Priority Based Brainvita: A Philosophical Perspective of Critical Thinking for Algorithm Generation using Game-based Approach

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Abstract— **India's National Education Policy (NEP) 2020 is the lighthouse whose luminance guides our unrevealed paths, and it is 'Philosophy' who acts like the backbone who holds the entire structure of NEP 2020 in a single unit. Critical thinking will make its presence felt when it has a 'philosophical backing'. Understanding the views of our contemporary Indian philosophers like Sri Aurobindo, the process of holistic learning is of utmost importance. This study focuses on the process of experiential learning rather than only targeting the achievement of the goal using a game-based approach. A traditional Brainvita game is modified using priority called 'Priority based Brainvita' to increase the complexity level of the gaming rules but maintain simplicity in the execution. The analysis of the activities in the study showcases how 'expert' versus 'beginner' Brainvita players show different attitudes, behavior and skill learning as dynamic situations arise on the game board. After the game-based development of critical thinking, a maze creation activity performed by the students which display how rules in algorithms and tasks can be generated. From the Artificial Intelligence perspective, Priority based Brainvita will enhance the 'algorithm generation' capacity in the students along with identifying rules in a game and correct strategies to achieve winning outcomes.**

Keywords— **Algorithm; Brainvita; Critical-thinking; NEP 2020; Philosophy; Priority.**

I. INTRODUCTION

The accomplishments of the 21st century mark the era of evolved thinkers. The human species has thrived since evolution due to their exceptional development in 'cognitive abilities'. As the human brain evolved, cognitive abilities like 'Thinking' and 'Problem - Solving' started gathering the spotlight and only those who possessed these capabilities could conquer the strenuous tasks with the correct approach and lead the way for the rest.

Philosophy has been the well-built steppingstone which advocates the use of critical thinking by every individual in every aspect of life. Philosophers from ancient and modern times have been guiding the generations through their rational and scholarly philosophies. Philosophers emphasize the nature and quality of critical thinking skills. Philosophical theories are theories of logic and opinion about understanding issues. Critical Thinking is perceived as an ability to ask questions, test, and think ideas by great philosophers like Plato, Socrates etc. Knowledgeable people often attempt to answer, 'What is Critical Thinking?' (Atabaki et al, 2015). The answer can never be within a fixed limit, as every task and the domain in which it is applied is different. The scope of critical thinking is huge, so are the paths that lead to it.

Before venturing into the world of critical thinking, one needs to be aware of its nature. Teaching something beyond the curriculum requires a unique technique for its effective transmission of the new concept. 'Games' act like a bridge that sets a path between the teacher and the student. Everyone possesses a different cognitive style. Including different kinds of learners is essential for any pedagogical study. Using 'games' as the tool, students with different cognitive styles apply different strategies to play and achieve the goal in the game. This improves their critical thinking, reasoning and problem-solving ability providing us several different solutions to the said problem (Chuang et al, 2021).

People and in particular the students understand the basic structure and movement styles of different components for the game of chess but fail in playing due to lack of level of critical thinking that is essential to perceive the moves. Students find implementing the concepts of Artificial Intelligence difficult due to lack of critical thinking. One should be able to visualize the steps in the algorithm, manipulated by rules and the effects on the result of the algorithm. Apart from coding, fine-tuning algorithms is of utmost importance as the computing resources are sophisticated and expensive.

In the year 2020, India upgraded its National Education Policy (NEP) and introduced NEP 2020 which aims to strengthen India's growth promoting higher order skills mainly like critical thinking and creativity. (NEP 2020).

This paper, integrates and demonstrates the amalgamation of 'philosophical thoughts' regarding NEP 2020 and the 'higher order learning skills' in relation to its use in Artificial Intelligence, through an innovative gaming technique called "Priority based Brainvita". This cost-efficient technique offers

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great variety of game modes that enable students to think qualitatively.

II. LITERATURE REVIEW

Critical Thinking has encompassed several domains, and its definition of skills and abilities is changing dynamically. The paper suggests that it is highly important to redefine critical thinking in the lines of Scientific Thinking, as it is the ability to generate, test, and evaluate claims, data, and theories. The author points out that though students know a particular fact but the reasoning behind that fact is incorrect. Students need to identify correct and incorrect information depending on evaluating the evidence at hand (Schmaltz et al, 2017).

