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GAMIFICATION IN CLOUD-BASED COLLABORATIVE LEARNING

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Abstract. Gamification is a widely accepted approach aimed at increasing the learner's motivation. The paper presents a study on gamification approach in face-to-face collaborative learning, supported by cloud-based environment. The concept of gamification is discussed, paying detailed attention to the motivating power of game elements and techniques.The existing elements and techniques in electronic and video games, as well as their applicability in the learning process are shown. The relations between game elements, game techniquesand game actionsare introduced. A gamified learning methodology is proposed and experimented with 93 real university students. A survey is conducted with learners and the results are provided. The findings reveal that when implemented properly, gamification of collaborative learning can prove an effective and motivational tool in education.

Keywords: gamification of learning; game elements; game techniques

1. Introduction

One of the main challenges of contemporary education is to keep the attention of learners and motivate them to participate more actively in the learning process. Teachers are faced with the challenge to understand how they learn, how they communicate and interact with the world in order to meet the needs of today's students and to teach more effectively (Gaftandzhieva, 2020).

The gamification approach is increasingly used to engage learners actively in the learning process, using the enormous motivating power of gaming elements and techniques, proven useful especially in playing electronic and video games. The use of game elements and techniques in learning aims to make complex theoretical training more accessible to all students. The practical activities in games and their repetition lead to a deeper understanding of the learning content (Connolly, 2012).

The main goal of this paper is to present a gamification approach, suitable in cloud-based collaborative education.

Section 2 introduces the concept of gamification with used specific game elements and techniques. The approach of applying these elements and techniques in learning, is explained in Section 3. Section 4 provides the proposed gamified methodology, illustrated with a specific experiment in blended

collaborative learning (face-to-face combined with cloud-based).Section 5 shows students' opinions about the gamification aspects of an academic writing course, elicited through a survey. The conclusions, presented in Section 6, summarize the main insights from the survey and some directions for future development.

2. Gamification elements and techniques

Gamification is an educational approach which aims at motivating learners to go through the learning content through additional game elements and techniques in the learning environment (Kapp, 2012). The aim is to increase learners' satisfaction and commitment by capturing their interest and inspiring them to continue studying the learning resources (Huang, 2013). Gaming can be applied to "make" people do things they would otherwise avoid (Mont, 2015).

Game elements and techniques in board, electronic and video games are in wide range.

The **avatar** in the games is a role that the player undertakeswhen participating in the game (player **changes the identity**). Avatars have different names, images and may have different skills depending on the game.

The **reward system** is a schedule with a quantitative description of the various reward elements (bonuses, badges, combos, rewards and resources) and the effort required to obtain them. According to Skinner (Iversen, 1992), the most effective reward system, is one in which rewards have a variable ratio of quantity, time interval and effort to receive.

Bonuses are expected rewards with different types of abstract units (such as points). The events in the game can increase or decrease the results of the different participants.

Badges are an award given for success or merit in a particular field. They can be physical (a small metal badge with some symbol – used in role-playing games) or digital (an image with an illustration).

A **combo** (short for a combination) is a set of actions performed sequentially, usually with strict time constraints, that give a significant advantage. It is usually given to the player as a kind of reward for the achieved goal.

The **reward** is an unexpected award (under certain conditions) with various incentives in the game that inspire and motivate the player.

Game **resources** can be various items to help facilitate the implementation of the objectives of the game.

Leaderboard in the gaming industry is used to denote a rank among the people who play. Players can be ranked based on achievements (e.g. points scored, levels, progress, time required for achievements). Leaderboards can provide an incentive for players to improve, as they give many of them a

sense of superiority or achievement. Users at the top of the rankings know that they are at the top of the pyramid at the current time, that is why this element provokes competition between players (Antin, 2011).

The **level** of the game is a section or part of the game. To advance to a higher level, the player usually has to achieve specific goals or perform specific tasks. The levels represent the sequence of execution.

Progress in a game is used to represent the player‘s current achievements and advancement (e.g. points earned, level reached and badges received).

The **status** in the game is the aggregate information about the current progress (goals achieved), the chosen avatar, the reached level and the available resources and tools.

