

Design Thinking for Futuristic Skills Development using Project-Based Learning (PBL) Approach: A Preliminary Study

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Abstract:

The teaching and learning methods adopt Project-Based Learning (PBL) to provide industry required skills to the graduates. It plays a vital role for problem solving and determine innovative solutions. However, Design thinking (DT) strengthen the innovation to enhance the solutions dynamically. The futuristic skills seek for integrated Technology based innovation for design, develop and apply to social needs which integrates critical thinking, problem solving, and communication and leadership skills. The Saudi Arabia vision 2030 is focused on integrating the skills for the national development. The DT is the conceptual tool identifying the skills required by the graduates through PBL pedagogy. This paper signifies DT role for futuristic skills, to integrate futuristic skills practices in PBL approach and preliminary results are discussed.

Keywords: Design thinking; Project Based Learning; Futuristic skills; teaching learning pedagogy.

1. INTRODUCTION

Project based Learning (PBL) is another to ancient instruction for students to enable supportive cooperation, progress communication and cluster skills, enhance peer teaching, include appropriate response, And support self and peer assessment on an in progress basis [13]. On the opposite hand, style Thinking (DT) plays a crucial part in cultivating a pupil United Nations agency will produce a stronger society by transforming product and facilities that solve world terrific issues [8]. By integrating each idea in a very twenty first Era Education and Modernization Skills context, this paper discloses that the majority of the breaches the learners met throughout their ancient learning activities can be resolved with a facilitate of assessments that are designed to live creative thinking in precise fields like PBL.

Digital age accomplishment, ingenious intelligent, current communication and high productivity that 21st-century learners got to succeed in today's

international economy. per [7, 11] normal teaching typically not succeed to adjust to 21st-century necessities that includes the peripheral necessities of the geographic point and wishes of a private learner as core necessities. Listening, , leading, collaborating, sharing and being versatile is as vital as knowledge domain. So, within the framework of information structure supported the event of skills, the instructors, being academics or trainers, ought to be able to monitor the extent of information the learners unendingly acquaint throughout the educational method per the goals sometimes attained by student's acting as a bunch.

A survey reportable in [9] has tried to shed lightweight on this analysis on the twenty first Century crucial Learning and Innovation Skills that involves:

- i) Crucial thinking
- ii) Creative thinking
- iii) Collaboration
- iv) Flexibility
- v) Information accomplishment

- vi) Media accomplishment vii) Technology accomplishment
- viii) Communication ix) Leadership x) Initiative
- xi) Productivity xiii) Social Skills

Finest way for Executing twenty first Century Skills [6] needs to

- Emphasis on real-world issues and methods
- Support inquiry-based learning experiences
- Deliver project methods to education
- Motivating in teaching students the way to learn

According to future work skills [Table 1], numerous six drivers like machine world, super structured organizations, extreme longevity, new media ecology, globally connected world and therefore the rise of sensible machines and systems have connection to the event of every talent.

Ministry of upper education has planned and revamped these art movement skills to implement and integrate to fulfill the vision 2030 of Asian nation. Also, has asked its neutral to seek out the challenges for these skills to be incorporated within the pedagogy system. For this all the stake holder were invited and participate within the transformation method. in sight of that the (PBL)project-based learning applying (DL)design thinking assure that the graduating students square measure effort the art movement skills.

3. METHODOLOGY

The methodology describes the idea of PBL,DT activities and its mapping method for art movement skills development of underneath graduate students.

3.1: Project primarily based Learning

Traditional Project primarily based Learning may be a active learning approach for the learner to expertise learning in a very totally different manner. thus PBL shifts the main focus of instruction from teacher-driven to learner-centered that is that the necessary talent for the

long run [10].Projects square measure offered jointly among the educational tool with specific learning objectives to develop imagine, explore, thinking skills for learning to understand and observe specific tasks that square measure aligned with learning outcomes, however it doesn't fulfill the graduates to adopt up to date techniques in their work setting. Therefore, and integrated approach is demanded by the trade .The The higher academic stake holders square measure tried to numerous doable combinable practices to confirm the specified trade skills to the graduates per their hand-picked programs. This work tried to integrate the project-based learning method with specific practical activities per the phases.presented in figure 1.

