from time to time. The measure of how well a business is doing can, however, only be done by analyzing the various financial statement prepared by the accountants. Unlike in the old days, the performance of a business can be checked on a daily basis, and this requires that the financial statements be prepared and made available to the various stakeholders at the time they are needed. The modern accountants, therefore, have to rely on quicker means of tracing the details of the financial transaction, preparing the financial statements and delivering the information to their respective destination. It, therefore, means that rapid flow of information cannot be separated from information and communication technology (ICT) and the use of the internet (Taiwo, 2016).

ICT makes it faster and easier to store and retrieve the data about various transactions. With the modern technology, information can easily be stored in a computer system as opposed to having the transactions recorded in a paper and huge files. The benefit of storing the data in the computer is that the information can be traced and easily reproduced if a need arises. Paperwork recordings, on the other hand, may take a lot of time to search.

The use of the internet has also made it much to receive and transmit information thus enhancing the process of rapid flow of information. For, instance, information can be sent and received from various remote sources within microseconds. The internet also provides reliable information storage methods such as cloud and email storage and storage. Also, internet storage methods are not restricted to any location as long the user has got internet access thus reducing the need to carry around heavy files for reference as was the case during the early days.

Hoyle, Schaefer & Doupnik (2015) defines accounting as the process of making records and summaries of financial transaction in the financial statement. It also involves classification of the various transactions into various categories and accounts. In general, accounting entails giving a clear account of how the funds of an organization have been spent and where they have been used and when. The recording is not just for the sake of it, albeit is carried out to help the management of an organization in planning and budgeting for the daily activities of the organization (Hoyle et al., 2015). It is in this regard that the financial statements should reliable and accurate as much as possible, and the records should be availed in a timely fashion. The rapid flow of information, therefore, does a lot to the modern accountants.

First, rapid flow of information increases the reliability of the modern accountants and their work (Lim, 2013). The enhanced reliability of the modern accountants is based on the fact that the modern accountants can be trusted to deliver the financial statements or any other accounting record at the right time when they are required. With rapid flow of information, the modern accountants can easily retrieve information about the various financial transactions and prepare the financial statements. Most of the financial statements can also now be prepared by the use of software, making the processes to be much quicker (Gögüs & Özer, 2014). The modern accountants simply have to feed the relevant information into the work and wait for the result. The process, however, does stop with the preparation of the documents. The statements have to reach the stakeholder as the management, financiers and the shareholders. The process has also be made much easier by the use of the internet whereby the documents can be sent through the emails of the stakeholders, or the information can be shared in the organization's portal for quick access. The rapid flow of information, therefore, significantly reduces the task performed by the modern accountant making it easier for them to meet the deadlines and hence increasing their reliability (Gögüs & Özer, 2014). The reliability of the financial statements prepared by the modern accountants has also become more reliable. It is so because most of the transactions whose effects are recorded in the financial statements can easily be confirmed since they are also recorded in computerized storage which can easily be shared. The transactions are thus much easier to verify.

Secondly, rapid flow of information makes it easier for the modern accountants to prepare comparable financial statements. Organizations need to compare their performance with that of other similar organizations, and this can only be achieved if the financial statements of the organization contain similar elements and are in given standard format. Through the rapid flow of information, the modern accountants can have access to the financial statements of other similar organizations and come with a similar format of the financial statement or include various elements which are considered important for the comparison purposes. Different financiers may also be interested in particular elements in the financial records. Such information can be obtained and acted upon within the short time possible due to use of the rapid flow of information.

Thirdly, rapid flow of information has led to the expansion of the knowledge of the modern accountants (Butler, 2016). Some of the elements that facilitate rapid flow of information are somehow complicated, and the modern accountants are therefore required to undergo some training to use the accounting facilities effectively and efficiently. According to Butler, the education helps in expanding the knowledge of the modern accountants not only in the field of accounting but also in the field of information communication technology. A modern accountant account can therefore easily work in the field of ICT with little or no further training. The rapid flow of information also exposes the modern accountants to a lot of information about various activities of the organization. The rapid flow of information in one way or the other synchronizes the activities of the organization, and the modern accountant is the centre of it all. The modern accountants, therefore, have the advantage of learning and getting the experience of how most of the activities of an organization are run (Butler, 2016).

The known gained in the process can be of important when one is promoted to the managerial position in the same organization or a different one. Accountants can also easily create their business and use the knowledge to run the firm successfully.

Finally, rapid flow of information reduces the responsibilities and hence the efficiency of the modern accountants. Before the emergence of the concepts of rapid flow of information, the accountants had to make follow up on the various transaction carried out by an organization. The accountants were, as a result, getting overburdened in some organizations. The net effect is that the efficiency of the accountants was greatly reduced and this could be seen in the financial statements which were full of errors (Lee, 2013). Some of the mistakes also landed several organizations into problems. The mistakes also spoilt the hard-earned reputation of some of the organization. Things, however, changed with the emergence of the rapid flow of information. The use of the information communication technology allows the financial transaction to be recorded by different departments and then the information forwarded to a central recording system. The records relating to the miscellaneous transaction can also be captured through the rapid flow of information without much problem. Some of the organization also uses the internet to create portals where the financial transactions are entered and synchronized. All the transactions of an organization in a given period can therefore found in particular file with backups in different departments. The result is that the accountants only have the responsibility of preparing the financial statements from the available records. With the reduced tasks, the accountants can then concentrate fully on the remaining duties thus increasing their efficiencies (Taipaleenmäki & Ikäheimo, 2013). The modern accountants are also given more time to verify the financial statements before they are dispatched to the various stakeholders.

CONCLUSION

In conclusion, it is clear that rapid flow of information has greatly impacted on the modern accountants. It has increased the reliability of the modern accountants and the financial statements in addition to making the financial records more comparable than ever before. It is also evident that the rapid flow of information has greatly minimized the responsibilities of the modern accountants thus increasing their efficiency to a great extent. The modern accountants have also expanded their knowledge through rapid flow of information.

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ADVANCING EDUCATION WITH INNOVATIVE TEACHING APPROACHES

Isa Erbas
University College Beder
Tirana, Albania
ierbas@beder.edu.al

ABSTRACT

As education continues to evolve, it is increasingly vital to incorporate innovative teaching methods that can cater to the diverse needs of learners and prepare them for the challenges of the 21st century. The study delves into the impact of imaginative, creative teaching and critical thinking techniques on educational progress. The study emphasises inquiry, collaboration, and problem-solving to better adapt to changing educational needs by shifting the focus from traditional, teacher-centred instruction to student-centred, active learning approaches. It highlights the potential of innovative teaching strategies to improve learning outcomes and enhance student engagement across various fields, including political science, international relations, philosophy, pedagogy, and psychology, as well as others. By integrating these innovative approaches into the classroom, students can tackle complex global issues and become active, informed global citizens. The study's objective is also to examine three distinct teaching approaches - executive, facilitator, and liberationist - in the context of innovative teaching. Using qualitative and quantitative methods, the study gathers and analyses data to provide recommendations for further enhancing the effectiveness of creative teaching approaches.

KEYWORDS: Advancing education, innovative teaching approaches, teacher-centred learning, student-centred learning, problem-solving.

INTRODUCTION

Albert Einstein said, “Education is not the learning of facts, but the training of the mind to think.” This quote succinctly captures the changing objective of education: to cultivate critical thinking and creativity rather than just imparting information. Noam Chomsky also expressed the view that education should aim to instil values beyond dominance and to nurture wise citizens in a society that values liberty and individual creativity. This educational shift is moving from rote memorisation to a more dynamic, interactive, and enjoyable learning experience (Asma Khaleel Abdallah, 2024, p. 54). Historically, education systems were designed to serve the needs of industrial society, focusing on producing workers for manual labour under strict hierarchies. The current global economy values not just what individuals know but how they can apply that knowledge in creative and practical ways (Schleicher, 2015).

This study explores various innovative teaching approaches that enhance student engagement, foster critical thinking, and prepare learners for the complexities of the 21st century. It examines the effectiveness of these methods in developing crucial skills such as collaboration and communication and discusses their long-term impact on student’s attitudes towards learning and their future aspirations.

By analyzing the executive, liberationist, and facilitator approaches to teaching, this article delves into how different methods cater to diverse learning needs and environments. Whether through traditional teaching, student-centered learning, or project-based and problem-based learning, the goal remains consistent: to equip students with the skills and mindset necessary to navigate an increasingly uncertain and dynamic world.

The discussion also highlights the importance of fostering creativity and providing a supportive learning environment, where the roles of teachers and students are redefined to promote mutual trust and collaborative curriculum planning. In conclusion, the article underscores the need for educational systems to adapt, ensuring that future generations are well-prepared to tackle global challenges with resilience, innovation, and a lifelong love of learning.

This study answers the following questions:

1. What are the most effective innovative teaching approaches for enhancing student engagement and learning outcomes?
2. Compared to traditional teaching methods, how do innovative teaching approaches impact students’ critical thinking skills, creativity, and problem-solving abilities?
3. How do innovative teaching approaches contribute to developing 21st-century skills, such as collaboration, communication, etc., among students?
4. What are the long-term impacts of exposure to innovative teaching approaches on students’ attitudes towards learning, career aspirations, and lifelong learning habits?

Advancing Education with Innovative Teaching Approaches

The goal of education is “to give a sense of the value of things other than domination,” to help create “wise citizens of a free community” in which both liberty and “individual creativeness” will flourish. Working people will be the masters of their fate, not tools of production (Chomsky, 2014, p. 58). Education is moving away from rote learning towards a dynamic, interactive, and enjoyable educational experience (Asma Khaleel Abdallah, 2024, p. 54).

In the early 20th century, schools were designed to meet the needs of an industrial society. The skills being taught and the methods being used were geared towards a society of industrial production – manual labour was expected, and work was done according to the orders of a central figure in the workplace. Today, there’s a shift towards self-management and innovative skills in the workplace (Jan Hylén, 2020, pp. 12-13).

In the past, education was about conveying knowledge. Today, it is about providing students with the tools to navigate an increasingly uncertain, unstable world. The global economy no longer rewards workers for what they know (Google (IA) knows everything); it rewards them for what they can do with what they know (Schleicher, 2015).

According to Gary D Fenstermacher and Jonas F. Soltis, there are three teaching approaches and teachers: Executive Approach, Liberationist Approach, Facilitator Approach.

The executive approach

The teacher or instructor, as an executive, sees the teacher as a manager of complex classroom processes, responsible for achieving specific outcomes with students by employing the best skills and techniques available.

The liberationist approach

This approach sees the teacher or instructor as someone who liberates and expands the learner's mind, introducing them to human ways of understanding and assisting them in developing into well-rounded, knowledgeable, and ethical human beings.

