

Flipped Gaming – testing three simulation games

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Abstract—At the Inland Norway University of Applied Sciences “flipped gaming” has been tested with two student groups (in 2017). This paper will present a newer version of the “flipping” and also how a total of eight groups utilized three different types of simulators to play the scenarios. The scenarios were developed by the student themselves as this was their mandatory assignment. The mandatory assignment was handed out in January. The assignment was about making a playable script for an incident, in addition to conduct the planning, execution and evaluation of a complete exercise in crisis management. They were given feedback once before the workshop where they presented and played the script. The tools that were used was Rayvn (<https://rayvn.global/>), Microsoft HoloLens (<https://www.microsoft.com/nb-no/hololens>) and a simulator based on a platform from Bohemia Interactive Solutions (<https://bisimulations.com/>) - the same platform as Virtual Battle Space 3 uses. Rayvn is an incident management tool, mainly for communication. The written messages can then be logged and stored for later reflections. Microsoft HoloLens is a tool for 3D vision, a tool that can show environments in 3D and allow the player to carry out operations using movements that are recorded and executed. This was a prototype. The game based simulator is computer based. The different views are 2D maps and 3D environments. The players use the keyboard and mouse to move the vehicles and avatars around. This in a “disaster town”, called “Lyngvik”, a very poor planned city centre with a large accident-/crisis potential. The study is based on the previous study of the learning outcome from assignment that is based on student input. The mandatory assignment was to develop a playable scenario and they could choose in which of the three different simulation tools they were to play their scenario. Two by two, the groups are to play each other’s scenario. They have received some supervision and the lecturers have remarked on that the students may lack insight in what a “playable scenario” require. One of the groups operates as the exercise management staff (the ones that makes the incidents happen and “play out”) and the other group is the ones who man the different roles in handling the scenario e.g. ---- different call out services. This group is also called main training audience (MTA). The students are in their 6th and last semester in their Bachelor in Crisis Management. The students have been subjected to diverse teaching methods, but this is the first time they have a simulation tool to work with in order to enhance their learning outcome. The preliminary reports from the reflections after the simulating are very positive. The students report on a learning outcome, both from making the scenarios and from simulating. There is also a final report to be written where the students are to reflect on their learning outcome from the simulation and the work on the assignment. The paper shows the results from the whole undertaking and presents further details from the different phases. We also present the theoretical backdrop and the methodological reasoning behind the data

collection and analysis.

Index Terms—simulation and gaming, reflection processes , flipped gaming, enhanced learning outcome

I. INTRODUCTION

This paper will present the research done this semester (spring 2018) regarding a course that, in addition to ordinary lectures, have used “flipped gaming”. “Flipped gaming[1]” was introduced at the ITHET conference in 2017 when the first test was conducted in the 6th term (last semester) of the students Bachelor study in Crisis Preparedness and Management at The Inland Norway University of Applied Sciences. The term is a derived from “flipped classroom” and points to how gaming and simulation can be utilized in an educational setting and at the same time follow principles from “flipped classroom”.

“Flipped classroom” is based on student activity, and that the students are able to share, discuss and to a certain extent organize their own learning activities. The traditional work of content delivery is transferred from the lecturer to the student[2][3]. The lecturer is more a facilitator and the students can utilize material made available prior to e.g. a seminar. The material may be articles, streaming video, podcasts, or similar.

For this undertaking – the “flipped gaming” – the students are given lectures, it is a 75% mandatory appearance required, and the “flip” is allocated to the mandatory assignment. In short, the mandatory assignment is, in student groups of 5-7 students, to create a playable script, be play staff for their own script, play another group’s script, evaluate immediately after orally and in writing a few weeks later. The assignment will be described in detail later in this paper. This way of organizing an assignment leaves a responsibility to the students regarding playability, conduction, reflection and evaluation.

The paper describe the theory that is used to inform the undertaking. Further we will argue for the methodological approach to data collection and analysis. Our research question has been: “How does the concept of “flipped gaming” support the students learning outcome?”

