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LEARN-BY-DOING VIRTUALLY; A GAMIFIED AND METAVERSE DESIGN FOR GROUP PROJECTS AIMING AT ENHANCING CONSTRUCTIVIST AND COLLABORATIVE LEARNING

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Abstract:

Probably the most challenging part of delivering a course is to engage the students in the learning process; to capture their interest to the extent that they will want to contribute to the on-going delivery of the course. Academics, try to achieve this in every possible way. Among other practices, educators plan their courses to include a variety of activities, utilize Information and Communication Technologies (ICT), reward the students for their contribution, show interest and offer prompt and honest support and feedback, act their role or use other appropriate means to make learning fun.

Many times, courses include group activities and projects. The students' experience with a group project is sometimes positive and is described by students as, "The project was great since it allowed us to understand the content better." and at other times it is described as a nightmare, "It was very hard to get everyone involved and I therefore ended up doing most of the work.". Group projects may offer the students a practical view of the course content by allowing them to play the role of the developer, engineer, manager, or other. Additionally, such projects benefit the student by giving them an experience closer to a real business operation. Group projects are supported by both the Social Constructivist Learning (SCL) and the Collaborative Learning (CL) theories. The benefits of deploying both theories are great but the challenges to make group projects work are persisting, with the biggest challenge being to get all group members engaged with the project's activities. This study begins by taking a step back to understand how the two learning theories are used in the design of group projects, to then take a step forward to examine how the students' experience in doing group projects may be enriched by incorporating gamification and virtual reality features in the project design.

Keywords: Collaborative learning, Constructivist learning, Gamification, Motivation, Virtual Worlds, Metaverse

I. INTRODUCTION

A spherical and holistic education is potentially shaping a young person's character. That along with life experiences. Education and more specifically academic degrees, also serve a more specific purpose and that is none other than to secure a job in the work place. To allow people to join the productivity stream, to make them more competitive and to enable them to build a successful (according to each person's definition of success), career. Fullan (2001), noted as the moral purpose of education, to teach students the skills that will enable them to become productive citizens when they complete their education. Camins (reported in Strauss, 2015), concluded that the purposes of education are: critical thinking, creativity, interpersonal skills and a sense of social responsibility. These are all influencing success in life, work and citizenship.

A number of frameworks were published which outline the skills necessary to enter the workforce and succeed in work and life. Among them, the P21 framework, published by the Partnership for 21st Century skills (Literacy, 2009), (Figure 1). These skills are grouped into four categories: 1) Core subjects and skills that every educated person should have mastered; 2) Learning and innovation skills; 3) Career and life skills; and 4) Digital Literacy skills. (Trilling & Fadel, 2009). All four categories must be fully interconnected in the process of 21st century teaching and learning. Dede (2009), has compared a number of frameworks about 21st century skills and concluded that these are generally consistent with each other though some may be identifying some subskills and others may feel that some areas are underemphasized and would like to stress them more.

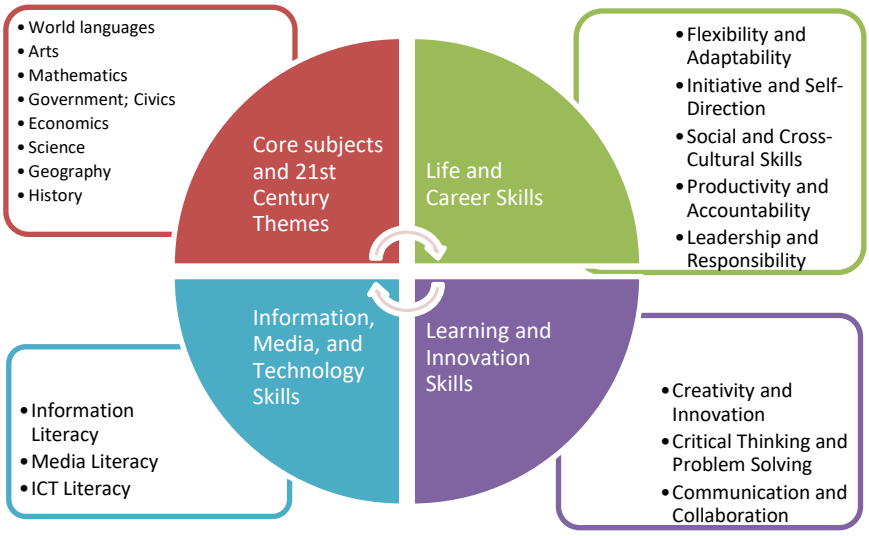

Figure 1 The 21st Century Student Skills (Source data received from Literacy, 2009)

