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BETTING ON ANSWERS AS A WAY OF ENGAGING STUDENTS

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Abstract: *The paper presents a model for classroom activities where true or false and multiple-choice questions are approached in an innovative way. Instead of simply providing answers to the questions, students are required to place a bet on their preferred answer, starting from a predetermined set of points, which change on each subsequent iteration depending on the correctness of the answers to the previous questions. Students are divided in teams and make the decision about the bet together, competing against other teams. We describe the design of a template spreadsheet for the conducting of the activities and briefly discuss the advantages and disadvantages of the model.*

Keywords: *Teaching, Classroom games, Gamification, Education*

INTRODUCTION

True or false (TF) and multiple-choice questions (MCQs) are a popular tool for both summative (final, used for evaluation purposes) and formative (ongoing, used to identify gaps in the student's knowledge and to aid the learning process) assessment. They are easy to use, relatively easy to prepare, allow for clear and unambiguous answers and provide a straightforward opportunity to track the learning progress - both for the learners themselves and also for the tutors. These types of questions are especially useful in large classes. However, they also come with disadvantages.

EXPOSITION

Weaknesses of TF and MCQs as assessment tools and proposed improvements

Despite their popularity, the literature abounds with critical papers on the use of TF and MCQs in both learning and assessment and with advice how to employ them in a better way (Frisbie and Becker, 1991; Burton, 2005). An issue of high concern is the format of the questions, which allows students to guess the correct answer completely at random (Burton, 2001; McKenna, 2019). It is a problem mostly for summative assessment, where it can be solved by shifting the assessment scale upwards, by increasing the number of questions, and/or the number of possible answers per questions (by including more of the so-called distracters) (Clark and Pollard, 2004). This solution is not without costs, because the creation of more questions requires more time and effort by the tutor and adding plausible distractors might not be possible for every single question. Guessing complicates formative assessment, too. Arriving at the right answers by chance may be misleading about the real progress of the students and overestimate their knowledge.

Another issue with TF and MCQs is the effort they exact from the students and the type of knowledge they assess. They are good for testing low-level knowledge – recall of factual information instead of deep comprehension and conceptual understanding. This may be partially overcome by the design of better questions that trigger higher-level knowledge and critical

thinking skills, but the successful implementation of this task is very contextual and depends on the study material. In the absence of clear and generally valid guidelines, this is more art than science and depends on the tutor's abilities to establish the connection between the material and the student. What is more, the format that makes these types of questions so attractive for summative assessment – the lack of subjectivity, could be regarded as a weakness in the case of formative assessment. The latter is, after all, not an end in itself, but a mere instrument in a process of knowledge-building. In a classroom setting, getting the answer right is of secondary importance to the way the student arrives to that answer, be it right or wrong. During seminar exercises closed-ended questions tend to obfuscate the reasoning behind the answer, favouring result over process. Given the option of guessing, the student can take the mental shortcut and simply provide and answer, bypassing the subjective examination of every possible answer.

Summative assessment has ways to deal with this, with the introduction of instruments that penalize wrong guesses. One of them is negative marking, where incorrect answers result in the loss of points. This approach solves a problem, but creates another – risk averse students may refrain from answering even in the presence of small hesitation (Romm, Schoer and Kika, 2019). For all its worth, negative marking is not suitable for formative assessment, where there is little or nothing at stake. Wrong answers bear no consequences and in any case the problem with "guessing wrong" is not with "wrong", but with "guessing", because arriving at answers in this way builds neither knowledge nor skills.

There are other, more sophisticated methods, that encourage internal consideration and mental effort in providing an answer. The first one is probability testing, where students allocate points among the options to reflect their subjective probability of being correct. The other, the order-of-preference scheme, is similar, and the students rank the answers according to their plausibility (Ng and Chan, 2009). Confidence-weighted answers (Dutke and Barenberg, 2015) or certainty-based marking (Gardner-Medwin, 2019, source for Table 1) require from the students to choose not only the answer, but to point how certain they are in their selection, thus activating a more intensive subjective decision-making procedure.

Table 1. An example scheme used for certainty-based marking

	Unsure	**Middling**	**Pretty sure**	**No reply**
Mark if correct	1	2	3	0
Mark if wrong	0	-2	-6	0

The advantage over negative marking is that points do not depend only on the correctness of the answer, but also on the certainty of the student. So, risk averse students may weigh their risk and still give an answer.

