



Game-Based Learning Bipolar Journey: A Digital Exploration of Mood Swings

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ABSTRACT

This paper discusses developing and evaluating a Game-Based Learning (GBL) application designed to educate people about bipolar disorder. The lack of engaging materials, specifically in the form of GBL application in learning about bipolar disorder (BD), is considered the point of departure for this study. This led to a lack of awareness and education, especially among people around bipolar disorder sufferers. Therefore, this application is intended to change the occurrence by giving people a chance to feel what's in their (bipolar people's) shoes. The goal of this study is to design, develop, and evaluate user engagement on the GBL for the players. The Game Development Life Cycle (GDLC) is adopted as the development methodology. The engagement evaluation yielded a significant result of 86% overall. Integrating educational content with interactive elements can significantly enhance learning outcomes. This study suggests future improvements to optimize the game's performance and balance educational depth with user engagement.

Keywords—Game-Based Learning, Bipolar Disorder, Game Development Life Cycle, Engagement Evaluation, Mental Health Education

INTRODUCTION

The impact of bipolar disorder (BD) not only affects individuals but also impacts families and society. The core symptom, extreme mood swings (mania/hypomania and depression), disrupts daily life, affecting work, relationships, and overall well-being [1]. Traditional education materials often focus solely on symptoms and medication while ignoring the broader challenges the individuals face, and this can prevent them from developing effective coping mechanisms [2]. The fear of stigma associated with mental illness will also discourage individuals from seeking help, worsening their symptoms [3], leading to social isolation [4] and finally leading to a more negative impact on people with BD, resulting in 20 times more likely to commit suicide [5]. Incomplete educational materials leave families and friends with a limited understanding of BD, making it difficult to provide the most effective care and support [2].

BD can significantly impact human daily life. Therefore, understanding BD is crucial for both individuals living with it and those close to them. Several methods, tools, and materials are available for disseminating information about BD and related topics for many reasons, such as raising awareness, improving treatment options, and preparing for family members and the patient themselves. Technologies are evolving rather quickly, which has made it possible for us to share information efficiently. Various multimedia elements such as digital content, social media platforms, and even gamified experiences can be strategically used to maximize audience engrossment and foster deeper engagement.

GBL is an increasingly popular way that transforms learning into an enjoyable experience. Pamphlets and lectures struggled to capture attention, thus hindering effective self-management and a deep understanding of the intricate



phases of BD [6]. This lack of engagement may translate into difficulties managing episodes and contribute to the persistent stigma surrounding mental health [4]. This project attempts to develop Game-Based Learning (GBL) as one of the alternative tools to transfer information about BD.

Problem Statement

In this digital age, people manage to seek information through electronic means. [7] found that most of their respondents tend to go for online search (81%) rather than paper-based methods to get information on BP. [8] highlight the potential of a virtual environment to empower individuals with BD by providing tools for self-management of mental health. Digital health tools provide the opportunity to make health services accessible and more engaging [9]. Digital health tools are the kick-start method to gain information. However, [10] reveal that users are dissatisfied with mental health applications and highlight a desire for more engaging features. The lack of engaging tools to disseminate information on BD is a point of departure for this project. Therefore, interactive and engaging digital tools could address these information needs in a user-friendly way, empowering individuals to understand better and manage their condition. Gamified learning presents a promising alternative to mental health education, allowing learners not only to attain knowledge but also to apply knowledge to solve problems [11].

Objectives

This project focuses on two major concerns: the design and development of a game-based learning (GBL) application titled Bipolar Journey: A Digital Exploration of Mood Swings, and the evaluation of user engagement.

Related Work

Mania is characterized by an overly elevated mood, which can often be described as euphoria or irritability, while depression is characterized by intense sadness, negativity, and loss of interest in once enjoyed activities (Jain & Mitra, 2023). It falls under the mental disorders. One of the mental disorders is BD, which manifests distinct episodes ranging from mania to depression.

The implications of BD not only affect individuals but also impact families and society. The core symptom, extreme mood swings (mania/hypomania and depression), disrupts daily life, affecting work, relationships, and overall well-being [1]. Therefore, understanding BD is crucial for both individuals living with it and those close to them. In this study, the idea is to transfer the knowledge on BD through GBL. The following subsection discusses the digital mental health intervention and narrows the idea to the GBL as the method to deliver the information.

Digital Mental Health Intervention

Several methods, tools, and materials are available for disseminating information about BD and related topics for many reasons, such as raising awareness, improving treatment options, and preparing for family members and the patient themselves. Digital mental health interventions (DMHI) offer a solution for people who want to seek information and support regarding mental health discreetly without fear of stigma [12]. This project attempts to develop GBL as one of the alternative tools to transfer information about BD. However, there are several drawbacks of DMHI which as most of the content is too juvenile, as it seems to be designed for younger children, and the educational material is boring or less engaging because they were viewed as too long [13]. Early mobile apps for mental health focused on basic functions like symptom tracking and psychoeducation. Later, these applications evolved to incorporate game mechanics, transforming into more structured and engaging DMHI. Game-based interventions for mental health are still under development [12]. Thus, this study aims to use a GBL as an intervention to convey BD knowledge and resolve the previously mentioned problems.

Game-Based Learning in Mental Health

Technology has long been utilized in education; however, the emergence of GBL and other contemporary tools and resources offers a special potential. These developments have the power to completely transform education



in the digital age by giving youth a personalized, dynamic, and interesting learning environment. According to [14], gamified interventions exhibit the capacity to boost knowledge acquisition when compared to traditional methods.