Critical thinking holds a strong position in the philosophy of education. The paper showcases debatable points on different aspects of how critical thinking is to be perceived. Several issues like 'can critical thinking be applied using informal logic versus formal logic', 'what is the difference between general critical thinking versus domain-specific thinking' etc. The author puts forth the general people's view about what is critical thinking about. And the responses boil down to a common consensus answer 'it enhances one's reasoning ability'. Before attempting to answer, 'what critical thinking is', people should 'first know the purpose of critical thinking', 'second, the concept of reasoning ability', and 'third the character of everyday problems' (Weinstein, 1993).

The objective of the research paper aimed to examine the impact of teaching philosophy for children in developing critical thinking and self-efficacy among students. 'Philosophy for children' program focuses on the use of applied philosophy. The program motivates students to apply philosophy in real life situations and experience the transition from a 'normal state' to a 'thoughtful state', from being 'indifferent' to being 'thoughtful', and from 'common thinking' to 'critical thinking'. Story books have been specially created specific to age groups and stories are stimuli for institutionalizing philosophy among children. Philosophy's moral values are inculcated by experiencing imaginative characters. This experience unearths the imaginative power of the students. Results indicated that there were significant differences in components of critical thinking (Rahdar, 2018).

The author puts forth, one of the greatest Indian Philosopher, Sri Aurobindo's beliefs that Vedanta of Upanishads represent 'integral or balanced view of life'. In Sri Aurobindo's view "India needs an education proper to the Indian soul and need a temperament and culture that we are in quest of, not indeed something faithful merely to the past, but to the developing soul of India, to her future need, to the greatness of her coming self-creation, to her eternal spirit". Sri Aurobindo's concept of integral education was based on five principal aspects. Physical education, Mental education, Vital education, Psychic education, and spiritual education (Behera, 2021).

Games often require game-consequential decisions in complex situations with limited information. This makes the students often need effective critical thinking to win. Any game-based learning requires six elements to be understood. They are rules, goals & objectives, outcomes & feedback, conflict – competition – challenge, interaction, and representation. Merging game motivation and learning process illustrated that game-based learning had a significant positive overall effect on students' critical thinking (Mao et al, 2022).

Chess is inherently strategic in nature and requires a lot of analytical skills to be in place. Due to its depth and complexity, chess is a game that tests one's intellectual maturation, critical reasoning, and logical thinking. Chess players perform academically better than non-chess players in subjects that require systematic thought process like Mathematics (Chitiyo et al, 2021).

The author says that a good learning model links theory to the processes. Scientific model of thinking combines knowledge and thinking to achieve better thinking skills. Teaching Game for Understanding (TGfU) model deals with tactical awareness and decision-making capabilities. TGfU considers the psychomotor, cognitive and social aspects of development. Focusing the right skill at the right place increases student competency (Usra et al, 2023).

Game based learning strategies stimulate the learning level of students. A subject like operating system by adding game elements into its course can increase the level of attraction of the students and improve collaborative learning compared to traditional collaborative learning technique (Lai et al, 2012).

III. PHILOSOPHY BASED CRITICAL THINKING

Philosophy embraces different domains of human experience. Philosophy unconditionally merges itself with allied fields to provide a deeper meaning to each concept's existence. Philosophical reflections provide us with methodologies and set of tools that guide us systematically to deal with different stimulus (Gamez et al, 2004).

If we consider the current 'critical thinking' scenario, a child needs to think critically on its own. Russel's path of reasoning the argument more than once is the best example of how each one needs to adapt to think from different perspectives. Gilles Deleuze and Felix Guattari's remarkable contribution in the field of Philosophy and Education depicts yet another method to conceive new concepts in us. The theory of 'concept and component' strategies us the way we look and think about a topic new to us (Deleuze et al, 1996). The importance of Deleuze and Guattari's theory is highlighted when we talk about incorporating the Multidisciplinary aspect into our educational system for NEP 2020. There shouldn't be fixed boundaries for mixing the concepts as that will hinder the level of creativity. Being 'creative' is essential for being 'critical'.

