

Article

Revision bingo

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Abstract

Bingo can be a versatile and engaging tool for spicing up end-of-module revision and other contexts in which course content is being reviewed. Instead of numbers being called out, students are given a verbal clue that fits with one of the answers on their playing grid. Get five correct answers in any straight line (including either of the major diagonals) and they win the game. The interactive and light-hearted medium of a bingo game can provide motivation for study and enhance learning by the students. Protein revision bingo is included as an example. © 2001 IUBMB. Published by Elsevier Science Ltd. All rights reserved.

1. Introduction

It has been recognised that the traditional lecture is frequently a passive experience for students and approaches that enhance their active participation in the learning process can deepen understanding [1]. Recommendations for improving learning have included the introduction of short breaks into a lecture, during which the students might be encouraged to either summarise in their own words the key concepts covered thus far, or to note down a question they should like the lecturer to address at a later stage. Similarly, a quiz or formative exam conducted as part of the lecture programme can improve the recall of information [1]. Revision bingo, is one such means of introducing a different dynamic into the teaching of biochemistry and molecular biology.

2. Description of the game

The concept is very straightforward. Students are attempting to complete a line on their board in order to win. Rather than simply matching a number, however, they are trying to find the answer to a clue or definition given by the tutor or lecturer.

In a real game of bingo each participant would have a unique playing card, but for revision bingo it is recommended that all students have the same playing

grid. In the era of desktop publishing it would be a relatively easy task to construct a range of cards, but there are educational advantages to be gained if all players are using the same board. In particular, the instructor retains control of the number of questions posed before a winning line is generated, and can therefore maximise the material reviewed before anyone wins.

Doesn't that mean everybody will generate a winning line at the same time? Yes, in theory, but in my experience—including a game in a lecture theatre with around 100 students—there has always been a clear winner. Although a small group tutorial is probably the ideal environment for revision bingo, you can get away with playing in a larger forum if you plan completion of a line to occur with one of the more tricky answers, and pose a question that begins obscure, but becomes progressively more obvious.

Players who declare early, i.e. before a winning line has really been generated, should be dealt with sensitively—their mistake is more likely to stem from an accidental wrong answer than an overwhelming desire to gain whatever small prize you have put on offer. A ban from declaring after the next question is probably sufficient, they can be back 'in' after that.

The example given here (Table 1) has been used at the end of a series of introductory lectures on proteins for first year undergraduates. A grid of 5×5 allows sufficient questions to be posed before a winning line is produced. A word-processed table with five columns of 5.6 cm (2.16 in) fits conveniently onto an A4 landscape page. As far as possible, similar words/concepts

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Table 1
Questions for protein revision bingo

α -helix	A secondary structure arrangement with hydrogen-bonding between amino acids, four residues apart in the same chain
β -galactosidase	An enzyme, cleaves lactose into glucose and galactose
β -mercaptoethanol	A reducing agent, used with urea to temporarily denature ribonuclease
β -sheet	An example of secondary structure which can be parallel or anti-parallel in arrangement
Competitive	An inhibitor that binds to the active site of an enzyme is said to be this
Cysteine	One of the only two amino acids found in proteins that contains sulphur in their side-chain. This amino acid can form disulphide bonds
Glutamate	An amino acid with a negatively charged side group at pH 7
Glycine	An amino acid with a side-chain consisting only of a hydrogen atom. This means that it has no chiral centre and is highly flexible
Haemoglobin	An example of a protein with quaternary structure, it binds oxygen and carries it around in the bloodstream
Henderson–Hasselbalch	An equation for relating the concepts of pK and pH and named after the scientists that derived it
K_{cat}	The turnover number of an enzyme, the number of substrate molecules per enzyme molecule per sec
K_M	The concentration of substrate at which an enzyme is operating at half of its maximal rate
Lineweaver–Burk	A double-reciprocal plot, helpful in determining the K_M and V_{max} of an enzyme. Now superseded experimentally by other approaches
Lysine	An amino acid with a positively charged side group at pH 7
Michaelis–Menten	Leonor and Maud, they studied algebraically the impact on rate of reaction when the concentration of substrate was changed
Non-competitive	An inhibitor that binds to an enzyme at a site other than the active site might be described as this
Ornithine	An amino acid, but not one of the 20 found in proteins. It is however found in the urea cycle
pK	The pH at which an ionisable group is 50% ionised
Proline	An amino, technically an imino, acid where the side-chain is covalently bonded to the backbone nitrogen as well as the alpha-carbon
Serine	An amino acid with an aliphatic side-chain featuring a hydroxyl (OH) group
Tryptophan	An amino acid with a double ring (indole) structure
Tubulin	A protein, not an enzyme, found in cytoskeleton
Tyrosine	An aromatic amino acid with a hydroxyl group in the side chain
V_{max}	The maximum rate at which an enzyme can act upon a particular substrate
Zwitterion	At neutral pH amino acids exist in this form with distinct positive and negatively charged ends

Table 2
Playing card for protein revision bingo

K_M	Competitive	Glutamate	Zwitterion	β -sheet
Proline	α -helix	Lineweaver -Burk	Ornithine	K_{cat}
Michaelis -Menten	Cysteine	Tyrosine	V_{max}	Non -competitive
Tubulin	Glycine	β -galactosidase	Tryptophan	Henderson-Hasselbalch
Serine	pK	Lysine	β -mercaptoethanol	Haemoglobin

have been dispersed around the grid and answers chosen so that only one solution should fit each question (Table 2).

3. Educational benefits

Revision bingo is flexible and fun. The concept can easily be adapted to fit any subject matter, and can be employed in a range of settings from lecture hall to tutorial group, either with students working as individuals or in teams. Although the quick-fire nature of the game is most suited to 'recall' questioning, there is no reason why the system could not be adapted to probe students' understanding of concepts at a deeper level.

The game can add challenge and enjoyment to the learning of course material.

Acknowledgements

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Reference

- [1] C.C. Bonwell, J.A. Eison, Active learning: creating excitement in the classroom, ASHE-ERIC Higher Education Report No. 1 Washington, DC: The George Washington University, summarised online at <http://www.nlf.com/html/lib/bib/91-9dig.htm> (last accessed April 17th 2001), 1991.