The analysis of related applications has yielded valuable insights into how games can represent emotional experiences. This study analyses four applications in the form of a game-based approach that relate to the emotional mental experience. Game names “Hellblade: Senua’s Sacrifice”, “Celeste”, “What Remains of Edith Finch”, and “In My Mind” were selected for the case study. In summary, Hellblade: Senua’s Sacrifice focuses on psychosis, which offers valuable lessons in experiencing the world through a distorted lens and coping with intense emotions. This is the most relevant for representing the manic and depressive phases of BD. The Celeste game explores themes of anxiety and depression through narrative and gameplay that encourages perseverance. In What Remains of Edith Finch, the themes of loss, grief, and family history are presented and explored in the game. This game also offers a unique and emotional experience. The last one is a game called In My Mind, which explores the experience of bipolar disorder. Focuses on atmosphere and emotional impact.

The potential similarities and areas for differentiation can be identified by examining the core concepts in existing game applications. These would have greater significance to spark the idea and the direction in the development of this project. The input is then transferred to the development part of this project through a systematic development methodology. In the next section, Game Development Life Cycle (GDLC) will be discussed as a methodological approach in this study.

METHODOLOGY

This project adopts the game-development life cycle (GDLC). According to [15], GDLC is an organized methodology that directs the development of GBL from start to finish. Well-managed development process based on an effective framework can eliminate unwanted risk, resulting in successful output.

The process begins with initiation, where the project's core idea is defined, including the audience, content, technology, scope, and hardware/software requirements. In pre-production, development steps are outlined, visual identity is established, and necessary tools are gathered. This phase produces a game flowchart and low-fidelity storyboard. Main production involves developing the application based on pre-production outputs. The app is then tested, with all components reviewed by developers and selected users, and technical issues documented. Evaluation follows, using the eGameflow model to assess user engagement across seven criteria: autonomy, goal clarity, concentration, challenge, immersion, feedback, and knowledge advancement. This also supports the project’s goal of creating engaging digital learning tools for BD knowledge transfer. Evaluation results are discussed in the final section.

RESULT AND FINDINGS

The evaluation is divided into four sections: A. Demographic information, B. Gaming preferences, C. Personal connection to bipolar disorder (BD), and D. Game engagement feedback. The eGameFlow questionnaire was adapted as the instrument to collect the data from the user about game engagement in section D. The overall findings in subsection E in this paper summarize the data analysis part for this project.

Demographic Result

Most respondents are between the ages of 18-24, which aligns with the game’s intended audience, as it is intended for those above 18. Figure 1 below shows the data represented in the pie chart. Gender was an optional demographic question with 24 respondents identified as Female (58.5%), followed by 16 Male participants (39%) and 1 prefer not to say (2.5%).

The predominant students in the responses (75.6%) indicated that the game may particularly resonate with young people who are likely navigating educational and social pressures, as well as mental health challenges. This aligns with the game’s target audience and its college-based narrative. The participants had a diverse range of educational backgrounds, including computer science, engineering, and individuals with varying knowledge of

mental health. This variety of respondents provides a broader perspective on the game's potential effectiveness in educating different groups. For instance, individuals with an educational background in computer science and engineering will appreciate the technical explanation of the game, while individuals with no such background could be introduced in an interactive and educational way to the condition.

These demographic insights are crucial in assessing how well the game connects with its intended audience and the effectiveness of the game as both an educational tool and engaging experience for individuals with varying levels of prior knowledge and experience. Figure 2 below shows the graph of participants' educational background.

Game Preferences Result

Game preferences analysis focuses on several key aspects, such as researching the participants' frequency of playing games, the types of game genres they typically engage with, the time of day they play, and the platforms used. This aims to explore the participants' gaming habits and preferences. The analysis indicates that most participants play games regularly, with 23 participants (56.1%) doing so, while 14 participants (34.1%) play infrequently, and the gaming habits of 4 participants (9.8%) remain unclear.

There are several types of genres included to analyse for a better understanding of participants' game preferences. The highest game preferences among participants are the adventure genre, with a total of 17 participants (41.5%), followed by the puzzle genre, with a total of 16 participants (39%). Figure VI.1 shows a graph of the distribution of game genres among participants. The result could be significant for future development and other developers as a preference.

