

A GAME BASED LEARNING ACTIVITY IN CLASSROOM ON G PROTEIN SIGNALLING AMONG FIRST YEAR MEDICAL STUDENTS

Dr. Tandra Ghosh*¹, Miss. Suchitra Dutta²

1. Associate Professor 2. Tutor, Department of Physiology, Tripura Medical College & Dr. B.R. Ambedkar Memorial Teaching Hospital, Hapania, Agartala.

*Corresponding author- Dr. Tandra Ghosh

Email id - tandra12@gmail.com

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ABSTRACT

Background: Due to vastly diverse and complex nature of information which are to be acquired during medical degree studies, as it possesses an utmost challenge both for the learners as well as the educators to excel in effective teaching and learning. But it is beyond doubt that, students should be taught with active and sustainable learning strategies at each step of medical study period. The irony is still exist as the most widely practice method is didactic form of teaching in classroom which provide with very minimum scope of eliciting effectiveness of productive teaching or student learning. To diversify the teaching repertoires beyond traditional didactics, one form that is gaining momentum, is the use of educational games, which is presently practiced minimally for classroom teaching. **Method:** the attempts have been undertaken to elicit the effectiveness of teaching strategies by combining educational game with didactic lecture in classroom to impart target knowledge regarding G protein signalling process, using interactive non-competitive, educational puzzle in small peer groups with didactic lecture sessions. **Result:** The result/ outcome reflected in this process that the game was more beneficial than didactic lecture alone to the students in classroom. Seventy five students (75) out of total eighty four students (84) has reported the that the learning experience by the game based activity has helped in better understanding of the topic than didactic lecture alone. **Conclusion:** Imparting the knowledge involving educational games can better ensure active student participation and resulting in more effective understanding as well as developing a growth mindset.

KEY WORDS : Medical education, Game and learning in Classroom.

INTRODUCTION

In India, medical students, while undergoing undergraduate medical course, are expected to assimilate a huge amount of information in Physiology, Biochemistry and Anatomy along with all round integration of not only morphological and functional aspects but also cellular and molecular details for normal and pathological conditions. Classroom teaching is the major form of teaching normal mode of teaching. In a usual normal class, the whole group is addressed through didactic lecture with some specific objectives of a topic. But

practically, in most of the cases, there is failure of executing definite uniform specific objectives. For assessment of teaching and learning effectiveness of the students, traditional examination is the only way to assess the effectiveness of teaching and learning. The relationship between faculty and students seems to be predominantly paternalistic, unidirectional. There is usually minimal scope of promoting metacognition or growth mindset through the didactic process or traditional system of examination. Occasionally the students have a randomised scope to

express their learning experience during classroom. The heavy emphasis is exerted on marks based traditional assessment throughout the undergraduate years, imparts a habit of massed practice or cramming of the books or class notes among students, which help to retain knowledge for only a short period of time. Also this system does not provides any scope for developing habit of logical skill and thinking process of the students, where on the contrary, examinations test memory of isolated facts rather than thinking process and problem-solving skills, students will tend to deliver faculty what only they ask for 1. Gibbs concurs: “the lack of congruence between course methods and assessment may actually undermine standards where students pay more attention to perceived assessment demands than to learning tasks.”(2)

Learning should involve the active construction of a conceptual knowledge and reflective one and help to build a consolidation of existing knowledge and newer knowledge. Maximum facilitators felt that the content and strategies of their lecture are mainly limited by the time constrain and information overload which results in no scope for evaluating achievement of learning goal. However, it has also been strongly felt that the constructive learning approach might reduce the learning “fatigability”, which often been experienced by medical students resulting from studying several broad disciplines either in rapid succession or simultaneously but in very little depth. Considering the amount of information required to learn, student concentrated on flexible teaching which necessary in medical education for effective learning. In this context, supplementation of lectures and practical classes with educational games has been found to be a good educational strategy³. Educational games can not only increase student interest in the subject under discussion but also increase active participation and integration of knowledge, developing the thinking skill and team work. To solve an educational game, student can be engaged in either competitive activity or in a structured non-competitive activity. Especially, on-competitive games allow students to learn by doing, developing their critical thinking skill

to solve problems without any reward or punishment pressurising increase in autonomy. (4)

Knowledge about G protein Signalling is an important though a complex concept which required not only in first year in physiology course but throughout the professional duration. We tried to evaluate the effectiveness of teaching this complex signalling process by didactic lecture and afterwards used a game among the students to evaluate achievement of targeting learning objectives of the topic and find out any difference in learners perception regarding game between didactic unidirectional lectures.