For the effective use of any skill, we need to understand the good and bad reasoning behind the usage. This capability and capacity of reasoning is provided by 'Philosophy' through 'Logic'. As an example, 'Philosophy for Children' is an educational approach focused on philosophical enquiry and dialogic teaching used in China. It stresses structured communication between the various entities. A student should be aware of how to construct the argument and intermix it in the dialogue. The study reveals a positive outcome in terms of

student reasoning ability and cognitive abilities. (Wu, 2021). 'Socratic questioning' revealed that though people had sufficient knowledge to arrive at a conclusion, due to lack of their logical arguments couldn't arrive at a decision (Lu et al, 2020).

Using only traditional methods to impart education and skills will not be sufficient to deal with challenges of the 21st century in this research paper, we have used 'Philosophy – as a technique to learn how to think' using game-based strategies.

A. India's need for NEP 2020

NEP 2020 is the vehicle that will route the youths through the complexities of Indian education system in a flexible, and inclusive manner. India's journey from rote-learning to experiential learning has several complex paradigms to be explored.

B. Inculcating - the Gurukul Aspect in NEP 2020

Humans perceive educational outcomes in terms of values like wisdom attained, respect gained, skills acquired etc. Inculcating values in students is the base for their industrious ventures. But why do values matter? A student can learn and apply the knowledge if the student knows that distinction between right and wrong actions (Mishra et al, 2023). Through experiential learning, they should be made to understand the causes and effects of the concept but also skillful application of knowledge.

C. NEP 2020 – Teaching beyond the classroom

In traditional classroom approach, considering multidisciplinary subject implementation, some schools lack 'expert faculties and framework for monitoring the progress of the students under these subject mergers is not available. Cost incurred is also a major reason for school to deal with (Balakrishnan, 2021).

Teaching beyond the classroom involves the use of innovative techniques catering to mass students with less expenditure. Experiential learning leads to innovation. Government of India has several initiatives to promote experiential learning for real-world experiences. Lack of guidelines for experiential curriculum and inadequate resources pose a hurdle in experiential growth (Rani et al, 2022).

D. Game Based Experiential Learning

Experiential learning is a path of exploring a series of world of real-world work experiences for resolving conflicts towards achieving the goal using combination competencies. It reduces the weariness of listening continuously for long hours in the classroom. This research paper targets micro and macro level of experiential learning for students using game-based learning. The gaming principles engage students in a lively manner. Each gaming rule makes a student think deeply across the boundaries of traditional thoughts and critically evaluate their actions to achieve the game goal.

Experiential learning is a product of 'social constructivism', which basically means knowledge that is actively gathered by the learners. The placement of games in instructional curriculum should be meticulously defined as the consequences of attempt should lead to motivation to learn higher. An experiment conducted at Surveying, at the Universidad Polite´cnica of Valencia (Spain) and the statistical analysis highlights that students who prefer less traditional teaching methods consider gaming as a serious learning activity and a way to learn new things (Andreu-Andrés et al, 2011).

IV. TRADITIONAL BRAINVITA GAME

A. The Brainvita Board

It consists of 33 holes arranged in a symmetric fashion and 32 similar pegs. As Fig. 1 illustrates, the centre hole is always left vacant at the beginning.

Fig. 1 : Brainvita Board

Final set Goal: - Only one peg should be present at the centre of the board.

The Working: - A peg will jump over another peg (either horizontally or vertically) only when there is a vacant hole in front of it. Fig. 2 illustrates horizontally, peg placed in hole 1 can jump over peg placed in hole 2 only if hole 3 is vacant. Same is true for vertical movement. Diagonal movements are not allowed. Only one peg jump is allowed.
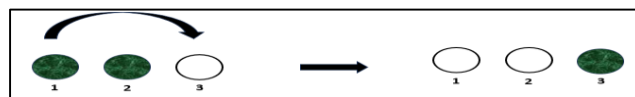

Fig. 2. Peg Movement

Limitations of the Brainvita game

When a beginner starts playing Brainvita, the player is filled with curiosity, to which jumps with which peg will direct them towards their goal. But once, they crack the code for win, it becomes like a daily routine. This happens because all the pegs are the same and it doesn't matter which peg lands at the centre of the board and the style of moves remain the same. So basically, at some point of time, once you master the game, the play becomes mechanical without any curiosity, hence not allowing critical thinking to emerge at the next level.