The cooperation in a **team** is an act of **team work** with other players to achieve a mutually desired and useful result. This is the social aspect of the games that many players enjoy. In team games, the more players work together, the more they are able to achieve. (Kapp, 2012)

According to Kapp (Kapp, 2012), **time** can be used as a motivating element for the activity and actions of the player. For example, timers increase stress level and motivate actions.**Time limits** are a technique used to provoke players, they focus and begin to perform the tasks needed to achieve the level or goal of the game.

Communication is used to deliver **messages** between two or more players in order to exchange information related to the game and to stimulate the desire for socialization between participants.

Feedback is getting an opinion from a competent party about the actions performed by the player, usually used as a kind of prompt or motivation.

The implementation of assigned **missions, adventures or challenges** in the games stimulates the satisfaction of the players. Many games use this technique to achieve various goals, most often described with stories and supplemented by time limits.

Hidden treasures are a technique for unlocking the discovery spirit of the players. Players must meet certain conditions to unlock hidden treasures.

The **story/history** is a description of specific sub-scenes for role-playing games and story-telling games.

The **rules of the game** are one of the main components of any game. The game is just a set of certain **rules**, which are designed specifically to limit the player‘s actions and keep the game manageable (Kapp, 2012).

3. Gamification approach in learning

A study of the existing game elements and techniques and their applicability in learning has been made.The avatar in learning can present different roles of learners that can be used in missions.

In the framework of a reward system, students can receive additional benefits under different rules and in different forms – badges (distinctive sign for achievements in various learning activities), rewards (unexpectedly received for certain successes, e.g. resources with interesting facts, certificates, etc.), bonuses (expected remuneration for completed learning activities, e.g. points), combos (additional hints or study materials, contributing to the solution of a certain task in a shorter period of time), game resources (different types of learning resources) and hidden treasures.

Leaderboard can arrange students according to their success (e.g. collected points and achieved current level).In training, the levels can be different learning topics or sections.

Student progress is a presentation of the percentage of the fulfilled objectives of the training.The status considers the current state of the learner - current avatar, assessment of the learner, learning activity, etc.

Table 1. The relationship between game element, technique and action

Game element	Game technique	Game action
Avatar	Changing Identity	Role Playing
Bonus	Reward System	Receiving a bonus
Badge	Reward system	Receiving an award
Combo	Reward System	Gaining an advantage
Reward	Reward System	Rewarding
Resource	Reward System	Gaining resources, exchanging resources
Leaderboard	Reward system	Participation in a competition
Level	Tracking progress	Going to the next level, repeating a level
Progress	Tracking progress	Getting information about the progress in the game
Status	Current status tracking	Receiving current status information
Team	Team work	Participation in group activities
Time	Time limit	Carrying out activity for a certain time
	Rules of the game	Following the rules
Resource, Message	Feedback	Obtaining an opinion from a competent party
Message	Communication	Sending a message, receiving a message
Various Elements	Challenge / Mission / Adventure	Completing a mission
Resource, Combo	Hidden Treasure	Treasure Hunt
	Story / History	Creating and entering a different reality

Teams are used for group learning activities and reporting on the ability of students to work in a team.Time limits can be used for both learning activities and learning resources.

Communication is an important factor in learning, through it students can share ideas and problems, cooperate and work on group learning activities and implement social communication.Feedback is usually used by the teacher to give an opinion to the learner about his/her work.

Missions can represent all the learning activities that the learner has to carry out within the learning course. For more complete gamification, a game story can be added to these learning activities to describe the purpose of the mission.The story as a whole can be an interesting context of the learning process, which describes a plot with different missions to complete.

Hidden treasures in the learning process are hidden learning resources that can be discovered / opened when certain learning conditions are met (e.g. when completing a certain mission). The rules of the game can be interpreted in learning as the rules of the learning process.

The relationship between the game techniques, the game elements that participate in the respective techniques, the game actions that take place in the game based on these techniques and the learner‘s reaction are presented in Table 1.

Bartle (Bartle, 1996) defines four types of game players, thar are motivated differently:

- **Killer** – Tries to dominate other players by acting on the people in the environment;
- **Achiever** – Acts in the world and cares about the assignments in the environment in order to win;
- **Explorer** – Interacts with the world and wants to explore the environment and discover as many new things as possible;
- **Socializer** – Interacts with the people in an environment and usually takes advantage of the communication function to socialize.

