



Debriefing Serious Games: Turning Gameplay into Learning

Fatimah Lateef, FRCS (A&E), MBBS, FAMS (Em Med) *

Corresponding Author: Fatimah Lateef, FRCS (A&E), MBBS, FAMS (Em Med), Senior Consultant – Dept of Emergency Medicine, Singapore General Hospital, Professor, Duke NUS Graduate Medical School, Yong Loo Lin School of Medicine, National University of Singapore and Lee Kong Chian Medical School, Nanyang Technological University, Director, SingHealth Duke NUS Institute of Medical Simulation (SIMS), Singapore.

Copy Right: © 2022 Fatimah Lateef. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Received Date: February 03, 2022

Published Date: March 01, 2022

Abstract

Serious games (SG) are digital games that prioritises learning over entertainment. It is very important to consider the 'learning experience' learners will have with the SG, before commencing the actual game development. The objective of these SG will be to provide them with a positive, engaging, fulfilling and yet enjoyable gameplay experience.

Debriefing a SG refers to the collective assessment and analysis of in-game experience and events, followed by the discussion with the learners. When conducting the debriefing, whether face-to-face or virtually, the first step is to have the learners who have completed the gameplay, come away, cool down and ventilate on how they feel. The next step would be for the debriefer to ask the learners what they felt had taken place, which is linked to their level of interaction and satisfaction with the SG.

Group sharing then takes place with the learners, reflecting as they verbally narrate their emotions, feelings, actions and performance in negotiating the SG. This can make the group discussion rigorous and richer with individuals contributing different perspectives. This can also be a data collection point of the debriefing. The debriefer can help to ensure there is connectivity between the SG and the real-life situation or the clinical situation. This is the equivalent of external validity of the SG. The learners should also be led to share what were the lessons learnt as well as the “what ifs” (the equivalent of sensitivity, reproducibility of the SG). Finally, it is also about how the learners would be moving forwards and how the experience will impact their practice. The debriefing must be well paced and not rushed. Usually, the more complex the game or the scenario, the more time would be required.

This paper also discusses how debriefing could be conducted for SG. Understanding the difference between debriefing and reflection is also emphasized. Finally, as we move, more and more, into technology-enhanced education, these techniques and skills will remain relevant, but may evolve to suit the context.

Keywords: serious games, debriefing, micro-debriefing, reflection.

Introduction

Serious games (SG) are digital games that prioritises learning over entertainment. There is still some element of entertainment and that is also why SG are often said to provide ‘edutainment’. It connects educational content with game content and facilitates reflection on the experience after the game. SG can be used for teaching, training, assessment and charting of learners’ progress and growth. It utilizes immersive science for engagement of learners and players through visual, auditory, cognitive or any combination of these, in a systematic way in order to build up understanding, capabilities, skills or behaviour. Gamification is now shown to be an acceptable and effective method of instruction. These have been used in a multitude of applications today which include skills training, behaviour inculcation, instilling critical thinking and clinical reasoning skills. SG in healthcare can be utilised to achieve behavioural change, reduce educational workload, shorten training time as well as facilitate

familiarization with processes and workflow. The technology is also relatively inexpensive today. (1-4) The most common learning outcomes from SGs are summarized in **Table 1**.

Table 1: Learning Outcomes from Serious Games

1.	Cognitive: knowledge and information
2.	Motor skills
3.	Affective values: attitude, motivation
4.	Communication skills
5.	Retention: memory of the factual information shared in the serious games
6.	Behaviour: performance

For planning SG, it is important to consider the context (eg. intensive care unit, emergency department, whole institution), the purpose (ie. the learning objectives) and player specific issues (eg. which group of learners, new recruits, junior doctors). It is very important to also give thought to the 'learning experience' that the learners will have with your SG. The objective will be to provide them with a positive, engaging, fulfilling and yet enjoyable gameplay. With the provision of balanced scenarios (tagged at the appropriate level for the target learners; not too complex and not too easy), these experiences can be the basis for providing the required scaffolding for nurturing learners, where they will remain engaged without getting bored or too anxious, with an overly complex scenario. The SG will present the scenario/challenge, allow the learners to make choices and decisions and subsequently, they will deal with the consequences of their choices. All these should preferably be decided before the game development phase. (4-7)

As with all other educational tools or platforms, feedback and debriefing is also crucial with SG. Together with the reflection process, it will help learners and players consolidate their learning. In the more commonly utilized simulation based scenarios, debriefing is carried out at the end of the scenario management. This is termed as terminal debriefing. (8-10) There are also variations to this whereby debriefing is conducted in smaller, bite-size, at strategic points during the scenario and this is known as micro-debriefing (also known as rapid cycle deliberate practice). There are also other variations possible for debriefing of SG. When complemented with debriefing, SG can yield higher levels of learning and retention as compared to just playing the SG alone. (11-14) For many, the questions that arise are, when and how is debriefing done for SG?