To operationalize this research question, we have chosen to formulate two more questions:

- 1) Which of the elements of the assignment given provide a learning outcome – according to the students?, and
- 2) What do the students claim they obtain the highest learning outcome from; working on the assignment, or the gaming/simulation?

II. THEORETICAL BACKDROP

Here we will present the theory that has informed this study.

A. Visualization, virtual reality and augmented reality

To be able to play out real life issues in a safe environment that allow for mistakes without having any major consequences for other people, provide a safe playground for testing different scenarios. Hence, it is possible also to alter details in scenarios to discover different issues, issues that could potentially have devastating effects if “tested” in the real world. Some issues may also have an ethical side to the testing, and visualization can provide an arena for testing and discussing ethical issues, e.g. in warfare (T. Vold & McCallum, 2011)[4].

Virtual reality (VR) lets the viewer be immersed into a “synthetic environment” which does not allow for a view of the real world (Kipper and Rampolla 2012)[5]. It is a “completely artificial digital environment that uses computer hardware and software to create the appearance of a real environment to the user”(p. 21). Augmented reality (AR), however, allows the real world to be displayed, but with “augmentations”; improvements that enriches or broadens an understanding of a situation (Kipper and Rampolla 2012)[5]. According to Kipper and Rampolla there are three characteristics that need to be present to define AR; that AR combines real and virtual information, AR is interactive, and AR operates and is used in a 3D environment (p. 4).

AR in education can support the learning process as it is possible to make errors and thus contribute to various degrees of learning experiences (T. Vold & McCallum, 2011)[4].

B. Adult learning

The students that are enrolled at the University are adults. Hence, it is important to pay attention to how adults learn.

Adults learn by being involved and engaged (Knowles, 1970, 1984, 1990)[6], [7], [8]. By being involved and engaged, they can also assume a responsibility and ownership of the undertaking.

Being involved can also mean to use ones own background and experiences. This will also increase the relevance (Sinclair, 2013)[9] regarding being able to utilize what is learned back in the organization. John Dewey[10] (1938) advocated for utilizing ones own background and experiences for learning purposes. To make use of what one has experienced before can aid in the process of learning as it is possible to recognize events and construct new knowledge based on previous understandings. It is also possible to view ones own perceptions

and experiences in a new light and change due to learning (Mezirow, 1991)[11].

Utilizing games and simulations means that the students will have experiences, which may challenge their previous perceptions of different issues and situations.

These experiences, the change of perceptions and using reflection as a bridge between the transitions can explained by David A. Kolb (1984)[12] experiential learning cycle.

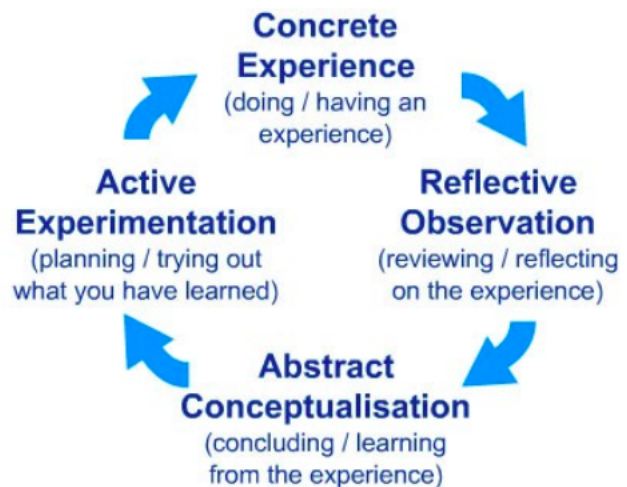


Fig. 1. The experiential learning cycle (from : www.simplypsychology.com)

The concrete experience is not necessarily less concrete when using games. The experience will be reviewed using a form of “After Action Review” (Busch & von der Oelsnitz, 2010)[13]. This includes what can be learned from the experience, and also to suggest what could have been altered regarding a new experience.