The facilitator approach

The facilitative teacher highly values the contributions of students in the classroom and emphasizes the use of their prior experiences. They are typically empathetic and focused on helping individuals achieve personal growth and a deep understanding of themselves (Soltis, 2004, pp. 11-56).

Teachers and instructors should do more than just teach; they should also act as coaches, mentors, nurturers, and sources of inspiration, striving to instill self-reliance in their students. They should take the time to understand each student's unique strengths and learning styles. A genuine love for the subject matter and a deep passion for teaching are essential. Furthermore, they should demonstrate unwavering, sacrificial love for their students, committed to their overall well-being. By integrating all of these approaches, educators can effectively prepare students for the evolving landscape of contemporary and innovative education.

It is essential for educators and students to establish mutual trust and adhere to the following eight principles:

1. Collaboratively develop curriculum plans and management approaches while sharing responsibilities.
2. Provide students with a variety of learning materials, including personal experiences, books, and reference resources.
3. Recognize learners' interests as a crucial teaching resource and encourage them to create independent or peer-based learning plans.
4. Foster an environment conducive to productive learning.
5. Emphasize the continuity of the learning process over specific content and focus on equipping students with the skills to master the knowledge they need.
6. Empower learners to set their learning objectives and support them in achieving these goals through self-directed learning.
7. Encourage students to assess their learning outcomes.
8. Cultivate a learning environment where students can express genuine emotions and reasoning, integrating learning seamlessly into their lives and behaviours (Ming Li, 2024, p. 22).

Types of Teaching/Learning Methods

Innovative education entails a variety of teaching and learning approaches, including:

- Traditional Teaching
- Student-Centered Learning
- Activity-Based Learning
- Resources-based learning
- Project-based learning
- Problem-based learning
- Flipped Classroom Model

Traditional Teaching

Teacher-centred education: The teacher sets general and individually adapted educational goals, chooses appropriate methods, and suggests educational aids (Alvyra Galkienė, 2021, p. 16). Based on practical experience, it is evident that attempting to directly teach concepts through traditional methods is ineffective and unproductive. Teachers who employ this approach often find that it leads to nothing more than superficial understanding, where students merely parrot words without truly grasping the underlying concepts, ultimately masking a lack of comprehension (Lev Vygotsky, 1986, p. 150).

Student-Centered learning

In 1994, Finland implemented curriculum reforms with the primary goal of transforming traditional classroom practices. This involved transitioning to a more student-centered curriculum, teaching students how to learn and think, and providing more opportunities for schools and teachers to innovate (Søren Harnow Klausen, 2024, p. 113). Teachers are under growing pressure to adopt learner-centred teaching methods that emphasise learning through experimentation, systematic thinking, problem-solving, critical thinking, and the ability to navigate knowledge networks effectively. Additionally, teachers are expected to adapt to changing social and community needs (Ridwan Maulana, 2023, p. 114).

Activity-Based Learning

The Activity-Based Learning Pedagogical Approach aims to help learners create mental models that enable higher-order performance, such as applied problem-solving and transferring information and skills (Jules Pieters, 2019, p. 311).

Resources-based learning

This educational approach enhances students' capability to learn and investigate autonomously. Additionally, resource-based learning empowers students to select their preferred methods and pace for solving a given problem, with the freedom to adapt based on their learning preferences, interests, and abilities (Ming Li, 2024, p. 32). Learners access a variety of learning materials instead of attending classes. These resources include print and non-print media such as books, articles, audio and video materials, electronic databases, and computer-based resources (Ming Li, 2024, p. 413).

Project-based learning

Students complete the projects independently with support (Jiangang Cheng, 2024, p. 136). Project-based learning effectively enables students to apply their knowledge and skills to solve real-world problems. It fosters critical thinking, communication, collaboration, and creativity, preparing students for success in the modern world (Ming Li, 2024).

Problem-based learning

Problem-based learning is an active learning approach in which learners work together to solve real-world problems. Teachers assist students in reflecting on these experiences and developing cognitive and collaborative skills (Ming Li, 2024, p. 412). Problem-based learning also involves guiding students to ask questions and using those questions to direct instruction (Jiangang Cheng, 2024, p. 136).

Flipped classroom model

Students switch between in-person and online instruction in the face-to-face and online rotation model. This approach includes a flipped classroom format, in which students study course materials online beforehand and then attend in-person classes for teacher-led instruction (Ming Li, 2024, p. 40). Flipped classroom refers to intentionally linking activities and assignments before, during, and after class (Jiangang Cheng, 2024, p. 136).

CONCLUSION

The evolution of education has been marked by a significant shift from traditional, teacher-centred methods to innovative, student-centred approaches that prioritize critical thinking, creativity, and problem-solving skills. This research underscores the importance of these innovative teaching strategies in enhancing student engagement and learning outcomes across various disciplines, including political science, international relations, philosophy, pedagogy, and psychology. By moving beyond rote memorization to embrace inquiry,

collaboration, and active learning, education can better prepare students for the complexities of the 21st century and foster their development as informed, capable global citizens.

An examination of the executive, liberationist, and facilitator approaches reveals that a multifaceted teaching strategy, which integrates the best aspects of each, is most effective in meeting diverse learning needs. This approach encourages educators to not only act as instructors but also as mentors, coaches, and facilitators who nurture self-reliance and personal growth in their students. By fostering a supportive and dynamic learning environment, educators can inspire a lifelong love of learning and equip students with the skills necessary to navigate an increasingly uncertain and dynamic world.

RECOMMENDATIONS

- Current times require us to educate people who will be able to solve future problems and deal with uncertainties and world crises.
- Governments, policymakers, and universities should promote teaching programmes that respond to society's real needs, foresee possible scenarios, and prepare future teachers to face disruption, uncertainty, and crises through solid training that integrates life skills.
- Governments, policymakers and universities should foster education by including creativity, innovation, problem-solving strategies, technology and life skills within the standards expected for teacher education.
- Teacher training programmes should include the development of creativity, innovation, problem-solving strategies, technology, and life skills in their curricula.
- Teacher education programmes must advance the integration of different competencies (disciplinary, pedagogical and generic, including life skills), which should be visible in courses with less traditional approaches.
- Students should receive teaching materials: recorded lectures, slides, books, tutoring, etc.

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HAJJ & TECHNOLOGY

Layan Abdulaziz A. Alateeq
Epoka University
Epoka University, Tirana, Albania
Layan6.2004@gmail.com

ABSTRACT

The Ministry of Hajj constantly works to enhance security and health protocols. The development of these improvements has been greatly influenced by artificial intelligence (AI) and technology. Many people may argue that AI is not the best option and can't enhance such changes. My research demonstrates a more comprehensive viewpoint on the simultaneous usage of technology and hajj and how it has affected it. In addition, it fosters the concept that one should always strive for improvement by organizing competitions like hackathons, which inspire the next generation to come up with innovative uses of technology. It also covers the process of applying to do the Hajj and the kinds of steps involved. Hajj is one of the most significant pilgrimages in the Muslim faith. It takes place in Saudi Arabia's sacred city of Macca. To guarantee that guests have the best possible time and leave with lasting memories, Drones and digital cameras have improved security, and safety measures like permitting virtual calls between the sheik in haram and the hajji have been implemented during COVID-19. This subject raises awareness among those who are thinking about or intend to do the Hajj.

KEYWORDS: AI, Hajj, development, innovative, application process, Saudi arabia

INTRODUCTION

One of the most important religious pilgrimages in Islam, the Hajj, has incorporated contemporary technology to enhance the experience and guarantee the safety of millions of travellers. Technology is a major factor in improving the journey, from sophisticated robots and sound systems to digital tools like Nusuk and smart wristbands. Through the introduction of innovations like interactive kiosks, extensive safety precautions, and crowd control techniques, the Hajj has become more accessible, efficient, and secure for all participants. This essay examines these developments in technology, emphasising how they affect the pilgrimage experience and the continuous attempts to incorporate contemporary solutions into this age-old custom.

What is Hajj

Muslims who are able to afford it must do the Hajj, one of the Five pillars of Islam, which is the annual pilgrimage to Mecca. It occurs in the Islamic calendar between the ninth and the twelfth day of Dhu al-Hijjah, which often translates to the Gregorian months of July or August. Shaving or cutting hair, going between the hills of Safa and Marwah (Sa'i), standing in prayer at the Arafat plain, throwing stones at pillars (Ramy al- Jamarat), washing oneself and dressing in white (Ihram), and sacrificing an animal are all significant practices. Muslims have the opportunity to come together on the Hajj, pledge allegiance to Allah, and find spiritual renewal and forgiveness. Every year, millions of Muslims gather in Mecca from all around the world.

Nusuk website

Nusuk offers a range of digital resources to help with Hajj and Umrah practices, including instructional videos, virtual reality tours of holy sites, and guides on how to perform the various religious rites and rituals. The website features various online tools and resources to assist in planning travel arrangements, such as booking flights, accommodations, and transportation. Nusuk also includes guidance on travel regulations and restrictions, as well as information on visas and vaccinations. The website is available in both Arabic and English languages. Additionally, every year, individuals can apply for a grant to perform Hajj, provided they meet certain criteria: they must be over 25 years old, have monthly wages not exceeding 3000 riyals (80980 lek/728 euro), have lived in Saudi Arabia with a good reputation for over a year, and must not have already performed Hajj.

Smart bracelets

With the help of barcodes, smart bracelets can track each pilgrim individually and offer a complete travel management solution. The four colours of these bracelets stand for several trip itinerary options. They include all the pertinent details on a traveler's itinerary, such as bus schedules, local names, and specifics about where they are residing. The bracelets allow pilgrims to easily explore their accommodations by granting access to designated accommodations and relevant areas. They also contain personal information like name, date of birth, and passport information, as well as medical emergency information including details for those with low blood sugar and blood types. By utilising a specialised programme to scan the barcode, pilgrims may obtain all this information, streamlining the process and improving the whole experience.

Haram Robots

The Haram's robots operate independently for 5-8 hours, delivering a dependable and effective service. Ten robots are in use at the Haram right now, and they each disperse thirty Zamzam waters and Qurans during a session that lasts for around ten minutes. Apart from these duties, the robots are employed to sanitise the Haram, estimating that they would cover an area of 600 metres, guaranteeing pilgrims a hygienic and secure atmosphere. These robots' operational efficiency is increased by sensors that prevent them from colliding with objects like humans, walls, and other obstructions. They also have sound detectors installed, which help identify calls for aid or support and guarantee people's safety inside the Haram.

Interactive Robots

Interactive robots, in the form of moving kiosk devices, are distributed around the Haram to assist pilgrims with various needs. These kiosks provide access to a sheikh, allowing pilgrims to ask questions about

matters they are unsure of between 4 pm and 8 pm. The kiosks offer instant translation from the sheikh's voice and vice versa, facilitating clear communication. They also show how to perform religious rites, making the process easier for those unfamiliar with the practices. The interactive robots support multiple languages, including English, Russian, French, Farsi, Turkish, Chinese, Urdu, and Bengali, ensuring that a wide range of pilgrims can benefit from their services.