41 responses

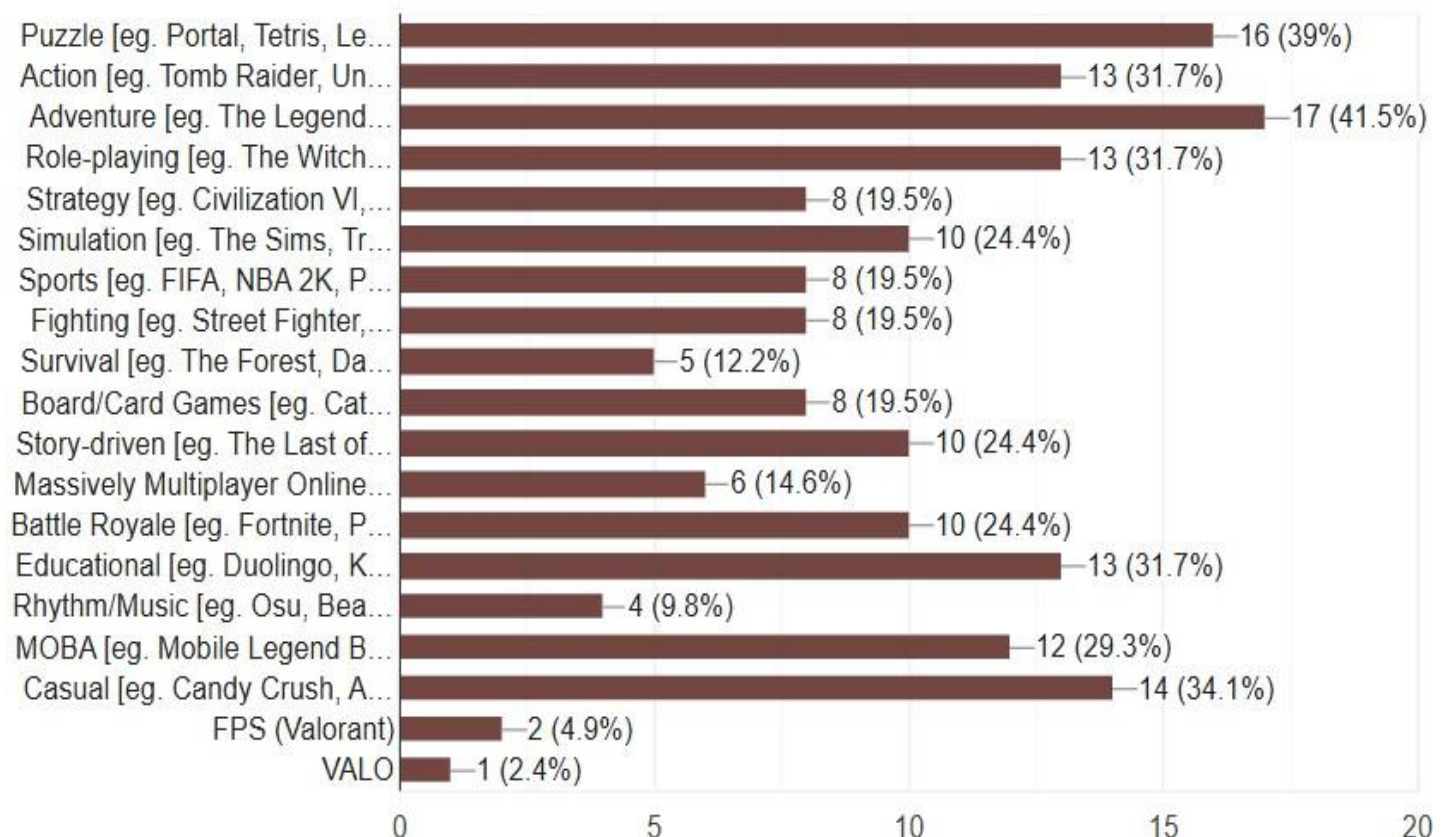


Fig. 1. The Distribution of Game Genre among Participants

Most participants play games for 0 to 4 hours per day, making up 65.9% (27 participants), followed by 5 to 9 hours per day at 29.3% (12 participants), and the remaining 4.9% (2 participants) play for 10 to 14 hours per day.

How often do you play games?

41 responses

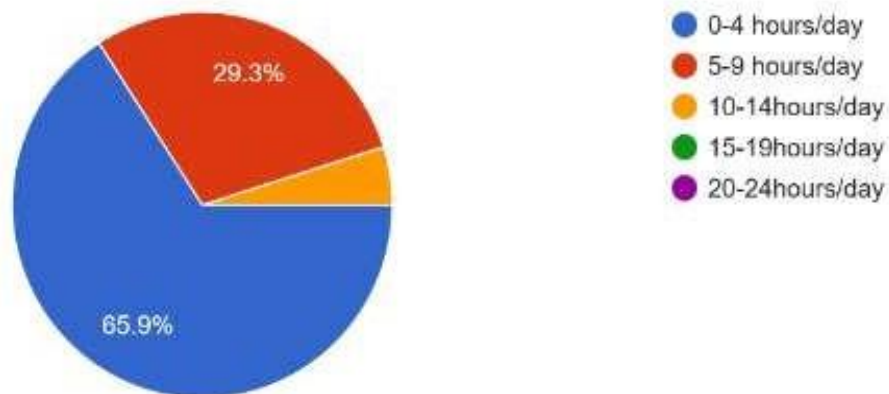


Fig. 2. Participants' daily gaming hours

As shown in the pie chart below, participants use mobile phones to play games, 14 participants use personal computers, and the remaining 2 participants use a console.

On which platform do you primarily play games?

41 responses

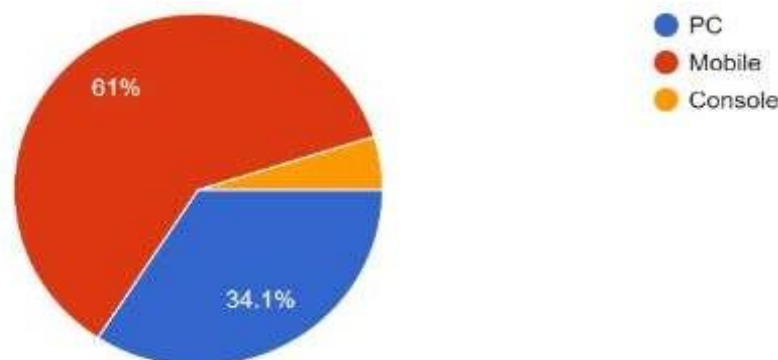


Fig. 3. Platform preferences

Personal Connection to BP

This section is intended to gain an understanding of personal connections towards BD and their prior experience with someone who has BD or is having a BD. The first questionnaire is about whether they are personally facing BD. Most of them agreed on not having the disorder (90.2%); however, some prefer not to say whether they have the disorder or not (7.3%), and 1 participant agreed they have that disorder (2.4%).

