Games are increasingly being used in healthcare education. We aimed to establish how students perceived the ‘game-like characteristics’ (Challenge, Curiosity, Control, Fantasy, Iteration and Reflection) in an educational board game. Students enjoyed playing the game and recognised most of the characteristics in our game which they felt enhanced rather than detracted from their learning. When educational games are developed, they should include all the game-like characteristics described.

Games are increasingly being used in healthcare education (Bochennek et al 2007) due to their beneficial effects on learning that include the active learning experience, which stimulates higher thinking in the form of analysis, synthesis and evaluation (Akl et al 2010). Other beneficial effects are thought to arise from the potential to improve student motivation and introduce competition into the classroom (Bochennek et al 2007), whilst creating an element of fun and excitement, which enhances retention by reducing stress and anxiety (Akl et al 2010).

We previously developed an educational board game (‘Medquest’) and introduced it into the neonatology teaching programme at the University of Liverpool Medical School. Using it in a randomized controlled trial suggested that students who played the board game in addition to attending the normal neonatology teaching sessions performed better in a multiple choice paper (Swiderska et al 2013).

After student feedback, we reviewed the game and modified in places it to try to ensure that the seven “game-like” characteristics previously described as being important for an educational game (Malone and Lepper 1987, Schaller 2015) were included. These qualities are providing: 1. Challenge 2. Curiosity 3. Control for the players, 4. a Fantasy element (by providing relevant analogies), 5. The possibility for iterative learning, 6. The opportunity for reflection, and 7. Re-playability.
Briefly, students play the game in two teams during an unsupervised, hour-long session during their neonatology attachment. They move round the board by answering questions on neonatal medicine correctly. They can choose the route round the board, can collect ‘star cards’ which can be exchanged for answers to the most difficult questions, and the winning team gets a small prize at the end. Students are encouraged to photograph answers if they want to keep them for future revision or reference. The aim of this study was to establish how the students perceived the game-like characteristics and how they affected their learning experience.

**Method**

Over a six week period, students were asked to complete a questionnaire immediately after playing the game. Questions were answered on Likert scales asking about the game-like characteristics of MedQuest and the students attitudes regarding the acceptability of the game as a learning tool. Students were also asked to indicate whether they would be willing to participate in interviews to explore their attitudes towards the game. These were digitally recorded, transcribed and analysed for emerging themes. Interviews continued until saturation of themes occurred. Written consent was obtained from these students for inclusion in the study, which was approved by the University of Liverpool Ethics committee.

**Results**

Fifty-one students completed questionnaires (table). Students generally felt the game was enjoyable and an appropriate way of learning, recognized the characteristics and did not feel these distracted from their learning. Ten students took part in semi-structured interviews. The main findings of these are reported here under the key themes identified.

**Enjoyment**

Students commented on the contrast between the game-playing session and their usual teaching sessions, and felt that their enjoyment of the game enhanced their learning.

“…'cause you’re having fun, and you learn better if you're having fun.” (Interview 7)

“…sometimes studying can be a real slow, real monotonous slog, but…it generally made what essentially was studying and made it fun.” (Interview 3)

Comments were made about the relaxed atmosphere of the unsupervised game-playing session.

“…it’s kind of more at a relaxed pace [than didactic teaching] and you can kind of think about what you're answering…so it goes in your head a little bit better” (Interview 6)

**Curiosity**

Students commented that the game drew their attention to several subjects that they had not previously encountered, and some mentioned that this increased their motivation to learn more about the specialty.

“…I actually made a note…to go up and do a bit of reading up on that.” (Interview 3)

“…it hammers home…the basic knowledge that you have and it gives you an incentive to learn more.” (Interview 3)

**Control**

Students commented that the opportunity to make choices in the game added to their enjoyment; however few of the students recognised opportunities in the game to employ strategy. Most felt that winning the game was dependent either on luck or on having more knowledge than the opposing team.

“…the first time it happened [choosing the route to take] we didn’t really recognise it as mattering…but
by the second one you were sort of looking at your options…” (Interview 9)

**Iteration**

Students recognised and appreciated the repetition of questions on similar topics throughout the game.

“…similar things came up and you started to learn it, you started to realize what was the right answer…” (Interview 4)

“…it’s that repetition…that really…helps you learn…” (Interview 4)

**Teamwork**

Most of the students identified teamwork as an important part of the game, and commented positively on the way the game encouraged them to adopt a group learning style.