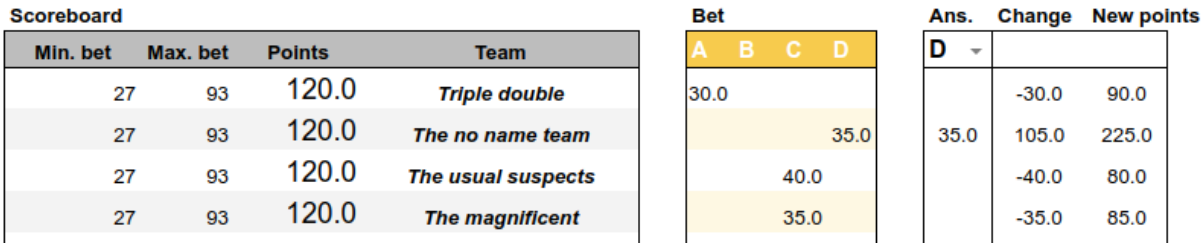
Betting on answers as a tool of formative assessment

Here we present a tool of formative assessment, which incorporates the strengths of certainty-based marking. The students place a bet on the answer, which they perceive to be correct. The tool is specifically tailored for classroom activity as a way to better engage students during seminar exercises. The tutor can use already existing closed-ended questions, so there is no need of additional preparation apart from loading them in the template[13]. It is not very appropriate for summative assessment, because it proceeds step-by-step and needs constant intervention and guidance by the tutor.

The basic idea is the following. The students see a question, for example "*What is the capital of Australia?*" with two to four answers, in our case let them be "*A) Melbourne, B) Sydney, C) Brisbane, D) Canberra*". Students work in groups. It is left to the discretion of the tutor to

[13] The template can be found as a Google Sheet at http://bit.ly/bettemplate2020 . It is read-only, so to use it you have to copy the file to your Google Drive from the "File - Make a copy" menu. The "readme" sheet contains detailed instructions how to use it.

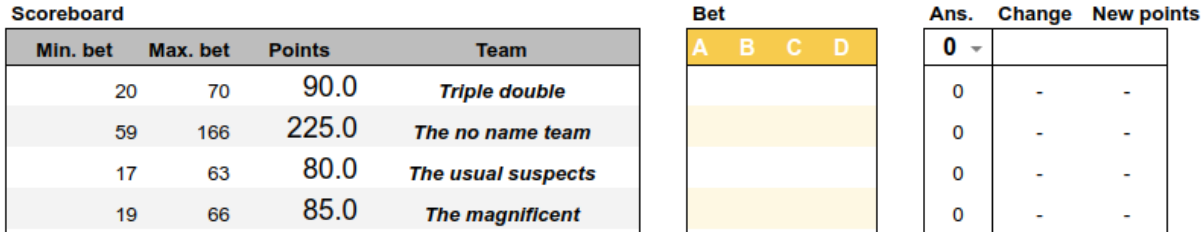
determine the number of people, but our experience shows that three or four is the optimal number. Beyond that groups lack cohesion and their members can't deliberate meaningfully on the answer.



Scoreboard				Bet				Ans.	Change	New points
Min. bet	Max. bet	Points	Team	A	B	C	D	D		
27	93	120.0	*Triple double*	30.0					-30.0	90.0
27	93	120.0	*The no name team*				35.0	35.0	105.0	225.0
27	93	120.0	*The usual suspects*			40.0			-40.0	80.0
27	93	120.0	*The magnificent*			35.0			-35.0	85.0

Fig. 1. Betting – initial setting and answers to the 1st question

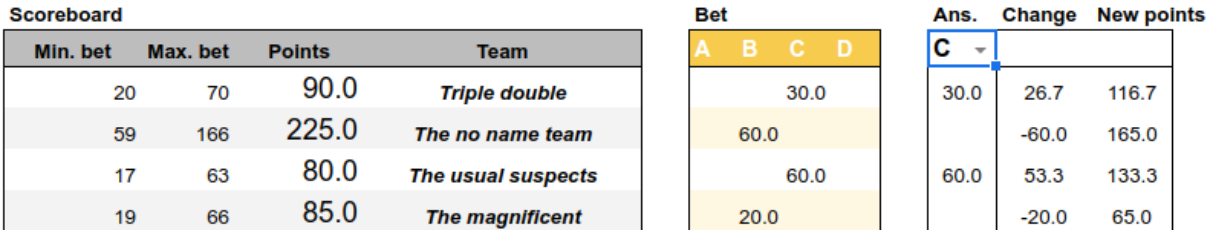
On Fig. 1 we see that the team "*Triple double*" has given 30 points on answer A), "*The no name team*" has placed a bet of 35 points on D) and the next teams have placed bets of 40 and 35 points on C). After the bets are made the tutor reveals the answer, which in this case is D). Teams 1, 3 and 4 lose their points, whereas "*The no name team*" (team 2) gets their points. The column "Change" shows the change in points after the round and the column "New points" shows the new points for the start of the next round. Fig. 2 shows the scoreboard before the start of round 2.



