Transformative Pedagogical Strategy: Bridging Theory and Practice for 21st Century Education

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Abstract: This research paper examines the concept of transformative pedagogical strategies in modern education, focusing on bridging the gap between theoretical concepts and practical application. The paper provides an overview of transformative learning theories and their relevance to education in the 21st century. It explores various pedagogical approaches such as student-centered learning, problem-based learning, and inquiry-based learning, highlighting their role in transforming traditional teaching methods. Project based learning is discussed in detail and different ways to enhance project-based learning have been proposed. The paper also discusses the challenges and considerations in implementing transformative pedagogy and provides recommendations for educators and policymakers to effectively integrate theory and practice in educational settings. Three case studies have also been reviewed in the paper to give an insight into the successful implications of practical knowledge.

Keywords: Problem based learning (PBL), Project-based learning (PjBL), Transformative pedagogies.

I. INTRODUCTION

The relationship between theory and practice in education is a complex and dynamic one, with each influencing the other in various ways. The theory-practice gap can be described as a lack of ability to relate the knowledge acquired in academics and research work with practice. The research shows that there is a vast gap between the theoretical knowledge and practical applications. This gap has been widening due to more technological advancement like artificial intelligence which has increased the challenges for present education system.

In the old pedagogies, a teacher's quality was assessed primarily in terms of their ability to deliver content in their area of specialisation. Pedagogical capacity was secondarily important; its development in colleges of education varied a lot by country and culture. In most places, "teaching strategies" overwhelmingly meant direct instruction. In recent decades, technology has been layered on top of content delivery and used primarily to support students' mastery of required curricular content. The question of what and how students should learn has been occupying a central place in debates on education in many countries.

Transformation in the field of teaching and learning is necessary to meet the learning outcome of any undergraduate course. Most of the students complain of lacking practical knowledge in their field of education in India. Transformation learning is one such tool which can bridge the gap between theory and practice in education sector. An education which fosters the growth of the students in a way that students use their critical thinking to analyse the subject knowledge and frame critical thinking approach for it.

[1] Discusses effective transformative pedagogical strategies which specifically focuses on STEM program. This research exposed gaps in the current literature for online learning and transformative pedagogical strategies in STEM (science, technology, engineering and mathematics) programs. [2] Addresses the gap between what works in research and what works in practice by considering evidence-based education policy and randomised practical trials. [3]In basic transformative learning has been discussed with detailed study. [4] The purpose is to revisit transformative article pedagogy in order to redefine its units of analysis, its objectives and its methodologies, in a way that would make it more meaningful in the context of today's knowledge driven society. [5] Discusses about the gap between theory and its practical implications but it does not include new elements and challenges in consideration like online learning platforms which provide unlimited theoretical contents and challenges teaching methodologies.[6] Compares theoretical education and practical education which concludes that it's important to utilize the data practically; otherwise, there's no purpose to achieve theoretical data. Thus, to possess excellent learning expertise one ought to gain each sensible and theoretical data. A lot of other literature also discusses the gap between the theory and practice.

Some key aspects of theory- practice relationship is:

1. Informing Practice: Educational theories provide frameworks for understanding how students learn and how teaching can be most effective. They inform the design of curriculum, instruction, and assessment practices in classrooms.
2. Guiding Reflection: Theories help educators reflect on their teaching practices, understand the underlying principles, and make informed decisions about how to improve and adapt their approaches.
3. Grounding in Research: Theoretical frameworks are often based on research and evidence, providing a foundation for effective teaching practices. Research-based theories can help educators make informed decisions about instructional strategies.
4. Professional Development: Theories can guide professional development activities for educators, helping them deepen their understanding of teaching and learning principles and improve their practice.
5. Challenging Assumptions: Theories can challenge traditional assumptions and practices in education, encouraging educators to rethink their approaches and consider new perspectives.
6. Contextualizing Practice: Theories help educators understand the broader context of education, including societal, cultural, and political factors that influence teaching and learning. This understanding can help educators adapt their practice to better meet the needs of diverse learners.
7. Promoting Innovation: Theories can inspire innovation in education by providing new ideas and perspectives on teaching and learning. They can encourage educators to experiment with new approaches and technologies.

Remainder of the paper is organized as section II covers Importance of student's practical work in different domains, section III are challenges to education, section IV proposes various pedagogical approaches, section V discusses project-based learning in detail, section VI is review of 3 different case studies for transformative pedagogies followed by last section VII of conclusion.