“…that was…the most prominent memory this year of really working…in a team.” (Interview 3)

“…it would like start a group discussion…like the way a PBL session should be…” (Interview 5)

“…you would listen to each other’s…arguments and…it opened your eyes as to the other possibilities.” (Interview 3)

**Competition**

Medical students were described by several interviewees as being particularly competitive, and the students recognised that the game encouraged an element of competition. Most felt that this added to their enjoyment of the game and increased their motivation to learn, but others were more negative about the way competition affected some members of the group.

“I think [the other team] learned a lot more just because they really really wanted to win.” (Interview 2)

“…there was somebody in our group that got quite heated over a few questions…” (Interview 5)

**Distraction**

The students were clear that the game elements did not distract them from learning, with most students feeling that they learned more than they would have done in a normal teaching session.

“…I think the whole game element…facilitated the learning, I don’t think it distracted at all.” (Interview 3)

**Table**

*Questionnaire data*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Score 1-2</th>
<th>Score 3-5</th>
<th>Score 6-7</th>
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</table>

**Discussion**

We have devised an educational board game which students have found to be enjoyable and an
appropriate use of their educational time (Swiderska et al 2013). In the current study we investigated whether ‘game-like’ characteristics enhanced by modifications to the game influenced student learning. Challenge and curiosity (Malone and Lepper 1987) were most readily recognised by students as being extremely important for learning. Despite finding the game challenging however, some felt they would have enjoyed the game more if they had had the chance to answer some less challenging questions, perhaps allowing them to share knowledge more easily and therefore learn from each other. Setting questions and answers to the right level of the players is therefore an important consideration when designing a game.

Although the redesigned game gave the students choice about the route they took around the board and offered the use of “star cards” to obtain answers, control was the least recognised characteristic. This might suggest that the game process (ie obtaining knowledge from the questions answered) was more important to students than the game outcome (ie tactical considerations that could be employed in order to win). Indeed, most felt that winning seemed more a matter of luck than strategy. However, on further questioning, students suggested further ways of introducing more strategy into the game, including offering a choice of different levels of difficulty, with the chance to progress further along the board if more difficult questions were answered.

In a medical educational game, the element of fantasy does not lend itself to inclusion. Providing metaphors or analogies without cartoons and illustrations or a degree of humour to illustrate a problem may be difficult and would perhaps be out of place when trying to educate in an unsupervised environment about serious illness. It is perhaps not surprising therefore that students did not feel there was a strong fantasy element and did not particularly feel that fantasy was an important attribute of a medical game. Some suggested this could be enhanced with the inclusion of more case-based questions. These may have increased the game’s relevance and context in the specialty of neonatology, resulting in more engagement with, and learning from the game (Schaller).

Reflection and iteration have been postulated as additions to the four basic characteristics which define an educational game (Schaller). Both of these require experiential engagement with similar tasks or problems. This experience is very difficult to provide in a short (one hour) unsupervised session such as ours although interestingly the students did not attribute low scores to these characteristics. Teamwork was a characteristic of the game suggested by the students that we had not previously identified. They commented that teamwork is an important part of medicine that they don’t get much opportunity to experience during normal teaching sessions and were positive about the benefits of playing the game in teams and working together to come up with the right answer to questions. Teamwork therefore seems an important characteristic to include in any educational game for medical students to support the development of their team working skills.

Competition, another characteristic that students suggested as being important, is a factor that cannot be separated from a game in which the object is to win. Most students saw competition as being enjoyable, and felt that medical students, in particular, are motivated by competition, but others commented that the game became less fun if members of the group became too competitive. It is therefore important to ensure a game does not become over-competitive and potentially hinder learning. Playing the game with a facilitator present may help to moderate inappropriate competitiveness but would involve an increase in human resources.

In conclusion, students recognised most of the game-like characteristics in our game and felt that they enhanced and did not detract from learning. We therefore suggest that educational games should be critically developed to try and include all the game-like characteristics described. Some of these are
difficult to incorporate, however resulting in many games being better defined as ‘content delivery with game like qualities’ and not true games (Schaller).

**Take Home Messages**

**Notes On Contributors**

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**Appendices**
Declaration of Interest

The author has declared that there are no conflicts of interest.