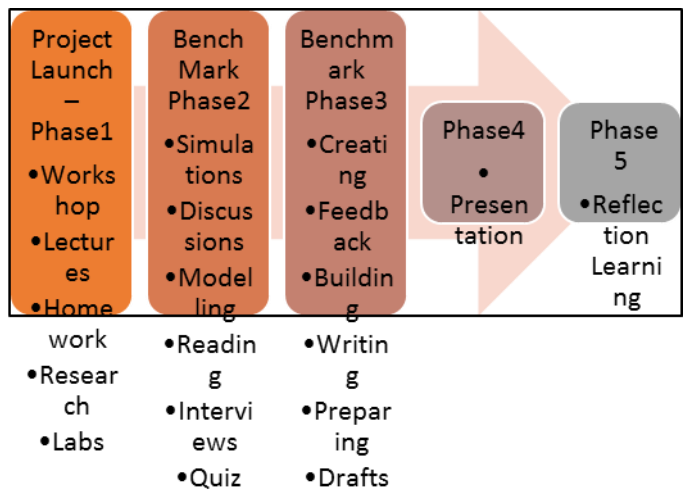


Figure. 1. Project Based Learning Phases

The project launch is the process to visualize the conceptual framework of an idea into a realistic implementation which includes analysis , design ,development ,deployment and maintenance which leads to solve real time scientific issues. The phases of the project and activities of each project are unique which ensure the acquisition of specific skills according to the domain nature, Herewith the general description of activities and its related skills provided. The first encompassed with activities , workshop lectures, research, homework and labs. This unit provides the conceptualization of conversion of ideas into a framework which requires thinking, investigation, acquisition of facts,

distribution of responsibility, identification of knowledge and sampling the protocols which needs the basic cognitive abilities and its related skills are supported by literacy, flexibility leadership, productivity and innovation initiatives. Based on the benchmark of phase one the unit two activities simulation, discussion, modelling, reading ,interviews and quiz are required to represent the conceptualization of the project; however, it requires information literacy, media literacy and technology literacy to simulate an idea based on the discussion which represents the model. The reading process initiate and innovative thoughts which aides to provide an interview leads to the decision making. It enables the conversion of cognitive thoughts into a conceptual model ,this model is bench marked with the existing other models and confirmed for the further development. The next phase of the project includes creation, building, drafting and feedback these processes are focused to build the project and produce conceptual idea into realistic process which involves productivity , social skills and flexibility to build the product based on the model. According to the presentation of the model the learning efficiency will be reflected. Therefore, the PBL approach is appreciated for acquiring the futuristic skills. The PBL approach needs suitable conventional mechanism therefore DT is identified, mapped and evaluated with set of learners that are described in the next session.

3.2. Design Thinking (DT)

The DT focused to expand education and development skill for the 21st era students via learner center approach, thinking about the innovative solutions, Providing Spontaneous LearningSkill, Interrogative, Challenging andDeveloping. However, it is a model to deal with “be creative on demand” necessities for learners and provide appreciated solutions for the learning difficulties of the 21st Era.

Dt provides a testable innovative solution prototypes based on redefining the problem, using iterative process in a non-linear method. This

method provides an approach to start the process and end the same ,at any functional point namely Empathize, Define, Ideate, Prototype and Test shown in figure 2. these functional points could be executed repeatedly until securing an innovative solution via redefining the problem. These solutions are testable with an appropriate prototype. Therefore, DT could be considered as a tool for skill development process at higher educational level. The functional points and its relationship is labelled in the following figure 2.

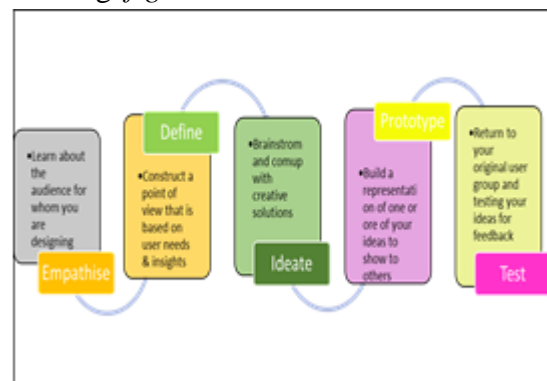


Figure. 2. Learning model of Design thinking

4. PBL WITH DT LEARNINGMODEL

The PBL accomplish with various teaching and learning tools, but the initiation of innovative thoughts requires unique thinking which is differing from others. therefore, to enhance the learning skills through PBL the DT approach integrated and evaluated as part of this work.