Sound system

Technology and sound systems in the Haram enhance the pilgrim experience through several innovative features. Instant translation for the sermon is available in five different languages using headphones, allowing pilgrims from diverse backgrounds to understand and engage with the teachings. Pilgrims can also recite the Quran in front of a sheikh in the Haram, free of charge, 24 hours a day. This service is available in over 130 different countries and has facilitated over 500,000 appointments. The Haram is equipped with more than 6000 speakers and four sound systems, including one main system and three backups, ensuring flawless audio delivery with 0% error. To maintain high-quality sound and service, over 50 employees are dedicated to overseeing these systems.

Technology features

Several tech features in Hajj significantly enhance the pilgrim experience. Barcodes around sacred sites allow pilgrims to download an application that guides them on how to leave, enter, and search for certain sacred sites without needing Wi-Fi, and this service is completely free. The Zamzam water machine boasts a storage space for over 1.7 million 10-liter bottles and produces a bottle every second, with more than 2000 storage compartments ensuring ample supply. QR codes are placed in different parts of Al Haram, which pilgrims can scan to receive step-by-step instructions for the rites to perform in their current section. Additionally, the Almutauif application helps manage crowd flow by showing where each person should go to avoid crowded areas and suggesting times when fewer people are in the Haram. To ensure devices remain charged, free power banks are provided for use during Hajj.

Hajj Hackathon

The Hajj Hackathon is the largest hackathon in the world, featuring more than 3,000 participants from fifty different countries. It took place on April 18th, 2018, and was won by a team of five Saudi women named "Turjuman." The team received an investment award of 1,000,000 riyals (approximately $242,437) for 15% equity, along with many other prizes. They invented software that translates informative signs in the Haram and holy sites, which operates without internet restrictions and works by scanning QR codes.

Safety features

Safety measures during Hajj are enhanced through various technological innovations. Every robot near the Haram or other Hajj sites is equipped with a sound sensor that detects cries for help or assistance, allowing civil defense teams to be contacted and dispatched more efficiently and effectively. Smart watches are recommended for those who are too young to enable their guardians to track them in Al Haram. These smart watches are also recommended for individuals with health problems, as they can measure heart rate and blood pressure. Additionally, there are bracelet machines for kids to further ensure their safety.

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PERFORMANCE EVALUATION OF OPTIMISATION TECHNIQUES FOR POWER CONSUMPTION IN FPGAS

Marsida Ibro,
Western Balkans University
Highway Tiranë-Durrës, KM 7, Tirana, Albania
marsida.ibro@wbu.edu.al

ABSTRACT

This paper aims to evaluate the effectiveness of nonlinear multi-objective optimisation methods for Field Programmable Gate Array (FPGA)-based designs, in terms of power consumption and time delay. Real-time processing is becoming increasingly important in various innovative technological domains like the Internet of Things (IoT), wireless networks, and mobile communications. Moreover, understanding and estimating how optimisation methods perform in FPGA-based designs is crucial. The performance optimisation methods have been applied for different VHDL (VHSIC Hardware Description Language) benchmark designs to better estimate the impact of the complexity of the designs in FPGAs. Power consumption in FPGAs is influenced by numerous architecture and design factors, making it a multi-parametric function. Implementing different designs across different FPGA devices using the MATLAB Optimization Toolbox, is aimed at gauging the performance of each optimisation method accurately.

KEYWORDS: FPGA, power consumption, performance, nonlinear, optimisation techniques, time-delay

Nowadays, advanced power consumption techniques and management strategies are becoming crucial for optimizing FPGA designs. Different latest studies show that power optimisation techniques for FPGA devices highlight various approaches to improve energy efficiency and performance. The paper by Khaleghi et al. (2019) emphasizes leveraging the thermal margin for voltage scaling, achieving up to 36% power reduction without performance loss and 66% total energy saving when targeting energy optimization. This work proposes thermal-aware voltage scaling to exploit timing margins, achieving significant power and energy savings. Power optimization in FPGA designs faces several significant challenges in dynamic power consumption due to switching activities in logic elements, routing resources, and I/O. The research on dynamic power consumption in FPGAs presents various techniques to optimize power usage while maintaining performance. It is important to minimize the dynamic power consumption in combinational circuits by employing a synthesis strategy involving multi-output functions and binary decision diagrams, achieving power reductions through non-disjoint decomposition. This work proposes dynamic power- gating for leakage power reduction, showing a 95% reduction in leakage power in sleep mode and over 15% total power savings. Ahmed et al. (2019) present FRoC 2.0, which utilizes dynamic voltage scaling (DVS) and robust testing to save 32% of total power consumption in FPGA applications [1]. In this work, the power consumption is tested through clock frequency and resource allocation management. Results shows that it can be achieved a reduces dynamic power consumption by controlling internal module states using dynamic clock trees [2].

Static Power Consumption has substantial static power consumption due to leakage of the current in different parts of the circuit design. Techniques to reduce leakage without affecting the functionality are essential but difficult to implement. Various methods are used to reduce static power in FPGAs, which is crucial for low-power applications [3]. This work [4] propose machine learning-based power gating and enhanced routing to reduce static power, showing a 70% reduction in static power consumption over previous methods.

Power Consumption Methods

Critical Path Aware Placement (CPAP) in FPGA design can offer the possibility of using different critical paths, which makes timing evaluation complex as voltage and temperature vary. Ensuring reliable operation while optimizing power is a critical challenge. The variable critical paths technique is used to manage and optimize the performance and reliability of FPGA designs by addressing the dynamic nature of critical paths [5]. This work introduces a dynamic critical path based on fit degree scheduling for reconfigurable multi-FPGAs, which dynamically evaluates critical paths and determines the most critical tasks to shorten scheduled length. The mathematical model involves an objective function targeting the minimization of $T_{critical}$ subject to placement, timing, power, and resource constraints. Solving this optimization problem requires heuristic or iterative methods capable of efficiently exploring the large solution space.

$$Minimize\ T_{critical}$$

where $T_{critical}$ is the total delay along the critical path. This delay can be expressed as the sum of the delays of all logic elements ($T_{L.E.}$) and interconnects ($T_{interconnect}$) along the critical path:

$$T_{critical} = \sum_{i \in CP} T_{LE,i} + \sum_{(i,j) \in CP} T_{interconnect,(i,j)} \quad (2)$$

Critical Path (CP) denotes the set of logic elements and interconnects that constitute the critical path, and $T_{interconnect,(i,j)}$ represents the delay between logic elements i and j along the critical path.

Time-Delay related optimization often involves trade-offs with performance. Balancing these trade-offs while meeting the design specifications is complex and requires sophisticated modelling and optimization techniques. The work related on time-delay in FPGAs [6] examines various methods to balance power consumption and delay, essential for optimizing FPGA performance in different applications. This analysis is based on quantized neural networks on FPGAs, highlighting the balance between accuracy, training time, and hardware efficiency. The optimization is subject to several constraints, including placement constraints where every logic element must be placed in a valid location within the FPGA grid. $\sum_{j=1}^{M} x_{ij} = 1, \forall\ I \in \{1, \ldots, N\}$, where xij is a binary variable that equals 1 if logic element i is placed in location j, and M is the total number of placement locations available. Beyond the critical path, the placement must satisfy overall timing requirements for the entire circuit, ensuring all paths meet the required operational frequency. Meanwhile, $T_{delay,k} \leq T_{max}, \forall\ k \in$ paths and $T_{delay,k}$ is the delay of path k, and T_{max} is the maximum allowable delay for proper operation.

Effective heat dissipation management is an important factor for power optimization. Latest research done regarding temperature management in FPGAs explores various strategies to mitigate heat generation and distribution, which is crucial for maintaining performance and reliability. For an FPGA with multiple heat sources or regions (i), the temperature of each region (T_i) considering steady-state conditions is:

$$T_i = T_{ambient} + \Delta T_i$$
$$\Delta T_i = P_i \cdot R_{th,i} \quad (3)$$

where P_i is the power dissipation and $R_{th,i}$ is the thermal resistance of the ith region to the ambient.

In a more complex FPGA system, with multiple layers of materials, the thermal model can be expanded to a network of thermal resistances and capacitances representing the heat transfer path:

$$\frac{dT_i}{d} = \frac{1}{C_{th,i}} \left(P_i - \sum_j \frac{T_i - T_j}{R_{th,ij}}\right) \quad (4)$$

where $C_{th,i}$ represent the thermal capacitance of the ith node, $R_{th,ij}$ is the thermal resistance between nodes i and j, T_i and T_j are the temperatures of nodes i and j, P_i is the power dissipation at node i, and dt represents a time differential, indicating this model can also capture transient thermal behavior.
In the work [7], are proposed a temperature-aware place and route methodology to minimize power consumption and distribute temperature uniformly across the FPGA by strategically placing unused configurable logic blocks (CLBs). The paper [8] present an FPGA-based approach to evaluate temperature and resource management strategies in multi-core processors, using ASIC emulation and run-time monitoring to test and compare strategies. Furthermore, in work [9] is proposed a machine learning-based model to manage the heat dissipation behaviour of multi-FPGA systems and mitigate thermal variation and hotspots through proactive task placement. Accurate power consumption estimation at early stages during the design is difficult but necessary for effective optimization. Machine learning models and other advanced techniques are being explored but require extensive training and validation. The literature [10] on power estimation techniques in FPGAs highlights various approaches to accurately predict and manage power consumption, which is crucial for optimizing performance and extending the lifespan of FPGA-based systems. This method is focused on accurate power estimation for DSP blocks in FPGAs, proposing a new identity for power evaluation that improves upon previous models by incorporating IP cores and regression-based techniques.

Proposes a new identity for power estimation of DSP blocks using regression-based models.
Optimizing power across these heterogeneous components while maintaining performance and functionality is challenging. The integration of heterogeneous resources in FPGAs involves the inclusion and management of different types of processing elements, such as LUTs, DSPs, and embedded cores, to optimize performance and resource utilization. The work [11] propose a legalization algorithm for heterogeneous FPGAs that improves resource allocation by evaluating congestion and sorting cells to achieve a balanced distribution. A unified management architecture to handle heterogeneous processing elements, creating compute pools to manage different implementations and behaviours, which simplifies development and enhances performance [12]. Resource allocation method for FPGA heterogeneous accelerator card clusters, enabling efficient use of storage resources. It presents a resource-shared RISC-V multicore architecture, which shares hardware resources among soft processor cores to reduce FPGA logic usage and improve performance [13].