Debriefing

Debriefing is used across many industries, in work integrated learning and other instances. It is a process whereby people who have gone through an experience are led through a purposeful discussion

of their experience, which involves reflection. Debriefing is separate from the event itself and requires even greater focus and attention. It should align with the set learning objectives and can be a powerful and meaningful learning event. This is where the experience of the simulation or playing the SG, is integrated into the facilitated learning journey. (3,4,7-9) The two stages of the debriefing process is usually:

- A. The reaction to the experience (of the event, the simulation or playing the SG) and then
- B. Sharing and reflection, guided by a trained facilitator, to generate the learning

There are six essential structural elements of debriefing: (5, 12, 14, 15)

1. The debriefer: usually a trained faculty who understands the principles of debriefing, simulation-based learning and preferably, adult learning. The person should be able to apply the appropriate model for the debriefing process, facilitate the process with some degree of flexibility and dynamism.
2. The participants/ learners to be debriefed: the key group for which the debriefing is focused on. The debriefing should be learner-centric in order to ensure learning takes place.
3. The experience or the episode (simulation or SG): refers to the immersive part of the activity or simulation. The focus is on experiential learning.
4. The impact of the experience: refers to what the learner experiences and then the lasting bearing it has on his learning.
5. The recollection or the reflection: this is the core of debriefing. The “reflection on” as well as “reflection of” the experience is important and sets the basis for reasoning, questioning and understanding, in order to meet the learning objectives.
6. Dedicated time: adequate training time must be set aside, sufficient enough for playing the SG and the debriefing process. These should not be rushed.

All these elements should be considered and fulfilled in order for an optimal debriefing to be conducted.

Debriefing a Serious Game

When debriefing is to be applied to a SG, it has to be decided early, preferably from the conceptualization phase. However, often it is only discussed during the game development or post-development phase. (7, 10) There are of course, SG whereby no elements of debriefing is incorporated or done, and it only involves “playing the SG”. In these cases, it is highly dependent on the learner how much they learn and reflect. After playing the SG multiple times, there may be some subconscious retention. (4,6,9)

Debriefing a SG refers to the collective assessment and analysis of in-game experience and events, followed by the discussion with the learners. Their reflection is crucial and the debriefer can help lead them into understanding this in relation to real-world practice. During debriefing all the observations will help form a common picture of what happened and these will help in calibrating them to improve

any measurement reliability. The debriefing and the SG must reinforce each other. (14-16) With the current Covid 19 pandemic, more and more debriefing is now conducted virtually or is also known as ‘tele-debriefing’

As in Fig 1, before learners play the SG, they should be given a pre-briefing session. This aims to explain what is the objective/s of the SG, their roles as they play the game, and the assumption that everyone involved is motivated and would like to improve themselves. In some cases, a trial and familiarization session can be included in the pre-briefing session. Others may take the learners through the familiarization of the SG, after the pre-briefing. Some SG are divided into various stages or modules, whilst some come in one stage/ module only. Learners should also be told if they can stop at certain strategic point or if they need to complete the whole module before taking time-out. Many SGs are played at the individual level, whilst there are some that involves multi-player. (10, 17-21)

After the learner plays the SG, there are a few options. (Fig1)