The second question is to determine if they know anyone who is facing BD, as it will determine their knowledge of the disorder. Half of the participants know someone close that have the disorder, meanwhile 36.6% did not know anyone who has the disorder. The remaining 14.6% are unsure of that. 48.8% of the participants stated that the close people having BD are their friends.

Engagement Result

This questionnaire is divided into seven elements/factors: learning experience/concentration factor, goal clarity, feedback, challenge, autonomy, immersion, and knowledge improvement.

Learning Experience

Each question in this section is coded with C1 until C4, and the responses are described such follows.

Most of the respondents agreed that gaming activities inside are related to a learning experience regarding BD. This proves that the implementation of BD is successful in this game. A total of 37 respondents (90.2%) agree that the game effectively grabs their attention during gameplay, and 35 respondents (85.4%) agree that the content of the game stimulates their focus on learning tasks without distraction. Respondents also agree (90.2%) that they can maintain concentration throughout the game without losing their interest. There are 36 respondents (87.8%) who agree that most of the games are directly related to the learning objectives of BD. This shows that they concentrate on all learning tasks that are available. This is because Bipolar Journey is a game that focuses solely on the narrative, which is the experience of BD, so there is no unrelated task except for the knowledge of that disorder. The graph in Figure 1 shows the result of the concentration factor in this study.

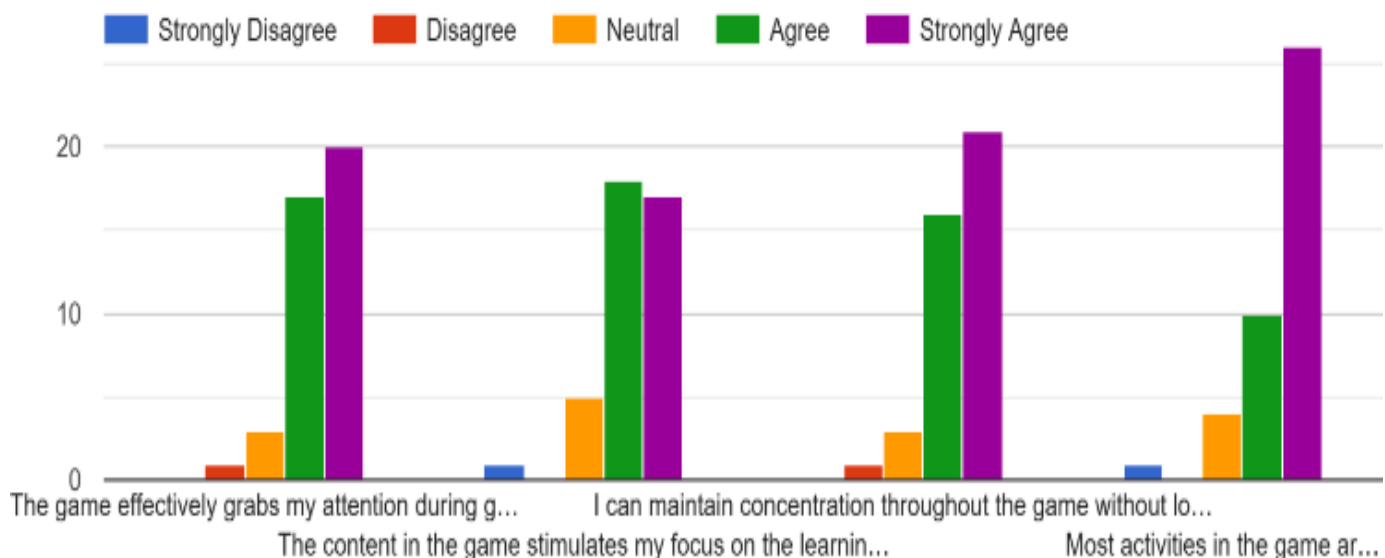


Fig. 4. Concentration factors result

The total mean calculated from the questionnaire is 4.36, thus shows that this BD Journey game successfully achieved the factor for concentration as one of the engagement elements

Table II: Mean score and frequency for the concentration factor

Code	SD	D	N	A	SA	Mean
C1	0	1	3	17	20	4.37
C2	1	0	5	18	17	4.23
C3	0	1	3	16	21	4.39
C4	1	0	4	10	26	4.46
Total Mean						4.36

SD -Strongly Disagree, D -Disagree, N -Neutral, A -Agree, SA -Strongly Agree



Goal Clarity

Next, the goal clarity factors are clarified. Each question is marked as GC1 through GC4. Table II depicts the mean score for the goal clarity factor result as one of the engagement elements. The total mean calculated for the goal clarity factor is 4.24, which shows that BD Journey achieved the desired aspect in the engagement elements.

Table II: Mean score and frequency for the goal clarity factor

Code	SD	D	N	A	SA	Mean
GC1	0	1	5	18	17	4.24
GC2	1	2	5	17	16	4.10
GC3	0	0	8	16	17	4.22
GC4	0	0	6	12	23	4.41
Total Mean						4.24

SD -Strongly Disagree, D -Disagree, N -Neutral, A -Agree, SA -Strongly Agree

Most of the respondents agreed that they understand the goal of the Bipolar Journey. In the first question, 35 (85.4%) agreed that the overall goals of the game were clearly explained at the beginning of the game. This shows that the game was clear in depiction the goal to finish the semester during gameplay. A total of 33 (80.5%) respondents agree that the game provides clear instructions on what they need to achieve during each stage. This might be due to the design of this game, which is a narrative choice-based game; the player is given vague instructions to produce different endings based on the consequences of each choice. Respondents also agree (80.5%) that the intermediate goals are presented clearly at the beginning of each scene in the game. This demonstrates that each mini-game has clear instructions to achieve the goal. Lastly, 35 (85.4%) respondents agree that they understand the purpose and direction of the game throughout their progress. The result is summarized in Figure 5 below.

