ENGAGING MINDS THROUGH ANIMATION: THE EFFECTIVENESS OF 2D CONTENT IN MEDICAL HEALTH EDUCATION

SARNI SUHAILA RAHIM[1], SHAHRIL PARUMO[2*], CHIA YEN TOH DARREN[3], ROSLEEN ABDUL SAMAD[4], SURIATI KHARTINI JALI[5]

[1,2,3,4]Fakulti Teknologi Maklumat Dan Komunikasi, Universiti Teknikal Malaysia Melaka (UTeM), 76100 Durian Tunggal, Melaka, Malaysia

[5]Faculty of Computer Science and Information Technology, Universiti Malaysia Sarawak (UNIMAS), 94300 Kota Samarahan, Sarawak, Malaysia

E-mail: [1]sarni@utem.edu.my, [2*]shahrilparumo@utem.edu.my, [3]b031910391@student.utem.edu.my, [4]rosleen@utem.edu.my, [5]jskhartini@unimas.my

ABSTRACT

The article examines the effectiveness of 2D animated content as an engaging and innovative educational tool for mental health education. The study explores how such animations can enhance understanding and raise awareness of mental health disorders among diverse audiences. Among the ongoing difficulties mental health education faces are stigma, misunderstandings, and a dearth of interesting materials that successfully explain difficult disorders like bipolar disease. To this end, six user-friendly animated modules were developed, focusing on key aspects of Bipolar Disorder, including an introduction to the condition, its symptoms, causes, prevalence, types, and available treatments. A structured evaluation process was employed, combining usability testing to measure knowledge retention with participant feedback to capture perceptions and experiences. The study engaged three target groups: healthcare professionals, multimedia experts involved in content creation, and members of the general public with varying levels of familiarity with Bipolar Disorder. By integrating insights from these groups, the research highlights the transformative potential of 2D animation in mental health education. Preliminary findings demonstrate that animated content significantly improves comprehension and awareness, presenting it as a dynamic, engaging, and accessible medium for disseminating information. These results underscore the promise of 2D animation in reducing stigma and misconceptions about mental health disorders, paving the way for the development of future educational resources and interventions.

Keywords: *2D Animation, Multimedia Content, Educational Media, Digital Animation, Interactive Learning*

1. INTRODUCTION

The utilization of 2D animated information has arisen as a revolutionary method in instructional tools, providing a distinctive combination of accessibility, engagement, and clarity. Animation, via its capacity to elucidate intricate topics via visual narrative, has gained substantial utility in diverse fields, including mental health education. In addressing delicate and intricate topics such as mental health disorders, 2D animation serves as a vital medium that combines artistry and education to effectively engage diverse audiences. This article examines the significance of 2D animated content in mental health education, highlighting its capacity to promote comprehension, increase awareness, and mitigate stigma associated with mental health issues.

The efficacy of 2D animations is in their capacity to dismantle obstacles to comprehension. Animations engage viewers through visual representation of information in ways that conventional text-based or lecture formats cannot. They accommodate diverse learning methods, such as visual and auditory, enhancing the material's relatability and memorability. Animated content offers a structured and comprehensible medium for conveying information on complex subjects such as Bipolar Disorder, which encompasses intricate symptoms, etiologies, and therapeutic approaches. Animations may elucidate medical terminology and cultivate empathy through meticulously crafted visuals and tales, enabling audiences to engage with the subject matter more profoundly.

Furthermore, 2D animations are proficient at engaging a wide and varied audience, including

healthcare professionals, multimedia specialists, and the general populace. Their adaptability enables content modification to accommodate different degrees of knowledge with the subject matter. Animated modules can bridge the knowledge gap between professionals and laypersons, creating an inclusive learning environment. The adaptability of 2D animation renders it an optimal medium for mental health teaching, as the target audience typically includes persons with varying levels of awareness and comprehension.

Stigma, ignorance, and a lack of engaging and accessible learning resources continue to plague mental health education. Traditional education often fails to explain the complexities of illnesses like Bipolar Disorder to non-specialists. This study explores 2D animated content as an innovative solution to these difficulties. This research creates and assesses six animated courses focused on Bipolar Disorder, aiming to enhance information retention and audience engagement. This research explores the potential of animation to enhance understanding, reduce stigma, and render mental health education engaging and accessible, utilizing a systematic review approach with diverse participant groups.

This study assesses the efficacy of 2D animation in mental health education by developing and evaluating six animated modules centered on Bipolar Disorder. These courses were designed to provide a comprehensive examination of the condition, addressing its symptoms, causes, prevalence, and treatments. The study illustrates that integrating user feedback and assessing knowledge retention indicates how animation can effectively engage audiences and enhance their understanding. The results highlight the significance of utilizing creative methods such as 2D animation to enhance knowledge, diminish misconceptions, and advance mental well-being on a larger scale.

This research posits that 2D animated educational content has the potential to markedly improve understanding, memory retention, and engagement in mental health education when juxtaposed with conventional text-based or static visual resources. The proposal suggests that animated modules focused on Bipolar Disorder will enhance understanding, diminish stigma, and cultivate more favorable views of mental health across various audiences. This research utilizes a systematic evaluation approach to examine how animation serves as an effective means of simplifying intricate information, thereby enhancing the accessibility and impact of mental health education.

2. LITERATURE REVIEW

2.1 Existing Works

The incorporation of animation in educational settings has garnered heightened interest owing to its capacity to elucidate intricate concepts and captivate varied audiences. In mental health education, 2D animation offers a distinctive chance to improve comprehension and awareness of psychiatric disorders through visually engaging and accessible material. Recent research underscores the need of innovative strategies in mental health education, especially those that tackle issues such as stigma, misinformation, and restricted access to resources. Studies indicate that multimedia tools, including animations, enhance knowledge retention and promote emotional engagement, rendering abstract or sensitive subjects more accessible and comprehensible. Nevertheless, despite its growing utilization, research on the particular impacts of 2D animation on mental health education remains limited. This gap underscores the need for thorough evaluations of how animated content may effectively convey critical information about mental health disorders and its ability to engage varied audiences, including healthcare professionals, educators, and the general populace.

Conventional educational approaches about mental health disorders, including books, brochures, and films [1-7], have encountered difficulties in engaging and effectively communicating information to diverse audiences. These static and primarily text-heavy formats may insufficiently represent the nuances of the disease or engage contemporary viewers, especially younger generations used to dynamic and interactive media.

Medical animations are concise educational films, primarily centered on surgical or physiological subjects, produced utilizing 3D computer graphics. These animated videos employ explicit images to enhance the audience's comprehension of the processes taking place within the human body. The integration of animation with medical science enhances the elucidation and transmission of concepts pertaining to injuries, diseases, and physiological functions. A multitude of research in the literature have investigated the utilization of animation for educational objectives [8-16], along with its applications in the medical domain [17-25].