For example, consider Fig. 3. If a player can derive this intermediate pattern, with its moves, the player is sure to achieve the goal. What is shown in Fig. 3 is just one of the tricks to win the game.

Fig. 3. : Trick pattern formation

V. PRIORITY BASED BRAINVITA GAME

A. The Inspiration – Chess

Chess undoubtedly, the mystery box of strategies compels you to cross your limits of critical thinking for winning the game. Anticipating not only the opponent's next move but also future moves in line requires high level of imagination of the movement of the different components of the Chess game. When one is not able to perceive the moves, that implies that the players critical thinking skills need to be improved. Since each components follows a different movement style, kids and school going students find it difficult to conceptualize the strategies in their mind. Inspiring from the nature of the game of chess, '*Priority based Brainvita*' incorporates similar logic on the path of chess but without specific components.

B. Priority based Brainvita (PBB): Working

It is based on the traditional game but with a twist of Priority. Board consists of 33 holes and 32 pegs but now there are 16 pegs with higher priority than the rest of the 16 pegs. Fig. 4 shows, 16 pegs with a golden dot on top and rest of the 16 pegs as it is. PBB follows simple algorithm like the traditional Brainvita but now since Priority is introduced, there are set of rules to handle the priority.

Fig. 4. : Arrangement of pegs with priority

1. Objectives

1) Learn the process of peg moves (understand the logic behind the rule formations, peg placements).
2) Adapt to different situations on the board game (understand effect of priority changes with peg movements on the board).

3) Understanding the trade-off between the peg moves when multiple options are possible (which move to execute as it should facilitate the future moves).
4) Perceive decision-making skills.
5) Hypothesis is that – acknowledging the foundational thought process in critical reasoning regarding the understanding, usefulness and applications of the rules in the context of Priority Based Brainvita Game and also relevance of rule based logical thinking in general algorithmic process across the domains.

2. Algorithm

Initially, *priority of the two types of pegs need to be decided*.

Jumping Rule: Only higher priority peg can jump over lower priority peg. Similar type pegs can jump over, provided vacant hole exists.

3. Priority Inversion Rule:

After the initial assignment of priority, a particular type of peg enjoys upholding the priority till:

1) *Their type is in majority or equal in number to the other type.* As soon as the concerned type turns minority on the board, automatically the other type turns out to be the higher priority. Other type will enjoy their higher priority till they don't turn out to be minority on the board.
2) *Priority inversion can take place, even when the type of pegs is in majority.* Considering a situation, where peg type is in majority but due to past peg moves, the situation of the higher priority pegs - it is unable to perform a jump from any position on the board due to non-availability of vacant holes.

4. Placement of pegs

Pegs of both the types are randomly placed on the board provided satisfying the conditions given below. Fig. 5 illustrates 04 options generally to start the game marked in yellow arrows. But if we see Fig. 5 carefully, 02 of the yellow arrows are marked with a red cross for depiction purpose. There is a vacant hole in front of the peg, but the peg is of lower priority hence cannot jump over higher priority.

Rule 1: Higher priority peg must be arranged before lower priority peg in "at least one of the 4 options" to begin the game. The arrangement in Fig. 5 shows 02 possible options for the players to begin with.

Fig. 5: Initial peg placement Rule 1

Consider Fig. 6., where a circle focuses on a particular peg placement with a red cross. The board has 4 similar divisions.

Rule 2: Considering the last line on the board of every division. No higher priority peg will be placed at the **middle of the line** alone. Placement of pegs on the last line can consist of higher priority pegs placed as shown in the divisions of Fig 6. i.e., either at the end of the line (either way), at end and middle placed together, or all 3 higher priority pegs in a line.
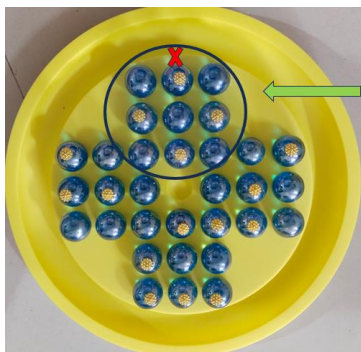

Fig. 6 : Initial peg placement Rule 2

Rule 3: The last line of each division, cannot consist of all lower priority pegs. One of the pegs must be of higher priority.