The reflection may also be in the form on what Donald Schön (1987, 1991)[14], [15] describes as “reflection on action”. It is also possible to facilitate for “reflection in action” and “reflection in action on action”. “Reflection in action” can be for the teacher to suggest explaining different actions during the simulation. “Reflection in action on action” can be to evaluate these actions, which may cause changes in the action if better solutions may come up during the reflection. This would be a way of priming the students to become “reflective practitioners”.

To prime students before action with regards to reflection, is described by John Cowan (2006)[16]. This “reflection before action” may resemble Kolb’s “abstract conceptualization”, but basing the previous experience on their own backgrounds or their fellow students experiences.

C. Social learning theory

It is also important to utilize social learning theory when preparing for educational experiences such as gaming and

simulations. The students may have experiences they can share with others and also discuss and develop together with their peers. Different experiences and different backgrounds and facilitating for sharing experiences may lead to a collective broadened learning. Lev Vygotsky (1978)[17] describe how collective learning can support the individual of reaching their “zone of proximal development”. Together, by sharing experiences, and by co-developing new knowledge, it is possible to learn more than on their own.

III. METHOD OF INQUIRY

In order to establish any relationship between the project and the learning outcome, we have collected qualitative data, such as observations, interviews with both groups and individuals, and our own field notes from the different stages.

Interviews, both with individuals and groups, provide qualitative data that can be interpreted and discussed (Dicicco-Bloom & Crabtree, 2006; McLeod, 2014; J. J. Schensul, 1999; S. Schensul, Schensul, & LeCompte, 1999)[18], [19], [20], [21]. The semistructured interview allow for pursuing different issues that may arise during the interview situation (Dalen, 2011; Postholm, 2010)[22], [23].

The data was organized in categories and sub-categories for the analysis.

In order to secure the data and make sure that the data are valid and reliable, we have done some “member checks” (Guba & Lincoln, 1989)[24].

A. *The project*

The project was undertaken as a part of a course in the Bachelor program in Crisis Management and Communication. The purpose was twofold; firstly - previous research on “Flipped Classroom” (A. T. Vold et al., 2017; A. T. Vold, Lundesgaard, & Braun, 2016; T. Vold, 2014; T. Vold et al., 2017) and using games and simulations for learning purposes have shown promising results, secondly – new tools needed testing for learning purposes.

The students are in a wide age group; between approximately 20 and 60 years old. This implies a diverse audience. Their backgrounds range from “ordinary” desk jobs to call out services.

Since July 22nd 2011, municipalities and organizations need to develop plans for crisis prevention and management. The Norwegian Directorate for Civil Protection (Norwegian abbreviation: DSB) works on defining how organizations and society in general can avoid and/or handle incidents, crisis and make sure that preparedness and effective crisis management is distributed throughout Norway and Norwegian workplaces ((DSB), 2012). This means that safety and preparedness no longer is a matter for only the military and central governmental offices. Hence, the need for education and training.

Throughout the course, the students are given lectures on topics that are relevant for the assignment and for the learning objectives for the course.

The assignment is delineated as follows:

First, the assignment is handed out and explained. The assignment have some constraints: they are – in groups – to develop a scenario, which needs to be playable. The students are offered supervision in order to secure the playability of the script. The student group also need to decide for which of the three different games/simulation tools they want to use for the simulation. Their task during the gaming/simulation is to be game hosts/staff or game masters and another group will play out their scenario. Equally, they will need to play some other group’s scenario.

After the gaming/simulation they are to sum up and make a quick evaluation of the gaming/simulation and their learning outcome, First Impression Report (FIR).

The last part of the assignment is to present a summary of how they have worked on their assignment, how they perceived to make a (playable) scenario, evaluate the learning outcome from making a scenario, evaluate being play staff for their own scenario and playing another group’s scenario, evaluate the reflection processes tied to the (total) assignment, and discuss how this assignment and the reflection support their learning process.