To achieve greater learning activity, we suggest using more different types of game elements and techniques to be able to influence allfour types of learners. Gachkova, 2020 explained which learners are affected from the game elements and techniques

– Killer – bonus, leaderboard, combo, progress, status, time limits;
– Achiever – badge, level, progress, bonus, reward, mission, feedback, resource;
– Explorer – hidden treasure, avatar, feedback, reward, story, mission;
– Socializer – team, communication.

4. Gamification example in course design

This section describes the application of gamification elements in the context of two consecutive university level English courses for IT students,

English for ICT: Lifelong writing in the Cloud and *English for ICT: Learner autonomy in the Cloud*. The courses are delivered on Google cloud and were designed within an eclectic methodological framework, drawing on principles of several language teaching approaches which are considered appropriate for technology-based learning, including Task-Based Learning and Teaching, Co-operative Language Learning, Learner-Centered Instruction, and Interactive Learning (Chapelle, 2014; Roessingh, 2014; González-Lloret 2015; Hinkelman, 2018). Gamification techniques were incorporated in the course design with the purpose of increasing students' involvement, as well as to reinforce teamwork, class participation, group discussions and communication among the students.

The learning process is designed in 9 units (game levels), each unit consists of 12 stages which build on students' language competence and skills. Gamification elements were incorporated in the different stages of each unit (Table 2).

Students' progress, grades, awards and bonuses are recorded in an online register, which they have access to anytime from any place. The register keeps students' anonymity, as only students' ID numbers are revealed, together with their current performance.

All of the units require practice-based application of what the students have learned. For example, in one project the students are required to create an educational YouTube video material on a topic of their choice related to ICT. The process includes writing a script, editing, creating a video, and presenting it to their classmates who play the role of "video critics". Each presentation is evaluated by the "video critics" in real time as they nominate them for competing in three categories: *YouTube King*, *YouTube Queen and YouTube Master*. The winners receive awards which they accept by giving a short acceptance speech.

Another project involves the creation of a web-based IT related content through the Google Sites platform. Students work in small teams of 4 people to select a specific content area, plan and develop their web-based information site. Each team presents their web-based information site and receives feedback from their instructor and classmates. After each presentation, the class is quizzed on the content of the presentation through the game-based learning platform Kahoot! (https://kahoot.com/), which uses an interactive way of presenting educational content. Learners use avatars when entering the Kahoot! Platform in order to keep their identity hidden from their peers. Students are given rewards for achievement, diligence, and effort. Badges such as *ninja*, *samurai* and *gladiator* are awarded each with a specific meaning. The *ninja badge* is awarded to a strong, accurate and agile player. The *gladiator badge* is deserved by a player who has moved up levels through hard work. The *samurai badge* is given to those players who have demonstrated good conduct, sense of responsibility, honesty, and integrity.

Table 2. Gamification elements/techniques in relation to the different stages of each unit

Unit stage	Gamification element/technique
1. SharePoint	Communication
2. LookAhead	Communication
3. StrategyBuilder	Team work
4. Nutshell	Story
5. Challenge	Hidden treasure
6. Project	Team work
7. Evaluation	Team work, Avatar
8. KnowHow	Hidden treasure
9. Insider	Mission, Leaderboard
10. TakeHome	Rewards, Bonuses, Badges
11. Vis-a-Vid	Rewards, Bonuses, Badges
12. OverDrive	Mission
All stages	Progress, Status, Time limits, Team, Feedback

Survey of students' opinions about the gamification

Data about students' opinions and attitudes to the gamification aspects of their English courses was collected at the end of the semester. The survey was anonymous and administered online. Ninety-three students completed the survey, of whom 58% were majoring in Software technology and design, 24% in Software engineering, and 18% in Informatics. The English language proficiency of the participants ranged between levels B1 and C1 according to the Common European Framework of Reference, with the following proportions: 29% B1, 53% B2, 15% C1, and 3% C1.

The results reported here summarize students' responses to the most pertinent questions from the survey, revealing students' perceptions, attitudes, and thoughts about the overall effectiveness of gamification, the rewards system, leaderboard, problem-based tasks, rules and regulations.