Lastly, to use the adequate optimization method for FPGAs is not easy and depends on many parameters at the same time. Optimization of power consumption for FPGAs is a complex task and require nonlinear constrains to be taken into consideration.

Multi-Objective Optimisation Techniques in FPGA

Multi-Objective Optimization (MOO) methods are used to simplify the problem by avoiding complicated mathematical equations. For FPGA-based designs exist several techniques to solve the issues with static and dynamic power consumption. In order to evaluate the impact of application of different methods. The optimization techniques in FPGAs can be categorized based on their architecture and design level. Most of the optimization techniques involves general design-level optimizations to enhance overall performance. Optimization techniques at design level aim to enhance the overall performance of the system. This technique specifically targets the reduction of both static and dynamic power consumption. Place and route focus on

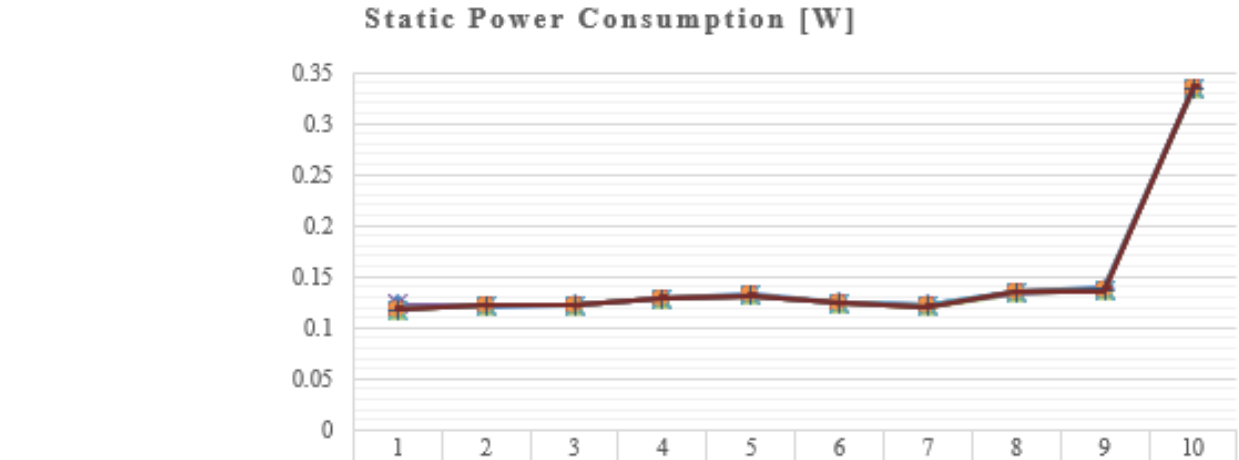
optimizing the placement of components within the system to improve performance and power efficiency. Post-Place and route power optimization combines initial placement optimization with subsequent power optimization techniques. Conversely, route optimization methods optimize the routing of connections between components to enhance performance and power efficiency. Finally, “Post-Route Phys Opt Design” applies further physical design optimizations after the routing stage to maximize system performance and power efficiency. This categorization elucidates the specific focus of each technique, whether it is on design-level improvements, power optimization, physical design, routing, or a combination of these aspects.

To better evaluate the effect of these optimization techniques, we have taken into consideration 10 benchmark designs in VHDL language. The selected benchmark circuits are selected from the simplier to the most complex one. These designs were implemented in the Zynq-7000 device by using Vivado software. To compare the performance of different multi-objective optimization methods, we have used the Optimization Toolbox in Matlab. The aim of the experiments is to investigate the multi-objective optimization methods and to answer the following questions:

- What are the primary benefits of using optimization techniques in FPGAs system design?
- What are the key challenges in implementing MOO techniques in modern systems?

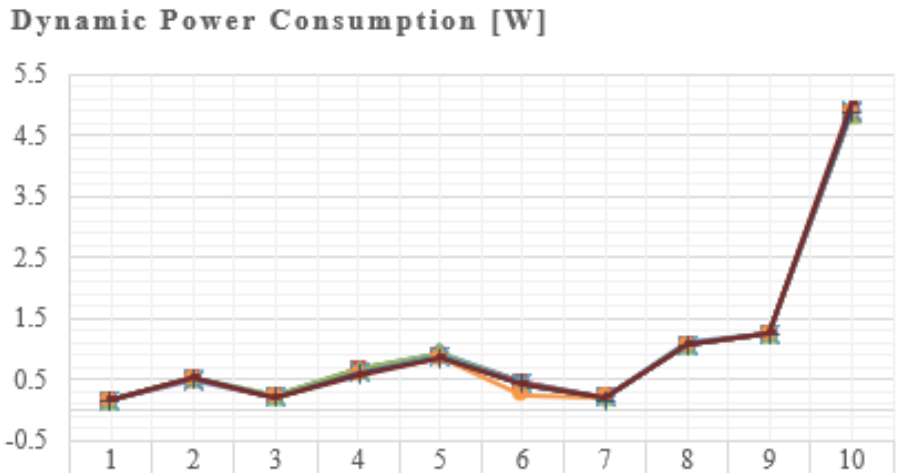
After testing the benchmark circuits the Fig 1., and Fig.2 show respectively the results for static and dynamic power consumption for different optimization techniques application.

The static power consumption is relatively stable for all methods across the first nine data points, ranging between approximately 0.117 and 0.139 W. A significant increase in static power consumption is observed at the most complex system implemented for all methods, reaching values around 0.334 W. The significant increase in static power consumption is consistent across all methods and suggests an external factor or a specific condition at this level of complexity that affects the configurations. Dynamic power consumption fluctuates across the different designs for all methods, throughout the graph. A substantial increase in dynamic power consumption is observed at the same complex design as in the static power, with values ranging from approximately 4.83 to 4.99 W. Implementing any of the presented optimization techniques can substantially reduce dynamic power consumption in most cases. The appropriate utilization of these techniques can enhance energy efficiency. Ongoing monitoring and analysis of dynamic power consumption should be conducted to ensure consistent performance and early identification of potential issues.



	1	2	3	4	5	6	7	8	9	10
No optimization	0.122	0.121	0.122	0.129	0.132	0.125	0.122	0.135	0.139	0.334
Opt design	0.118	0.1217	0.1215	0.1285	0.1317	0.1244	0.121	0.1342	0.137	0.3338
Power Opt	0.1176	0.1213	0.1215	0.1283	0.1317	0.1242	0.1209	0.1338	0.1366	0.3337
Place Design	0.122	0.1216	0.1215	0.12835	0.1317	0.1241	0.1213	0.1341	0.137	0.3338
Post-Place Power opt design	0.118	0.1217	0.1215	0.1281	0.1317	0.1241	0.1215	0.1342	0.137	0.3338
Post-Place Phys opt design	0.1175	0.1217	0.1215	0.1281	0.1317	0.1246	0.121	0.1342	0.1367	0.3337
Route design	0.1175	0.1217	0.1215	0.1285	0.1317	0.1246	0.121	0.1342	0.1372	0.3336
Post-Route Phys opt design	0.1177	0.12165	0.1215	0.1285	0.1317	0.1246	0.121	0.1342	0.1359	0.3338

Fig. 1. Results of static power optimization techniques



	1	2	3	4	5	6	7	8	9	10
No optimization	0.157	0.53	0.216	0.673	0.918	0.431	0.208	1.087	1.26	4.911
Opt design	0.155	0.51	0.21	0.66	0.9	0.43	0.2	1.08	1.25	4.83
Power Opt	0.151	0.509	0.216	0.65	0.91	0.42	0.19	1.08	1.257	4.85
Place Design	0.152	0.5	0.209	0.61	0.9	0.425	0.189	1.077	1.255	4.86
Post-Place Power opt design	0.151	0.51	0.207	0.6	0.899	0.421	0.188	1.076	1.251	4.9
Post-Place Phys opt design	0.15	0.51	0.207	0.59	0.86	0.24	0.189	1.076	1.253	4.88
Route design	0.15	0.511	0.206	0.59	0.85	0.422	0.18	1.068	1.255	4.88
Post-Route Phys opt design	0.147	0.509	0.201	0.56	0.85	0.42	0.185	1.066	1.259	4.99

Fig. 2. Results of dynamic power optimization techniques

CONCLUSIONS

Power consumption in FPGA-based designs is becoming a crucial factor for the real-time and wireless applications. In the cases where no optimization is applied to the design there is a higher static power compared to the optimized methods but converges with them in different designs. Place and route, in both pre and post implementation, perform similarly to the other optimized methods, with marginal differences. Furthermore, these methods show very close static power consumption values, suggesting consistent optimization. All optimization methods consistently show lower static power consumption compared to the case when no optimization method is applied during different phases of FPGA-related designs. The differences between the various optimization techniques are minimal for the circuits that we have taken as a reference, indicating that any of the optimization strategies can effectively reduce power consumption compared to no optimization.

In conclusion, the results indicate that employing optimization methods significantly reduces static power consumption compared to not using any optimization, with minimal differences among the various optimization techniques. In many cases, the complexity of the design is not the determining factor for power consumption, but further studies and other factor should be taken into consideration.

In the future, it will be conducted a more thoroughly investigation of more optimization methods based on time, performance and complexity.

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EXPLORING THE ETHICAL DILEMMAS OF AI INTEGRATION IN HIGHER EDUCATION: THE NEED FOR A FRAMEWORK FOR RESPONSIBLE INNOVATION

Skender Bruçaj
Bedër University College
Tirana, Albania
sbrucaj@beder.edu.al

ABSTRACT

Integrating artificial intelligence (AI) technologies into higher education holds immense promise for enhancing learning experiences and improving administrative efficiency, academic research, and innovation. The potential impact of AI in academia is significant. It can help create inclusive learning environments, support faculty and staff, and contribute to the overall mission of higher education. However, using AI in this context also brings various ethical challenges that must be managed proactively, not just considered. This research delves into the ethical concerns associated with AI in higher education. These include privacy-related issues, bias, transparency, pedagogical impact, job displacement, access, equity, and intellectual property. By analysing existing literature and utilizing exemplary frameworks, this study introduces a comprehensive framework that identifies challenges, offers a roadmap for their resolution, and advocates for responsible AI innovation in academia. By investing in ethical issues related to AI in higher education, institutions can harness the power of AI to create a brighter future for education while mitigating potential risks and safeguarding all stakeholders' rights and well-being.

KEYWORDS: Artificial Intelligence, Higher education, AI Ethics, Innovation, AI Tools.