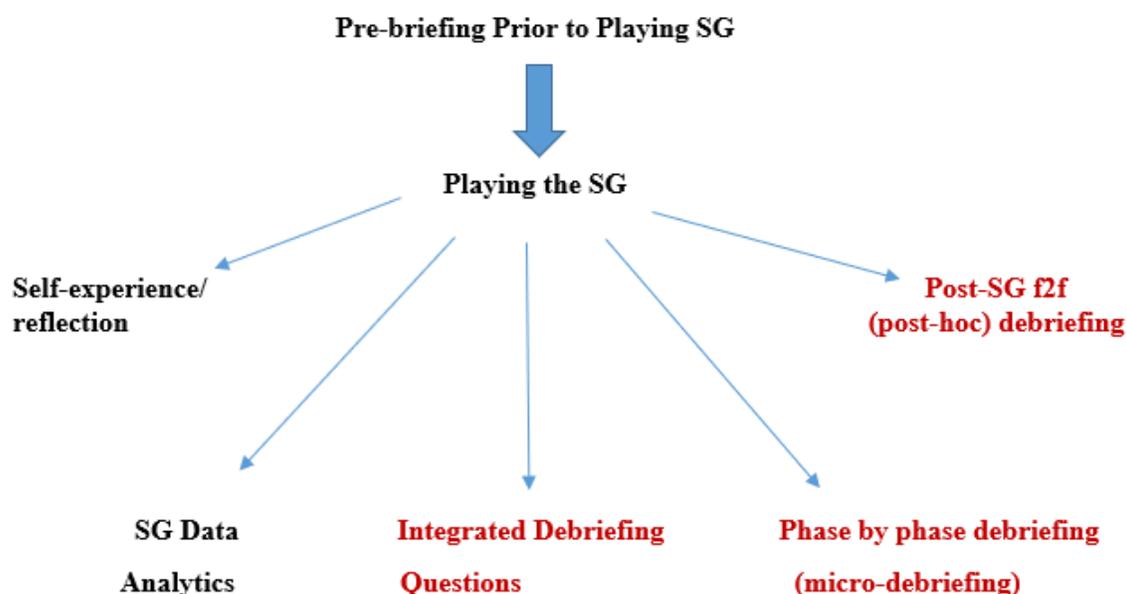


Fig 1: The Stages in Playing and Debriefing of a Serious Game

SG: Serious Games

f2f: face to face

Red font: indicate guided and supported learning using Debriefing

1. The learner who has gone through the experience of playing the SG, self-reflect or is left on his own to draw conclusions and deductions. This approach is relatively non-directed by an external party and is dependent on the intrinsic motivation of the learner. In such SG, very much depends on the learner; how much he can deduce and learn by playing the SG. The learner will go through self reflection and self-assessment to help develop their own clinical reasoning. Critical self-reflection can help develop self-awareness. This approach may be useful for very senior and advanced learners as part of life-long learning or as part of faculty development. (5, 10)
2. Planning for SG data analytics is a decision that needs to be made early so that the needed programme and software can be incorporated. This consideration must be borne in mind during game development and design. It may be possible to see which are the modules or steps whereby learners are having difficulties, find challenging or are taking a longer time for decision making. The more straightforward and easier steps can also be deduced by these analytics, which will show how quickly learners can negotiate each module. As these SG are played, actual time can be captured and this will enable analysis of time taken or processing time by learners for a variety of tasks or steps. To have such data analytics programming for a SG, it may cost higher as there is a need to get a IT (information technology) trained personnel to prepare and incorporate this. It would be useful to have this person engaged from the conceptualization stage so that he can suggest what is feasible and what is not recommended. For such SG, once the learners have played, backroom data charts can be called up and thus, interpretation made pertaining to the SG as a learning activity. (2, 4, 10, 16, 20)
3. In some SG, there are integrated debriefing questions embedded into the game itself. These must be carefully planned and is useful to have the inputs from an education specialist. Usually these must be alignment with the set learning objectives and be interspersed at strategic points of the gameplay. Essentially, it requires the build-in of the debriefing data into the SG software. Data from the responses to these questions can be seen by the facilitating faculty and conclusions be drawn and acted upon accordingly. Some studies have shown that integrated debriefing has the highest learning outcomes. One reason for this could be the temporal proximity of the debriefing in relation to the activity. This is somewhat similar to the immediacy of feedback on learning. Timely feedback can promote and inspire learning. (15-18, 22, 23) **(Table 2)**
4. **Micro-debriefing** can also be used for SG debriefing. This is useful for games which are longer in duration or have multiple phases and modules. The faculty in charge can stop the gameplay after each module at strategic points and facilitate a debriefing. Alternatively, the debriefing can be embedded as questions at the end of each module. This debriefing can also be done face-to-face (if the learners are playing in the same location) or virtually (if the learners are all playing at different locations). This method of debriefing a SG can be more time consuming and will require a faculty to be present for the whole duration of the game play. This may be a useful

technique for younger learners, students or new recruits who may require more direction and support. (11, 13, 14, 19, 22)

5. For post-SG debriefing, the learners will play the game till completion and at the end, a terminal debriefing session will be facilitated by a faculty. Again, this can be face-to-face or virtual. Also known as post-hoc debriefing, this can be conducted in a personalised manner or in a group. The learners will reflect on their game playing experience and share. Whilst the learners play the game individually, the debriefing can be conducted as a group. This way, they can learn from each other as well. (3, 5, 12, 14) **(Table 2)**

For those who are considering whether to have debriefing for their SG and also which option is best and most appropriate for them, it is important to take note that studies have shown that: (12,,13,15-17)

- a. SG supplemented with debriefing can yield better learning gains compared to those without debriefing and
- b. SG complemented with debriefing can yield a higher level of retention, compared to those without debriefing.