PBL through DT education model helps to:

- Involve students with the help of investigation process to exploring theirworld
- Society subjects around a real-world problem to solve.
- Scholars to do research, plan, design and create a product
- Complete cooperative student work on projects, guided by theteacher.
- Present an optimal solution to the currently used model oflearning.

DT method mainly motivates on understanding for users. in the business domain The practice of DT

seems to be developing but is absent in instructional design university programs, professional training and workplace practices. So, DT has the feasibility to combine with PBL to come up with improved design solutions which will promote advanced learning practices.

The skills and its integration of learning process mapped and presented in table 1 based on grouping of futuristic skills.

Table 1: Association of 21st Century Futuristic Skills' with Design Learning

Skills	Futuristic skills	(DL)Design Learning
S1	Critical thinking	D1- Empathise
	Creativity	
	Collaboration	
	Communication	
S2	Information Literacy	D2-Define
	Media Literacy	
	Technology Literacy	
S3	Flexibility	D3-Ideate
	Leadership	
S4	Initiative	D4- Prototype
	Social Skills	
S5	Productivity	D5- Test

The set1 skills are denoted as S1 which consist of critical thinking, creativity, communication and collaboration contributing to DT Empathize denoted as D1. The set2 representing information, media and technology literacy is denoted as S2 contributing D2 Define phase. The Ideate(D3) of DT supported by flexibility and leadership skills represented as set3 (S3). The initiative and social skills which are supporting to Prototype D4 of DT stated as set4(S4) and the Productivity skill supported for Test(D5) is presented as set5(S5). The PBL approach and its effective enhancement for skill development using design thinking phases mapped and presented in table 2.

Table 2: Mapping between PBL and DT:

	DT	D1	D2	D3	D4	D5
	Activities	Empathiz	Define	Ideate	Prototyp	Test
P1	Project launch	✓		✓		
P2	Project Analysis		✓	✓		
P3	Project Design		✓		✓	
P4	Project Development			✓	✓	✓
P5	Project Implementation				✓	✓

According to the associative mapping between PBL and DT phases its corresponding skill sets are mapped and presented as per learning process in table 3. For an e.g. The PBL phase 1(Project Launch) activity which is aligned with DT of Empathize ensure the skill S1(Critical thinking, Creativity, Collaboration, Communication).

Table 3: Skills Acquisition in PBL with DT

	DT	D1	D2	D3	D4	D5
	Activities	Empathize	Define	Ideate	Prototype	Test
P1	Project launch	S1		S3		
P2	Project Analysis		S2	S3		
P3	Project Design		S2		S4	
P4	Project Development			S3	S4	S5
P5	Project Implementation				S4	S5

5. RESULT AND DISCUSSION

As per the mapping of table 3, all the skill sets are fulfilled while applying DL activities in PBL phases, these skills set process are evaluated

with learners while they are doing their projects .The evaluation process is categorized as Beginning, Developing ,Accomplished and Exemplary with the range value of 1 to 4. The sample learner evaluation is presented in table 4.

Table 4: Evaluation on futuristic skills while starting in (PBL) to (DT)

PBT	DT Activities	D1	D2	D3	D4	D5	Total
		Empathize	Define	Ideate	Prototype	Test	
P1	Project launch	1		1			2
P2	Project Analysis		2	1			3
P3	Project Design		1		2		3
P4	Project Development			2	2	2	6
P5	Project Implementation				2	1	3
Total		1	3	4	6	3	17

The table 4 values are representing the futuristic skill measures at the beginning the PBL based learning .While the learners are following the PBL based approach the skills are acquired by the learner it is observed at the end of the project with the same measuring process. The measured values of the same learners at the end of the process presented in table 5.