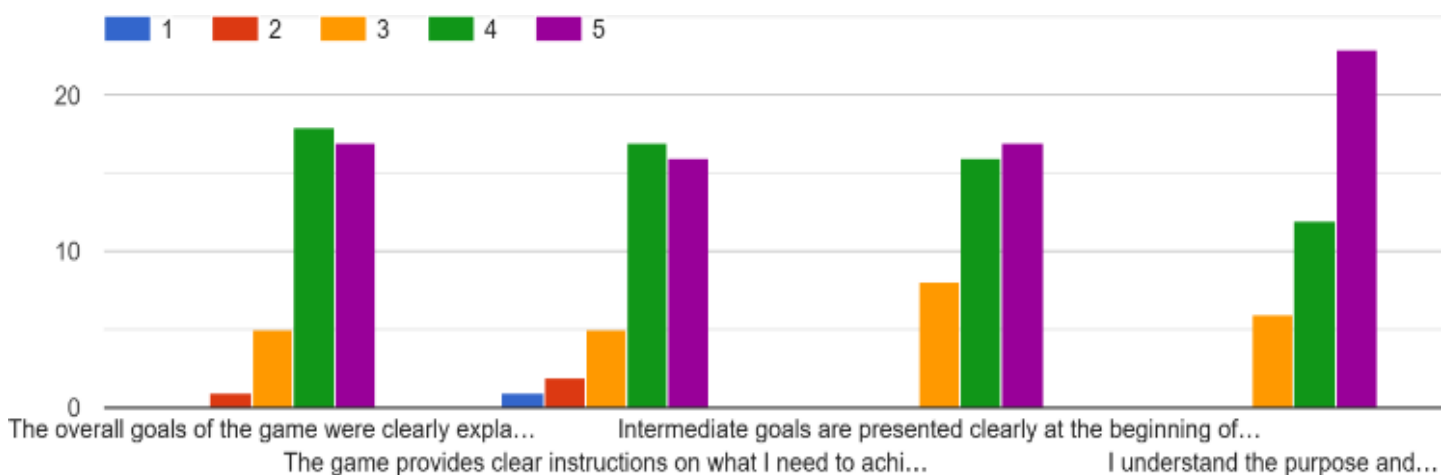


Fig. 5. Goal clarity factor

Feedback factor

Figure 6 summarizes the findings of feedback based on the questionnaire. 36 respondents (87.8%) agree that Bipolar Journey provides immediate feedback on their progress, and they receive clear feedback about their actions during their gameplay, as each choice will affect the mood scale and environmental changes. A total of 36 (87.8%) respondents also agree that they are notified immediately about new tasks or objectives of the game,

and the game provides clear information on their success or failure in achieving intermediate goals. This shows that the game has clear feedback when the choice is made by the respondents.

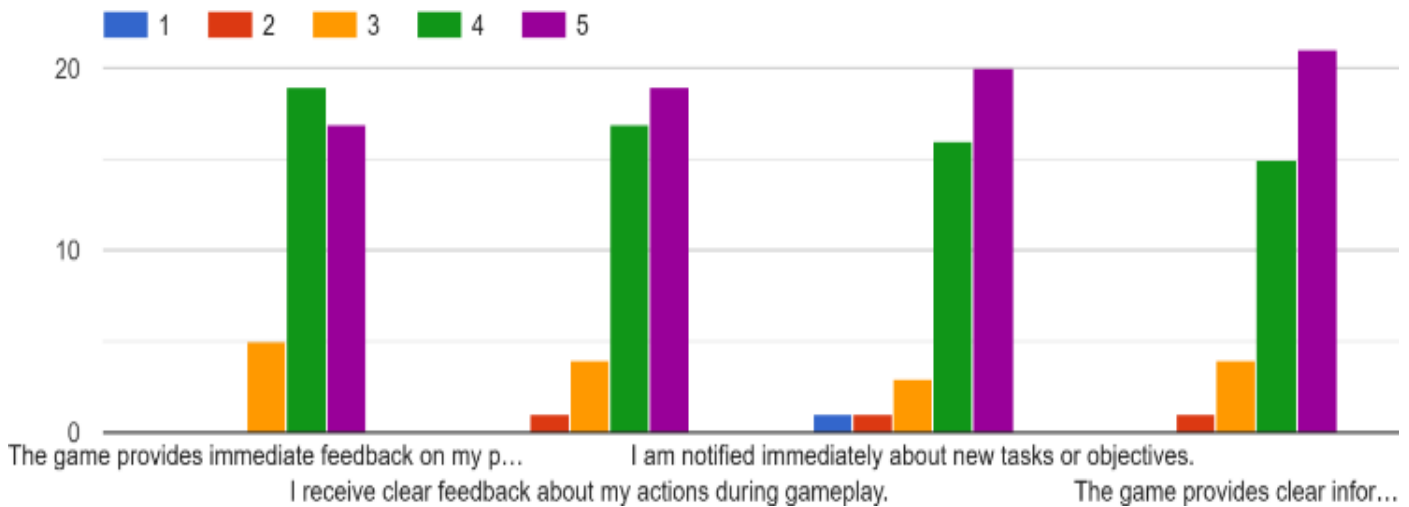


Fig. 6. Feedback Factor

The mean calculated was 4.30. This shows that the result analysis for the feedback factors is high. All the essential elements within the game are considered successfully interpreted.