Debriefing Integrated into the SG	Post-hoc Debriefing after the SG
Done immediately after each segment/ module and thus allows for better recollection and recall of events/ incidents during the game	Debriefing is ‘terminal’ or at the end of the whole SG and thus recall may not be as accurate and detailed
When SG is separated into phases/ modules, debriefing can be conducted in bite-sizes (known as micro-debrief). This helps to split up the cognitive load into manageable quantum	Facilitated debriefing at the end may be longer and has to cover more pointers and elements. This makes the cognitive load heavier towards the end
There is greater ownership as any elements and activity are self-initiated by the learner. Internal motivation levels are usually higher	This is facilitated by faculty or trainer and thus involves more external motivation
Greater autonomy on the part of the learner	As it is guided and facilitated, the level of autonomy may not be as high
Entertainment and learning are integrated	The differentiation of entertainment and learning may tend to be more defined
Involves more self-processing	More of a group processing activity
Formative assessment	Used more for summative assessment
The more immediate inputs and feedback after each module/ segment may enable learners to go back and replay the segment to improve and learn from their mistakes.	As this tends to usually be a facilitated activity, learners may not have the ability to go right back to repeat the gameplay until the terminal debrief has completed

This is a value-add for integrated feedback or debrief	
Learners tend to become independent/ competent earlier	May need a longer period to attain competency (but dependent on the type and selection of learners)

Table 2: Comparison of Debriefing integrated into SG versus Post-hoc or Terminal Debriefing

The Process of Debriefing and Reflection after Gameplay

When conducting the debriefing, whether face-to-face or virtually, the first step is to have the learners who have completed the gameplay, come away, cool down and ventilate on how they feel. The next step would be for the debriefer/ facilitator to ask the learners what they felt had taken place, which is linked to their level of interaction and satisfaction with the SG. Here is where they will start sharing their experience, views and there will be group sharing. This can make the group discussion rigorous and richer with individuals sharing different perspectives. This can also be a data collection point of the debriefing. The debriefer can help to ensure there is connectivity between the SG and the real-life situation or the clinical situation. This is the equivalent of external validity of the SG. The learners should also be led to share what were the lessons learnt as well as the “what ifs” (the equivalent of sensitivity, reproducibility of the SG). Finally, it is also about how the learners would be moving forwards and how the experience will impact their practice. The debriefing must be well paced and not rushed. Usually, the more complex the game or the scenario, the more time would be required. (4, 9, 15, 24-26)

(Table 3)

Kirkpatrick’s Levels	Elements
1	Reaction and response, satisfaction with the interaction
2	Learning and formal self-assessment (or other forms of assessment)
3	Behaviour impact on practice
4	Results and patients outcomes

Table 3: Kirkpatrick’s Levels of learning with the approach to Serious Gameplay

Some debriefers prefer to have a relatively fixed structure to follow during debriefing, whilst others are more attuned to some degree of flexibility to ensure free-flowing discussions. Debriefers need to have some basic understanding of the debriefing process. They can apply any framework or model they are comfortable with, similar to debriefing any other simulation activity. They can also explore options and integrate as necessary as they facilitate the debriefing. Other factors that affects SG debriefing include debriefer style, grasp of the debriefing process and depth of knowledge. It is important to be aware that debriefing a serious game is different from just carrying out the assessment of the performance of the SG. (26-35) The level of trust and psychological safety of the learners is also an important factor to consider. (36-38)

Debriefing is closely linked to reflection and they are indeed inter-dependent, but each represents a unique process. Reflection is the basis for debriefing. Debriefing is the process that stimulates reflection. It is important for the debriefer to strike the right balance between the two, for each session. Reflection can be quite an abstract concept, but simply put, it involves an individual ‘reliving’, recalling and going through in his mind, an experience. In our context, it would be what he has gone through when playing the SG. Reflection is done individually, independently, at a personal level by a person. It can be repeated and deepened for one to gain better insight and understanding. It contributes actively to the integration of what has been learnt. The term ‘reflective learning’, means reflection with processing of information or an experience. (39-42) Some of the characteristics differentiating debriefing from reflection are shared in **Table 4**.