II. IMPORTANCE OF STUDENTS' PRACTICAL WORK IN DIFFERENT DOMAINS

The studies have suggested that a gap exists between the current outputs of the education system and society's education needs, but that this could be bridged by a multipronged approach that involves making changes to curricula, teacher supply and training, infrastructure and technology. One important aspect of transformative pedagogy lies in practical based education system in every domain whether it is engineering domain, medicine domain or nursing domain. Without proper practicing, students lack the ability to work for big companies or industries. Practical knowledge is a tool for creative and critical thinking.

In this section, the gap between theoretical and practical knowledge has been highlighted as a need to transform present educational system in general. Engineering domain and health care domain has been taken as a base to study this gap.

1. *Engineering domains:*

Important problems for the engineering education system are providing students with practical skills and combining multiple elements of practical knowledge to fulfil a specific engineering task. Any engineering branch is incomplete without practical. College and universities other than IITs and NITs focus more on theory rather than practical approach. Education through practice is a basic requirement of 21st century. Engineering graduates are lagging in terms of practical knowledge and practical skills required in real world.

2. *Health care :*

Clinical mastery and knowledge acquisition are important aspects of a nurse's overall performance. The theory-practice gap is described as a lack of ability to relate and enforce the knowledge acquired in academics and research work with practice and its attending consequences make nurses vulnerable, thereby affecting the health care system of any nation in general. The consequences of these gaps have resulted in poor awareness of current advancements and research findings by nurses. Rather a strong reliance on traditional approaches has been adopted, such as intuition against empirical and research discoveries; lack of integration of Evidence-Based Practice (EBP) into either the curriculum or day-to-day care; and poor collaboration between academic areas and clinical activities. The outcome of the intertwined relationship of both knowledge and perception has a great influence on the way clinical nurses practice, regardless of the professional guidelines that depend on how situations are handled, they either positively become minimized or negatively become wider.

III. CHALLENGES TO EDUCATION

Theoretical education, which focuses on teaching abstract concepts, theories, and principles, faces several challenges in practice. Some of the key challenges include:

The vocational education and training (VET) sector's focus on training for competence has apparently widened the gap between knowledge and skills. Theoretical knowledge is the province of universities while registered training organisations develop trainees' ability to 'simply perform skills' presumably without necessarily knowing why they do them.

1. Relevance to Practice: One of the primary challenges of theoretical education is ensuring that the concepts and theories taught are relevant and applicable to real-world situations. Students may struggle to see the practical value of theoretical knowledge if it is not clearly connected to their everyday experiences or future career goals.
2. Engagement and Motivation: Abstract theories and concepts can be challenging to understand and may not always capture students' interest or motivation. Keeping students engaged in theoretical learning requires innovative teaching methods and approaches.
3. Retention and Transfer: Students may struggle to retain theoretical knowledge over time, especially if they do not have opportunities to apply or reinforce it. Additionally, transferring theoretical knowledge to new contexts or situations can be difficult for some students.
4. Depth vs. Breadth: Balancing the depth and breadth of theoretical content can be challenging. Educators must decide how much time to spend on each concept and how to prioritize certain theories over others, given limited instructional time.
5. Assessment: Assessing theoretical knowledge can be challenging, as traditional assessment methods such as exams may not effectively measure students' understanding of abstract concepts. Alternative assessment methods, such as projects or portfolios, may be more suitable but can be resource-intensive to implement.
6. Teacher Preparedness: Teaching theoretical concepts effectively requires a deep understanding of the subject matter and the ability to

explain complex ideas in a way that is accessible to students. Not all teachers may feel adequately prepared or comfortable teaching theoretical content.

7. Resource Constraints: Implementing theoretical education effectively may require resources such as textbooks, materials, and technology. Schools and educational institutions with limited resources may struggle to provide the necessary support for theoretical learning.

Addressing these challenges requires a multifaceted approach that includes curriculum design, instructional strategies, assessment practices, and teacher professional development. By overcoming these challenges, theoretical education can be more effective in preparing students for future academic and professional success.

IV. PEDAGOGICAL STRATEGIES

Pedagogical strategies refer to the methods, techniques, and approaches used by teachers to facilitate learning in students. These strategies are like solutions to bridge the gap between theoretical and practical knowledge in higher education.

1. *Problem-Based Learning (PjBL)*
   Involves presenting students with real-world problems or scenarios that require them to apply their knowledge and skills to find solutions. Problem-Based Learning (PBL) is a student-centered pedagogical approach that is particularly well-suited for technical education. In PBL, students learn by actively engaging in real-world, open-ended problems that require them to research, analyse, and propose solutions. The ways to implement problem-based learning are
   1. Creative classroom real world problem discussion and proposing answers with due participation of the students.
   2. Provides hands on experience
2. *Project-Based Learning (PBL)*
   Similar to PBL, but students work on an extended project very time, allowing for deeper exploration and application of concepts.
3. *Inquiry-Based Learning:*
   Involves posing questions, problems, or scenarios to students and guiding them through the process of finding answers or solutions.
4. *Cooperative Learning:*
   Involves students working together in small groups to achieve a

common goal, fostering collaboration and teamwork skills.