INTRODUCTION

Artificial Intelligence (AI) has existed since the 1960s, and its use in education has led to the development of intelligent tutoring systems, making it a significant area of research (Bond et al., 2024). Artificial intelligence is a difficult concept to define and comprehend. The Council of Europe has provided the following definition: 'Artificial Intelligence is a set of sciences, theories, and techniques whose purpose is to reproduce by a machine the cognitive abilities of a human being'. Current developments aim, for instance, to be able to entrust a machine with complex tasks previously delegated to a human (Council of Europe, 2021). Artificial intelligence (AI) is a field of computer science focused on creating machines that can perform tasks that require human-like intelligence. In recent years, AI has become an essential part of people's lives due to its powerful functions, and it profoundly impacts all areas of human activities, including education. These AI models are built on powerful algorithms and capabilities to support personalized learning systems and automated assessment systems that enhance students' learning and teachers' teaching. Considering the societal transformations caused by the COVID-19 pandemic, its effects on the educational sector, and the adoption of digital technologies, it is crucial to investigate the connection between AI technologies and education. The emergence of ChatGPT, DALL-E, Gemini, and Copilot has both amazed and alarmed us with their generative AI capabilities. As a result, schools, universities, and organizations must prepare themselves for the increasing number of AI chatbots that will become available shortly (Bozkurt & Sharma, 2023). The growing use of AI-powered tools in education has sparked a conversation around several essential topics. These include whether institutions and educators are adequately prepared for this technology, ethical considerations surrounding its use, how to establish trust in AI, and the value it can add to teaching and learning (Burton et al.,2017)

Additionally, there is a growing need for governance, regulation, research, and training to keep pace with AI's rapid and widespread transformation of the education sector. Artificial intelligence is a global phenomenon that requires governmental action. The European Union, for example, has adopted the EU AI Act, which is seen as the first holistic AI law in the world. At the same time, a group in Australia was formed to create a structure for generative AI in education. In the United States, the Department of Education has advocated for an AI bill of rights to devise a complete strategy for AI implementation in education (Bond et al., 2024). Integrating artificial intelligence (AI) in higher education represents a transformative shift with the potential to enhance educational experiences and administrative efficiency significantly. AI technologies, including adaptive learning platforms and automated administrative systems, have the potential to revolutionize higher education by providing personalized learning, streamlining operations, and offering data-driven insights. However, using AI in education also raises important ethical questions that require thoughtful consideration and responsible innovation. This introduction explores the critical ethical issues associated with AI integration in higher education and emphasizes the urgent need to develop a comprehensive ethical framework. This framework is essential to guide responsible AI adoption in higher education, ensuring that the potential of AI to transform education is realized ethically and equitably.

The European Union's White Paper on Artificial Intelligence outlines the European strategy for developing AI, highlighting the potential benefits, risks, and the need for a coordinated approach. The paper suggests AI can significantly enhance healthcare, farming, climate change mitigation, and production systems. However, it also acknowledges the risks posed by AI, including opaque decision-making, discrimination, intrusion into private lives, and criminal use. The EU aims to promote the development and deployment of AI based on European values by supporting a regulatory and investment-oriented approach to address potential risks (Council of Europe, 2021). The primary objective of this research is to explore the ethical challenges posed by integrating AI into higher education. This includes examining bias, privacy, transparency, accountability, and the impact on educational equity and quality.

The research underscores the importance of responsible AI adoption in higher education, which promises substantial advancements in personalized learning and operational efficiency but also introduces significant ethical dilemmas such as bias, privacy invasion, and accountability issues. Therefore, a robust ethical framework is essential to ensure responsible AI innovation that upholds fairness, equity, transparency, and accountability.

LITERATURE REVIEW

Technology is developing rapidly, making it challenging for many academics and researchers to fully comprehend the technical aspects of AI. However, we need to focus on the challenges related to AI ethics and implementation. To fully understand AI's impact on our lives, we must take a broader approach and

consider diverse perspectives. (Green et al, 2020). AI is undoubtedly about power, with much at stake in terms of political, financial, social, and even military dominance. AI technology can affect society in many ways, but it must be regulated to avoid harm and abuse through legal, economic, and ethical means (Erin et al., 2022). In recent months, academic settings have been growing concerned about using text-generative artificial intelligence (AI), such as ChatGPT, Bing, Co-Pilot, Jenna.ai, and Grammarly. One of the primary concerns is the potential for students to utilize AI-powered tools to cheat or plagiarize their written assignments and exams. Additionally, there is apprehension that such tools may impede the development of students' writing and critical thinking skills. (Civil, 2023) (Tseng et al.; M., 2023) as they rely more on automated tools to complete their work. Some scholars argue that this could negatively impact the quality of education and ultimately hinder the students' learning. The profound impact of AI technology in higher education raises important ethical considerations that we should consider before swiftly incorporating AI. AI technology was not initially intended for educational purposes, and educators' concerns may differ significantly from those of AI developers. Many well-known universities worldwide, such as Oxford and Cambridge, have stated that using AI bots for assignments is considered academic misconduct (Chan, C.K.Y.2023). However, some argue that generative AI has the potential to revolutionize education and enhance students' learning experiences. For instance, some experts propose using generative AI to offer personalized feedback and assistance to students, helping them to recognize areas of weakness and enhance their skills in an adaptive way (Kasneci et al., 2023; Sinhaliz et al., 2023).

According to one last research data, about one-third of college students surveyed in the US have utilized an AI chatbot such as ChatGPT to complete written homework assignments, with 60% using the program on more than half of their assignments. ChatGPT is a generative AI tool capable of imitating human writing, with some students using it to cheat. The study found that 75% of students believe that using the program for cheating is wrong but still do it, and nearly 30% believe their professors need to be made aware of their use of the tool (Baker et al., 2020). Higher education is undergoing significant transformations, considering the development of artificial intelligence. Incentivized by the global academic enterprise and state governments, these transformations have incited much conversation on their possible societal effects. AI systems in higher education often inherit biases in their training data, leading to unfair outcomes in areas such as admissions, grading, and recruitment (Baker et al., 2020). Mitigation strategies, such as diversified training datasets and algorithmic transparency, are critical but challenging to implement effectively (Jones, 2021).
The UNESCO framework for AI in education focuses on a humanistic approach. It aims to protect human rights, equip individuals with the necessary skills and values for sustainable development, and promote effective collaboration between humans and machines in life, learning, and work (UNESCO 2021). The framework emphasizes human control over AI and ensures that it enhances the abilities of both teachers and students. Additionally, the framework advocates for ethical, transparent, non-discriminatory, and auditable design of AI applications. UNESCO's work on AI ethics and governance originates from the Recommendation on the Ethics of Artificial Intelligence, adopted by 193 countries in 2021 (UNESCO 2021). In June 2019, "The Global Landscape of Ethics Guideline" was published.

This influential article analyzed convergence among AI ethical guidelines over the last five years, using a database of 84 guidelines from various sources. The study showed a global convergence around five ethical principles: transparency, justice and fairness, non-maleficence, responsibility, and privacy. AI systems in higher education often inherit biases in their training data, leading to unfair outcomes in areas such as admissions, grading, and recruitment (Baker et al., 2020).

Mitigation strategies, such as diversified training datasets and algorithmic transparency, are critical but challenging to implement effectively (Jones, 2021). The use of AI in online learning platforms raises significant privacy issues, as these systems collect vast amounts of personal data (Miller, 2020). Robust data protection policies and practices are needed to ensure student privacy (Lee, 2021). Lack of transparency in AI decision-making processes can lead to mistrust among students and educators (Davis & Patterson, 2020). Therefore, implementing transparent AI systems and precise accountability mechanisms is essential for building trust and ensuring ethical use (Smith et al., 2021). AI has the potential to either bridge or widen the educational gap. While it can provide personalized learning experiences, it may also exacerbate existing inequalities if not implemented thoughtfully (Brown et al., 2020). Ensuring equitable access to AI tools and addressing socioeconomic disparities is crucial (Garcia, 2023).AI integration can enhance pedagogical practices by providing real-time feedback and personalized learning pathways (Johnson & White, 2020). However, more reliance on AI can undermine critical thinking and reduce human interaction, essential education components (Nguyen, 2021). There is a growing recognition of the need for comprehensive ethical guidelines and regulatory

frameworks to govern AI use in education (Williams & Martin, 2020). Comparative studies suggest that regulatory approaches vary widely across regions, highlighting the need for harmonized international standards (Kim, 2021).

The European Network for Academic Integrity (ENAI) is an international association that brings together educational institutions and individuals interested in promoting academic integrity. It emphasizes the importance of educating all stakeholders about the responsible use of AI tools by academic integrity practices and values. It is essential to highlight the need for a comprehensive AI policy in higher education that addresses the risks and opportunities associated with generative AI technologies. (ENAI 2024)

METHODOLOGY

The methodology adopted for exploring the ethical dilemmas of AI integration in higher education is qualitative, focusing on an in-depth understanding and interpretation of different frameworks for implementing AI in higher education. This approach is particularly suitable for investigating ethical concerns, which are often nuanced and context-specific based on the latest academic research. Through a qualitative lens, this research aims to uncover the underlying factors contributing to ethical challenges, compare existing frameworks, and develop recommendations for responsible AI innovation. The research focuses on creating a comprehensive framework for responsible AI innovation in academia. Throughout the study, we delved into several research questions: How does AI influence the student-teacher relationship, and what ethical considerations arise from this interaction? What long-term effects does AI integration have on pedagogical methods and student learning outcomes in higher education? How do different regulatory frameworks across countries address the ethical use of AI in higher education, and what best practices can be identified? What are the ethical implications of AI in special education, and how can AI tools be designed to support the needs of special education students ethically? How can educators be effectively trained to use AI tools ethically and responsibly in their teaching practices?

Each question addresses critical aspects of AI integration in higher education, contributing to developing a comprehensive framework for responsible innovation. They also provide a foundation for hypotheses and guide the direction of research projects that can significantly impact the field.

4.ETHICAL FRAMEWORKS OF AI AND RESPONSIBLE INNOVATION IN HIGHER EDUCATION

Addressing these ethical dilemmas requires the development of comprehensive ethical frameworks that guide the responsible integration of AI in higher education. Such frameworks should encompass principles of fairness, transparency, accountability, privacy, and equity, providing a foundation for the ethical use of AI technologies. They should also involve diverse stakeholders, including educators, students, policymakers, and technologists, to ensure that the perspectives and interests of all affected parties are considered (Floridi et al., 2018). Several models and guidelines for ethical AI have been proposed in recent years, including the IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems and the European Commission's Ethics Guidelines for Trustworthy AI (Chatila, & Havens, 2019; European Commission, 2019). These frameworks offer valuable insights and recommendations that can inform the development of tailored ethical guidelines for AI in higher education. However, there remains a need for ongoing research and dialogue to adapt these principles to educational environments' specific contexts and challenges.