Table II: Mean score and frequency of feedback factor

Code	SD	D	N	A	SA	Mean
F1	0	0	5	18	17	4.20
F2	0	1	4	17	19	4.32
F3	1	1	3	16	20	4.29
F4	0	1	4	15	21	4.37
Total Mean						4.30

SD -Strongly Disagree, D -Disagree, N -Neutral, A -Agree, SA -Strongly Agree

Challenge Factors

Then, the challenge factor is analysed in the game (Bipolar Journey) – see Figure 7. There are several challenges assigned in the mini game inside Bipolar Journey. 39 respondents (95.1%) agree that the game offers helpful hints in text that assist in overcoming challenges. 37 respondents (90.2%) agree that the game provides either supportive audio or video aids that help them in tackling the challenges. 35 respondents (85.4%) agree on enjoying the game without feeling overwhelmed or anxious. Lastly, 33 respondents (80.5%) agree that the game introduces new challenges at an appropriate pace.

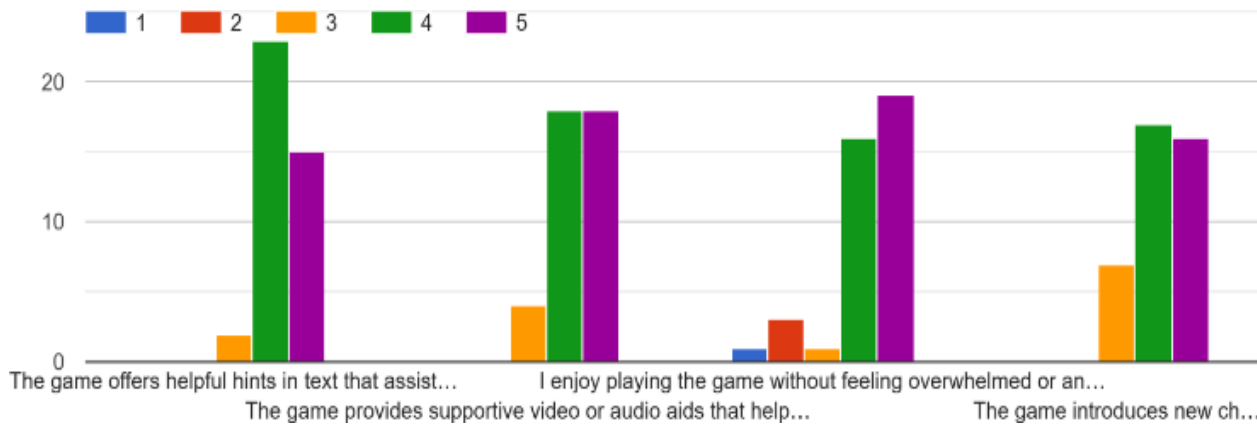


Fig. 7. Challenge factors

The analysis was then calculated with a high value mean result (4.27), indicating successful challenges within the game elements.

Table II: Mean score and frequency of the challenge factors

Code	SD	D	N	A	SA	Mean
CH1	0	0	2	23	16	4.34
CH2	0	0	4	18	19	4.37
CH3	2	3	1	16	19	4.15
CH4	0	0	8	17	16	4.20
Total Mean						4.27

SD -Strongly Disagree, D -Disagree, N -Neutral, A -Agree, SA -Strongly Agree

Autonomy Factors

Figure 8 below showcases the result of the analysis on the autonomy factor. There are 39 respondents (95.1%) who agree that the game allows them to make choices that impact their progress. Bipolar Journey successfully integrates the choice-based elements within the gameplay. Moreover, 37 respondents (90.2%) agree that they have a sense of control over their actions within the game itself as they can navigate the environment and places. 28 respondents (68.3%) agree that they know the next steps they need to take within the game. The game may not have clarified each step, as it is a choice-based game where each choice will result in consequences of one's action, depicted in real life. Lastly, 35 respondents (85.4%) agree that they feel empowered to make decisions and progress in the game.

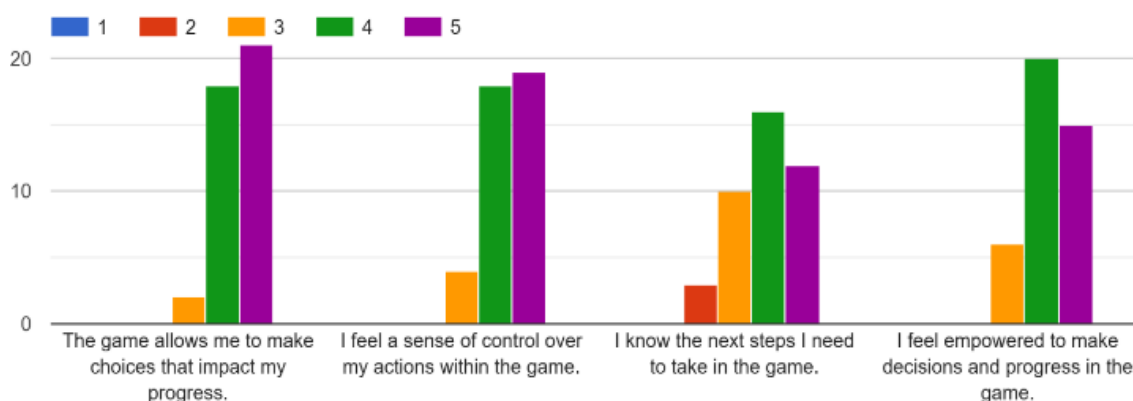


Fig. 8. Autonomy factor

The analysis was then calculated with a mean of 4.27, indicating a high result of the autonomy factor that exists in Bipolar Journey.