In our present study we would like to focus on Life and Career Skills and Learning and Innovation Skills as these can be approached in group project assignments requested as part of a more general collaborative learning strategy followed in the delivery of an academic course. The study takes an inward approach into group projects and investigates how gamification and virtual worlds might be used to enrich the students' experience in completing a group project.

II. WHY INVEST ON COLLABORATIVE LEARNING? WHY INSIST ON GROUP PROJECTS?

Bednar, Cunningham, Duffy, and Perry (1995) argued, quite rightly, that instructional strategies and tools must be based on some theory of learning and cognition. At times, educators show preference to an eclectic approach as they combine principles and techniques from different theoretical perspectives (Bonk and Cunningham, 1998). Sometimes, an experimental strategy or tool, as it is many times the case when exploring the potentials of new ICT, can lead to an addition to existing theory or show a new way of manifesting its use.

Bonk and Cunningham (1998), summarized learning theories into the following three categories: (A) learning as information processing - a cognitive skills approach. This calls for tools aimed at enabling the efficient communication of information and giving way to effective strategies for remembering. (B) Learning as experiential growth and pattern recognition - a cognitive constructivist approach. For this, instruction and tools should focus on experiences and activities that promote the individual development of the appropriate cognitive networks. (C) Learning as a sociocultural dialogic activity - a social constructivist or sociocultural approach. Instruction tools for this type of learning should explore ways of embedding learning in tasks which lead to participation in a community of practice. Learning, in our opinion, can be as complex as all these theories put together. Learning undoubtedly involves information processing, and experiential growth, and is a sociocultural activity.

SOCIAL CONSTRUCTIVIST LEARNING AND COLLABORATIVE LEARNING ENVIRONMENTS

Selecting to use an eclectic approach of combining different learning theories, we would like to begin our discussion by delving a bit on the principles of the social constructivism theory (SCT) as applied to social constructivist learning environments (SCLE) and those of collaborative learning environments (CLE).

Learners in a SCLE interact with each other to exchange information, knowledge and experiences, to seek and give help. They are encouraged to investigate their ideas and solutions and by doing so, they construct their own knowledge (Wink & Putney, 2002; Kim, 2008; Maddux, et al., 1997; Wertsch, 1992). The learners according to the SCT of Vygotsky, Piaget, Dewey and other psychologists who developed the model, have the key role in their

own learning process with the instructor being the facilitator of the learning environment and the content provider (Crawford, 1996; Doolittle & Hicks, 2003). The SCT acknowledges the importance of social interactions in enhancing one's thinking and learning and leading to the construction of new ideas.

In CLE, learning is seen as a sociocultural dialogic activity, and the system is specially developed to support the participation, collaboration, and cooperation of users sharing a common goal (Alzahrani and Woollard, 2013). To construct a successful CLE, it is important to understand the bonds which exist and those which could be created so that the group of learners can work collaboratively and achieve their goals. Existing organizational structures and relationships along with possible incentives for collaborative action are worth investigating (Zaraté, et al., 2008).