In 2018, McGraw Hill, Nord Anglia Education, Pearson PLC, and Microsoft Corporation collaborated to establish the Institute for Ethical AI in Education at the University of Buckingham. After two years of consulting with technology and education experts worldwide, a shared understanding of the ethical implications of using AI in education was arrived at, and recommendations on how AI should be ethically designed and applied in practice were made. As a result, an Ethical Framework for AI in Education was launched by the Institute for Ethical AI in Education in 2020. The framework aims to ensure that all learners can benefit from AI in education while protecting against its known risks. (IEAE,2024)

The table in Table :1 Below are framework guidelines to help educators securely and safely use AI teaching tools.

Guidelines for AI in Education
AI should be used to achieve well-defined educational goals based on strong societal, educational or scientific evidence that is for the benefit of learners.
AI should be used to assess and recognise a broader range of learners' aptitudes.
AI should boost institutions' capacity while respecting human relationships.
AI systems should promote equity between different groups of learners and not discriminate against any group of learners.
AI should be used to increase the control learners have over their learning and development.
A balance should be struck between privacy and the legitimate use of data to drive well-defined and desired academic goals.
Humans are ultimately responsible for educational outcomes and should therefore have an appropriate level of oversight of how AI systems operate.
Learners and educators should have a reasonable understanding of AI and its implications.
AI resources should be designed by people who understand the impact of these resources.

Regarding the ethical risks and challenges of using AI in higher education, we can focus on the following (Green, et al 2020).

Topic	Details
Academic Misconduct	Formulate guidelines and strategies for detecting and preventing the improper use of generative AI.
Governance of AI	Address data privacy, transparency, accountability and security. Be transparent about data collection and usage and be receptive to feedback and criticism.
Privacy and Security	Ensure that the data used by generative AI technologies is kept private and secure.
Transparency and Accountability	Be transparent about the use of generative AI, including disclosing information about the algorithms and their functions, as well as any potential biases or limitations of the AI tools.
Monitoring and Evaluating AI Implementation	Continuously monitor and evaluate the implementation of AI into university teaching and learning.
Equity in Access to AI Technologies	Ensure equitable access to AI technologies for all students and staff, regardless of their background or access to technology. May involve the procurement of AI tools for use by the entire university community.
Attributing AI Technologies	Require students to state clearly which part of their work was helped by AI, similar to references and citations in current academic practice.
Providing training and support for teachers, staff and students in AI literacy	To ensure successful integration of AI in teaching and learning, universities must provide adequate training and support for teachers, staff, and students. Teachers express concerns about coping with this new trend, helping students use AI effectively, and learning from student usage.

The Ethical Framework for AI in higher Education aims to enable learners to benefit from AI while protecting them from the risks associated with this technology. The Framework includes objectives and criteria for achieving educational goals, assessing a broader range of learners' talents, improving administration and workload, promoting equity, increasing learner autonomy, ensuring privacy, transparency, and accountability, and fostering informed participation and ethical design. Universities are not just factories of growth, churning out employable or industry-ready youth. They also generate wealth, economic prosperity, and enhanced quality of life. However, a university is supposed to cultivate productive thinkers and create an environment in which a pure and clear atmosphere of thought is created; think critically and participate creatively in the total life of the university, which the students can also inspire and have a clear vision regarding their future. The main question

is how the integration of AI would affect the university's fundamental purpose. To answer this question, it is essential to understand how a university functions. Therefore, we can identify the two main dimensions of university functionality. One is as a higher educational establishment, and the second is as a generator of knowledge and technology. Higher education institutions aim to develop self-directed, independent, and confident learners who will contribute to society through leadership and civic responsibilities. As knowledge generators, universities should provide new knowledge and change paradigms to help society develop and meet new challenges. Artificial Intelligence has become an integral part of our present and will continue to be a significant aspect of our future. Therefore, university leaders and academic institutions are responsible for adapting and responding to future generations' evolving values and needs. This involves addressing ethical challenges related to technological advancement and the integration of AI in higher education.

CONCLUSION

The ethical implications of AI technology in higher education present a complex challenge. Our academia and society stand at the cusp of a transformation shaped by this technology. While we should be excited to embrace the full potential of AI, we need to be thoughtful and deliberate in our approach to ensure it aligns with our ethical principles. The ultimate responsibility of higher educational institutions is to consider the nuances of the various technologies and the contexts in which we integrate them to ensure the safety of all our students. To tackle ethical dilemmas related to the use of AI in higher education, it is crucial to create ethical frameworks that offer well-defined guidelines and principles for governance and decision-making. These frameworks should be developed collaboratively with stakeholders from academia, industry, government, and civil society to ensure that various perspectives are considered and that all ethical concerns surrounding AI implementation are comprehensively addressed. Frameworks in higher education should consider the unique roles and responsibilities of universities, faculty members, administrators, and students. Establishing ethical frameworks enables higher education institutions to develop a shared understanding of AI ethical guidelines and principles (Southgate, 2020). Incorporating AI systems in higher education should prioritize fairness, transparency, accountability, and respect for privacy and data protection. To navigate the ethical challenges of AI integration, raising awareness, providing thorough training and resources, utilizing existing ethical frameworks, establishing collaborative partnerships, and regularly evaluating and updating policies and practices are essential. By doing so, higher education institutions can promote responsible and ethical use of AI tools, safeguarding the interests and well-being of students and stakeholders while maximizing the potential benefits of AI in the educational setting. The integration of AI in higher education presents both opportunities and challenges. While AI can enhance learning experiences and administrative efficiency, it poses significant ethical dilemmas. Institutions must develop and implement ethical frameworks to guide the responsible use of AI, ensuring fairness, transparency, and accountability (Xu, L. 2020). Policymakers and educators must work collaboratively to address privacy concerns, mitigate biases, and promote equitable access to AI tools. Ongoing research and dialogue are essential to navigating the evolving landscape of AI in higher education and ensuring that it serves the interests of all stakeholders.

The field is rapidly evolving, with increasing attention from academic researchers, policymakers, and educational institutions. Recent studies emphasize the importance of interdisciplinary approaches, combining insights from computer science, education, ethics, and law. While significant progress has been made, there is still a need for more empirical research and practical guidelines to address the ethical challenges posed by AI in higher education (Wang et al.; J., 2019). In conclusion, integrating AI into higher education presents significant opportunities and profound ethical challenges. To harness the benefits of AI while mitigating its risks, it is imperative to develop and implement robust ethical frameworks that guide responsible innovation. By addressing issues of bias, privacy, transparency, and accountability and involving diverse stakeholders in the conversation, higher education institutions can ensure that AI technologies are used ethically and effectively to enhance educational outcomes and promote equity. As AI evolves, ongoing research and dialogue will be essential to navigating the complex ethical landscape and fostering a culture of responsible AI adoption in higher education.

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ICHESD
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CHALLENGES AND OPPORTUNITIES IN TECHNOLOGY ENTREPRENEURSHIP FOR WOMEN: A FOCUS ON EMPOWERMENT

Jora Banda
European University of Tirana
Tiranë, Albania
jora.banda@uet.edu.al

Iges Banda
Western Balkans University
Tiranë, Albania
iges.banda@wbu.edu.al

ABSTRACT

The aim of this paper focuses on the demonstration process of the way that emerging digital technologies can empower women's entrepreneurship by helping them surpass the difficulties they encounter and fostering a better network environment. To gain this, it will be conducted a detailed analysis of the current existing research on women's entrepreneurship, with a focus point on the literature that has been published until now. Methodology - It will be utilized a structured literature review methodology to analyse Scopus records published so far on the topic of women and technology entrepreneurship. The VOS viewer tool will be used for citational and cluster analysis. This aids in ensuring an orderly, clear, and replicable study. Also, a qualitative data analysis is conducted to better identify the areas of research. Findings - The analysis will focus on the impact of digital technologies on women's entrepreneurship and their impact on overcoming difficulties that women encounter in their entrepreneurial path. The study, will provide a conceptual discussion of the research areas that have emerged and highlight potential opportunities for future investigations. Practical implications - The key implication of the study is to further develop understanding and practice in the fields of the utilization of digital technologies in management and its intersection with gender. The study will provide insights into the ongoing debate on "Gender and Management" by re-evaluating networking tasks through social media. The advantages of our study include empirical research, theoretical advancements, practical applications, and existing problems related to gender in management.

KEYWORDS: Technology; Entrepreneurship; Innovation; Digital; Gender Inequality

1. INTRODUCTION

A new economy driven by high technology has experienced high levels of start-ups and innovative activities across industries. Other authors like Yoo et al., 2012; Nambisan et al., 2017; Cohen et al., 2017; Giones and Brem, 2017; and von Briel et al., 2017 have contributed to the development of the understanding of digitization and its impact on different dimensions of entrepreneurship. These impacts stretch into the creation and growth of new entrepreneurial initiatives and businesses in the digital environment.

Nonetheless, women's experiences and positions are complex, and they continue to be challenged in the context of digital entrepreneurship. Previous research on women in technology entrepreneurship, including the challenges, discrimination, and prospects women face in the emerging era. Chandra and Leenders, 2012; Huang et al., 2017; Rayna et al., 2015; Chang, 2017) support the arguments that women entrepreneurs are finding ways around, networking to disarm barriers, and participating in fast-growth novel ventures supported by digital resources. Finally, it addresses networks, ecosystems, and communities about women's experiences within technology entrepreneurship.

While the discourse on women entrepreneurship and digital technologies is rather recent, there is a lack of knowledge concerning the ways that the latest technologies can support women entrepreneurs as empowering means. The present paper claims that while the current literature has addressed the entrepreneurship practices by women, there is a dearth of a systematic review considering the potential of emerging digital technologies to overcome barriers to women entrepreneurs and create a positive network climate.

The literature review reveals that prior scholarship mainly explores more conventional aspects of women's entrepreneurship while neglecting the effects of novel advancements in digital technologies on the subject. Because the challenges that women face in their entrepreneurial endeavours remain felt, for instance, in the availability of resources, networks, and opportunities, there is a significant urge to understand how digital technologies can facilitate change.

To this end, this paper aims to help fill this research gap by providing a literature review on the current state of knowledge on the subject while focusing on women's entrepreneurship and new emerging technologies. Consequently, the objective of the paper is to use a systematic review of the scholarly literature to provide insights into the underexplored role of digital tools in addressing the difficulties that female entrepreneurs encounter and fostering the factors that would enhance their success.

Thus, the paper does not only review the available body of knowledge on women's entrepreneurship but also seeks to contribute to the existing knowledge by discussing the possibilities and effects of digital technologies on the development of women's entrepreneurship. This is important because it closes the existing gap in existing knowledge and attempts to map unseen possibilities where technology can improve the lives of women entrepreneurs in future studies and applications.