Debriefing	Reflection
Active and concrete	More abstract
Facilitated and guided by a debriefer	Individually done, more independent and personal
Group sharing and activity	Each person does this personally usually
Can be structured or less structured depending on the group dynamics, the debriefers preference and other factors	Based on individual’s recall and memory in recollection
Focus is outward; on action and problem solving	Drawn from internally and reflection can be repeated and cyclical. Can be deepened in order to increase understanding
Involves processing emotions	Promotes engagement with emotions
Involves reviewing experiences	Also involves revisiting experiences
Verbal and active communication; involves sharing	Quiet, introspective
Does require time but with more verbal and immediacy	Takes time, effort and discipline,

Table 4: Comparison of the Process of Debriefing and Reflection

Conclusion

As educators and learners are exposed to more technology-enhanced learning opportunities, SG is one that will continue to feature prominently. This has also been promulgated by the current Covid 19 pandemic and will continue to feature in the new norm. Learners and educators must keep abreast and become familiar with the process of reflection and debriefing, whether these are applied to traditional modes of learning or to the newer modalities of educational tools and platforms.(43)

References

1. Crookall D. Serious games, debriefing and simulation/ gaming as discipline. Simulation and Gaming 2010; 41: 898-920

2. Lederman LC. Debriefing: Towards a systematic assessment of theory and practice. *Simulation and Gaming* 1992; 23(2): 145-160
3. Abulebda K, Auerbach M, Limaiem F. Debriefing techniques utilised in medical simulation. In: *StatPearls (Internet)*. Treasure Island (FL). StatPearls Publishing, Jan 2021. Available: <https://www.ncbi.nlm.nih.gov/books/NBK546660/>
4. Lateef F, Lim RE, Loh WYM, Yew CPK, Wong M, Lew KX, Suppiah M. Taking serious games forward in curriculum and assessment: Starting infusions right every time. *Journal of Emergency, Trauma and Shock* 2021; 14: 232-239
5. Charsky D. From edutainment to serious games: a change in the use of game characteristics. *Games Cult* 2010; 5(2): 177-198
6. Petranek C, Corey S, Black R. Three levels of learning in simulations: Participating, debriefing and journal writing. *Simulation and Gaming* 1992; 23(2): 174-185
7. Thiagarajan S. Using games for debriefing. *Simulation and Gaming* 1992; 23(2): 161-173
8. Peters VAM, Vissers GAN. A simple classification model for debriefing simulation games. *Simulation and Gaming* 2004; 35(1): 70-84
9. Fanning RM, Gaba DM. The role of debriefing in simulation based learning. 2007; 2: 115-125
10. Klabbers JH. Gaming and Simulation: Principles of a science of design. *Simulation and gaming* 2003; 34: 569-591
11. Lateef F. The use of micro-debrief in simulation-based learning for medical students. *SF Journal of Med and Research* 2021; 2(1): 1015
12. Kriz WC. Creating effective learning environments and learning organizations through gaming simulation designs. *Simulation and Gaming* 2003; 34: 495-511
13. Qudrat-Ullah H. Debriefing can reduce misperception of feedback. The case for renewable resource management. *Simulation and Gaming* 2007; 38: 382-397
14. Van der Meij H, Leemkuil H, Li JL Does individual or collaborative self-debriefing better enhance learning from games.? *Computers in Human Behaviour* 2013; 29: 2471-2479
15. Van den Hoogen J, Lo J, Meijer S. Debriefing Research games: context, substance and method. *Simulation and gaming* 2016; 47(3): 368-388
16. Grund CK, Schelkle M. Developing serious games with integrated debriefing. *Bus Inf Syst Eng* 2020; 62(2): 87-101