5. *Flipped Classroom*:
   Involves students engaging with course content outside of class (e.g., through videos or readings) and using class time for activities, discussions, and hands-on learning.
6. *Experiential Learning:*
   Involves learning through experience, such as field trips, internships, or hands-on activities, to enhance understanding and retention of concepts.
7. *Differentiated Instruction:*
   Involves tailoring instruction to meet the diverse needs of students, such as through varying the content, process, or product of learning.
8. *Technology-Enhanced Learning:*
   Involves using technology tools and resources to enhance teaching and learning, such as through online platforms, multimedia presentations, or simulations.

V. PROJECT BASED LEARNING

This section discusses about Project Based Learning (PjBL) can provide solution based approach for bridging the gap between theory and practice. Project-based learning (PjBL) is a comprehensive instructional approach to engage students in sustained, cooperative investigation.

Project-based learning is used to connect theoretical knowledge and practice skills by taking a project from industry and completing it within the peer supported learning environment of the classroom, returning the project product to industry. In the PjBL approach, students are required to answer a question or develop a product for example. In doing this it is felt that they are able to take control of the learning environment and process, working in groups to complete a series of tasks to reach the project outcome. Because the project involves complex tasks, a range of inter-disciplinary skills is developed as distinct from focusing on one aspect of knowledge or skill development – mathematics, for example. The benefits for students are described as enhanced problem-solving skills, communication skills, team work skills and an understanding of the abstract or theoretical concepts behind the project issue including the way these are translated into action

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Project based learning can be implemented in different ways at universities or industrial levels as shown in figure 1.

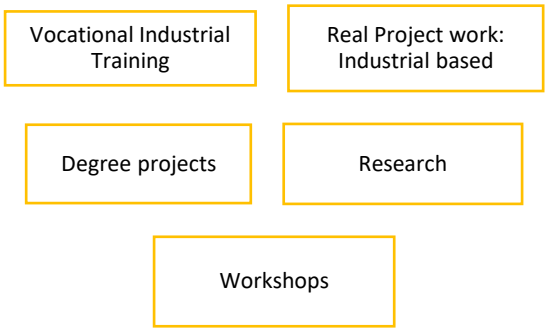

Figure 1: Different ways of Project Based Learning

A. Vocational Industrial Training:

Vocational Industrial Training (VIT) is a form of training that focuses on providing practical skills and knowledge related to a specific trade or industry. It is often used to prepare individuals for employment in a particular field. VIT programs typically include hands-on training and may also incorporate classroom instruction to supplement practical skills with relevant theoretical knowledge. These programs are designed to equip individuals with the skills and knowledge needed to succeed in their chosen profession.

B. Real Project work: Industrial based

Project-based learning is used to connect theoretical knowledge and practice skills by taking a project from industry and completing it within the peer supported learning environment of the classroom, returning the project product to industry.

C. Degree projects

Every educational curriculum mostly includes some assignments and projects as part of degree work. For example, engineering has Project included in its final year syllabus. This way students will be able to work on theoretical concepts and its practical implicationjs and applications. The prime responsibility of effective learning lies with the institution and the faculties to ensure proper project management. The students should be regularly supervised and guided by the teachers to work on the project.

D. Research

Research can play a crucial role in bridging the theory-practice gap in various fields, including engineering as shown in Figure 2. Research helps identify real-world problems or challenges faced by practitioners, which may not be apparent from theoretical knowledge alone. By conducting research, engineers can develop practical solutions to address the identified problems, based on a thorough understanding of the underlying theory.

Research can validate theoretical concepts by testing them in real-world scenarios, thereby bridging the gap between theory and practice. Research findings can inform the development of engineering curricula to ensure that they are relevant and up-to-date, thus better preparing students for practical applications. Research can contribute to the ongoing professional development of engineers by providing insights into emerging trends, technologies, and best practices. Research findings can facilitate the transfer of knowledge from academia to industry, ensuring that theoretical advancements are applied in practice. Research can provide evidence-based insights to support decision-making processes in engineering practice, leading to more effective and efficient outcomes.

Figure 2: Importance of Research

E. Workshops

Workshops related to the educational field can be organised for the students which mainly focuses on practical knowledge of the students. For example, Software learning and coding workshops can be organised which enhances the skill set of the students. Big industries and companies need employees with high skill set. Workshops specifically can be a tool to enhance skills of the students for bridging the gap between theory and practice.