Table 1: Testing Respondents

General Information	Number of Respondents
A medical doctor from the UTeM Health Center and a counsellor from UTeM's Counselling Department	2
Instructors at UTeM and multimedia professionals with experience ranging from 1 year to over 15 years	7
Individuals from any age group, profession, or demographic within the general public	54

Table 2: Testing Data for User Testing

	Multimedia Expert	Subject Matter Expert	Members of the Public
General Information	Lecturers from UTeM and IT professionals with 1 to 15+ years of experience.	Mental health experts, including a qualified medical doctor and counsellor.	General public spanning all age groups, demographics, and professions.
Description	To evaluate the technical aspects of the animation based on the principles of multimedia and digital art.	To ensure the relevance and accuracy of the animation's content with the proposed topic.	To define and assess the effectiveness of this animation.

2.2 An Animated Content Development for Bipolar Disorder Awareness

Even though mental health education has come a long way, the public still doesn't fully understand conditions like Bipolar Disorder because of shame, false information, and limited access. Existing study shows that we need more effective and interesting teaching tools. However, the old ways of teaching don't always work to keep people's attention or help them remember what they've learned. This study fills in that gap by looking into how 2D animated material could be used as a solution. The main questions that this study is trying to answer are: (1) How much better is 2D animation than traditional ways at helping people understand and remember mental health information? (2) How does animated material change how people think about bipolar disorder and lessen the stigma that surrounds it? The goal of this study is to help make mental health education strategies that work better by looking into these questions.

The animation titled An Animated Content Development for Bipolar Disorder Awareness has six main topics: (i) Introduction, (ii) Symptoms, (iii) Causes, (iv) Statistics, (v) Types, and (vi) Treatment. This article seeks to provide factual facts and relevant data on Bipolar Disorder to improve comprehension of the topic. The animation improves the efficacy and efficiency of information dissemination through an engaging and accessible manner. Sequentially named screenshots of the developed animation are presented as Figures 1 to 3.

Figure 1: Screenshot of the main page
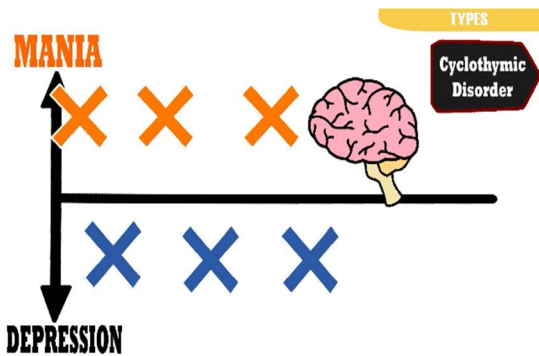

Figure 2: Screenshot of Introduction page

Figure 3: Screenshot of the Types module

3. METHODOLOGY

This step involves testing to assess the efficacy of the 2D animation in communicating information and fulfilling its intended objective. The evaluation centers on comprehending users' perceptions of the functionality and favorable characteristics of the 2D animation. A complete test plan is executed to facilitate the testing process, focusing on the general population, subject matter specialists, and multimedia professionals. The characteristics of the respondents participating in the evaluation are encapsulated in Table 1.

During the testing and evaluation process, questionnaires were distributed to target users, either virtually or in person, to achieve the primary objective of user acceptance testing. Before completing the questionnaires, users were required to view the 2D animation titled An Animated Content Development for Bipolar Disorder Awareness. Participants were required to furnish comprehensive answers to every item in the questionnaire. In the concluding part, users were invited to provide input on possible improvements and recommendations for future developments. The information obtained from user testing is presented in Table 2.

4. DATA ANALYSIS AND RESULTS

This section displays diagrams and figures based on the testing results, providing a succinct summary of the definitive outcomes.
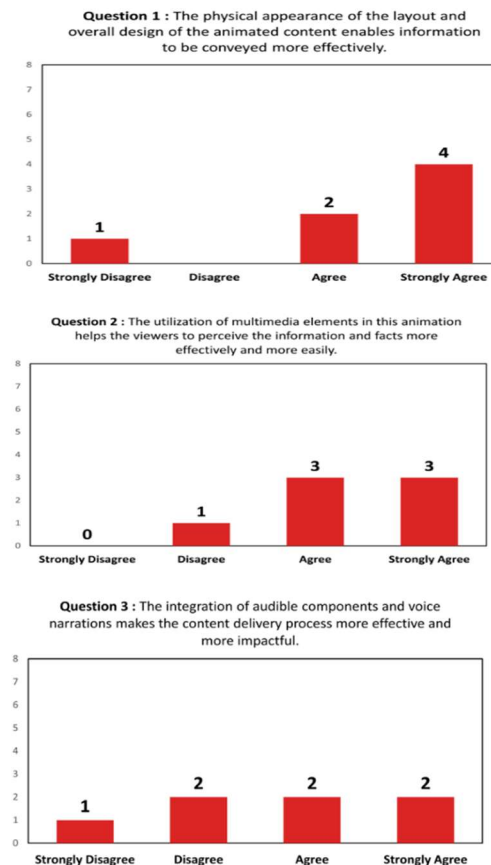
4.1 Multimedia Experts

The research encompassed seven multimedia specialists, comprising two instructors from the Faculty of Information and Communication Technology (FTMK) at UTeM and five IT practitioners from other organizations. Sets of

questionnaires were distributed via Google Forms, along with a video link granting access to the animated video titled An Animated Content Development for Bipolar Disorder Awareness. After viewing the animation, the multimedia experts evaluated it based on functionality, accessibility, and user interface. The data collected during the testing activities were subsequently analyzed and presented in the form of graphs and tables.

4.1.1 Charts of Functionality for Multimedia Experts

Figure 4 illustrates the testing outcomes concerning functionality, evaluating the efficacy of information dissemination. The test findings indicate that most multimedia specialists concur that the animation meets the requisite functional standards, since it adheres to accepted multimedia concepts.
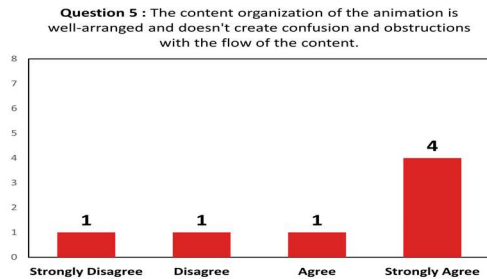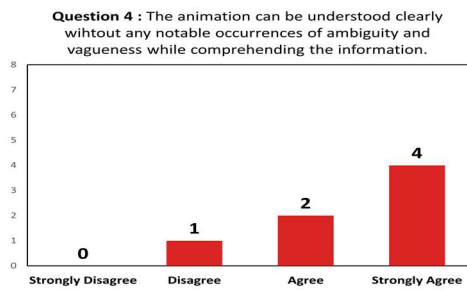
Question 4 : The animation can be understood clearly wihtout any notable occurrences of ambiguity and vagueness while comprehending the information.

Question 5 : The content organization of the animation is well-arranged and doesn't create confusion and obstructions with the flow of the content.