B. *The simulation tools/game platforms*

The different gaming/simulation platforms are as follows:

VBS3 (Virtual Battle Space 3 from Bohemia Simulations). In this game based environment, they have programmed a (fake) Norwegian “disaster town” called Lyngvik. Here it is possible to program different types of incidents, like landslides, fires, etc. Then the avatars have to perform rescue operations.

HoloLens from Microsoft is a mixed reality tool (<https://www.microsoft.com/en-us/hololens/developers>).

According to the representatives, this was the first time this tool was used in solving crisis and crisis management. The tool was used together with a VHF radio (using the band width of the hunting channels for this assignment) for communication purposes.

Rayvn is a tool for incident management. It is a text based tool which used with the radio provide a different type of simulation. To write the incidents and how to solve them will provide the students with a verbalization and record for discussion that is a valuable basis for discussions and reflections. It provide a text based communication that can prove valuable for the students as it may resemble other tools they will have to work on in a real life crisis. For our purposes, it serves issues like team learning, verbalization, and communication.

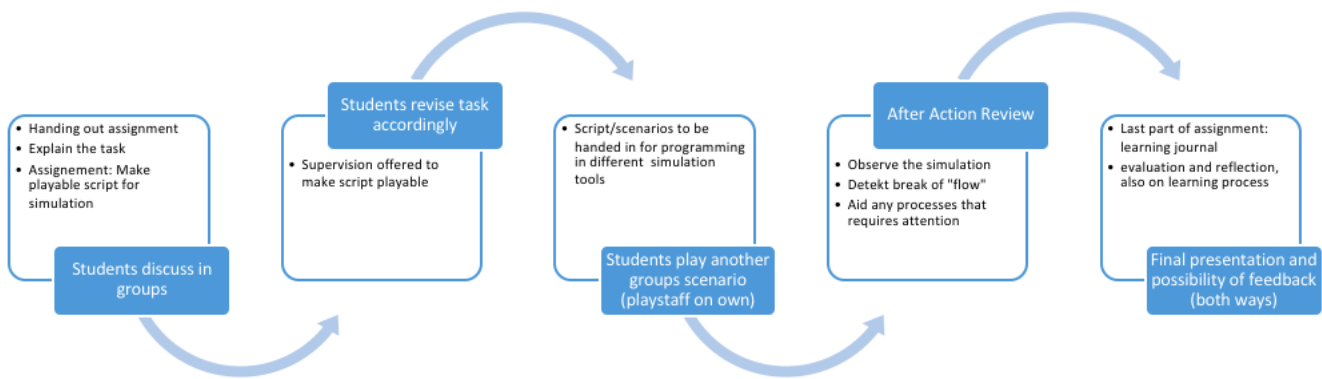


Fig. 2. Overview of the assignment

IV. RESULTS AND DISCUSSION

The results from our investigations show some points for improvement, but also some important issues to pursue further. One of the issues, is the gaming in “Lyngvik” (VBS3). The students that are digital natives and gamers have no problem moving the avatars and their vehicles around in the virtual environment. They find it fun and engaging. However, the ones that are not gamers, struggle with getting their avatars in place and to move them about in order to solve the task in question. This may obstruct flow (Csikszentmihalyi, 1990)[25] of the gaming and in worst case contribute towards being too focused on not being able to move the avatars rather than performing the rescue operation. This may again reduce the learning outcome of the gaming (Kember et al., 1999)[26]. The total response on this gaming session was however, that all of the respondents claim they should have done this earlier in their education. They claim it is essential to their learning process and that this should be introduced already in the first semester. Quotes like : “we need this” and “this should have been a part of our training from day one (of the study)” support the idea of this contributing to their perceived learning outcome. This, they claim would also reduce the risk of obstructing the learning outcome due to lack of gaming skills.

The students also state they get a better understanding of the importance of communication during crisis. All of the different tools provide the artificial settings and they do provide the learning opportunity it was intended to be. In different ways the different tools provide a safe “play ground” for the students.