MATERIAL AND METHOD

- A. This work was performed with under graduates students (n = 84) on the topic of G- Protein signalling of Endocrine System of 2nd semester , which is in the period when the physiology lectures are conducted following the guideline of Declaration of Helsinki.
- B. First a didactic lecture using power point presentation was done on G-protein signalling for 30 mins. Then the students were asked to be divided into groups, with 8 students each group and participate in a learning game. It was instructed that each group had to solve the game by only discussing among peers without seeing any notes or book as fast as they can within 30 min.
- C. The game was developed based on figures and small pieces of chips of the G-protein cycle referred in the figure of standard book based on the target learning objective; Karp cell biology & Ganong’s Physiology review 23rd edition (Lange,2009) . The game presents diagram of G-protein signalling cycle to fill in the blanks and chips (shown in table 1) for used to complete the cycle. In the table 1, the path of the G-protein signalling has been presented as a checker board. Paper chips were supplied to students of various shapes as shown in table 1. The chips indicate the name of the steps and process in cycle G-protein signalling. The target was to identify the suitable chip in the particular step to match table 1 and paste the chips to complete the signalling as in

Figure 2 to understand the main steps as shown in table 2.

- D. Each group of 8 students receive a set, consisting of a checker board and pieces of chips to assemble the game. During the assembly of the game, students were expected to organize each piece on the board to the respective phase of the cycle of the G-protein signalling as instructed in checker board. The game was coordinated and supervised by the authors, ensuring participation of each students and making sure of the following instruction of not to see notes or book or internet. Subsequently, the instructors kept a check on each group's board if whether, they had been correctly organized. Groups, who failed to do so, were encouraged to find and fix their mistakes giving clues. During this activity, the instructors also discussed about each student's choices for each steps and proposed some clues to make the students reevaluate themselves comparing the different opinions among the members of the group. The students were allowed to work in groups in period up to 30 minutes.
- E. Once all the groups had accurately completed their game, the instructors concluded the activity with a discussion on the target teaching objective and addressing the main issues raised by the students during assembling the different components of the game. The discussion with the entire class took 20 min. Students Feedback on the usefulness of the class activity was assessed by feedback questionnaire, given to the students at the last 10 minutes section of the class. (Appendix1)

RESULTS

Total eighty four (84) students participated in the activity. Sixty four (64) out of eighty four students perceive that only involving during the game, they understand the topic and eleven (11) students out of eighty four students found the activity more useful than theory class. (Table 2 and Figure 4)

DISCUSSION:

Results show more than 75% students were able to understand the learning objective only during the education game activity. It indirectly indicates the