5. Balancing the peg types

Explanation of rule 1: If golden dot pegs are given higher priority, then it will be one among those pegs that will land up at centre. Maintaining balance between the number of peg types is essential throughout the game and that is the logic totally dependent on the player. Many a times, as the game progresses, there will be a situation where one type of peg must jump over its own type there by reducing its own numbers on the board.

Explanation of rule 2: The pegs present in the 2nd and 3rd line will make their movements and since higher priority peg is the middle and no vacant hole on the board to move, it get blocked, and the entire line will remain as it is on the board.

Explanation of rule 3: If all pegs are of lower priority in line, then there will be no movement of the pegs, in-spite of having vacant holes.

VI. EXPLANATION WITH EXAMPLE

Example 1 : Fig. 7 shows initial positions of the randomly placed pegs. Out of the 4 option to begin with, one option is marked as a red cross does not allow the move to take place as that standard priority rule cannot be applied, since lower priority peg is able to jump over higher priority peg.

Fig. 7 : Original random placement of pegs

There is no restriction on which peg starts or plays any move at any point of time, provided priority rules are followed. Fig. 8 shows player's 1st move.

Fig. 8 : First move

Now see the difference in the play. In a traditional Brainvita, a player has 3 options as marked with red arrows in Fig. 9. But in PPB, a player has to take care of the priority constraints present on the pegs. Green marked arrows show possible 2nd moves for a player.
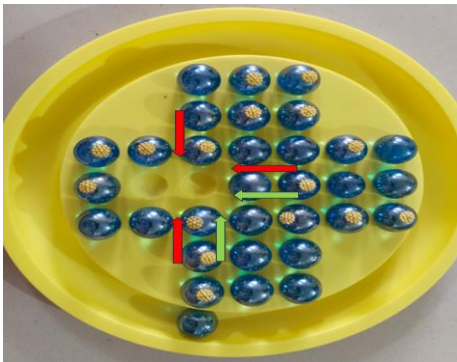
Fig. 9 : Traditional moves versus moves with priority.

Fig. 10 shows players 2nd move with a green arrow and future possible 3rd moves with yellow arrows. After the second move again check the table for who's in majority and if priority inversion will take place.

Fig. 10 : 3rd move

Players should try to maintain the balance of each type of peg. More or complete elimination of one type of peg will not help in strategizing a players win. As shown in Fig. 11, there are 14 of golden point peg and 11 of plain pegs. The pegs depending upon your strategy may remain neck to neck or slide down in number. It also shows, 8th moves possible and impossible option.

Fig. 11 : After 7th move

Fig. 12 illustrates the actual move. But why only that move? Because no doubt it is important to eliminate lower priority pegs but also to maintain the balance is of utmost importance.

Fig. 12 : After 8th move

The style of the game is like the analogy of chess. As in chess you need to anticipate move based on the type of component moving and action that is performed, here in PBB we do not deal with intricacies of different types of movements. All pegs have the same movement, i.e., of jumping one peg at a time, but constraints affect the decision whether to jump or not to jump. Fig. 13 illustrates some intermediate moves.
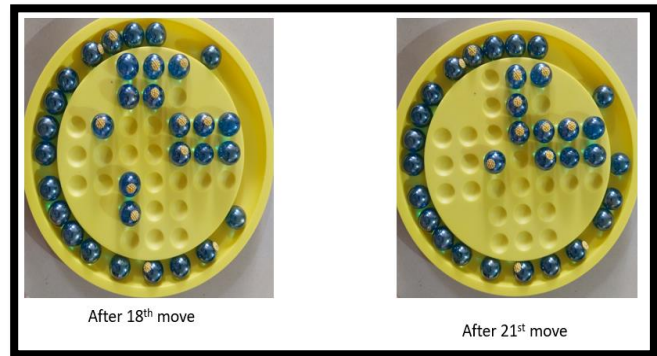

Fig. 13 : Intermediate moves

Fig. 14 shows the outcome. The final goal was not achieved but learning was rigorous.