SCLE and CLE can be combined if different activities are planned under the umbrella of a common online learning environment commonly referred to as a Learning or Course Management System (LMS/CMS). Examples of such systems include Moodle, Blackboard and Canvas As for the tools they offer, these can be grouped into: (a) tools used to inform the students, such as Labels, Files, Folders, Pages, Books, and URLs; (b) activities for informing and evaluating, such as Forums, Assignments, Quizzes, Lessons, Chat, and Workshops; (c) activities for sharing data, such as Databases, Glossaries, Wikis; and (d) activities for identifying trends, such as Choices, Feedback, and Surveys (Moodle, 2022). Through the functionality of a LMS, a course can be delivered and students' collaborations may be promoted and supported. Additional tools may be required to support audio and video computer conferencing, online document collaboration and co-authoring, content organizing and sharing, and communication. Depending on the nature of the course and the desirable mode of delivery, whether face-to-face, online, or hybrid, the role of the teacher may be different. As described by the SCLE, the teacher may be offering encouragement to students to complete the course and engage in peer interaction but it is the student who is driving his/her own learning pace. Alternatively, as in CLE, the teacher may be governing and controlling the learning process while facilitating and encouraging collaborative work. Alzahrani and Woollard (2013), suggest that the idea of the limited role of the teacher in the SCLE is encouraging the students to engage in collaborative learning. A combination of the above-mentioned tools can be utilized in a course setup to enable both roles for certain activities, as desired, therefore the SCLE and CLE would have been combined.

GROUP PROJECTS

Collaborative learning in the form of group projects is deployed in many courses for two main reasons: 1) to offer the students a practical view of the course content by allowing them to play the role of the developer, engineer, manager, or other, and 2) to offer them an experience similar to job assignments which they will get once they get employed.

"Learning-by-doing" is a term which was introduced by Dewey at the beginning of the 20th century (Dewey, 1916). Dewey believed that education should not be about teaching dead facts but about developing skills and knowledge which students can immediately integrate in the lives. At the same time, Bandura (1917), formed his social learning theory in which he considers interaction and dialogue to be key components of learning. Also, Vygotsky (1978), described learning as an active social activity whereby individuals interact and influence one another. Currently, accreditation bodies for tertiary education still emphasize the need for collaboration and cooperation among students and encourage group learning activities. The Association to Advance Collegiate Schools of Business (AACSB) requests from faculty to: a) encourage collaboration and cooperation among participants, b) promote students' contribution in the learning of others, and c) promote learning experiences and skills for group and individual dynamics. AACSB, stresses the importance of group and peer learning and considers it a responsibility of students to their fellow students to actively participate in group learning experiences (AACSB, 2020).

Benefits from collaborative learning include among other, fostering critical thinking, developing positive interdependence, improving problem-solving strategies, internalizing content knowledge and promoting retention rates, achieving better results, improving personal achievement satisfaction, and enhancing interpersonal communication skills (Johnson, Johnson, and Holubec 1992; Li, and Campbell 2008; Gross 1993; Gokhale 1995; James, et al.,

2002; Gupta 2004; Schofield 2006; Springer, Stanne, and Donovan 1999; Johnson, Johnson, and Smith 1991). Learning is enhanced when people have to elaborate, explain and defend their meanings to others (Brown and Palincsar, 1989). Johnson and Johnson (1989), support that people learn more thoroughly when they learn to teach someone else. In reference to the 21st century student skills, mentioned earlier, we may connect collaborative work, as should be the case of group projects, with all of the Life and Career skills and if not all of the Learning and Innovation skills, at least with "Communication and Collaboration". Group projects also allow for the assignment of bigger tasks which can include more requirements and can be more complete. For example, an information systems development project which may be designed around a business need and in a way that will expose students to an experience resembling that of a real-world work environment.

Even though collaboration is sought, group projects are, not desirably but many times, completed in a cooperative manner whereby work is divided between the group members who then act individually, to finally combine their independent efforts into a final product. Other concerns about group work include: lack of support and training, lack of clear objectives, and difficulties in accommodating different work schedules and other cultural and language differences of members (Kitchen and McDougall, 1998; Hathorn and Ingram, 2002; Paulus, 2004; Burdett, 2003). The biggest challenge in assigning group work is though, "social loafing" or "free riding", terms used to describe inequality of contribution and effort among group members. This is the main fear of students when assigned group work (Williams, et al., 1991). Their expressed dissatisfaction has a direct impact on their perception of fair grading (Aggarwal and Obrien, 2008; Li and Campbell, 2008). Suggestions for limiting social loafing include a) limiting the scope of the project (dividing it into small components for example), b) smaller group size, c) multiple peer evaluations (Aggarwal and Obrien, 2008). Additional recommendations by Li and Campbell (2008), Ward (2006), Cohen (1994), Jolliffe (2007), Mello (1993), are:

- Stress the learning objectives, purposes and benefits of group projects and their relevance to workplaces;
- Consider team training for group communication, role identification, problem solving, and time management;
- Establish individual roles and duties and introduce frequent and open feedback and peer assessment;
- Encourage students to face problems and manage interpersonal conflicts;
- Discuss the role of culture in communication, interaction, and role concepts;
- Develop an effective group management system, establishing specific policies to monitor and address social loafing and free riding, and acknowledge and reward team and individual contribution.