Table I: Mean score and frequency of the autonomy factor

Code	SD	D	N	A	SA	Mean
A1	0	0	2	18	21	4.46
A2	0	0	4	18	19	4.37
A3	0	3	10	16	12	3.90
A4	0	0	6	20	15	4.22
Total Mean						4.24

SD -Strongly Disagree, D -Disagree, N -Neutral, A -Agree, SA -Strongly Agree

Immersion Factors

Several immersion elements are included within the Bipolar Journey result; such result analysis is summarized in Figure 9 below. There are 31 respondents (75.0%) who agree that they forgot about the time passing while playing the game. Furthermore, 30 respondents (73.2%) agree that they become fully immersed in the game and lose awareness of their surroundings. Also, 35 respondents (85.4%) agree that they are deeply involved in the story and gameplay of the game. Lastly, 33 (80.5%) agree that they feel emotionally connected to the events happening in the game. This shows that the game successfully depicts the life of a student having a BD that the respondents feel emotionally and deeply involved in the story of the game.

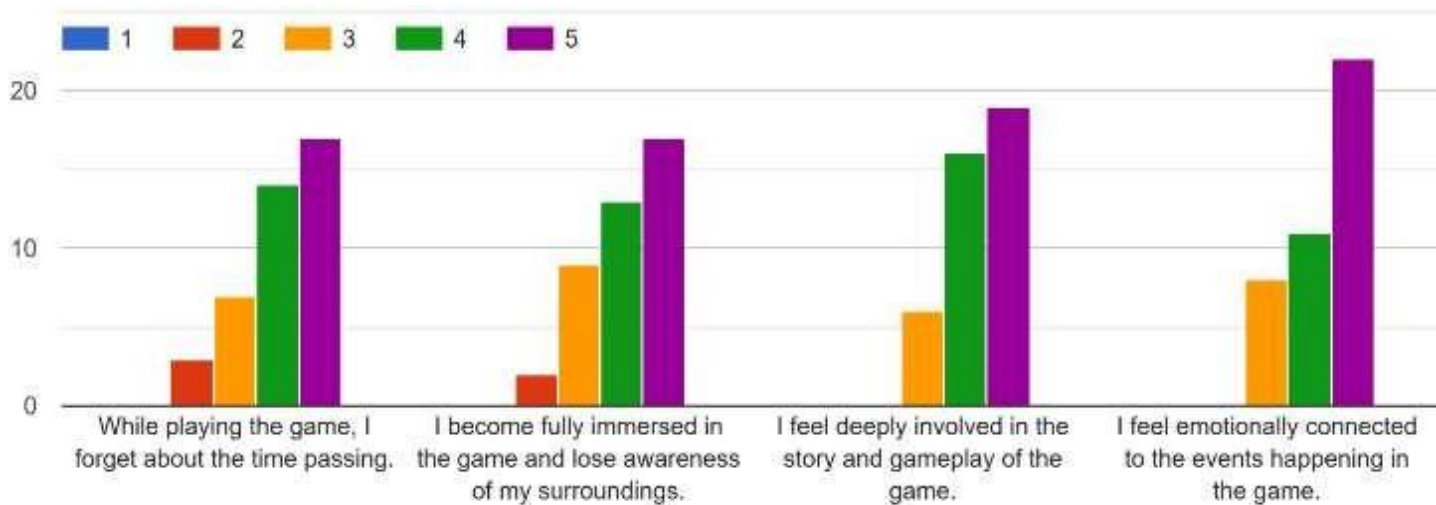


Fig. 9. Immersion factor

The immersion factor was then calculated with a mean of 4.22, which indicates a high result. This shows the success of the immersion factor within the game elements. The immersion factor, calculated with a mean of 4.22 as shown in Table VI below, is considered a success within the game.

Table I: Mean score and frequency of the immersion factor

Code	SD	D	N	A	SA	Mean
I1	0	3	7	14	17	4.10
I2	0	2	9	13	17	4.10
I3	0	0	6	16	19	4.32

I4	0	0	8	11	22	4.34
Total Mean						4.22

SD -Strongly Disagree, D -Disagree, N -Neutral, A -Agree, SA -Strongly Agree

Knowledge Improvement

The last element is the knowledge improvement factor within Bipolar Journey. 38 respondents (92.7%) agree that the game helps them increase their understanding of BD. Furthermore, 38 respondents (92.7%) agree that they learn and grasp key concepts about the disorder. Next, 38 respondents (92.7%) agree that the game motivates them to apply knowledge about BD in real life. Lastly, 38 agree (92.7%) that the game makes them want to explore more about BD after playing this game. This shows the game successfully engages people to learn more about this disorder.