Fig. 14 : Final outcome

The Table I snippet below shows the count of both pegs at every move and whether priority inversion occurred or not. For this game the priority inversion did not occur at all. That means good strategy was used by balancing both types of pegs. Because if one goes on eliminating the other type of pegs, there will come a point where priority inversion will take place due to non-possibility of movements by higher priority pegs.

TABLE I : Move Summary

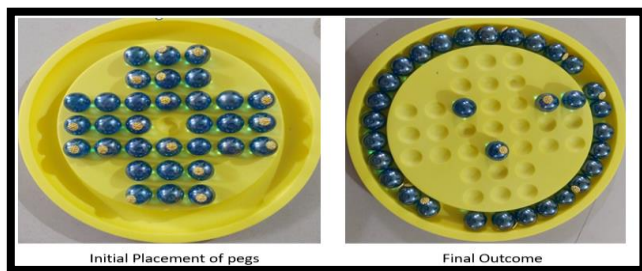| Move No.	Golden Dot Peg	Plain Peg	Priority Inversion?
1	16	15	No
2	15	15	No
3	15	14	No
.	.	.	.
25	5	2	No
26	4	2	No
27	3	2	No
28	2	2	No

Example 2:
Consider Table II for Fig. 15 arrangement.

Fig. 15 : Another input arrangement of pegs and outcome

TABLE II : Move Summary

Move No.	Golden Dot Peg	Plain Peg	Priority Inversion?
1	16	15	No
2	16	14	No
3	15	13	No
.	.	.	.
7	12	13	Yes
.	.	.	.
10	11	11	Yes
.	.	.	.
21	5	6	Yes
.	.	.	.
28	2	2	No

From the Table II observation, Priority inversion occurs regularly. This also shows that both the peg types are competing for priority leading to each other's elimination and maintaining balance. *If we see move no. 7 and 21, priority inversion is due majority and minority of pegs. But move no. 10 there is priority inversion from golden dot peg type to the plain type*, though they are in majority or at par because golden type pegs are blocked and cannot perform any jumping moves, the priority is inverted, so that game can proceed.

VII. STUDY AND OBSERVATIONS

A. Observations

A small set of 15 students were taken into consideration. Each student participated in their individual capacity. Performing the activities three times a week for 2 hours each. Study was carried out in a total 03 weeks. They were divided into 2 groups.

Group 'A' consisted of 08 students who *have played* Brainvita before and are well versed with the rules or techniques to win the traditional Brainvita game. *Group 'B'* consisted of 07 students who *have not played* Brainvita before nor they are aware of the rules and tricks of it.

Achieving the final goal is just the finishing touch. ***PBB stresses more on the learning of the process, that includes decision-making, reasoning and critical thinking leading to all round development of problem-solving skills. And in accordance with our philosophers' views, we intend to analyse the student's thought process and not evaluate it.*** First, experiment was started by playing traditional Brainvita.

Observation 1: Since Group 'A' students, knew about the original game they comfortable achieved the Goal. Group 'B' students were first demonstrated the game rules. After the demonstration, group 'B' students tried their hands at achieving the goal. 02 students could achieve, the said goal.

Observation 2: When **PBB was explained** to both the groups, we could **remarkably study their learning traits**. In the initial rounds, few students from Group 'A' found it difficult to adapt to **priority** into consideration before jumping the peg. This highlighted that, though final goal defined remains same, several constraints can change the path that led to it. *But are the problem-solvers ready to quickly switch and try new solutions?* **One's Adaptability and rigidity of mind can be studied**. Whereas group 'B' students performed slightly better in the *initial rounds* than group 'A' students. Reason might be because 1) as it is they were new to the concept of playing Brainvita, so switching to a different constraint environment did not heavily affect them. 2) They were more open to expecting any kind of outcome. 'Group A' students *weighed more on the final goal* achievement rather than the *process of achieving* it. *Acceptance of failure* is another, important feature, one needs to learn. Doesn't matter if the final goal is not achieved but learning from the process every time can lead you closer to success avoiding wrong choices.