VI. REVIEW OF CASE STUDY

Different countries are successfully reducing the gap between theory and practice using various effective norms and strategies. This section presents a3 case study review already done so as to conclude the strategical approach to enhance practical skills of the higher education sector.

A. Case Study 1: FINLAND

Finland is widely recognized for its successful implementation of a practical-based education system. The Finnish education system prioritizes experiential learning, active participation, and student-centered approaches. Here are some key features of Finland's practical-based education system:

1. Reduced emphasis on standardized testing: Finland has significantly reduced the emphasis on standardized testing and instead focuses on holistic assessment methods that evaluate students' comprehensive skills and abilities.
2. Strong emphasis on play and creativity: Finland believes in the power of play and creativity in the learning process. Students engage in hands-on activities, group projects, and problem-solving tasks, fostering critical thinking and innovation.
3. Teacher autonomy and professionalism: Finnish teachers have a high degree of autonomy and are trusted to design their own curriculum and teaching methods. This flexibility allows them to incorporate practical and real-world applications into their lessons.
4. Vocational education and apprenticeships: Finland places equal importance on vocational education alongside traditional academic education. Vocational schools offer practical training and apprenticeships, enabling students to gain valuable skills and experiences relevant to their chosen career paths.

The Finnish education system's practical-based approach has contributed to the country's consistently high rankings in international education assessments, such as the Programme for International Student Assessment (PISA).

B. Case Study 2: GERMANY

Germany is renowned for its successful dual education system, which combines theoretical learning with practical training. The dual education system focuses on preparing students for vocational careers and has been instrumental in addressing skills gaps in various industries. Key elements of Germany's practical-based education system include:

1. Apprenticeship programs: Germany offers a robust apprenticeship system, where students alternate between classroom-based learning and on-the-job training. This enables students to acquire practical skills directly from industry professionals and gain valuable work experience.
2. Strong industry partnerships: German educational institutions closely collaborate with local businesses and industries to design apprenticeship programs aligned

with market needs. This ensures that students receive up-to-date training and are equipped with the skills demanded by the job market.

3. Recognized qualifications: Apprenticeships in Germany lead to recognized qualifications, such as vocational degrees or certifications. These qualifications are highly valued by employers, providing apprentices with a competitive edge in the job market.
4. Career-oriented curriculum: The German education system integrates practical aspects into the curriculum, offering students the opportunity to apply theoretical knowledge through hands-on projects, internships, and industry collaborations.

The dual education system has played a significant role in Germany's economic success, fostering a skilled workforce and reducing youth unemployment rates.

C. Case Study 3: SINGAPORE

Singapore is known for its innovative and practical-based education system, which aims to develop students' critical thinking, problem-solving, and collaboration skills. Here are notable features of Singapore's practical-based education system:

1. Emphasis on applied learning: The Singaporean curriculum emphasizes applied learning through real-world problem-solving tasks and project-based assignments. Students actively engage in hands-on activities, experiments, and research, allowing them to understand how theoretical concepts apply in practical contexts.
2. Strong focus on STEM education: Singapore places a strong emphasis on Science, Technology, Engineering, and Mathematics (STEM) education. The curriculum incorporates practical experiments, coding, robotics, and design thinking, enabling students to develop practical skills relevant to the STEM fields.
3. Work-study programs: Singapore offers work-study programs, such as the Work-Study Diploma and the Skills Future Work-Study Degree, which allow students to gain practical experience while pursuing their academic studies. These programs integrate classroom learning with industry attachments, preparing students for future careers.

4. Collaboration with industry and research institutions: Singapore's education system actively collaborates with industry partners and research institutions to provide students with opportunities for internships, mentorship, and exposure to real-world challenges. This collaboration ensures that students acquire practical skills and stay updated with industry trends. Singapore's practical-based education system has contributed to its strong performance in global education rankings and the development of a highly skilled workforce that drives its knowledge-based economy.

VII. CONCLUSION

Practical knowledge and theoretical knowledge are part of every field. The gap between the two is due to disconnection between the two. Industries and real-world practice of any field does not consider theories behind a practical work. They only focus on practical insights of projects without explaining or considering theory behind it and theories in the universities only consider theory but no applications of the theory. The gap can be reduced with university and industrial tie up with the use of different pedagogical approaches as discussed in this paper. Also, the case studies highlight how practical-based education systems have been implemented successfully in different countries, offering valuable insights and best practices for educators and policymakers worldwide. By focusing on experiential learning, collaboration, and real-world applications, these countries have made significant strides in preparing their students for the challenges of the modern world.

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