2. DATA AND BIBLIOMETRIC ANALYSIS METHODOLOGY

To identify the current trends in the contexts discussed in the literature regarding the possible ways of empowering women entrepreneurship with the help of newly developed digital technologies, we employed a systematic literature review (SLR). This approach, known for reducing biases and identifying trends as well as the future avenues of research, forms the empirical base to include the seminal articles: (Centobelli et al, 2017, Massaro et al., 2016; Petticrew and Roberts, 2006; Tranfield et al., 2003). An SLR is particularly relevant to investigate the dynamic of the process of digital technologies and the theoretical context of women's entrepreneurship. Furthermore, it allows outlining the future research agenda, as well as the theoretical and practical contributions of the study (Kraus et al., 2022). They extend the conventional SLR by including the keyword and content analysis, getting a more thorough content-related perspective to determine the valuable insights (Ribière and Walter, 2013). The new developments of SLRs include using the volume of research articles to infer prior work (Massaro et al., 2016).

2.1 Research Questions

To start the SLR process, we framed research questions about the development of the literature and its main themes and consequences (Massaro et al., 2016).

1. What is the emerging trend in the literature on women's entrepreneurship and digital technology?
2. What should be highlighted in the literature?
3. What are the implications of this research?

2.2 Method

After selecting the research questions, the research proposal was prepared, which outlines sources of information, approaches, studies to be included, and tools for analysis and integration of data (Petticrew and Roberts, 2008). In line with recommendations that call for a combination of both SLR and bibliometrics, this study employed both approaches so as to increase the reliability of analysing the findings. Many authors, such as Feng et al. (2017) and Fahimnia et al. (2015), recommended that these two approaches should be integrated to enhance the relevance of the findings.

The first set of articles was obtained from the Scopus database since it is known to index academic searches for a wide range of journals (Mishra et al., 2017). This concurs with the general opinion of the literature suggesting that Scopus is a reliable database for literature review studies.

The keywords and combinations identified and used for the article search were: titles containing "entrepreneur", "gender", "issue", "innovations" OR "digit", "technology" (153 articles), and data gathered from September 2023, until October 2023. In order to render certain results several descriptive analysis were done on the collected data. In the end, to get the overview of the emerging trends, research gaps as well as future directives, a content analysis was performed.

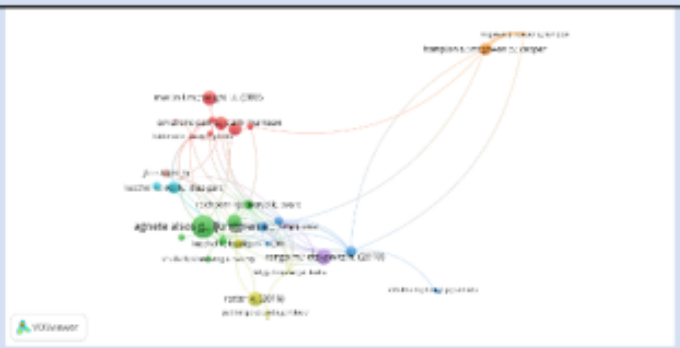
3. FINDINGS

The phase of content analysis began with coupling analysis (Kessler, 1963) conducted with Vos Viewer software which indicated the connectivity of each research paper in the sample using the common references of the papers (Boyack & Klavans, 2010). When a document cited in another document is cited more frequently this measure increases suggesting that there is a higher relatedness between the documents. In the present study, the 158 papers were used, thereby applying the Kessler (1963) formula. Consequently, the number of included articles was limited to documents/sources where relevance was based on the articles that specifically provided at least 2 references at minimum (Boyack & Klavans, 2010). Consequently, in this analysis, eight clusters and thirty-seven papers were generated which were arranged in different colours of map developing tools as indicated in the table below.

The use of clustering was aimed at eliminating the spelling of results and the dispersion of related topics across dissimilar fields. These clusters were made to group articles that shared a different topic or direction. To categorize the selected papers based on the content analysis, it was used the clustering algorithm which had been presented by Van Eck and Waltman (2017).

Based on the in-dept analysis of each paper included in the resultant clusters, the following research areas are identified.

Table 1. Cluster Analysis

Bibliographic map			
			
Cluster	**Authors**	**Year**	**Citations**
Cluster 1 (9 items - red)	Alda-Vidal C.; Rusca M.; Zwarteveen M.; Schwartz K.; Pouw N.	2017	12
	Ekinsmyth C.	2014	58
	Gupta N.; Etzkowitz H.	2021	13
	Kubberød E.; Jones S.; Pettersen I.B.	2021	5
	Kumari M.	2020	7
	Martin L.M.; Wright L.T.	2005	69
	May D.; Hosch-Dayican B.; Leisyte L.; Lensing K.; Sigl L.; Terkowsky C.	2015	3
	Ozkazanc-Pan B.; Clark Muntean S.	2018	59
	Pablo-Martí F.; García-Tabuenca A.; Crespo-Espert J.L.	2014	15
Cluster 2 (7 items - green)	Agnete Alsos G.; Ljunggren E.; Hytti U.	2013	182
	Cesaroni F.M.; Sentuti A.; Buratti A.	2015	25
	Dai Y.; Byun G.; Ding F.	2019	61
	Gunawan A.A.; van Riel A.A.C.R.; Essers C.	2021	15
	Reichborn-Kjennerud K.; Svare H.	2014	32
	Shukla T.; Chauhan G.S.; Saumya S.	2018	13
	Striebing C.; Kalpazidou Schmidt E.; Palmén R.	2019	3
Cluster 3 (6 items – light blue)	Alonso-Galicia P.E.; Fernández-Pérez V.; Rodríguez-Ariza L.; Fuentes-Fuentes M.D.M.	2015	33
	Chhabra M.; Dana L.-P.; Ramadani V.; Agarwal M.	2022	9
	Gilmartin S.K.; Thompson M.E.; Morton E.; Jin Q.; Chen H.L.; Colby A.; Sheppard S.D.	2019	25
	Iman, A. Nazarov, Z. Obydenkova, A	2022	10
	Martin L.; Wright L.; Beaven Z.; Matlay H.	2015	39
	Uribe-Toril J.; De Pablo J.; Ruiz-Real J.L.; Pires Manso J.R.	2019	8
Cluster 4 (5 items – light green)	Fraser S.	2019	4
	Kuschel K.; Lepeley M.-T.	2016	30
	Lichy J.; Farquhar J.D.; Kachour M.	2020	3
	Paoloni P.; Secundo G.; Ndou V.; Modaffari G.	2019	7
	Ratten V.	2016	68
Cluster 5 (4 items – violet)	De Rosa M.; Bartoli L.; Charatsari C.; Lioutas E.	2021	5
	Lawton Smith H.; Meschitti V.; Le Roux J.; Panton M.; Baines N.; Poulovassilis A.; Henry C.	2020	
	Ranga M.; Etzkowitz H.	2010	84
	Wang Q.	2023	2
Cluster 6 (2 items – turquoise)	Cadenas G.A.; Cantú E.A.; Lynn N.; Spence T.; Ruth A.	2020	25
	Kuschel K.; Ettl K.; Díaz-García C.; Alsos G.A.	2020	51
Cluster 7 (2 items – orange)	Hampton A.; McGowan P.; Cooper S.	2011	49
	McGowan P.; Cooper S.; Hampton A.	2013	3
Cluster 8 (2 items – acid green)	Alsos G.A.; Haugum M.; Ljunggren E.	2017	2
	Jha S.K.	2018	21

3.1 Empowering Women and Technology

The studies categorized in this cluster examined the relationship between communication technologies and Digital Literacy Women empowerment and entrepreneurship. Among the studies presenting a specific case study or highlining the role of women empowerment through technological advances is the following: With the methodology, Alda-Vidal et al. (2017), Kubberød et al. (2021) and Ozkazanc-Pan et al. (2018), all employ a qualitative research approach to their investigation regarding women's employability through the use of technology. According to Ekinsmyth C. (2014), women are handicapped right from the beginning because they are structurally disempowered in resourcing their businesses and forming strategic partnerships. Nonetheless, it appears that they have been able to manage and avoid these disadvantages through learning not to be included and, thus, disrupting and decolonizing the masculinized culture. Being an outsider fosters the theory of belonging in the process of entrepreneurial learning. Moreover, Kubberød et al. (2021) introduce the noon of by-passing as another type of dealing with marginalization that aims at gender non-recognizability. Thus, the study relies on the findings from a study of nine women opportunity entrepreneurs involved in high-tech ventures in Norway. It uses a qualitative phenomenological design focusing on retrospective and detailed interviews to examine the learning biographies of the entrepreneurs. Gupta and Etzkowitz (2021) provided an analysis of women entrepreneurs' engagement with the social world based on a post-structural feminist perspective. The study reveals how activity and context matter in constructing opportunities and managing gender issues in entrepreneurship. The interactions with academic incubators are rated positive, therefore controlling gender relations and contributing to the creation of a growing culture of entrepreneurship.

3.2 Growth and Development of Female Entrepreneurs

This paper suggests that previous studies such as Reichborn-Kjennerud and Svare (2014), Gunawan et al. (2021), and Dai et al. (2019) have provided documented proof that the growth aspirations of male and female entrepreneurs differ. The sample comprised both males and females from the mid-aged and middle social classes. Exploring the concept of entrepreneurship further prolongs the disclosure of gender dimension varying motives and behaviours of female and male entrepreneurship. The materials also launch an exploration of gender diverse perspectives in new venture teams, considering the positive relationship between gender diversity and increased innovation performance noting the increasing proliferation of women in shaping entrepreneurial talent. The studies suggest that the 254 Proceedings of the 7th International Conference on Gender Research Valentina Ndou et al findings supported the argument that women and men use similar qualities when practicing as entrepreneurs, however, women are characterized by more modest ambitions and different values than those portrayed by men. This in turn affects their growth potential. Further, Cesaroni and Sentu (2015) research the causes of bank loans and differences in genders. They consider three hypotheses. First, whether men and women entrepreneurs requested new bank loans during the crisis. Second, if they get the necessary bank loans at these conditions, and last but not least, if there are some other factors other than gender that may affect the ability to get the bank credit. The assessment of Italian male and female enterprising during an economic downturn reveals that female entrepreneurs are not as disadvantaged as one would think when it comes to credit access during an economic downturn. Although there are some minor differences that still remain to some extent today especially regarding women persons who experience some difficulties to obtain the credit they requested, some other factors like age, education level, banking history, and experience in the specific industry do not greatly affect the credit access. The study argues that, in sum, these factors equally do not help or hinder entrepreneurs when it comes to credit risk in any economic crisis.