Observation 3: As the **game was *played for several rounds*** encompassing several days. *Group 'A' students could adapt to the new rules and develop better strategies to proceed towards wining.* They were **able to *re-learn in a new constraint environment.*** In group 'B' students, after several days of play, only 3 students were able to scale-up with training and motivation. This is the point when learning process makes a difference. From group 'B', 01 student left the activity, due to change in preference.

B. Analysing Creativeness

At the end of activity, students were given an activity, where they had to design the maze instead of only tracing the path in

the maze. Before justifying the solution, one should understand the formulation of the problem and rules guiding it. This is what is exactly expected from the students while designing rules and algorithms for a selected problem. Fig. 16 shows snapshots of two creative maze formation ideas.
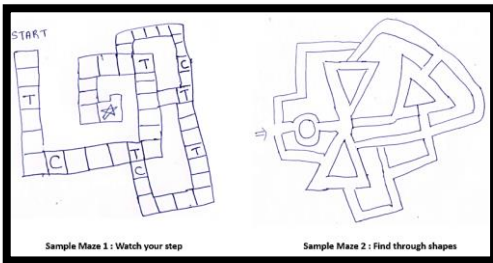

Fig. 16: Sample Maze formations

Sample maze 1, beginning from 'start', one can traverse through any number of blocks at a time until they come across T and C letters in the maze. T is for tortoise (slow), so move one step back and C is for cheetah (fast), leap towards next letter in line (C or T) till you catch the 'star' at the centre of the maze. Sample maze 2, uses combinations of geometric shapes to form the maze and aims at solving the maze by same entry and exit point but using different paths. The aim of this research work is based on creating new rules for new problem and exploring modified and innovative solutions through those rules.

Student Opinion:

 Participant: 'Was very good, it becomes easy but sometimes is very hard.'
Participant: 'Good to make you think about priority and know how to create rules.. It gives a good challenge. Enjoyed it.'
Participant: Modified Brainvita was good compared to normal one, but it is little difficult to remember to keep track of the priority of the marbles as game is played.

Applications to Domains-Subjects

Artificial intelligence (AI): Usage of AI algorithms in real life scenarios are driven by complex set of rules. Humans have the capability to understand the context and the rules to be applied in those contexts. Hence, understanding of generation of rules and their execution provides weightage to the nature of the algorithms.

Resource Utilization: Humans utilize resources, at every stage of life. The need to understand the resource usage rules and the logic behind turns essential for optimal use of resources. Hence decoding the logic helps to make efficient decisions.

Benefits of Priority based Brainvita game

1) Expands the boundaries of strategic critical thinking and analytical ability.
2) Cost-effectiveness: to practice critical thinking techniques it is not necessary that one has to use expensive tools and techniques. With one game board and few modifications to the pegs, we can generate a new way to play the same game. The cost plays an important role as we take NEP 2020 towards the rural India.
3) No fixed method in the game, makes a student experience the reactive actions of the moves in the PPB game, hence growth in experiential learning.

VIII. CONCLUSION

This research work analyses the relevance of game based experiential learning with respect to three aspects. First aspect, alignment of NEP 2020 objectives with contemporary Indian philosophes. Second aspect, enhancing critical thinking through experiential learning using *'philosophy'* and *'strategic games'* *as tools*. Educationally strategic games should be designed with easy understanding of the instructions and have provisions or criteria for assessment of the skill induced in students. Apart from the game enjoyment, a learner's experience is the most critical aspect that needs to be evaluated at various levels of applicability (Li, 2021). Participants were also allowed to do the initial placement of pegs on the board. This led to their understanding of application of rules and their context. For example, what if all priority pegs are concentrated in one area? The participant tried playing, but ended up realizing that the rule doesn't lead to the goal as maintaining balance between the types of pegs proves difficult. This is the experiential learning aspect that makes the participant think about the logic behind the conception of the rule. Third aspect involving the experiment analysis of playing 'Priority based Brainvita'. First and foremost, this experiment brought about adaptability of the human behaviour and psychology, when situation is new versus situation is modified. Priority based Brainvita provides an easy alternative to think and play the strategic moves eliminating the need to learn variety of moves at the entry level. Considering artificial intelligence domain, PBB helps in formalizing rules and planning moves for a given task. Game based learning proves to be one of the most engaging and productive activity if formulated in the correct manner.