Scoreboard				Bet				Ans.	Change	New points
Min. bet	Max. bet	Points	Team	A	B	C	D	0		
20	70	90.0	*Triple double*					0	-	-
59	166	225.0	*The no name team*					0	-	-
17	63	80.0	*The usual suspects*					0	-	-
19	66	85.0	*The magnificent*					0	-	-

Fig. 2. Betting – before the start of the 2nd round

Let's assume that the correct answer for question 2 is C). The teams' answers are shown on Fig. 3. In this case two teams have provided the correct answer - "*Triple double*" and *"The usual suspects".* They get the 80 points, lost by the teams that have bet wrong (respectively 60 and 20 points for team 2 and team 4). The points earned by teams 1 and 3 are distributed according to the ratio of their bets, that is 1:2 (reflecting their 30 and 60 point correct bets), which adds 26,7 and 53,3 points to their existing results.



Scoreboard				Bet				Ans.	Change	New points
Min. bet	Max. bet	Points	Team	A	B	C	D	C		
20	70	90.0	*Triple double*			30.0		30.0	26.7	116.7
59	166	225.0	*The no name team*	60.0					-60.0	165.0
17	63	80.0	*The usual suspects*			60.0		60.0	53.3	133.3
19	66	85.0	*The magnificent*	20.0					-20.0	65.0

Fig. 3. Betting – answers to the 3rd question

If there are three teams with correct bets (not shown), the points of the team with the wrong bet will be distributed among these three teams according to the size of their bets. In the case, in which all teams provide wrong answers, each team will lose their bet points. When everyone bets on the right answer, their points will not change. The rounds go on till the end of the class or when the questions are exhausted.

The teams have minimum and maximum bets they have to make, depending on the number of points at their disposal before the start of the round. As the team points increase during the run of the betting game, the formula for the calculation of the minimum bet forces the team to bet a higher minimum as a share of its total points. On the other hand, the formula for the calculation of

the maximum bet forces the team to bet a lower maximum as a share of its total points. In this way we want to avoid two negative developments. First, a team that gets an early advantage may avoid losing points by placing very small bets, thus making it harder for the others to catch up. Second, a team with many points may be willing to dedicate more points for risky bets against other teams in absolute terms, because in relative terms, considering the team's total points, that bet may seem dispensable.

Lagging a lot behind early can be demotivating for a team, that is why there are additional design tweaks to avoid this as much as possible. In general, teams place their bets consecutively. In the 1st round, team 1 places its bet, then team 2, and so on. In the 2nd round, betting starts with team 2, then team 3, etc., finishing with team 1. In every round, however, after all the teams have placed their initial bets, the team with the least total points can change its bet, seeing the position of the others.

Advantages and disadvantages of the proposed betting system

The system has the advantages of certainty-based marking with the addition that it controls for the difficulty of the questions. In certainty-based marking the scale is predetermined by the tutor and it doesn't change, regardless whether the questions are difficult or not. Betting has the advantage that easy questions will get correct answers by all or most teams and the return on the answer will be low. If a team bets correctly on a difficult question, its return will be high, as it will get the points of the teams that gave wrong answers. More importantly, however, the game design sets a team of students against other teams and allows for strategic interaction, which boosts intrinsic motivation to participate. It has been argued that peer comparison can work as an intrinsic motivation (Smith, 2019), and it can be even more challenging when your own result is determined not only by your own actions and the actions of your teammates, but by the sum of actions of each participating team.

Another tacit advantage is that team work requires a single answer by every team. This means that if team members have differing opinions, every student will have to convince his or her teammates, which demands deliberation and justification of the answer. Of course, even when students are asked ordinary MCQs, the tutor may ask them to give a justification for that answer, but this justificatoin may be merely mechanical. Besides, there may be no time for the tutor to hear out each and every student in the classroom. Students can also be hesitant to answer if they are afraid to appear wrong in front of the whole class and the tutor, whereas in small groups of their peers they may be willing to express their opinion. In-group deliberation can also make the topic more emotionally charged and deemed more important, which has been shown to have a positive effect on memorization (Castel et al., 2007; Kaplan et al., 2012; Stefanidi, et al., 2018).

The disadvantages are that some students who are less competitive may feel less at ease with this format. Another possible weakness would be when the teams are unbalanced. This can happen both between and within teams. A team, composed of more knowledgeable students, could get an early advantage and maintain it henceforth. Or, there might be dominant participants that dictate the collective decision-making process on behalf of their whole team. Here, it is the role of the tutor, knowing the personality of the students, to try to avoid such imbalances. A side issue is that the possible number of questions covered with the proposed approach will be usually smaller compared to a standard "ask-and-answer" method.

CONCLUSION

The proposed betting system combines elements of confidence-weighted marking schemes, group work, strategic player interaction and game design in order to engage students in the learning process. Based on the implementation of the system in our classes so far, it appears to result in more involved class work, and the students generally respond with approval, finding the approach preferable to the way of conducting seminar exercises. It remains to be seen if it also has a positive effect on learning, and whether higher engagement leads to better scores on summative assessments. But at this point we lack sufficient data to perform further research.

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