GAMIFIED EDUCATION SYSTEMS

If you are looking into enabling your students for collaborative group work using ICT you should begin by considering the functionality available by the LMS. Using available tools, you may approach your goals for SCL and CL. For example, several educators have successfully used wikis (Alzahrani and Woollard, 2013; Cubric, 2007; Ebersbach, et al., 2005; Leuf and Cunningham, 2001; Richardson, 2006). Also, blogs and wikis (Godwin-Jones, 2003; Stylianou and Kokkinaki, 2008; Armstrong and Retterer, 2004; Ferris and Wilder, 2006), and other functionality. Additional LMS tools are available to inform, share, evaluate and promote group work.

The next step would be to use gamification elements in course design to increase student motivation and engagement and therefore achieve learning more effectively (Toda, et al., 2019a; Kalogiannakis, Papadakis, and Zourmpakis, 2021; Ntokos, 2021a; Borges, et al., 2014; Marti-Parreno, et al., 2016). Since 2010, when gamification popularity increased, there is considerable research output to prove educators' and researchers' interest in the subject (Swacha, 2021; Thiebes, et al., 2014). Gamified education systems use game-like elements to synthesize a gameful student experience to ultimately improve student performance (Landers, 2019; Deterding, et al., 2011; Kapp, 2012; Sanchez and Marti-Parreno, 2016; Seaborn, 2014). There are several gamification elements available for use but some are preferred more than others. Toda, et al. (2019b) created a taxonomy of 21 gamification features. Ntokos (2021a), conducted an empirical systematic review of 40 recent studies in higher education and in the fields of computer science and game development, that used

gamification to engage students. The top five elements of preference according to their study, are Points, Badges, Leaderboards, Levels, and Collaboration tools.

THE METAVERSE

The COVID-19 pandemic forced a lot of experimenting with ICT to take place in all aspects of life, business, and education. We are not allowed to ignore all the hardship that the pandemic has brought upon humanity, but we may say that we are lucky that it happened when it did. As far as education goes, the ICT available at the time and the readiness of academia to engage into remote, online, synchronous and asynchronous teaching and learning proved to be a success (Georgiadou, et al., 2021). In the post-pandemic era, we should be challenged to keep the positives from the experiences we had with the extensive use of ICT during the pandemic, and with more strategic and carefully-designed approaches be guided into utilizing ICT in education more efficiently and effectively.

Social networking, simulation, and online gaming paved the way to the next hot technology with a growing interest, being the metaverse; a compound word from “meta” as transcendent, and universe. The metaverse represents a 3D Virtual World (VW) in which users can interact through a virtual avatar. Three fundamental characteristics of VWs according to Díaz, Saldaña, and Avila (2020), are: 1) Interactivity between the user and with the metaverse; 2) Corporeity meaning virtual presence as avatars; and 3) Persistence to describe that the avatar continues to exist in the metaverse even when members are not connected.

Examples of metaverse success stories include Second Life with around 64.7 million active users with over than 100 academic institutions including the Stanford University, the Harvard Law School, the American Cancer Society, a Swedish embassy (Narim and Koçman, 2021; Kluge and Riley, 2008); Roblox (50 million daily active users by the end of 2021 with 31% year-on-year growth); Sandbox (2 million registered users); Decentraland (around 1000 users per week).

Zuckerberg’s press release in 2021 (Zuckerberg, 2021), describing the metaverse experience in work and private lives, has raised people’s curiosity regarding metaverse. But, the majority of the comments posted under his video express a lot of skepticism. For example, “I see the potential of VR for entertainment purposes; however, I feel that Metaverse will detract from reality… I think there are a lot of people who may enjoy this escape from reality...”; “The problem of living in the Metaverse is removing VR glasses and realizing you're actually alone and none of the things you've been doing in the virtual world is fungible. Alienation is basically the reason why we teach our children not to overuse video games and social media. But here we are talking about translating this into our day-to-day habitual life. Not sure about how healthy this could be.”