The first question focused on thebenefits of gamification for improving students' overall English language proficiency. Ninety of the participants (97%) thought that the game-like elements of their English language course had helped them improve their English language competemce and skills. Only 3 students (3%) did not find them useful. The word cloud (Fig.1) contains the key words from the participants' explanations of why they considered gamification teaching useful. The word *improved* was repeatedly used in the participants' open-ended responses and occurred in collocations with *reading, speaking*, *listening*, *writing*, and *communication skills*. The most frequent adjectives in relation to the target gamification elements were

engaging, *interesting*, *motivating*, *enjoyable* and *effective*. Some participants wrote that learning through gamification is *fun* and *faster*.

Figure 1. Word cloud derived from the participants' responses

The participants were also asked to express their opinions about the **reward system** and to check the types of rewards they found the most appealing and effective. Eighty-three percent (N=77) of the participants had a positive opinion about rewards. The remaining 16 students (17%) responded negatively. Fig. 2 shows some of the most illustrative quotes from the open-ended responses of the participants. The affirmative responses viewed rewards as a recognition and appreciation for a well done job, motivating them to go further, giving them confidence and satisfaction.

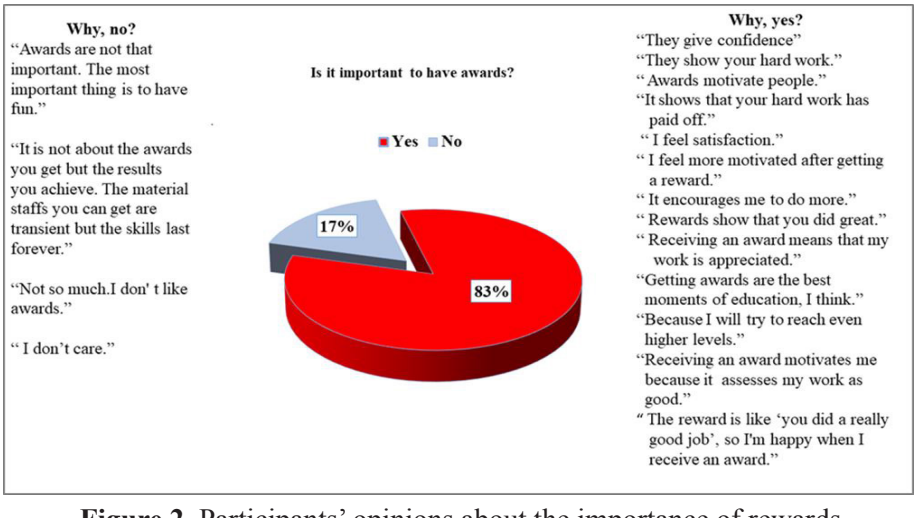

Figure 2. Participants' opinions about the importance of rewards

The negative responses came from students who did not need to be encouraged by material tokens in order to work on their learning. Those students felt intrinsically motivated and considered rewards unimportant and unnecessary.

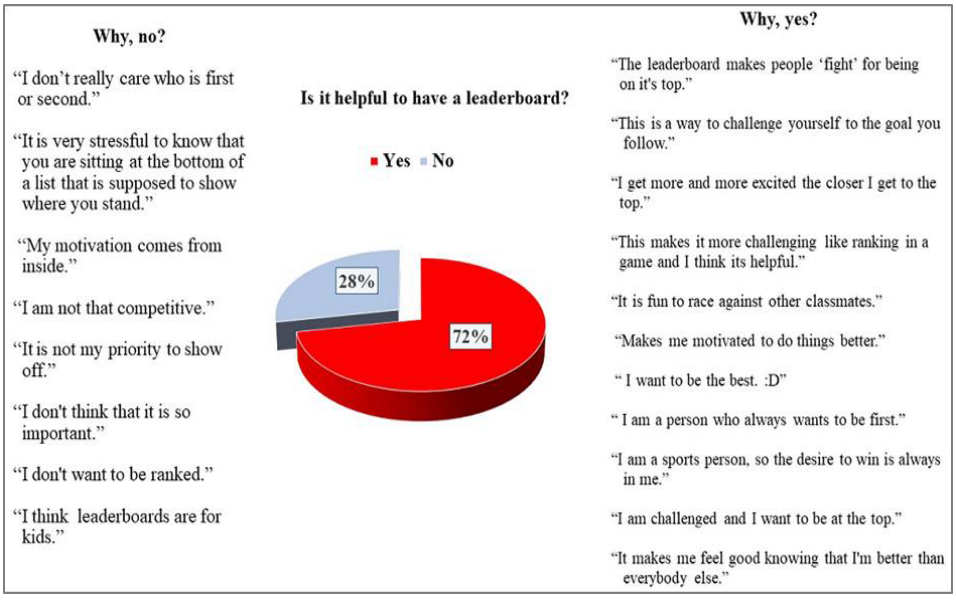

Figure 3. Participants' opinions about having a leaderboard in their classes

A **leaderboard** employs a norm-referenced principle of ranking players/students according to their achievement, it was important to elicit participants' attitudes and thoughts about the effect of having a leaderboard in their English language classes.