Figure 4: Results of Functionality by Multimedia Experts

4.1.2 Charts of User Interface for Multimedia Experts

Figure 5 demonstrates that multimedia specialists largely agree that the animation is visually appealing to audiences. The majority provided favorable feedback concerning the incorporation of visual elements and visuals in the 2D animation material. A considerable number of specialists agreed that the color tones and motifs utilized in the animation are aesthetically appealing, thematically suitable, and coherent with the overarching concept. Furthermore, statistical study reveals that multimedia specialists see the implementation of typefaces, along with their sizes and attributes, as optimal.
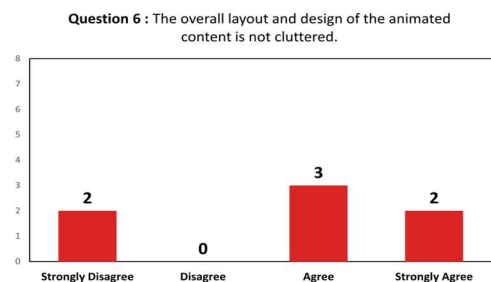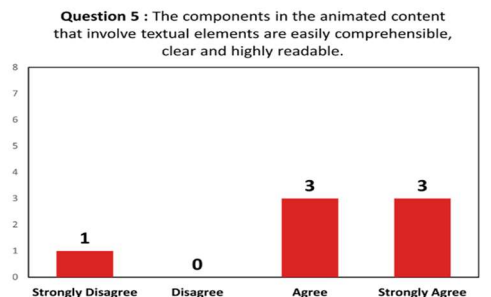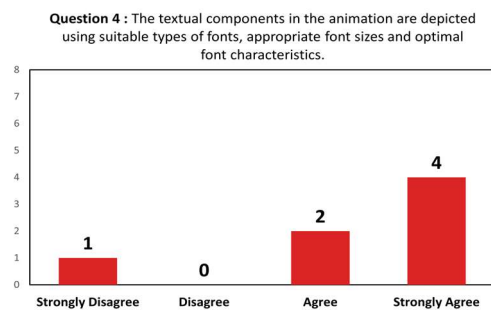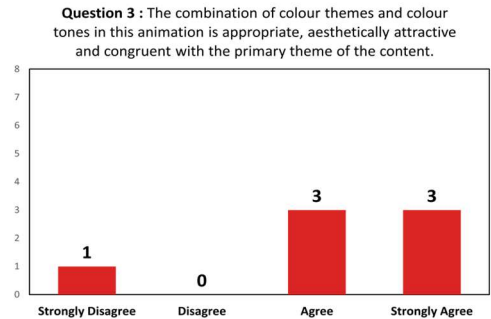
Question 1 : The animated content is physically attractive and aesthetically pleasing towards the viewers on an overall sense.

Question 2 : The pictorial entities and graphical components used in this animation are attractive, appropriate and highly suitable for the primary theme of the animated content.

Question 3 : The combination of colour themes and colour tones in this animation is appropriate, aesthetically attractive and congruent with the primary theme of the content.

Question 4 : The textual components in the animation are depicted using suitable types of fonts, appropriate font sizes and optimal font characteristics.

Question 5 : The components in the animated content that involve textual elements are easily comprehensible, clear and highly readable.

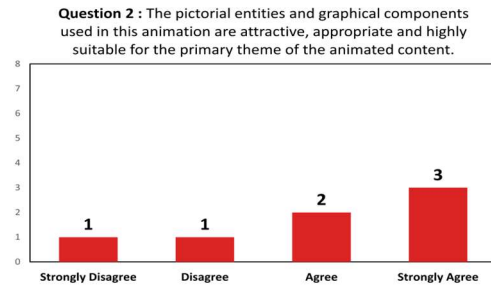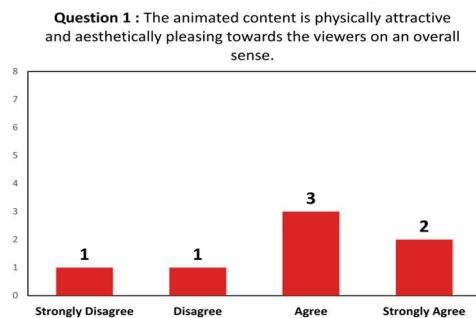**Question 6 :** The overall layout and design of the animated content is not cluttered.

Figure 5: Results of User Interface by Multimedia Experts

4.1.3 Charts of Accessibility for Multimedia Experts

As indicated in Figure 6, the findings from Question 1 reveal that the audible components and voice narrations are both appropriate and sufficiently clear. Regarding Question 2, the majority of multimedia experts agree that the chosen color themes and tones do not hinder visual perception. Additionally, most experts concur that the graphics and pictorial elements effectively convey their intended meanings without causing misinterpretations. Furthermore, a majority of experts express a favorable opinion about the readability of the fonts used in the 2D animation. They also agree that the accent in the voice narrations is unlikely to create comprehension difficulties for most demographic groups. Finally, the statistical data from Question 6 indicate that viewers are highly likely to follow the content without encountering significant obstacles.

Question 1 : The audible components and voice narrations in the animation are clear enough to understand effortlessly and interpret with ease.
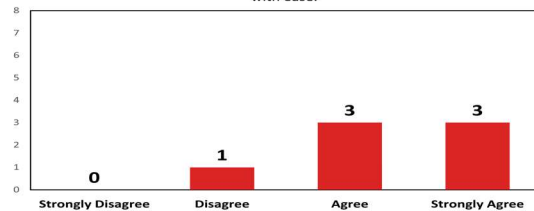

Question 2 : The choice of colour themes doesn't interfere or obstruct the visual faculties of a person to perceive information.
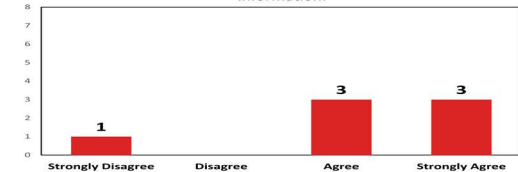

Question 3 : The appearance of the graphics and pictorial components accurately represent what they are supposed to represent without causing feelings of ambiguity and confusion.
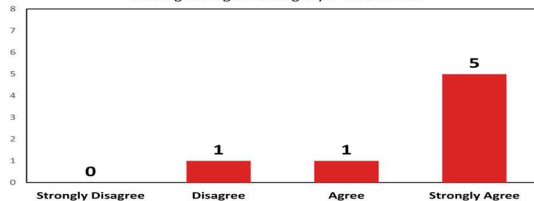
Question 4 : The fonts used in this animated content are eye-friendly and soothing on the visual faculties.
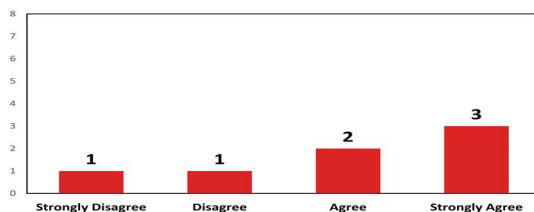
Question 5 : The accent used in the voice narration is appropriate, relevant and suitable for most segments of society and most demographics of viewers.
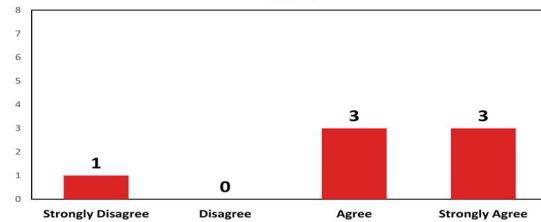
Question 6 : The delivered information and facts are effortlessly grasped without major hindrances such as not being able to follow along with the content flow of the animation.
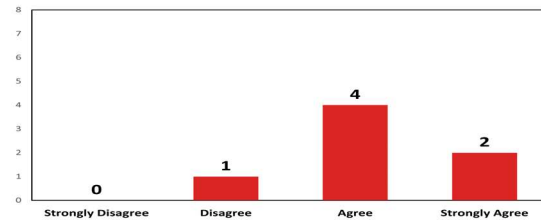

Figure 6: Results of Accessibility by Multimedia Experts

Detailed findings from the multimedia experts' responses are summarized in Table 3.

