Gamification Workflow for Growth Mindset Processes

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***Abstract*—This study aims to examine the growth mindset, which is a matter of concern in the education system. A growth mindset is a type of intelligence that can be enhanced through hard work and a good strategy. The behavior can be changed by education and motivation. A growth mindset can be engendered by using motivation and gamification concepts. This research aims to augment and improve the mindset of interactive systems with gamification.Gamification workflow focuses on the evaluation process. The findings show the processes that can be influenced by gamification activities. The growth mindset is measured by the learner's persistence through positive feedback, level, motivation, leaderboard, and their competency. These results can be used in gamification activity design where a growth mindset can be engendered through motivation and performance.This is a working research to apply the gamification workflow, which encourages students to increase learning engagement with advanced technology.**

Keywords—Gamification, Growth Mindset, Game mechanics, Gamification workflow, Persistence

I. INTRODUCTION

This study aims to review gamification design and how to influence the growth mindset in terms of processing. The research examines conceptual gamification design in which factors related to gamification encourage people to learn.

This research focuses on the motivation strategies in gamification and game-based learning to influence the growth mindset. New technology may help people to learn how to adapt their lives and be motivated to learn new things as technology can change their lifestyle and behavior.A growth mindset is a form of intelligence that can be enhanced through hard work and a good strategy.Education can involve as many types of intelligence as possible through the student accomplishment activities [23]. The growth mindset can be taught by using motivation and gamification concepts.Nowadays, on a micro level, students believe they can get smarter and that effort makes them stronger.Therefore, they put in extra time and effort to acquire fulfillment. However, on a macro level, Thailand has issues with motivation in the educational system, and there is lack of methods to evaluate growth mindset design in Thailand. These issues are matters of concern and need to be resolved to encourage Thai students to adopt a growth mindset.

This research aims to determine the gamification workflow which encourages people to conduct their lives using advanced technology and to engender a growth mindset. Changing views on learning, from limitations and scarcity to abundance and a growth mindset in the educational system means taking small steps in the right direction.

II. Background

A. Growth Mindset

The term 'mindset' refers to implicit beliefs that individuals hold about basic human qualitiesthat have been shown to influencepeople's thinking and practices[33]. A student's mindset has been found to influence their motivation and school achievements [1][29].Having a growth mindset means that a student can enhance their talents and abilities as a result of effort. A growth mindset is a type of intelligence that can be enhanced through hard work and a good strategy[28].The growth mindset can be engendered[25] by using motivation and performance [28].

A growth mindset is a soft skill that continues to be important [4]. For instance, athletes are driven to achieve success and can realize their potential through effort, practice, and instruction. In the educational field, research has shown that students with a growth mindset canstrongly enhance their success and achievements[10]. A *growth mindset* helps people to enhance their over time, and mindset research examines the power of such beliefs in influencing human behavior[14].

B. Growth Mindset Criteria

People with a growth mindset highlight learning goals such as becoming smarter,improving abilities, making an effort and understanding failures in learning[33].The underlying mechanism for students to have their own agency in finding out new knowledge is intrinsic motivation. A growth mindset is the belief that intelligence can be nurtured through learning and effort, while intrinsic motivation is the volition to engage in a task for inherent satisfaction[26].

The most frequently attached meanings of growth mindset criteria areas follows [6]:

- Development: Incremental and continuous improvement ,self-development, learning, helping others grow, and growing beyond one's current status.
- Empowerment:Mutual accountability, taking responsibility, taking charge, and being fearless in times of change.

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• Openness: Embracing the new, being open to new challenges and industries, being curious, "dreaming big," and challenging the status quo.

This research will address the processes that encourage development, empowerment, and openness through game mechanics.

C. Gamification

The gamification concepts plays a crucial role in changing people's mindsets, behavior and culture to achieve a sustainable outcome. Research has shown that a growth mindset encourages a healthier attitude toward practice and learning, a hunger for feedback, a greater ability to deal with setbacks, and significantly better performance over time [7].

Gamification is defined as the use of game elements and mechanics in non-game contexts [16]. Gamification may also be applied in other contexts such as learning and educational activities [9]. The common techniques are rewards, leaderboards, likes and dislikes, transparency and measurement [35]. A rewards behavior system in gamification can encourage people to have a growth mindset[28].The gamification concept is used as an instructional tool to yield better behavioral outcomes.

The gamification can create a powerful experience, leveraging both motivation and engagement. The recent trend toward "gamifying" applications is based well-designed and balanced games and includes simplest components, such as badges, levels, points, and leader-boards [23] to offer both a technical toolset and a set of best practices to implement successful gamified experiences in educational contexts [22]. Gamification can be applied to enhance motivation through intrinsic rewards and feedback.The activities concept might require the implementation of gamification, which suggests a user-centered design.