The students also report on it being necessary to have mandatory attendance. This was an issue they had addressed early in the semester, as many are in a work life. More than 50% attendance was unwanted by the students. The 75% attendance was early disputed, but when the course is finished, this is something they really appreciate. This suggest that forcing them to attend, will also contribute towards more time in the study setting together with their peers and for the ones that have less time for privately to join their study group (due

to work life, family life, distance, etc.) will have to spend time together, that they normally would not. This provide an opportunity to learn from each other and this support the social learning (Vygotsky, 1978)[17]. Learning from each other and by sharing knowledge, building on their own experiences (Dewey, 1938)[10] may support their learning outcome.

Some of the students also claim to retrospectively understand better the requirement of a “playable scenario”. They claim that they first through the gaming/simulation understood that it was necessary to pay greater attention to the playability. Low playability may also lead to break of flow (Csikszentmihalyi, 1990)[25] and thus allow for obstructed learning (Kember et al., 1999)[26]. Even if most of the scenarios were playable, there were some minor details that arose due to the lack of focussing on the playability. The learning they claim to have from this, is the necessity of planning well for exercises back in their organization, and to –in as full extent as possible - test the whole scenario repetedely, in advance of the “live” one.

To be play staff for their own scenario has also provided the students with valuable insight in how their planning is perceived by others. Also to play other groups scenarios provide them with the response perspective with regards to training for incidents (Hafting, Ree-Lindstad, & Vold, 2006; T. Vold, 2011)[27][27].

To develop a scenario as a part of an assignment is also reported to support the learning outcomes. The reflection process, reflection before action (Cowan, 2006)[16] is valuable for their learning process. It also provide the students with a sense of inclusion and co-development, that enhances the sense of involvement and allow them to utilize their own backgrounds and experiences (Dewey, 1938; Knowles, 1970, 1984, 1990)[10], [6], [7], [8]. It also allow the student to utilize the other students experiences. This social learning they claim to support their learning process, which is supported by the social learning theory (Vygotskij & Kozulin, 1986; Vygotsky, 1978)[17], [28].

The reflection processes during and after the gaming/simulation, they also claim to support their learning out-

come. This is supported by theory that explains how to become a reflective practitioner (Moon, 2006; Schön, 1987, 1991)[29], [14], [15]. The reflection process they undergo in the last part of their assignment (the presentation of their reflections on the total assignment) show a development process that we also find in theory on experiential learning theory (Kolb, 1984)[12] and in writing reflective journals (Moon, 2004, 2006)[30], [29].

V. CONCLUSION

The assignment has been well received over time by the students. From the rather negative attitude of the mandatory attendance and the scepticism with regards to developing their own scenarios, to the statements of how this is crucial to their learning during the study, show a development that the students needed during their study. They claim that it needs to be a larger part of the whole study program, and that simulation and gaming should be introduced in the first semester and that it should be done throughout the whole study.

The assignment need some development, such as a greater focus on providing support on the playability of the scenarios, and a mandatory reflective journal writing. The total reported learning outcome from the assignment is, however, rather overwhelming. As the assignment is developed from earlier attempts, and experiences, and support learning theory that embraces both adult learning, social learning theory, and theory on utilizing reflection for learning, this should not be surprising. However, there are still some issues that may obstruct the learning, such as gaming skills, technical errors, break down of technology, to mention a few issues that may occur.

The feedback from the students, both through the research data and through their reflections during the assignments will provide valuable guidelines for the further development.

A. Further research

Utilizing the gaming/simulation tools earlier in the study program will be tested out and it is necessary to do research on how this can develop the study and support the relevance of the study. It is important to continuously improve the study in order to support the relevance and the individuals learning outcome from the study.

Modified assignments are planned for other courses earlier in the study program and need to be investigated for both learning outcome for the course, but also longitudinally regarding how introducing gaming and simulation earlier in the study program will support the learning outcome from the assignment in the last semester. Will it reduce the issues pointed out, such as the gaming skills, and the understanding of the importance of the playability of a scenario. These are issues that we need to follow up on and investigate further.

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