References

Andreu-Andrés M., García-Casas M., (2011), Perceptions of Gaming as Experiential Learning by Engineering Students, *International Journal of Engineering Education*, Vol 27(4), pp 795-804.
Atabaki A.M.S., Keshtiaray N., Yarmohammadian M. H., (2015), Scrutiny of Critical Thinking Concept,

International Education Studies, Vol. 8, No. 3, pp 93-102.

Balakrishnan K., (2021), Empowering Emerging India Through Excellence in Education-Reflections on NEP 2020, *Elementary Education* Online, Vol 20 (1), pp 3596-3602.

Behera H., (2021), A Study on Educational Thoughts of Sri Aurobindo Ghosh with Special Reference to Five Principal Aspects, International *Journal of Creative Research Thoughts*, Vol 9 No. 7, pp 303-309.

Chitiyo G., Zagumny L., Littrell M. N., Besnoy K., Akenson A. B., Davis K. M., Ablakwa C., Lastres M., (2021), Students' Perceptions of the Benefits of Scholastic Chess Instruction, *Brock Education Journal*, Vol 31 (1), pp 39-51.

Chuang, T.-Y., Yeh, M. K.-C., & Lin, Y.-L. (2021). The Impact of Game Playing on Students' Reasoning Ability, Varying According to Their Cognitive Style. *Educational Technology & Society*, Vol 24, Issue (3), pp 29–43.

Deleuze, G., Guattari, F. (1996). *What Is Philosophy?*, Columbia University Press- US, pp 1-20.

Gamez D., Carel H., (2004), *What Philosophy Is*, Bloomsbury Academic – UK, pp xvii, 1-3,73-75.

Lai, Chien-Hung, Lee Tsung-Po, Jong Bin, Hsia Yen-The, (2012), A Research on Applying Game-Based Learning to Enhance the Participation of Student. *Lecture Notes in Electrical Engineering*. pp 311-318.

Li Y., (2021), Educational Game Design Based on Experiential Learning Theory, *9th International Conference on Information and Education Technology (ICIET)*, Japan, pp. 190-193.

Lu C., Swatevacharkul R., (2020), An Analysis of Critical Thinking from the Philosophical, Reflective, Cognitive and Cultural Perspective, *English Language and Literature Studies*, Pub.- Canadian Center of Science and Education, Vol. 10, No. 4, pp 70-77.

New Education Policy 2020, Ministry of Human Resource Development, Government of India. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf

Mao W., Cui Y., Chiu M. M., Lei H., (2022), Effects of Game-Based Learning on Students' Critical Thinking: A Meta-Analysis, *Journal of Educational Computing Research*, Vol 59 (8), pp 1682–1708.

Mishra P., Shastri S. J., Moorthi C. M., Kasarla S., (2023), Value Education and National Education Policy 2020, *AG Publishing House (AGPH Books)*, pp (2-28),(43-47).

Rahdar, A., Pourghaz, A., & Marziyeh, A. (2018). The Impact of Teaching Philosophy for Children on Critical Openness and Reflective Skepticism in Developing Critical Thinking and Self-Efficacy, *International Journal of Instruction*, Vol 11 No.3, pp 539-556. https://doi.org/10.12973/iji.2018.11337a

Rani K., Tyagi T. K., (2022), Experiential Learning in School Education: Prospects and Challenges, *International Journal of Advance and Applied Research*, Vol.10 No.2, pp 378-383.

Schmaltz R. M., Jansen E., Wenckowski N., (2017) Redefining Critical Thinking: Teaching Students to Think like Scientists. *Frontiers in Psychology*, Vol 8, Article No. 459.

Usra M., Bayu W. I., Solahuddin S., Octara K., (2023), Improving critical thinking ability using teaching game for understanding, *Journal of Physical Education and Sport*, Vol. 23 (2), Article 51, pp. 419 – 423.

Weinstein M., (1993), Critical Thinking: The great debate, *Educational Theory*, Vol 43 No. 1, pp 99-117.

Wu, C., (2021), Training Teachers in China to Use the Philosophy for Children Approach and Its Impact on Critical Thinking Skills: A Pilot Study, *Education Sciences*, Vol 11.
https://doi.org/10.3390/educsci11050206

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