D. Gamification Workflow

The challenge is in offering a reward system whenpeople put serious work into skills development[10]as they progress during play[28].The gamification workflow includes activity steps [19]. The first step is objective communication to students through goal setting. Second, gamification activities in the classroom are designed to be easy to use with portable devices.Motivation will be driven by intrinsic and extrinsic rewards. Consequently, the learning outcomes.can be measured.

E. Growth Mindset Measurement

The growth mindset could be measured by capturing a player's persistence. Persistence refers to the amount of time spent and the number of levels they play[28].Persistence and drawing on past knowledge are the most important habits that should be encouraged [4].Assessments can be made through a player's performance when completing complex tasks over a long period of time [28].Gamification includes a reward system that encourages desirable behavior, which is part of a growth mindset. Effort is the crucial component of growth mindset practice by understanding mistakes and confronting deficiencies[10]. Having a growth mindset means that students seek and enjoy challenges and remain highly motivated even after prolonged difficulty. [Claxton].

F. Good Strategy Behavior/Positive Reinforcement

Reinforcement refers to "a stimulus which follows and is contingent upon a behavior and increases the probability of a behavior being repeated[36].Positive reinforcement was developed by Skinner. Simply put, positive reinforcement is where something pleasant is 'added' when a specific action is performed [3].

In the context of teaching and education, positive reinforcement means providing incentives for students to repeat desired behaviors. Reinforcement can be divided into two forms of motivation, which are intrinsic and extrinsic motivation. Intrinsic motivation is "the desire to engage in behaviors for no reason other than sheer enjoyment, challenge, pleasure, or interest[21] while extrinsic motivation occurs when we are motivated to perform a behavior or engage in an activity to earn an external reward[34].

II. Growth Mindset Processes

A growth mindset includes cognitively-active processes in relation to a specific task which can influence individual and/ or organizational outcomes[14]. A growth mindset involves the malleability of intelligence and/or personal characteristics [33].Having a growth mindset can influence people's behavior. The game's mechanics can influence people's competency and impact their belief.s.

It is necessary to determine how gamification can stimulate the growth of mindset processes. The hook model is based on its ability to "hook" people into using a method regularly to form a habit[12], .The weakness of this model is that it overlooks some critical aspects that contribute to the likelihood of triggers being effective during activities. The process can be divided into the following four aspects [12]:

- Trigger: Weekly notification of "this week's reading list" on the first screen shown in the app.
- Action:Tick off each source the student has used.
- Variable Reward:Color change in the completion bar and positive message displayed.
- Investment: Visual progress towards completion.

Hook technology can be used to help to alleviate difficulties by providing a means to influence the behaviors of individuals. The game mechanics canbe designed to include a reward system, which awards points to players for sportsmanlike conduct that is worthy of recognition[11].

Individuals with a growth mindset find persistence is useful because they believe their abilities can change through hard work[15]. This study hypothesizes that game activities act as a trigger to encourage such beliefs. An aim of this study is to determine how people's performance can be enhanced by having a growth mindset, which encourages more effort and persistence while studying.Performance can be influenced by activity engagement. An engagement is an arrangement that is made to do something at a particular time. In terms of education, engagement may be considered as the ' behavioral intensity and emotional quality of a person's active involvement during a task' [31]. Bouvier et al. (2014) stated that engagement depends on users 'characteristics such as motives, expectations, abilities, and skills and on the form, content, and context of the activity [2]. The 'Flow State' is the mental state of engagement in a game activity [5] in which the user becomes intrinsically motivated and immersed in the activity.

The gamification mechanics are goal setting, activity rules, time, competition or cooperation condition, rewards, and feedback. The mechanics can encourage motivation through activity engagement [17]. The concept of engagement is based on idea that intelligence is flexible and is something that can grow.

III. Experiment Design

The experiment design is an assessment method involving the collection of significant behavioral data. The design is based on the relationship between mindset and academic achievement.

A. Mixed Methods

Mixed methods are employed in this research and involves collecting, analyzing, and interpreting quantitative and qualitative data. The observation technique will be used to track and access participant behavior. The quantitative data is the Grade Point Average (GPA) which represents learning competency. Assessing learning competency is a key approach to yield greater accountability and quality assurance in the classroom [27].

This research aims to determine the relationship between student competency and learning outcomes including persistence and leaderboard position during class activities. The thirty-five participants were fourth-year students at the Creative Design & Entertainment Technology College at Dhurakij Pundit University.

B. Persistence

Persistence can play an important role in learning through game challenges, which act as stimuli to motivate learners.and can affect subsequent effort[8].Gamified learning has been found to engage students and enhance learning[8].Student persistenceis related to academic success. Persistence is a learning strategy that derives from motivation[37].