The majority of the students (72%, N=67) had a positive attitude to having a leaderboard (Fig. 3), the other 28% (N = 26) expressed an opposite view. The participants who were favorably disposed liked the incorporation of a leaderboard in their classrooms because in this way they felt challenged to strive to get to the top and be first.

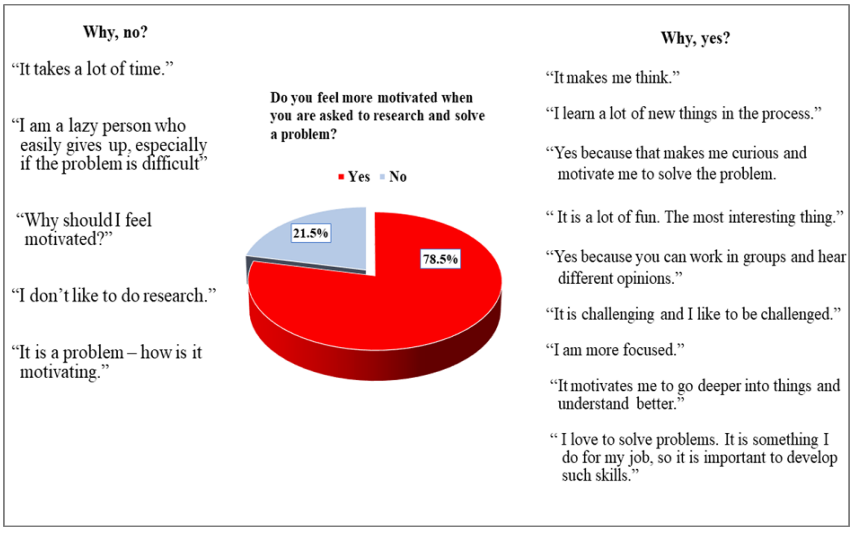

Figure 4. Participants' opinions about research and problem-based task

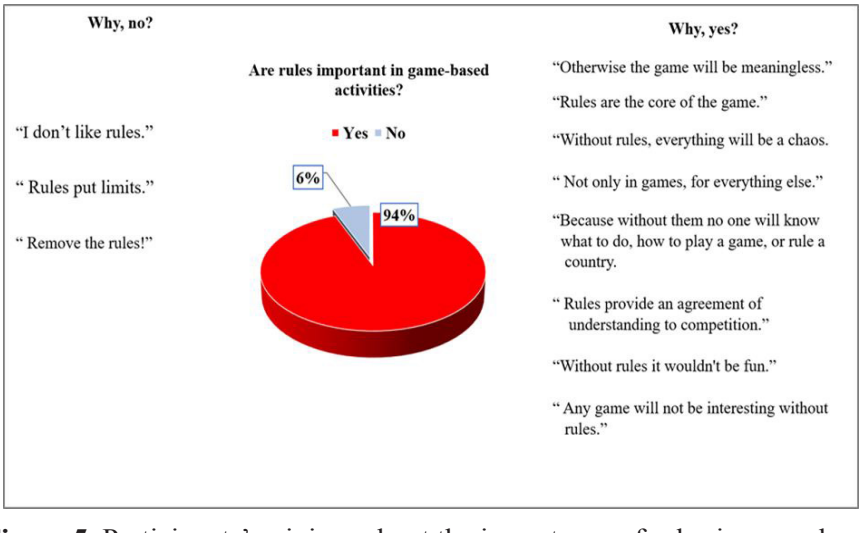

Figure 5. Participants' opinions about the importance of rules in game-based activities

On the other side, the participants who were not favorably inclined towards leaderboards defined themselves as intrinsically motivated who did not like to be competitive or to be ranked.