Table 3: Result Summary for Multimedia Expert

Question Type	Strongly Disagree	Disagree	Agree	Strongly Agree	Total
Functionality	8.57%	14.29%	28.57%	48.75%	100%
User Interface	16.67%	4.76%	38.09%	40.48%	100%
Accessibility	7.14%	9.52%	38.10%	45.24%	100%
Average	10.79%	9.52%	34.92%	44.76%	100%

4.2 Subject Matter Experts

Two subject matter experts were involved in the testing process. They were given a link to an animated video along with a set of printed questionnaires. After viewing the 2D animation, they were asked to assess the video's content, effectiveness, and flexibility. The data gathered from the testing was subsequently analyzed and represented through graphs and visuals.

4.2.1 Charts of Content for Subject Matter Experts

The experts conducted a comprehensive evaluation of the accuracy, relevance, and correctness of the facts, information, and statistical data presented in the animation "An Animated Content Development for Bipolar Disorder Awareness." The assessment focused on determining whether the content of the

2D animation aligns with established scientific knowledge in the fields of mental health and psychiatric treatment. The majority of experts expressed a positive view regarding the accuracy of the animation's content. Moreover, they concurred that no substantial errors were identified in the application of medical jargon and scientific vocabulary. The experts considered the factual data and scientific information to be suitably informative. The experts also conveyed a positive assessment of the content's alignment with the relevant subjects addressed in the modules.
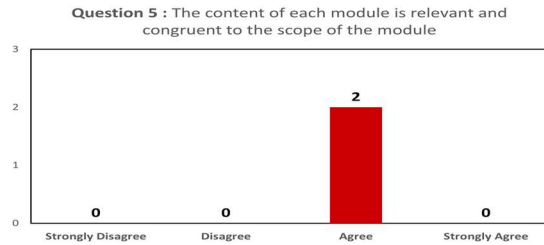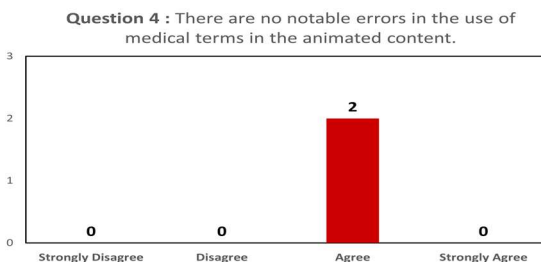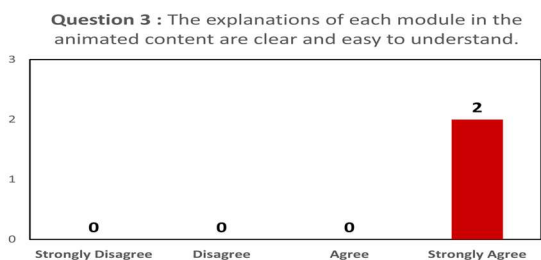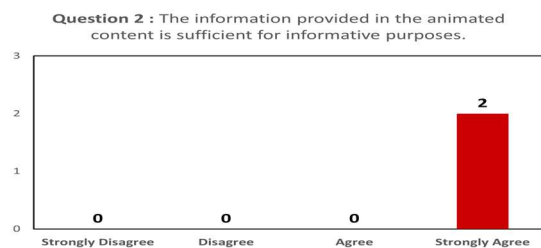
Question 1 : The information provided in the animated content is valid and correct

Question 2 : The information provided in the animated content is sufficient for informative purposes.

Question 3 : The explanations of each module in the animated content are clear and easy to understand.

Question 4 : There are no notable errors in the use of medical terms in the animated content.

Question 5 : The content of each module is relevant and congruent to the scope of the module
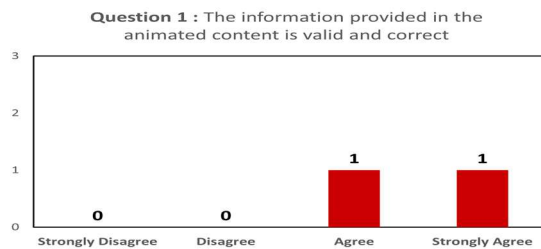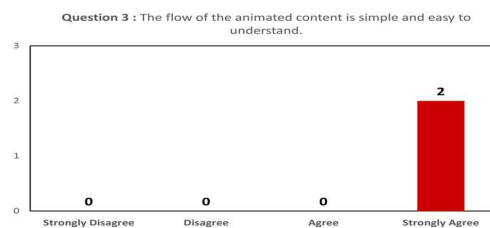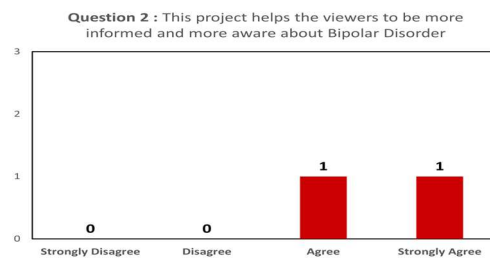

Figure 7: Result of Content by Subject Matter Experts

4.2.2 Charts of Effectiveness for Subject Matter Experts

The experts assessed the effectiveness of the 2D animation as a content delivery medium. Their findings indicated that the pictorial elements accurately conveyed information about Bipolar Disorder, with only minor inaccuracies. They also noted that the animation's flow enhanced comprehension of the material. Moreover, the color palette, typography, and voiceover were deemed suitable and impactful. The experts determined that 2D animation is an efficient medium for conveying information regarding Bipolar Disorder.

Question 1 : The pictorial components in the animated content represent the facts of Bipolar Disorder without severe inaccuracies

Question 2 : This project helps the viewers to be more informed and more aware about Bipolar Disorder