C. Leaderboard

A leaderboard is a large board displaying the ranking of the leaders in a competitive event and is one of the most-used game elements. The purpose of a leaderboard is to show people where they are ranked in a gamified system. Leaderboards can be employed in a multitude of different ways that aim to increase motivation and goal setting [30]. Having a leaderboard can lead to a higher level of production for students who are motivated by it[12].However, Zichermann and Lindner (2013) found that while leaderboards are motivating to some, they can be demotivating to others[39].

D. Competency

Games can be used as a training tool for many kinds of learning goals that develop competencies [38]. Game mechanics can trigger and reinforce the competencies of situational awareness such as workload management, and the application of procedures[20]. A game can provide information about the player's performance such as response times, correct answers, and the procedures followed during play. The game data are connected to behavior which indicate crucial competencies[20].

Data on growth mindset processes are obtained through the collection of player data.The learning outcome is the student's GPA. The student can enhance competency through practice.The motivation for learning is measured through questionnaire questions about their achievements and sense of pride, including enhanced respect from others.

IV. Gamification Workflow for Growth MindSETS

The findings support the hypothesis that havinga growth mindset can drive player performance because the processes are designed by using project-based outcomes. These outcomes are measure through a final project for senior Interactive Design and Game Development students.

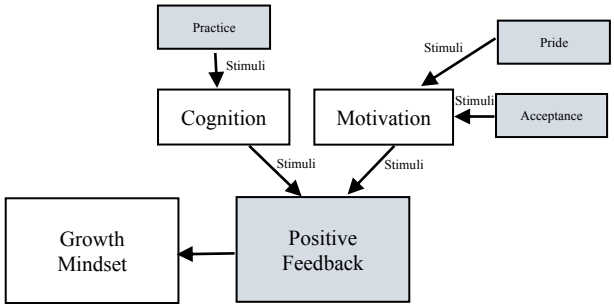

Figure 2: The Gamification conceptual workflow

The assessment method is designed to determine the stimulus factors such as practice, pride, acceptance and positive feedback when they study in the program for 4 years.This conceptual framework reflects how a growth mindset is actualized in the learning practices. Students can be encouraged to adopt a growth mindset through positive feedback.

The framework in figure 2 presents the relationships between the growth mindset and other factors. Table 1 shows the learner practices and growth mindset pedagogy[32] and how pedagogy affects the growth mindset. Learning practices can be divided into two parts: the individual student and the whole class.

The individual student can be driven by their persistence, thinking process, motivation and expectations. The whole class can be encouraged by using group activities.

Table 1: Learner practices and their actualization in growth mindset pedagogy [32]

Teaching practices	Actualization of growth mindset pedagogy	Key pedagogical factors affecting the growth mindset
The individual student	Knowing a student´s strengths and weaknesses and taking into consideration a student´s individual needs	Supporting student´s individual learning processes
	Critical feedback	Persistence
	No focus on actual mistakes but on the fact that a student recognized the mistake	Fostering students´ process-focused thinking

	High expectations and persistence	Promoting mastery orientation
The whole class	Give praise immediately and clearly	Fostering students´ process-focused thinking
	High expectations	

V. RESULTS

This study employed a nonparametric correlation coefficient (Spearman's correlation) which is used to measure the strength of the relationship between two variables. The correlation between two variables is particularly helpful when investing learning processes. For example, a correlation can be helpful in determining how well a studentperforms (GPA) when compared to theirattitude or motivation.

The results (Fig 3) show the relationship between the leaning outcome (GPA) and the learners' processing and attitude. The significance of the learning outcome measures was found to be positive. implying that the more people practice when learning(0.460),the greater the likelihood is that an individual will acquire skills(0.598).