higher cognitive load and learning fatigue induced among student during the didactic lecture session. (5, 6) Involving students in educational game is clearly showing to be more effective and at the same time beneficial to the students' process of learning. The game also ensures active participation of each student during learning process and discussion with peers to achieve a target in a challenging yet in a non competitive way. There are many factors identified which can slow or hinder the learning curve during classroom teaching. Factors like socioeconomic background, language, culture, diverse peer group are very delicate factors which need to be addressed carefully to promote belongingness of the students in the learning environment. (7, 8) There are various preferred mode of learning for different students such as audio-visual, modelling and kinaesthetic etc. which though students themselves are not aware, (9) but the most important factor which a teacher can contribute positively is motivation and engagement. Motivation is seen as a pre-requisite of and a necessary element for student engagement in learning process. Student engagement in learning process is not only an end in itself but also a mean for achieving and stimulating effective long term memory. (10) This educational game allows students to learn by doing, imparting struggle in working memory to solve problems, and also involving improvement in communication skill and negotiation with peers. Educational game is one of the tools with which attention and learning activity can be captured even in large groups of students. The memory struggle ensures a long term memory in them. Apart from these, during discussion with peers student becomes aware of possible errors. Aware and Unaware Error processing, have been indentified and recommended as important physiological indices of learning and growth mindset. (11) Growth mindset enable students to embrace failures and to be more efficient learning and problem solving approach in future. As faculty, we need to be less paternalistic and defensive of a system to one that is more student-centered. Teachers as faculty should take initiative in leading an effective and flexible form of teaching strategies, which will increase the autonomy of the students (12) managing cognitive overload.

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CONCLUSION

In the perspective of improvement in educational capstone and equity, transformation of classroom from one-way didactic session to a framework of co-engaging both teachers and students is necessary for effective transfer of facts and skills. An interactive classroom provides an opportunity for inclusion of diverse learning community of different socioeconomic, cultural and language background of medical schools in India. Engagement of students in solving intellectual puzzles in classrooms is one of the most efficient ways of improving literary efficiency of complex medical knowledge.

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TABLE 1: Targeted learning objectives

G Protein Signaling	
Active GPCR with G-Protein	GPCR - γ - α - β
Ligand bind to G-Protein	GPCR++ Ligand --- γ - α - β
Activation Of G-Protein	GDP -> GTP γ - GTP --- γ - β
Active G-Protein binds to target enzyme	α - enzyme - GTP
Intrinsic GTP-ase activity	γ - α - β GTP -> GDP
Inactive trimaric G-Protein	γ - α - β --- GDP

TABLE 2: Analysis of the feedback of the Students

	No of Students(84)	Percentage of the students
1. This active leaning process was not necessary for me to understand the topic.	01	1.19%
2. This active leaning process was not necessary for me but it help me to make a note	08	9.52%
3. This active leaning process was useful to better understand me regarding that topic	64	76.19%
4. This active leaning process was very useful for me to understand the topic more than the theoretical class.	11	13.09%

Appendix 1.

“In the physiology class, a game on G-protein signalling was used. Please indicate which was most helpful in learning about G-protein signalling by checking one of the alternatives below:

1. This game was not necessary for me to understand the topic.
2. This game was not necessary for me but it helps me to make a note.
3. After participating in the game I can understand the topic.
4. This game helps me to understand the topic more than the theoretical class.