Question 3 : The flow of the animated content is simple and easy to understand.
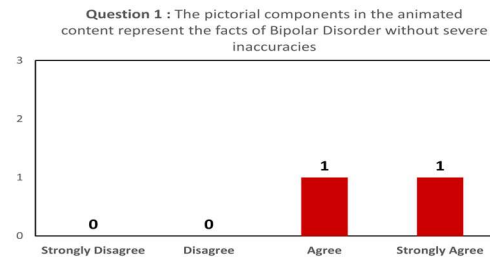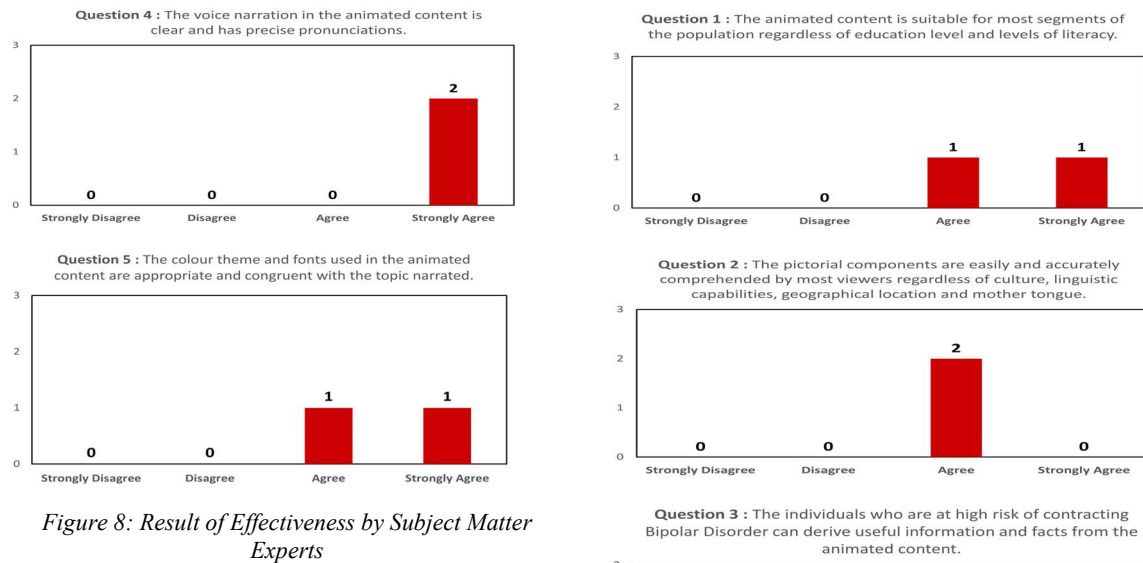
Figure 8: Result of Effectiveness by Subject Matter Experts

4.2.3 Charts of Flexibility for Subject Matter Experts

During the concluding testing phase, subject matter experts assessed the adaptability of the 2D animation "An Animated Content Development for Bipolar Disorder Awareness." Both experts concurred that the animation proficiently communicates its message, regardless of the viewers' literacy or educational background. Furthermore, they assessed the visual elements of the animation as unlikely to impart factually incorrect impressions, regardless of viewers' linguistic, cultural, or geographical contexts. The experts also concurred that individuals at high risk for Bipolar Disorder would find the animated content to be a valuable source of information.

The subject matter experts confirmed that the content is comprehensible to individuals of all ages. Moreover, both experts endorsed the effectiveness of the animated video in delivering valuable information to those who may support individuals with Bipolar Disorder in seeking psychiatric treatment. The experts provided favorable assessments of the content, efficacy, and adaptability of the 2D animation "An Animated Content Development for Bipolar Disorder Awareness," confirming that it is an effective medium for conveying information about Bipolar Disorder.

The study's conclusions are encapsulated in Table 4, which displays the outcomes obtained from research involving subject matter experts.
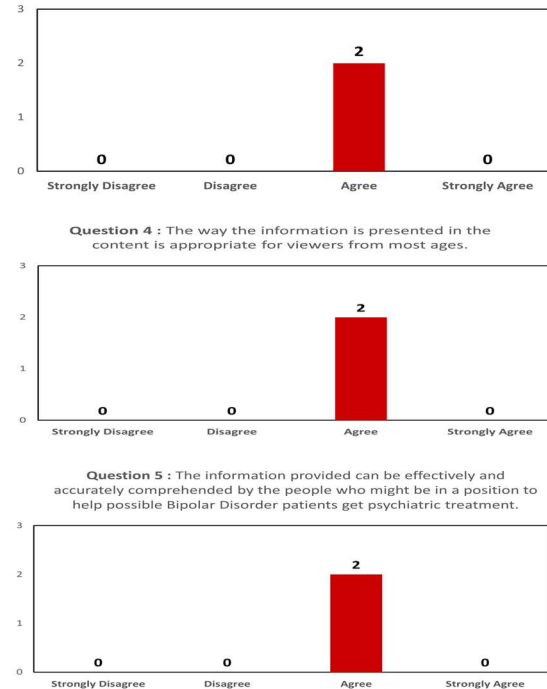

Figure 9: Result of Flexibility by Subject Matter Experts

Table 4: Result Summary for Subject Matter Expert

Question Type	Strongly Disagree	Disagree	Agree	Strongly Agree	Total
Content	-	-	50%	50%	100%
Effectiveness	-	-	30%	70%	100%
Flexibility	-	-	90%	10%	100%
Average	-	-	56.7%	43.3%	100%

4.3 Members of the Public

This study utilized a sample of 54 participants from the general populace, employing questionnaires as the technique of data collection. An online questionnaire was disseminated via the Google Forms platform, accompanied by a video link to watch "An Animated Content Development for Bipolar Disorder Awareness." In the testing phase, users assessed the 2D animation by choosing their favorite content distribution method and evaluating three critical aspects: efficiency, efficacy, and user interface. The data collected from these activities were subsequently examined and presented using graphical representations and statistical graphics.

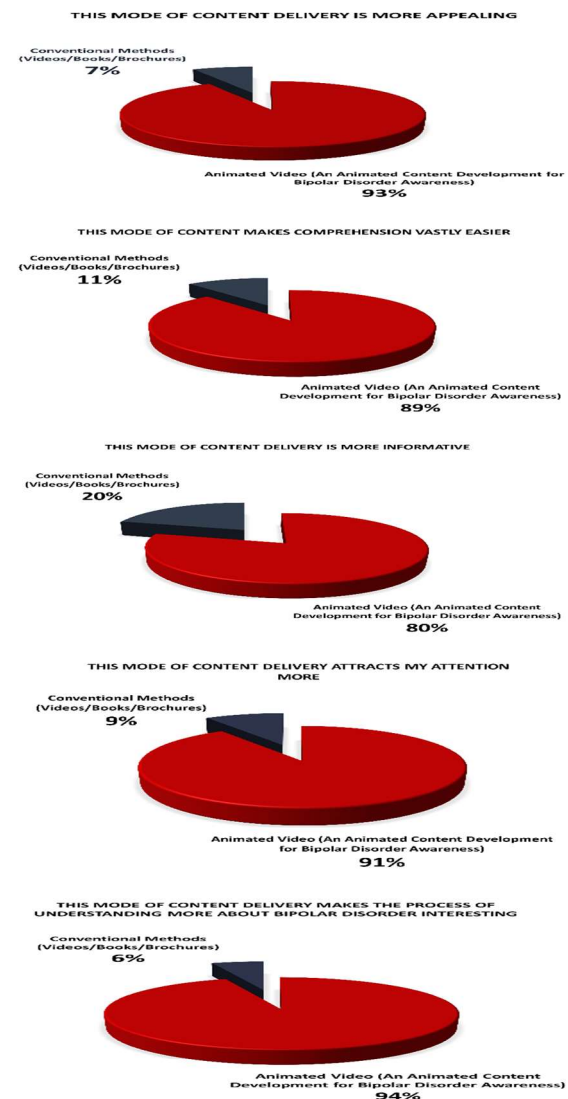### 4.3.1 Charts of Efficiency for Members of the Public

This portion of the article examines the testing outcomes related to the efficacy of animation as an information distribution strategy. Participants were requested to specify their preferred way of content distribution between two alternatives: a 2D animation on Bipolar Disorder or conventional formats such as books, pamphlets, or videos. The results from the testing activities conducted with the public are illustrated in Figure 10.