17. Kusurkar RA, Ten Cate TJ, Vos CMP, Westers P, Croiset G. How motivation affects academic performance: a structural equation modelling analysis. *Adv Health Sci Educ* 2013; 18(1): 57-69
18. Garris R, Ahlers R, Driskel JE. Games, motivation and learning. A research and practice model. *Simul Gaming* 2002; 33(4): 441-467
19. Nadolski RJ, Hummel HGK. Retrospective cognitive feedback for progress monitoring in serious games *Br J Educ Technol* 2017; 48(6): 1368-1379
20. Lateef F. Computer-based simulation and online teaching netiquette in the time of Covid 19. *EC Emergency Medicine and Crit care* 2020; 4(8): 84-91
21. Lateef F. Covid 19 and teams in the virtual space. *Medical and Research Publication* 2021; 3.6
22. Kickmeier-Rust MD, Albert D. Micro-adaptivity: protecting immersion in didactically adaptive digital educational games. *J Computer Assist learn* 2010; 26(20): 95-105
23. Michelet D, Barne J, Truchot J, Piot MA, Cabon P, Tesniere A. Effects of computer debriefing on acquisition and retention of learning after screen-based simulation of neonatal resuscitation: Randomised Controlled Trial. *JMIR Serious Games* 2020; 8(3): e18633. Available at doi.10.2196/18633
24. The Kirkpatrick's Model. Learn the four levels of evaluation. Ardent Learning. Available at : <https://ardentlearning.com/log/what-is-the-kirkpatrick-model>
25. Alsalamah A, Callahan C. Adapting the Kirkpatrick Four level model to training criteria for evaluation of training programme for teachers. *Edu Sci* 2021; 11: 116
26. Smidt A, Balandin S, Sigafoos J, Reed VA. The Kirkpatrick Model: a useful tool for evaluating training outcomes. *J of Intellectual and Devp Disability* 2009; 34(3): 266-274
27. Pavlov OV, Seed K, Robinson LW. Improving instructional simulation with structural debriefing. *Simul Gaming* 2015; 46(3-4): 383-403
28. Rudolph JW, Simon R, Raemer DB, Eppich WJ. Debriefing in formative assessment: closing performance gaps in medical education. *Acad Emerg Med* 2008; 15(11): 1010-1016
29. Gee JP. What video games have to teach us about learning and literacy. *Comput Entertain* 2003; 1(1): 20
30. Kiili K. Digital game-based learning: towards an experiential game-based model. *The Internet and Higher Edu* 2005; 8(1): 13-24
31. Wouters P, Van Oostendorp H. A meta-analysis review of the role of instructional support in game-based learning. *Computers and Edu* 2013; 60(1): 412-425

32. Sailer M, Homner L. The gamification of learning: a meta-analysis> Edu Psychological Review 2020; 32(1): 77-112
33. Degand J, Loup G, Didier J-Y. Towards an immersive debriefing of serious games in VR: a framework concept. In: deRosa F, Marfisi SI, Badsnid HJ, Bellotti F, Dondio P, Romero M (eds). Games and Learning Alliances. GALA 2021. Lecture notes in Computer Science Vol 13134. Springer. Cham. Available at : https://doi.org/10.1007/978-3-030-92182-8_14
34. Nicholson S. Completing the experience: Debriefing in Educational games. Syst Cybern Informatics 2013; 11(6): 27-31
35. Coovert MD, Winner J, Bennett W, Howard DJ. Serious games are a serious tool for team research. International J of Serious games 2017; 4(1): 41-55
36. Seelandt JC, Walker K, Kolbe M. A debriefer must be neutral and other debriefing myths: A systemic inquiry-based qualitative study of taken-for-granted beliefs about clinical debriefing. Advances in Sim 2021; 6(7). Available at <https://doi.org/10.1186/41077-021-00161-5>
37. Lateef F. Culture of psychological safety in the ED: Don't forget the hidden curriculum. Archives of Emerg and Intensive car 2021; 4910:18-26
38. Lateef F. Does culture eat strategy in debriefing? Which one wins? Global J of Emerge Med 2017; 1(10): 1-4
39. Dankbaar MEW, Richters O, Kellerman CJ, Prins G, ten Cote OTJ, van Merrienboer JJG et al. Comparative effectiveness of a serious game and an e module to support patient safety knowledge and awareness. BMC Med Edu 2017; 17: 30
40. Yu Zhonggen. A met-analysis of use of serious games in education and learning. Int J of Computer Games Technol 2019; Article 4797032 (8 pages)
41. Sawyer T, Eppich W, Bre H- Fleegler M, Grant V, Cheng a. More than one way to debrief: a critical review of healthcare simulation debriefing. Sim in Healthcare 2016; 11: 209-217
42. Reiersen JA, Haurkedal TA, Hedeman H, Bjok IT. Structured debriefing: what difference does it make? Nurse Edu in Practice 2017; 25: 104-110
43. Ehrlinger J, Johnson K, Banner M, Dunning D, Kruger J. Why the unskilled are unaware: further explanation of (absent) self-insight among the incompetent. Organ Behv Hum Decis Process 2008; 105(1): 98-121