A more pragmatic view of the metaverse is, in our opinion, that of Nadella Satya, Microsoft CEO (Nadella, 2021; Nadella, 2022). His view that “… As we embed computing in the real world, we can embed the real world in computing.” (Nadella, 2021 Interview 20:00’) while not forgetting the value of real human conduct “…It’s the people that I work with that keeps me going at a given place…”.

At the same time, a comprehensive report by Market Research Future showed that the global Metaverse value was $21.91 billion in 2020 and predicted a growth of 41.7% by 2030 (Sashidharan, 2022). The use of the metaverse is wide spreading! Examples include: virtual worlds like Hubs Mozilla, Gather, Fortnite, and Horizon Worlds; games like Illuvium, Roboblox, Sandbox, Minecraft; real estate deals using platforms like Sandbox and Secondlife; professional use as in meetings in metaverse; events such as concerts, sports like Sensorium Galaxy sports, conferences, and more (Sashidharan, 2022).

As for education in the metaverse? It is happening! From VR applications created for educational purposes, (Díaz, Saldaña, and Avila, 2020; Suh and Seongjin, 2022; Jovanović and Milosavljević, 2022; Hwang et al., 2022; Chien et al., 2022; VictoryXR, 2022a; VictoryXR, 2022b; Narim and Koçman, 2021 – recorded 12 studies on the use of Metaverse in education between 2013-2021); to complete classes given in the metaverse as is the case of the Morehouse college in Atlanta, Georgia which launched in 2021 three classes: World History,

Biology 105, and Inorganic Chemistry; to metaversities, as Universities in the Metaverse, such as the University of Maryland, the New Mexico State University, the Morehouse College in Georgia and others which invest on establishing a digital twin metaverse campus. As we speak more courses are being created: the University of Nicosia, Cyprus, launched a free, online course "Introduction to NFTs and the Metaverse"; the world's first university course delivered exclusively on the blockchain and the metaverse. Are we getting into all this too fast? Should we take a minute to re-examine our practices based on theories of learning and cognition, and then plan our next steps? We should treat the metaverse as a new opportunity and connect it to the existing pedagogical theories and/or redefine the theories while considering the features of the metaverse.

Virtual worlds, according to Kluge and Riley (2008), present an opportunity for educators to implement learner-based pedagogies. They may promote active, constructivist, collaborative, and inquiry or problem-based learning. They can also be adapted to implement authentic learning strategies which will focus on real-world, complex problems and their solutions. The learner will perform role-playing in tackling problems, activities, and case studies while participating in a virtual community of practice (CoP). Active participation also described as learning-by-doing, is a great opportunity for virtual worlds.

Challenges to VW include the hardware and other requirements for an optimal use of the VW, accessibility, distractions from things happening in the VW environment, development time and skills required to set up the VW, gaps in the legal framework governing virtual interactions/transactions and more (Kluge and Riley, 2008).

You may be surprised to learn that LMS functionality is being incorporated in VW. Sloodle is one such open-source project which integrates the multi-user virtual environment of Second Life or OpenSim with the Moodle LMS.

Expanding on some of the suggestions of Hwang and Chien (2022), on how the metaverse can be used in education to enrich the student experience we could list the following:

- To situate learners in a cognitive- or skill-practicing environment that could be risky or dangerous or not possible/affordable in the real world.
- To situate learners in the contexts to experience and learn context they generally do not have the opportunity to be involved with in the real world.
- To enable learners to perceive or learn something that requires long-term involvement and practice and accelerate their learning.
- To enable learners to perceive, experience, or observe things from different perspectives or roles.
- To enable learners to learn, interact, and collaborate with people that they might not have opportunities to work with in the real world.
- To explore the potential or higher order thinking of learners by engaging them in complex, diverse, and authentic tasks.