FIG.1. Checker board for completing the task

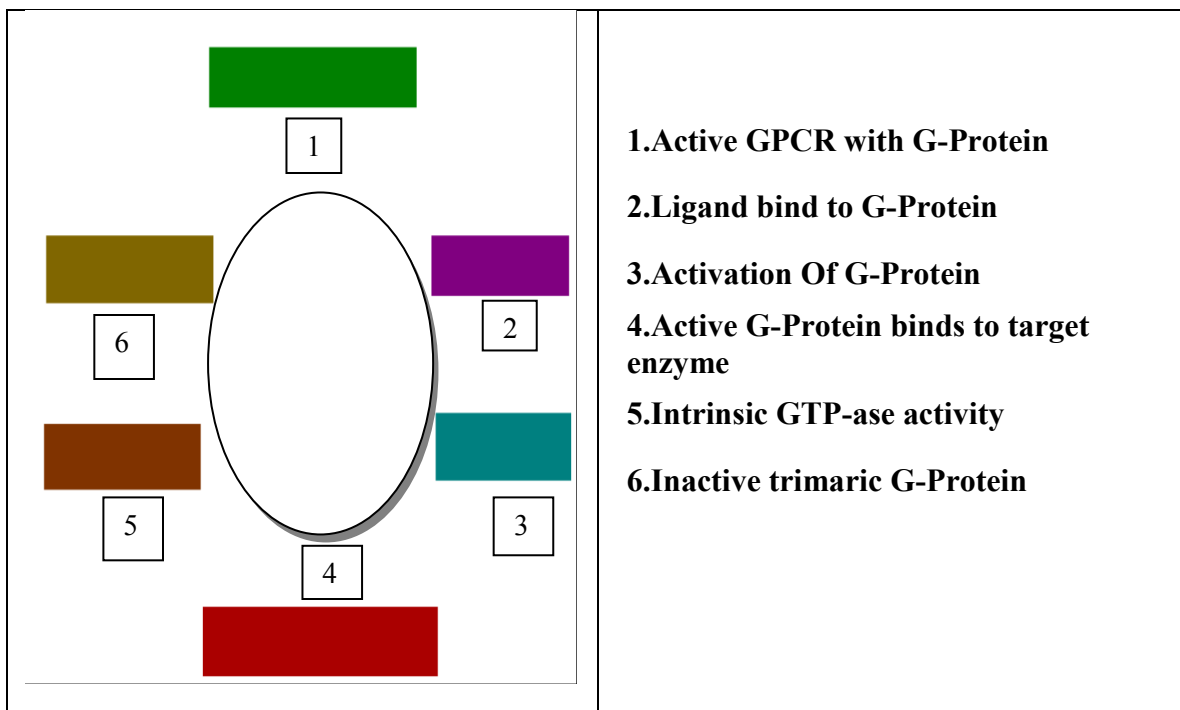


FIG 2: Paper clips used for learning activity

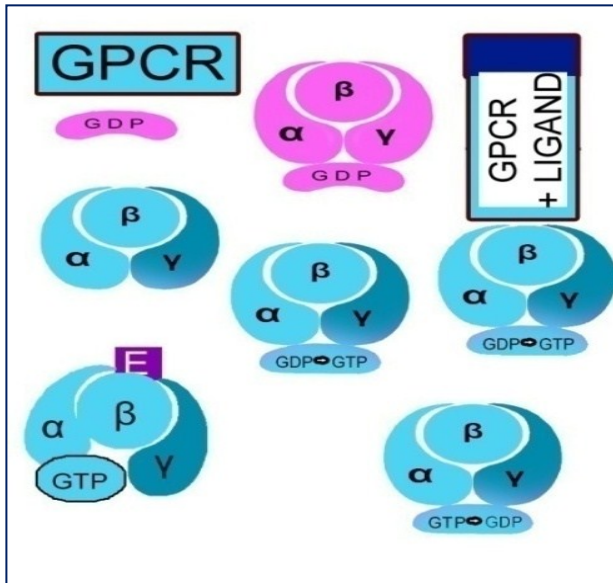


FIG 3. Targeted Checker board for task completion by the students

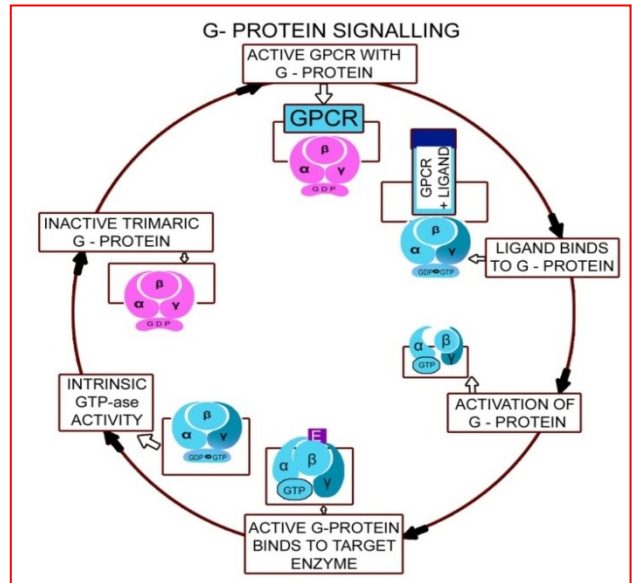


FIGURE 4. Histogram of response after activity