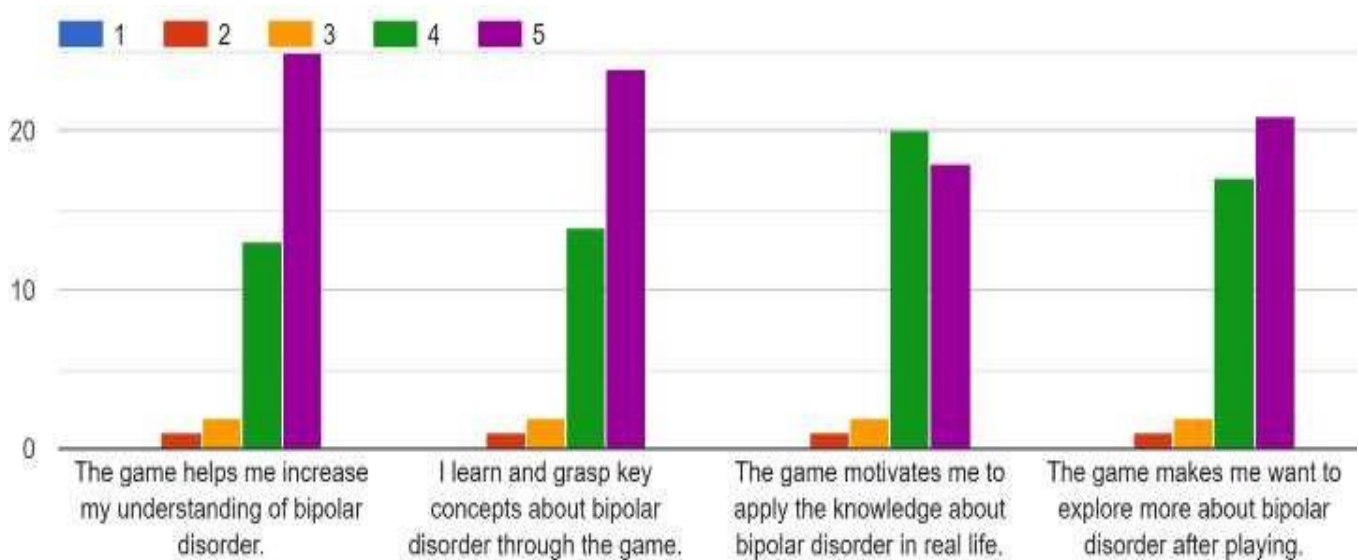


Fig. 10. Knowledge improvement factor

Knowledge improvement in this game has a success rate with a mean score of 4.44, as shown in Table VII below.

Table I: Mean score and frequency of the knowledge improvement factor

Code	SD	D	N	A	SA	Mean
K1	0	1	2	13	25	4.51
K2	0	1	2	14	24	4.49
K3	0	1	2	20	18	4.34
K4	0	1	2	17	21	4.41
Total Mean						4.44

SD -Strongly Disagree, D -Disagree, N -Neutral, A -Agree, SA -Strongly Agree

Overall Findings

The overall engagement index calculation is used to determine the percentage based on the game's engagement factors. This common technique is often applied in research to measure participant responses by averaging the mean scores related to engagement levels. Based on Section D, the total combined mean is:

$$\sum \bar{x} = 4.36 + 4.24 + 4.30 + 4.27 + 4.24 + 4.22 + 4.44$$



To find the average mean score, the total is divided by the number of engagement factors, which in this project is 7

$$\bar{x} = \frac{30.07}{7}$$

$$\bar{x} = 4.30$$

This mean score is then converted into a percentage. Since the maximum score on the Likert scale is 5, the conversion is done as follows:

$$\text{Engagement Percentage} = \left(\frac{4.30}{5} \right) \times 100\% = 86\%$$

In conclusion, The Bipolar Journey is considered a successful and engaging educational tool for learning about BD, achieving an engagement score of 86%, which is well above the 50% threshold.

CONCLUSION

This study explored the development and evaluation of a Game-Based Learning (GBL) application titled Bipolar Journey: A Digital Exploration of Mood Swings, aimed at enhancing awareness and understanding of bipolar disorder (BD). The project addressed the lack of engaging educational tools in mental health education by integrating narrative-driven gameplay with evidence-based content. Utilizing the Game Development Life Cycle (GDLC) as a methodological framework, the application was designed to simulate the emotional fluctuations experienced by individuals with BD, thereby fostering empathy and knowledge among players.

The evaluation, based on the eGameFlow model, demonstrated a high level of user engagement across seven key factors: concentration, goal clarity, feedback, challenge, autonomy, immersion, and knowledge improvement. The overall engagement index reached 86%, indicating that the game effectively captured users' attention and facilitated meaningful learning experiences. These findings affirm the potential of GBL as a powerful medium for mental health education, particularly in demystifying complex psychological conditions and reducing stigma.

Future Research

Future research should consider the following directions to build upon the current study. Longitudinal studies - investigate the long-term impact of GBL on knowledge retention, attitude change, and behavioural outcomes related to mental health awareness and stigma reduction. Diverse populations - expand the participant pool to include individuals from various age groups, cultural backgrounds, and educational levels to assess the game's effectiveness across different demographics. Clinical validation - collaborate with mental health professionals to validate the educational content and explore the therapeutic potential of the game as a supplementary tool in clinical settings. Platform Expansion - adapt the game for mobile and web platforms to increase accessibility and reach, particularly for underserved or remote communities. Adaptive learning features - incorporate AI-driven personalization to tailor the gameplay experience based on users' learning pace, preferences, and prior knowledge. Multiplayer and social features - explore the integration of collaborative or competitive elements to enhance engagement and foster peer learning.

By addressing these areas, future iterations of Bipolar Journey and similar GBL applications can further contribute to the field of digital mental health education, offering scalable, engaging, and impactful tools for public awareness and support.

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