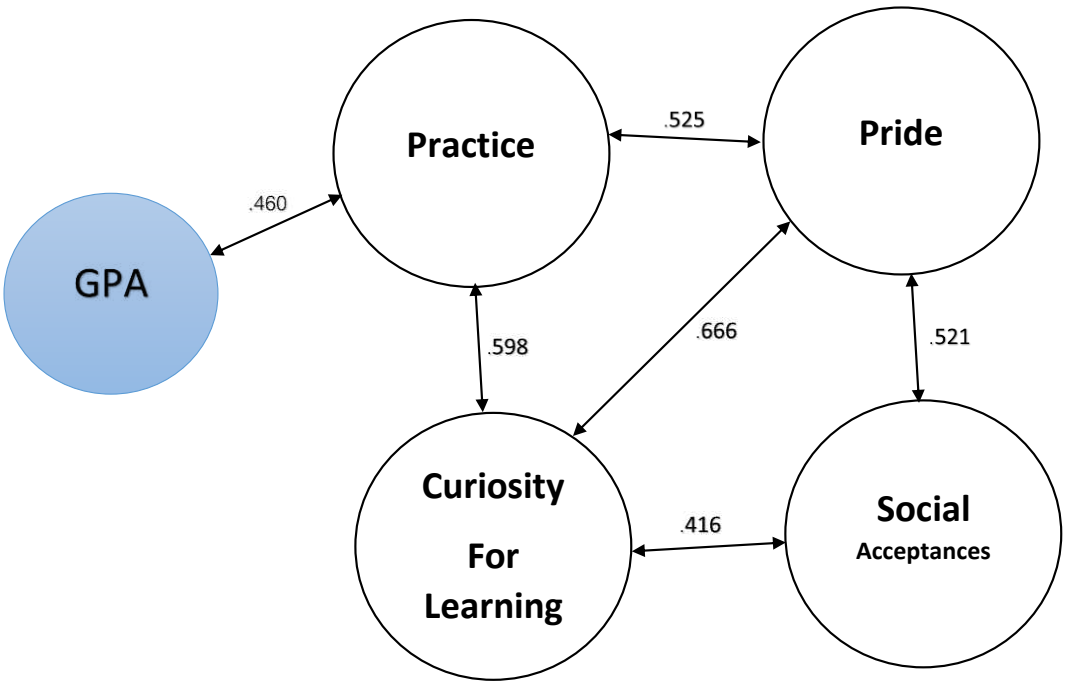

Figure 3: Results

There is a statistically significant association between pride resulting from success and social acceptance (0.521). There is a significant association between pride and the curiosity for learning (0.666).Learners practice more when they are motivated and feel proud

VI. DISCUSSION

Gamification workflow for growth mindset processes can be influenced by gamified activities. The growth mindset is measured by the learner's persistence through positive feedback, level, motivation, leaderboard and their competency. The results suggest that gamification can help to motivate students and enhance performance.

This figure 4 illustrates the relationship between the learning and growth mindset processes[18]. The level achieved in the game reflects the learners' motivation, engagement and ability. The leader board can affect the learner's sense of pride and the competencies acquired while learning can lead to enhanced social acceptance.In addition, positive feedback can also influence a learner's mindset and may affect the learning outcome (GPA). This conceptual workflow will help researchers to design activities that can improve the gamification concept

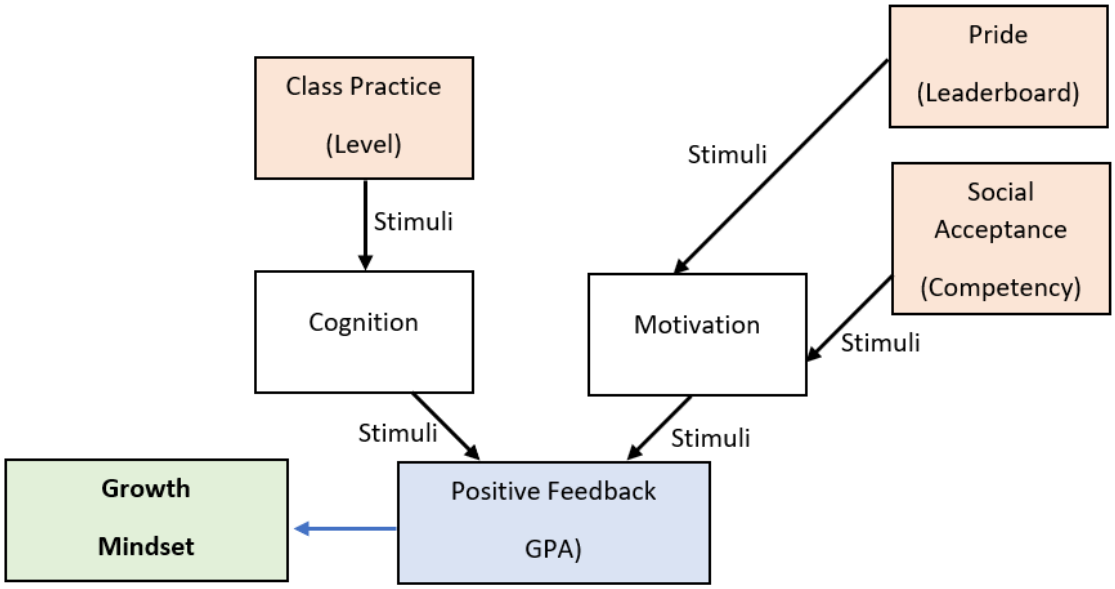

Figure 4: The Gamification conceptual workflow for learning processes

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