In this phase of the testing activities, 50 out of 54 respondents found 2D animation to be the most engaging method of content delivery, surpassing traditional systems like books, videos, and brochures. The appeal of 2D animation lies in its manipulation of position, use of graphical and textual elements, and incorporation of enticing multimedia components. Additionally, 48 out of 54 respondents agreed that 2D animation facilitates easier comprehension and information compared to conventional modes of content delivery. The vibrant, colorful, and dynamic nature of 2D animation enhances the viewers' ability to grasp and retain the presented information.

Among the 54 responders, 43 (80%) favored 2D animation as the most informative method of content delivery. The dynamic characteristics of 2D animation facilitate the efficient collection of information and data, rendering it more effective than conventional techniques like brochures, books, and videos. Furthermore, 49 of the 54 respondents found 2D animation to be more engaging than conventional methods, attributing this to its interactive multimedia components.

Approximately 94% of the 54 respondents favored 2D animation as the most efficient method for comprehending Bipolar Disorder. The captivating and visually dynamic multimedia components of 2D animation are thought to more efficiently enhance the audience's cognitive abilities. Ninety-four percent of participants indicated a pronounced preference for 2D animation, claiming enhanced pleasure and enjoyment relative to alternative content distribution techniques. This preference is ascribed to the vibrant and dynamic design components, encompassing typefaces, graphics, words, and images, which are likely to elicit favorable emotional reactions, such as pleasure and satisfaction, among the respondents.
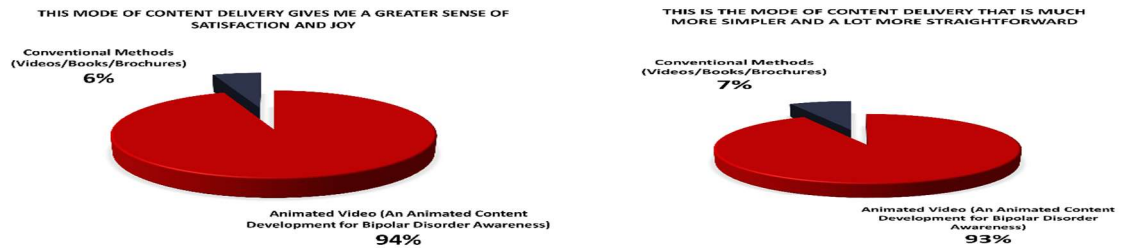
THIS MODE OF CONTENT DELIVERY GIVES ME A GREATER SENSE OF SATISFACTION AND JOY

Conventional Methods (Videos/Books/Brochures) 6%

Animated Video (An Animated Content Development for Bipolar Disorder Awareness) 94%

Figure 10: Result of Efficiency by the Members of the Public

4.3.2 Charts of Effectiveness for Members of the Public

The survey participants from the public also participated in evaluating the effectiveness of 'An Animated Content Development for Bipolar Disorder Awareness'. They were tasked with selecting between two options: (i) the 2D animation and (ii) brochures/books/videos, based on their simplicity, information retrieval, and the effectiveness of content delivery.

Out of the 54 respondents, 50 participants in the testing process favored 2D animation as a simpler and more straightforward mode of content delivery compared to methods such as books, brochures, and videos. According to the results, 2D animation effectively conveys information and useful facts with minimal visual and audio elements, in contrast to the complex content found in traditional media. Additionally, 48 respondents indicated that 2D animation was more helpful in conveying information about Bipolar Disorder than traditional techniques. The efficacy is ascribed to the stimulating and engaging characteristics of 2D animation, which captivates viewers' visual and cognitive faculties through its dynamic, colorful, and intriguing multimedia components.

In a 54-person research, 50 of the respondents preferred 2D animation as a more instantaneous and easily available means of content distribution than more traditional media including books, pamphlets, and movies. Unlike the complexities of traditional media, the research showed that 2D animation effectively conveys information and basic elements with minimum visual and sonic components. Furthermore, 48 respondents felt that 2D animation was more efficacious in conveying information regarding Bipolar Disorder than traditional approaches. The efficacy is due to the engaging and thought-provoking qualities of 2D animation, which captivates viewers with its dynamic, colorful, and intriguing multimedia elements.
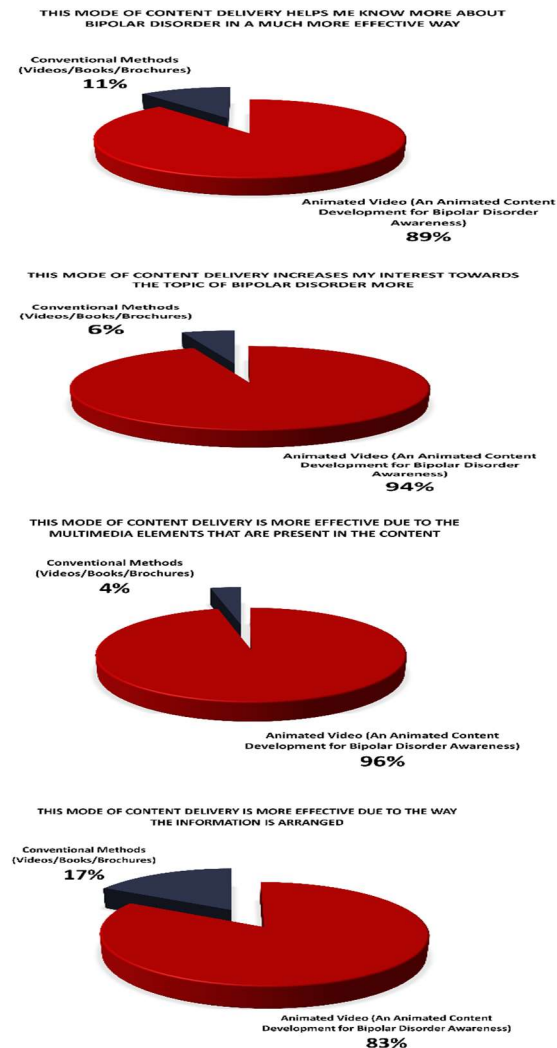
THIS IS THE MODE OF CONTENT DELIVERY THAT IS MUCH MORE SIMPLER AND A LOT MORE STRAIGHTFORWARD

Conventional Methods (Videos/Books/Brochures) 7%

Animated Video (An Animated Content Development for Bipolar Disorder Awareness) 93%

THIS MODE OF CONTENT DELIVERY HELPS ME KNOW MORE ABOUT BIPOLAR DISORDER IN A MUCH MORE EFFECTIVE WAY

Conventional Methods (Videos/Books/Brochures) 11%

Animated Video (An Animated Content Development for Bipolar Disorder Awareness) 89%

THIS MODE OF CONTENT DELIVERY INCREASES MY INTEREST TOWARDS THE TOPIC OF BIPOLAR DISORDER MORE

Conventional Methods (Videos/Books/Brochures) 6%

Animated Video (An Animated Content Development for Bipolar Disorder Awareness) 94%

THIS MODE OF CONTENT DELIVERY IS MORE EFFECTIVE DUE TO THE MULTIMEDIA ELEMENTS THAT ARE PRESENT IN THE CONTENT

Conventional Methods (Videos/Books/Brochures) 4%

Animated Video (An Animated Content Development for Bipolar Disorder Awareness) 96%

THIS MODE OF CONTENT DELIVERY IS MORE EFFECTIVE DUE TO THE WAY THE INFORMATION IS ARRANGED

Conventional Methods (Videos/Books/Brochures) 17%

Animated Video (An Animated Content Development for Bipolar Disorder Awareness) 83%

Figure 11: Result of Effectiveness by Members of the Public

4.3.3 Charts of User-Interface for Members of the Public

In the previous section, members of the public shared their opinions on the user interface of the 2D animation An Animated Content Development for Bipolar Disorder Awareness. Participants were asked to choose their preferred content delivery interface based on its appeal, engagement, and ability to capture their attention.