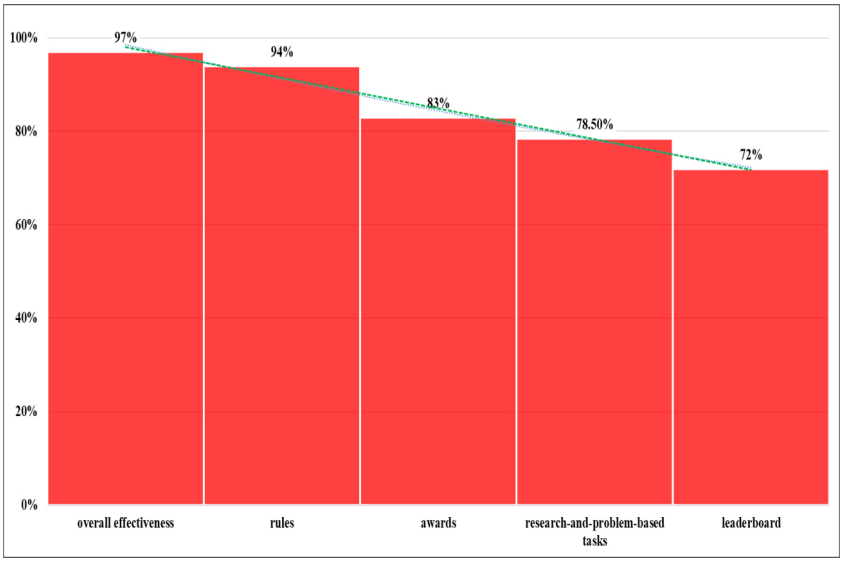

Figure 6. Participants' favorable attitudes towards different aspects of gamification

Problem-and-research based tasks (**missions**) are techniques employed in the game industry and in educational contexts in order to stimulate discovery spirit and critical thinking and thus lead to deeper engagement and long-term (learning) benefits. The participants in the survey were asked whether they feel more motivated and involved when they are asked to research, investigate and solve a problem. Seventy-three (78.5%) of the respondents provided affirmative answers and 20 (21.5%) did not feel more motivated (Fig. 4). The students who felt more motivated by problem-based tasks explained that such tasks make them think, discover and learn new things, work with team members and hear different opinions. They found such tasks interesting, challenging, and fun.

All games are rule-based and the players are expected to observe the **rules of the game**. We asked the participants in the survey to express their opinion about the importance of rules (Fig. 5). Ninety-four percent (N = 87) of the students considered rules important and only 6% (N = 6) did not.

The supporters of rules defined them as the *core element*, giving meaning to all games, making them *interesting* and *fun*. The few students who were not in favor of rules did not provide real explanations for the reason they disliked them, except that they consider them *limiting* and that rules should be removed.

Fig. 6 summarizes students' favorable attitudes towards the different aspects of gamification in descending order, ranging between 97% to 72%. Investing and researching is a lot of fun.

Conclusion

Extrapolating from the results of the survey, we can conclude that the gamification elements that were incorporated in the intensive English courses for the target student group were considered effective, meaningful, and motivating by the majority of the respondents.

These findings collaborate Kapp's (Kapp, 2012) and Huang's (Huang, 2013) assertions that gamification of the learning process can lead to a deeper involvement of the learners by stirring their interest, motivation and strive to do better. Game-based team tasks build students' collaborative skills and appreciation for fellow players. Through the process, they learn to observe and appreciate rules, get recognition for their work, are rewarded for their achievements, and experience a sense of satisfaction and fulfillment.

One element of gamification that appeared to be somewhat controversial in the participants' views was the use of a leaderboard. While the majority of the students seemed excited to compete with the rest of their classmates and found this stimulating, about 30% of them did not feel comfortable to be part of this ranking. We consider that these students' preferences and feelings should be recognized in the future administrations of the course by making this element optional. Another alternative is to have a leaderboard for team contests and not for individual student competition.

Even though our results provide strong support for the benefits of gamification on students' learning, motivation, and strive, one insight that has emerged from the survey is that certain game-like elements may not be appreciated by all students, so preliminary surveys of student attitudes and views should be conducted in order to identify techniques that may not be favorably received by some students. Such techniques could be implemented with some adaptations in order to satisfy individual differences.

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