Educators should consider this technology to enhance the student-learning experience and use it wisely where appropriate. A number of companies offer products which may be used for assisting educators in their efforts to incorporate VW in their course design. For example, Edify (edify.ac), Vibrela (vibrela.com), and VictoryXR (victoryxr.com). Nevertheless, it should probably be expected that the cost of using VW technologies will be high due to the time and effort that one will invest in learning and applying such technologies in education.

III. DESIGNING A GROUP PROJECT WITH GAMIFICATION ELEMENTS AND A TASTE OF VR

In this last section of the study, we would like to introduce some of the above technologies, namely gamification with a flair of the metaverse, in a group project activity. This group project is happening in a Systems Analysis and Design course and it gives to Computer Science, Computer Engineering, and Information Systems university students who are taking the course, the chance to practice the concepts introduced in the class. The project tackles some hypothetical business requirement calling for an information system's (IS) solution. The

adopted approach normally follows the traditional Waterfall System Development Life Cycle (SDLC) up to the phase of Systems Design, with the students delivering a partially completed non-operational, high-fidelity prototype of an IS solution. In this group project activity, the students are asked to act as systems analysts and work in groups for the delivery of the project tasks. At the same time, students may be asked to act as business users for a different group, providing business information and feedback about the business requirements.

Adopting some of the recommendations for group projects (mentioned earlier) we propose to redesign this group activity as following:

1) The project will be designed around an agile methodology to bypass long documentation and focus on a fast delivery of an IS solution. Though the Design Sprint by Google Ventures, is not listed in the top five main agile methodologies (Santo, 2022), we decided to use it as the possibility of scheduling all activities in a 5-day week schedule seemed appealing. We believe that the speed of achieving progress and the overall time required, being just a week, will motivate the students in completing the work collaboratively. The particular method was also proposed by Toda et al. (2019a) to gamify a learning system. The concepts of the Design Sprint methodology will be covered in the class.
2) The group members taking the role of systems analysts and being responsible for delivering the task, will be restricted to 3-4. Students will be given the option to form their own group or be assigned to one by the lecturer. The business will be represented in the project, by the lecturer as the decision maker on behalf of the business management, and other students, in the role of business users who will be interviewed and offer feedback.
3) Peer evaluations will be completed at the end of each day/activity. Points given will be accumulating until the end of the process and will contribute to the individual's grade for the project.
4) Prior to the commencement of the activities the lecturer will:
    a. stress the learning objectives, purpose and benefits of group projects and their relevance to the workplace;
    b. form the groups by assigning students who have not formed their own groups and appoint the first group manager. This student will manage the activities of Day 1. Other students can replace him/her as Manager for each remaining day;
    c. assign other students (2-3) as the business users to work with the developers in each group; the lecturer will be the business manager in all groups;
    d. describe the responsibilities for each role in the project, offer training regarding communication, problem solving, time management, and other relevant tasks;
    e. discuss timely and constructive conflict management and social loafing reporting;
    f. explain the need for frequent peer assessment and how this will be used in the calculation of the grade for the group and the individual.
5) Once the group teams have been formed, the lecturer will schedule all of the project activities for all teams. Preferable time for these activities will be after the middle of the semester in order to first cover most of the foundation theory of the course. The presence of all team members in these group activities will be required. The lecturer will attend the first meeting of each group which will take place during class time. The remaining (4) meetings needed to complete the work will be scheduled outside class time on the following days. The business users will be participating as required/requested.
6) Each day's work will be submitted for partial grading. The final project grade for each student will be a composite of daily work grades (same for all group members), and peer assessment.

ADDING GAMIFICATION ELEMENTS AND VR

The following gamification elements, as presented in Ntokos, (2021b), will be added in the group project:

1) Points. This element is suitable for giving immediate visual feedback to students and will be used both for the peer evaluations and the lecturer evaluation at the end of each day/activity. The two evaluations will run separately. In assigning the final project grade for each student, the lecturer will also consider the overall points received by peers. This will be a form of continuous feedback for students. Where necessary it may be complemented with explanations/directions.
2) Badges will be awarded with the completion of the main project milestone activities.
3) Leaderboards will be used to announce the lecturer points accumulated with the completion of each activity. A separate leaderboard will announce the top five contributors by accumulating the scores received from peer evaluations.
4) Competition & Collaboration. We expect that some competition will be created among teams and individuals due to the leaderboards. Other than that, the team members are basically asked to collaborate to complete the assigned tasks.