Table 5: Evaluation on Futuristic skills Ending in (PBL) to(DT)

PBL	DT Activities	D1	D2	D3	D4	D5	Total
		Empathize	Define	Ideate	Prototype	Test	
P1	Project launch	2		3			5
P2	Project Analysis		3	2			5
P3	Project Design		2		3		6
P4	Project Development			3	3	3	9
P5	Project Implementation				3	2	5
Total		2	5	8	9	5	30

As per the comparison between table 4 & 5 the learners total skill development point increased from 17 to 30 the highest variation occurs in the design phase from 4 to 8 which shows that the design skills are high developed in the DT approach integrated with PBL process. All the remaining

phases also shows the positive growth for both DT and PBL process. For each student the starting measure and the measure which occurs in the end of the project present in table 6 & 7.

Table 6: Skills Score Before PBL approach with DT activities

Skills Score Before PBL						
	D1	D2	D3	D4	D5	total
S1	3	2	3	1	3	12
S2	1	1	2	3	1	8
S3	1	2	2	1	2	8
S4	3	2	3	3	1	12
S5	3	1	3	1	1	9
S6	3	3	3	1	2	12
S7	2	1	1	3	3	10
S8	2	3	2	1	2	10
S9	1	1	3	3	3	11
S10	2	2	1	1	3	9
S11	3	2	2	3	1	11
S12	3	1	2	3	1	10
S13	1	2	2	2	3	10
S14	2	3	1	3	3	12
S15	1	3	1	1	1	7
S16	3	1	1	3	3	11

Table 7: Skills Score After PBL approach with DT activities

Skills Score After PBL						
	D1	D2	D3	D4	D5	total
S1	2	3	3	4	2	14
S2	2	4	2	3	3	14
S3	4	3	2	4	4	17
S4	4	4	3	4	2	17
S5	2	2	3	4	2	13
S6	3	4	2	3	4	16
S7	2	2	2	2	3	11
S8	3	3	2	4	2	14
S9	3	4	2	2	4	15
S10	3	3	3	4	4	17
S11	2	4	4	2	2	14
S12	3	2	2	3	3	13
S13	2	3	3	4	3	15
S14	3	3	4	3	2	15
S15	2	4	4	2	2	14
S16	2	3	3	4	4	16

As per the comparison between skills scores of table 6 & 7 its proved that PBL approach integrated with DT activities developed the skill of the learners. The variation of learning skills of each individual student group presented in the chart

figured. The Skill development progress presented as follows :

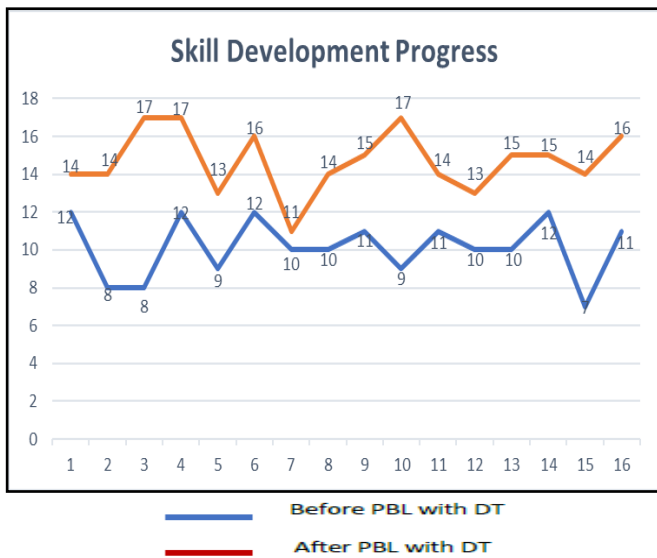


Figure 3. Individual student skill development

According to the chart the 3rd student and 15th student gained highest level of skills through PBL with DT activities, the 1st and the 7th student have acquired the skill at minimal level but the charts shows that all the student s are improved their futuristic skills from minimum 1 skill point to the maximum of 9 skill points , it proves that the PBL with DT is one among the prefect tool for acquiring the futuristic.

6. CONCLUSION

As per the experimental research of 14 students from the Computer Science background evaluated the futuristic development process via Project Based Learning integrated with Design Thinking Activities .The project phases and Design Thinking activities are mapped and associated with futuristic skills. The performance measures are assessed before starting the learning process and end of the learning process using the PBL approach as the results the futuristic skill measures are increased for all the learners which are proved based on the acquired results. The PBL and DT activities are tested with limited samples of students in a single domain specific learner. Though the results are positive it should to be tested with more samples and multiple domain of learners as a future work.

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