Of the 54 responders, 51 (94%) concurred that 2D animation is the most aesthetically pleasing method of content transmission. This choice is mostly due to the animation's substantial incorporation of visual elements, vivid colors, and varied multimedia components. Additionally, 48 respondents expressed a preference for 2D animation owing to its readability, clarity, and comprehensibility. This preference may arise from the dynamic display of textual components and the capacity to adjust text sizes in 2D animation, setting it apart from the static text commonly seen in brochures and books.

In a study including 54 participants, 49 individuals said that they perceive 2D animation as a more successful method of content dissemination than traditional media, including books, pamphlets, and films. Participants regarded the vibrant and dynamic graphics and text in 2D animation as more engaging, enhancing their understanding of the topic. Furthermore, 50 respondents (93%) indicated that 2D animation is more aesthetically pleasing and emotionally resonant than conventional techniques. The incorporation of engaging images, animated text, and visual elements in 2D animation was observed to enhance cognitive engagement more efficiently than traditional media. Furthermore, 98% of participants asserted that 2D animation incorporates more visually engaging and attention-grabbing elements than existing techniques. The incorporation of graphical and pictorial components, together with intentional modifications of size, placement, and spacing, augments the overall attractiveness and visual appeal of 2D animation.
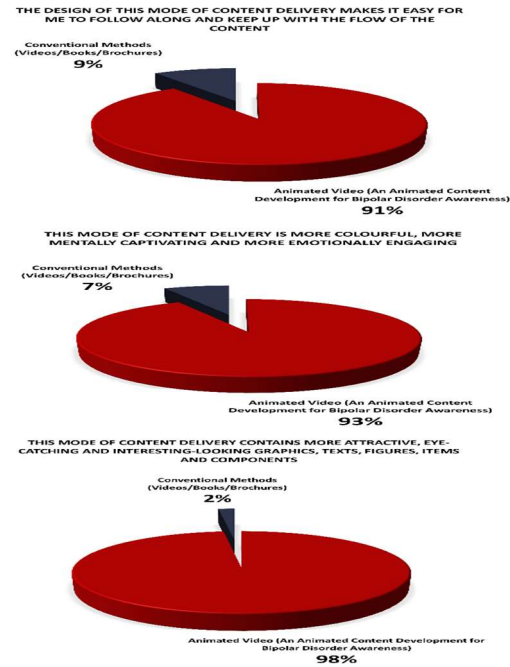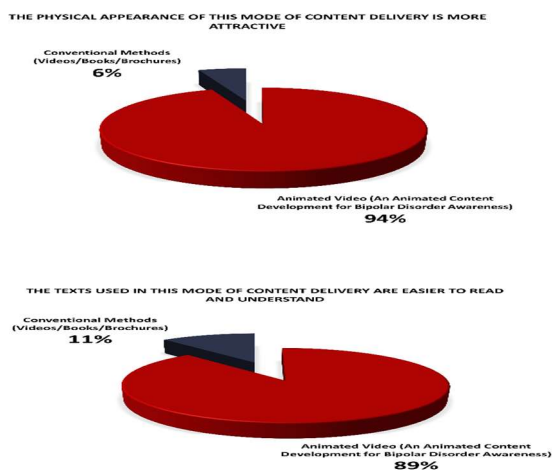

Figure 12: Results of User Interface by Members of the Public

Table 5 presents a summary of the public testing results.

Table 5: Result Summary for Members of the General Public

Question Type	Animated Video	Books/Brochures/ Videos	Total
Efficiency	90.12%	9.88%	100%
Effectiveness	91.11%	8.89%	100%
User-Interface	92.96%	7.04%	100%
Average	91.40%	8.60%	100%

5. DISCUSSION

Folks are learning more about mental health issues, but it's still tough to teach others about them since there are shameful things to say and boring ways to learn. Folks used to talk about tough conditions like Bipolar Disorder in ways that don't always work well. This can cause misunderstandings that stall treatments and keep people from getting enough help. To solve these problems, we need new ideas that make things easier to understand and get to. The idea behind this study comes from the cognitive theory of multimedia learning, which says that well-designed visual material can help people remember things and be more interested in learning.

This study aims to close the knowledge gap between doctors and the public by using 2D animation as a teaching aid. This will lead to a better-informed and more helpful society as a whole.

The outcomes of this study provide substantial insights into the ability of 2D animated content to enhance education on Bipolar Disorder by increasing awareness and understanding among diverse target audiences. A thorough assessment has identified several key areas for improvement.

A notable issue with 2D animation is the use of double negatives in the voice narration. The term "not uncommon" may induce confusion because to its confusing form and diction. Furthermore, the narration exhibits superfluous repetition, perhaps inducing cognitive dissonance in listeners. The recurrent appearance of analogous phrases in close proximity exacerbates this problem, perhaps stemming from excessive use of text transitions, as textual components predominate the animation. To enhance clarity and engagement, subsequent revisions should include a broader array of multimedia components, diminishing dependence on static images and textual transitions.

The title of this research emphasizes raising awareness about Bipolar Disorder; however, the content primarily presents factual data and scientific information about the condition. The animation would be more impactful if it adopted a bolder and more assertive approach in addressing the stigma, injustices, and negative perceptions associated with Bipolar Disorder. Additionally, incorporating subtitles is essential to ensuring accessibility for diverse cultural and linguistic communities. Relying solely on voice narration may limit the animation's effectiveness in reaching all segments of society, given its complex demographic composition.

The principal aim of this study is to enhance public comprehension of Bipolar Disorder. Current ways of providing information regarding the condition have demonstrated ineffectiveness, restricting access to essential facts for potential beneficiaries. Our testing operations reveal that 2D animation can effectively surmount these problems and rectify the deficiencies identified in current methodologies and systems suggested by other researchers [1-7]. The Animated Content for Bipolar Disorder Awareness aims to improve understanding by using visuals, visual features, and diverse multimedia components, so rendering the information more interesting and accessible.

The results of this study correspond with its primary objective of evaluating the efficacy of 2D animated content in improving mental health education. Findings demonstrate that animation markedly enhances information retention and engagement, affirming its viability as an effective instructional resource. Unlike traditional text-based materials and static visuals, which have been critiqued for their limited engagement and cognitive overload, animated content offers a more dynamic and immersive learning experience. This research highlights the unique benefits of animation in clarifying complex information and reducing stigma, despite prior studies examining video-based and gamified approaches. Future studies should include comparison evaluations of animation with other innovative digital interventions to improve and refine mental health education methods.