3.3 Female Entrepreneurs and Leadership

In this cluster, there are some works addressing the issue of entrepreneurs' images inherited from males and socializing processes as the source of the problem concerning female entrepreneurship that creates some "glass ceilings". Maron et al. (2015) gathered information on fifteen women business owners running business enterprises that had evolved beyond the initial business start-up stage were sourced from national databases. The authors conclude that women may be prepared to cope with challenges thanks to the desire to embrace conventional male-oriented approaches to conducting business and the determination to prove themselves and their capacities under these guidelines. While male practitioners by themselves enjoyed conventional recognition as shrewd dealers, women faced more challenges of acceptance and credibility as 'abnormal' employees. This is also supported by Alonso-Galicia et al. (2014) who they stressed that the effect of close social groups is received differently by men or women, particularly in terms of support towards academics and entrepreneurial development, and perceived control over the development of entrepreneurial intention. Finally, Iman et al. (2022) investigate gender in the context of entrepreneurship in post-Communist societies by analyzing the Global Entrepreneurship Monitor data of 11,617 private firms in 25 states of Eastern Europe

and the Central Asian region. The results indicate that female owners are more bent on adopting new forms of marketing as compared to males. Furthermore, while having more female managers is associated with firm innovation specifically, the rising democratization trends contribute towards change in gender differences within a range of innovative solutions.

3.4 Women Entrepreneurs in Digital Start-ups

As in our study, Kuschel and Lepeley (2016), and Paoloni et al. (2018) incorporate a systemic literature review to identify the potential of emerging digital technologies. This evolving digital world underlines their important function in improving opportunities for females in business. All these technologies help to address some of the challenges that women in entrepreneurship face and therefore go a long way in creating a better networking environment. In addition, Raten (2016) attempts to explore the position of women entrepreneurs who envisage commencing an informal business with emphasis on the part played by knowledge and innovation. Exploring the customer knowledge development, innovative outcome expectations, and culture among women for informal business ventures. Lastly, Lichy et al. (2020) examine how women entrepreneurs employ SNSs in marketing their businesses in Lebanon. The authors employ a two-phase research design, namely, a survey of a panel of specialized business commentators and digital qualitative data collection techniques that facilitate access to the ''hidden'' actors. This study establishes that women entrepreneurs use SNS for networking with potential clients, communicating and nurturing relations within the entrepreneurial environment. Moreover, SNS contributes connection in supporting family units as a source of extra income.

3.5 Gender Dimension of Technology, Innovation and Entrepreneurship

De Rosa et al. (2021) investigated the patterns of innovation adoption among Italian female-owned farms, focusing on how support services and farmers' entrepreneurial mindset explain these patterns. This highlights the need to have different policy measures on gender in rural Italy to capture different innovation strategies, this is due to the need to capture the gender dynamics that exist in the adoption of technology, innovations, and entrepreneurship. In a similar vein, Ranga and Etzkowitz (2010) highlight how over the last two decades, women's roles in innovation, technology, and entrepreneurship that were conventionally within the purview of feminist research only have increasingly come into the limelight. In this study, the authors analyze current issues that continue to prevent women from occupying scientific and enterprise positions, often unnoticed in the incorporation and leadership of emerging technologies, and putting forward an exemplary case of women spearheading a major shift to a Knowledge Society in full. This piece of evidence is in sync with Wang's (2023) research that highlighted the fact that these businesses have exhibited a gendered resilience in the sphere of technology, innovation, and entrepreneurship in the face of the pandemic. Last but not least, the research article by Lawton et al. (2020), sheds light on the constraint of gender diversity in academic entrepreneurship especially concerning the low participation of women in STEM and the problems they face in commercializing. It provides an understanding of commercial activities in an academic context at Birkbeck, University of London, and how men control research grants and factors that affect commercial success networks and organizational support useful for universities and investors.

3.6 Entrepreneurship Gender Gap and Education

In this cluster gathers articles which reveal the need for the new studies to close the gender gap and work toward equal opportunities for men and women so that they could equally participate in entrepreneurial activities spearheaded by STEM. Similarly, Cadenas et al. (2020) highlight the elephant in the room of the gender gap in STEM entrepreneurship where female entrepreneurs are still rare in the field mainly due to sexism. This paper calls for the closure of this gap by synthesising the literature on women's entrepreneurship and gender issues in STEM by focusing on factors influencing women's participation in STEM-based entrepreneurship. In addition, Kuschel et al. (2020) explain the difficulties students from the low-repressed groups when it comes to access to entrepreneurial education for STEM profile and the approximation within the framework of the above-mentioned "Poder" program. It charters its effectiveness in substantially improving different outcomes and attitudes of diverse learners, stressing on the program's effectiveness in the promotion of career and employment agency and the overcoming of deficits and barriers of the existing system of entrepreneurship, and STEM education.

3.7 Networking and Female High-Tech Entrepreneurship

This cluster consists of papers that analyze the concept of networking and the role of women in high-tech startup companies. Hampton et al. (2011) respond to a lack of scholarly work related to female entrepreneurship and networking within traditionally male-dominated industries of high technology. In the present research, the

author adopts an exploratory research approach to examine the characteristics, composition, and dynamics of SET businesswomen's networks in Northern Island in the business life cycle based on the results of qualitative interviews. It stressed the need to focus on the network quality for the female entrepreneurs involved in SET-based ventures, revealing information essential for government intervention. Everyone on networking effectiveness and to support women in high-tech entrepreneurship, a research area relatively untouched in the existing literature on female entrepreneurship. Furthermore, in the same year, McGowan et al., show that networking is crucial for high-tech entrepreneurship, especially for female entrepreneurs given that few of them venture into technology-related sectors. It identifies the shortage of comparative study of the method how male and female entrepreneurs construct and use networks as suggested by this work, stressing the need to fill this gap as a way of increasing female participation in high-tech entrepreneurship. This work uses qualitative research to analyze the characteristics and value of entrepreneurial networks in both genders, to identify the patterns and implications for enhancing female participation and outcomes in high-tech businesses.

3.8 Gender Equality in Entrepreneurship Ecosystem

The research categorized in this cluster discussed gender imbalance in the entrepreneurship ecosystem. Specifically, the first study of Alsos et al. (2017) focuses on the effects of policy implementation where Norway's Program for Regional R&D and Innovation targets the promotion of gender parity in entrepreneurial ecosystems at the regional level. The study compares the gendered objectives formulated in plans and guidelines with the outcomes and reveals few changes toward gender equality despite ambitious goals and initiatives. It identifies the absence of appropriate instruments and low integration between objectives in the political guidelines, activities, and reporting. It implies that, although the ecosystem approach targets industry and firm levels adequately, it has no adequate measures to engage women appropriately. The policy conclusion underlines the impossibility of building an economic environment favorable for women through only policies and calls for a comprehensive approach to gender equality while providing the practical instruments to pursue the goals. Similarly, in the research by Jha (2018), it is pointed out that to unlock a plethora of opportunity, adequate funding, and talent, the ecosystem has to prioritize value creation overvaluation, provide education to young entrepreneurs, celebrate purposeful failure, have explicit solutions to the Indian context, and address the startup gender gap.

4. CONCLUSION

All in all, the presented research clusters provide a balanced and relatively exhaustive overview of the diverse aspects related to the role of women in entrepreneurship using such topics as technology, growth, leadership, digital start-ups, feminization of technology, networking, and the entrepreneurial environment. The implications provide insight into the complexities of the experiences that women face in their business exploration.

Thus, the convergence of communication technologies and digital skills in supporting women entrepreneurs is a research work that addresses an important aspect of contemporary life. Fundamentally, it builds a complex symbiosis, which serves as a basis for re-establishing women's relationship with technology and determining how technology may foster their entrepreneurial drive. Given the relevance of technology to business ventures, recognition of how technology is adopted by women is critical. In more detail, an understanding of the particular platforms uses, and approaches that are popular among women in business endeavours can contribute to a more sensitive analysis of the key strengths and opportunities, as well as the problems of women's presence in cyberspace.

Examining the sources of women entrepreneurs' coping and the technique of 'not belonging,' one is able to explore a deeper layer of their survival. This tactical approach asserts that women entrepreneurs create their own opportunities and defy the status quo given the adverse systemic barriers for them. Future works may refine the details of this approach, consider how this strategy builds or changes with time, and decoding how this affects the decision process of the entrepreneurs.

As earlier mentioned, it is understood that there are contextual factors that may affect women entrepreneurs; hence, the call for a gender-sensitive approach to support women in their entrepreneurial endeavours. To this end, one is able to take an in-depth look at different contexts including the socio-cultural, economic, or institutional as a way of giving directions on how to best put in place support systems. The findings of the study hold implications for the policy and practice aimed at advancing the concerns of women business owners since the study explored how various contexts influence the entrepreneurial experience of women.

Examining the opposing mix of 'success' cases in the engagement with academic incubators, may illustrate how a much more intentional approach to constructing 'interstitial support', may foster such positive change-making for students. Perceiving the academic incubators of the elements that boost the quality performance of women academics, unveils the brave success of women and practices to be replicated. These best practices can be sampled by policymakers and those in the industry to promote and support gender diversity in vocational that will enable more women to access finance to start their businesses.

In other words, it becomes extremely difficult to deal with stereotypes that more or less, form a part of our perception criterion. The common theme of groups and the need for support surfaces, specifically the role of support for the female entrepreneurs for the purpose of the presentation of the experiences in the course of the study of the practices. The attempts at revisiting new norms and reconstructing the acceptable status quo that hamper the existing barriers to leadership and the surge of female entrepreneurs.

Technologies of the new generation that are constant features of the current world help in the elimination of rigid hardships that women entrepreneurs face. It is also strategically possible to build the argument that, apart from improving business communications, the use of SNS reveals the so-called emergent digital competencies in managing the dynamics of the modern business climate.

The effort to shut gender discrimination when it comes to STEM-oriented entrepreneurship therefore needs an increased and comprehensive approach. Therefore, developing equity and impalement of effective social entrepreneurship programs needs to be pursued as it plays the significant role of boosting different learners and reorientation in STEM education.

4.1 Practical Implications

As implications we highlight the need for ongoing research in women's entrepreneurship, emphasizing: Consequently, the first question of this study is as follows:

1. Longitudinal Studies: Discover the main changes in women's entrepreneurial journey across time and the effects of various factors in their careers.
2. Technological Adoption: Examine how Women entrepreneurs are affected by fast-going technological advancements in relationship to their business opportunities and market environment.
3. Policy evaluation: Conduct a critique of the existing trends in the policies directed to women in entrepreneurship, and provide suggestions for improving the plans and programs.
4. Institutional Support: Asses the status of institutional support geared toward women in entrepreneurship as a guide towards defining promoting environments. Promoting gender equality is aimed at improving the quality and quantity of gender-sensitive research, especially as it covers these areas, contributing to the development of policies. Collaboration of academia, policymakers, and the industry in the current world is essential in facilitating an environment that encourages women to fully engage in entrepreneurial activities.

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(+355) 67 60 20 600
info@wbu.edu.al
Autostrada Tiranë-Durrës, KM 7, Tiranë | Shqipëri

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