As it was already mentioned, the first group meeting will be scheduled as a face-to-face meeting taking place during class time. In the event that the class will be running online, these group meetings can be facilitated by the Breakout Rooms option of the LMS. The remaining meetings can be scheduled in a virtual world (VW) environment. The VW experience will potentially:

- Allow the students to live the project in a more business-like setup in which they will schedule and hold business meetings and complete specific business tasks. Additionally, in the VW, might be possible for the students to experience the task they are asked to automate or the information product they have been requested to design.
- Offer the chance to more students to participate in the project activities and the group members to collaborate. As a result, an overall positive group project experience in a game-like learning environment is envisioned.

Our suggestion for using a VW to complete a group project's activities would appeal to most students, who being already familiar with VWs, as in gaming, would most probably like our idea. We are not certain whether the presently available technologies can support the tasks efficiently or if time will be wasted. Thus, the choice of using the VW environment for their meetings will be entirely up to each group. Alternatively, a group's members may select to meet physically, or using audio or video conferencing tools and complete all their work using other tools of their choice.

More additional gamification elements could be realized:

5) Virtual World is by itself a distinct gamification element. A VW for a project of this type may be including an area for meetings which will be linked with online multimedia resources necessary to complete the project; an area designed to resemble the business environment in which the task/activity will be demonstrated by the business participants in the group meeting; and other places holding related events or activities. Picture 1 shows some sample rooms in VW.
6) Time. This takes the meaning of completing the VW tasks in a pre-agreed time interval. It may materialize using a clock on the screen, showing time remaining.
7) Awards and Feedback. In addition to points and badges, students can also be rewarded for promptness in task delivery, professionalism in their work, and other positive behaviour, with positive feedback and bonus points.
8) Progression. Can be used to show how much of the total work was completed in terms of tasks or deliverables. It may be followed on a miniature Gantt chart on the screen.

These are our suggestions for a gamified group project implementation in an IS course. The design can of course be extended and modified for other projects.

IV. SUMMARY

In this study, we aimed at investigating how gamification and virtual reality can support collaborative and constructivist learning in a group project used as an assessed learning activity in a university course.

We reviewed the social constructivist learning theory characterized by learners interacting with each other to exchange information, knowledge and experiences, to seek and give help. Learners in the model are encouraged to investigate their ideas and solutions and by doing so, they construct their own knowledge. We also reviewed collaborative learning principles where learning occurs as a sociocultural dialogic activity, and the environment is specially constructed to support the participation, collaboration, and cooperation of users sharing a common goal. As we intended to approach both theories in the design of a group project, we continued to study the literature on group project activities. We welcomed their benefits in fostering critical thinking, developing positive interdependence, improving problem-solving strategies, internalizing content knowledge and promoting retention rates, achieving better results, improving personal achievement satisfaction and enhancing interpersonal communication skills. At the same time, we recognized the challenges to achieve collaboration, use successful group management, resolve conflicts and discourage social loafing.

We wanted to use gamification elements in our group project design to increase student motivation and engagement and achieve learning more effectively. We therefore studied gamified education systems and the different gamification elements.

Finally, we wanted to investigate the possibility of incorporate in our group project design, the metaverse experience by adding features of virtual worlds. The metaverse may be viewed as an additional opportunity to implement a student-centered learning pedagogy to include social constructivist and collaborative learning. In a virtual world the learner can experience an authentic, immersive, collaborative and constructivist learning.

Combining all of the knowledge we have acquired on the above topics of Social Constructivist Learning Environments, Collaborative Learning Environments, group projects and then gamification and virtual world possibilities, we tried to put together a new model of a group project which aspires to capture the students' attention and offer them a positive and exciting group experience.

Our contribution is the up-to-date review of the literature in all five topic areas, complemented by our opinions and experience in education matters. Also, the design of a new type of group project which is gamified and has a virtual world added feature. This can be replicated, adapted, and adopted for other group projects.

Is it time to experiment with Virtual Reality (VR) and the exciting Metaverse experience to reach a Gamified Collaborative Learning experience?

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