This study illustrates the efficacy of 2D animated content in mental health teaching, however significant limitations persist. The research predominantly examines Bipolar Disorder, raising the question of whether analogous outcomes would be seen in other mental health disorders. The study's evaluation is based on short-term knowledge retention and participant feedback, lacking an assessment of long-term impact or behavioral changes. Future research should investigate the long-term effectiveness of animated content and evaluate its applicability to a broader spectrum of mental health disorders. Moreover, expanding the research to include a broader spectrum of demographic groups and diverse cultural contexts could substantially enhance the generalizability of the findings.

6. CONCLUSION

The results of this study align well with its research objectives, demonstrating that 2D animated content markedly enhances comprehension, knowledge retention, and awareness of Bipolar Disorder. Results indicate that participants across all target groups displayed improved understanding of core concepts, hence affirming the objective of assessing animation as a viable educational tool. The decrease in stigma and misunderstandings noted among participants underscores the study's objective of assessing animation's influence on mental health beliefs. These results underscore the promise of animated content as a legitimate substitute for conventional instructional approaches, emphasizing the necessity for additional investigation and incorporation of animation in mental health education.

This study underscores the transformative capacity of 2D animated content in medical education, illustrating its efficacy in improving engagement, knowledge retention, and comprehension of Bipolar Disorder. The research

demonstrates that six interactive animated modules effectively combine visual storytelling with organized instructional content to enhance mental health literacy. The assessment process, incorporating usability testing and feedback from healthcare professionals, multimedia specialists, and the general populace, illustrates that 2D animation serves as an effective and accessible medium for disseminating vital health information.

The findings indicate that animated content improves comprehension and substantially reduces stigma and misconceptions associated with mental health disorders. Two-dimensional animation provides a more interesting and immersive learning environment than conventional teaching approaches, therefore improving the grasp of difficult medical ideas. This study emphasizes how increasingly multimedia is seen as a necessary tool for public health teaching and campaigning.

Future research should investigate the wider applications of 2D animation in medical education, including its efficacy in addressing various mental health disorders and its adaptability to different cultural and language situations. Moreover, using future technologies like interactive animations and augmented reality may significantly improve user engagement and educational results. Expanding the application of 2D animation in educational initiatives enables healthcare professionals and educators to promote a more informed and inclusive perspective on mental health awareness, thereby enhancing public understanding and support for individuals impacted by mental health disorders.

Furthermore, the success of this study emphasizes the imperative for continuous innovation in digital health education. Technological advancements can enhance the efficacy of 2D animation in conveying complex medical concepts by incorporating more interactive and adaptive elements. Future initiatives must include personalized learning pathways, multilingual subtitles, and culturally relevant narratives to improve accessibility and diversity. By leveraging the benefits of animation, educators and healthcare professionals may produce more engaging, informative, and efficacious materials, ultimately fostering a more health-literate society and promoting early intervention and support for individuals affected by mental health disorders.

This study underscores a notable advancement in the field by illustrating how 2D animated content serves as a novel tool for mental health education, effectively integrating conventional learning techniques with modern digital solutions. This study emphasizes the advantages of animation over traditional text-based or static visual resources, which have been deemed less engaging and accessible. Animation significantly improves comprehension, knowledge retention, and helps in reducing stigma. The study offers empirical evidence for the effectiveness of animation as an educational tool by combining usability testing with participant feedback from various groups. The results enhance the existing research on multimedia learning within mental health education and provide a basis for continued investigation into digital approaches in public health communication.

ACKNOWLEDGEMENT

REFERENCES

[1] Malaysian Psychiatric Association. (n.d.). Bipolar Disorder.

[2] Bipolar disorder - about. Malaysian Psychiatric Association. (n.d.). Retrieved April 7, 2023, from https://psychiatry-malaysia.com/public/ public-education/mental-disorders/bipolar-disorder/bipolar-disorder-about/

[3] Recognize Early Signs of Psychiatric Disturbances (2020). YouTube. Retrieved March 24, 2023, from https://youtu.be/ iwDY4a2-Ihc

[4] U.S. Department of Health and Human Services. (n.d.). Bipolar disorder. National Institute of Mental Health. Retrieved February 28, 2023, from https://www.nimh.nih.gov/ health/topics/bipolar-disorder

[5] Mayo Foundation for Medical Education and Research. (2022, December 13). Bipolar disorder. Mayo Clinic. Retrieved February 28, 2023, from https://www.mayoclinic.org/ diseasesconditions/bipolar-disorder/ symptoms-causes/syc-20355955

[6] Stigma, prejudice and discrimination against people with mental illness. American Psychiatric Association - Stigma, Prejudice and Discrimination Against People with Mental Illness. (n.d.). https://www.psychiatry.org/ patients-families/stigma-and-discrimination

[7] Mental Health : How the Brain Works. (2015). YouTube. Retrieved June 25, 2023, from https://youtu.be/MyxCjnHqBq8

[8] S. S. Rahim, H. Saleh, N. Z. F. Faizal and S. Parumo, Development of a Two-dimensional Animation for Business Law: Elements of a Valid Contract, *International Journal of Advanced Computer Science and Applications*, *14*(7), pp. 200-208, 2023. https://doi.org/ 10.14569/IJACSA. 2023.0140722

[9] S. S. Rahim, H. Saleh, N. Z. Fadhlan Faizal, and S. Parumo, "Evaluation of the effects of 2D animation on business law: elements of a valid contact", International Journal of Advanced Computer Science and Applications, vol. 14, no. 6, pp. 487-496, 2023.

[10] Melin ZA. "Acid and Alkali Form 2", 2020. https://www.youtube.com/watch?v=SKvvH8_BfSs&t=2s, accessed on March 18, 2022.

[11] EduwebTV KPM. "Form 2 Science DLP Acid & Alkali DLP0023" https://www.youtube.com/watch?v=GRs0yrKt174, accessed on March 20, 2022.

[12] F. Stebner, T. Kühl, T. N. Höffler, J. Wirth and P. Ayres, "The role of process information in narrations while learning with animations and static pictures," Computers & Education, vol. 104, pp. 34-48.8, 2017.

[13] T. Calotto and P. A. Jaques, "The effects of animated pedagogical agents in an english-as-a-foreign-language learning environment," International Journal of Human-Computer Studies, vol. 95, pp. 15-26, 2016.

[14] S. S. Rahim, A. A. Abdullah, S. Parumo and S. K. Jali, Revitalizing Science Education: Unveiling the Potential of 2D Animations to Enhance Understanding and Engagement, Journal of Theoretical and Applied Information Technology, 102(7), pp. 3200-3211, 2024.

[15] Kogan, G., Chassidim, H., and Rabaev, I. The efficacy of animation and visualization in teaching data structures: a case study. *Educational technology research and development*, pp.1-24, 2024.

[16] Tetriyani, E., Jihad, A., Rachmawati, T. K., and Sugilar, H. Development of video animation media for learning a system two-variable linear equation. *KnE Social Sciences*, pp. 423-430, 2024.

[17] M. T. Hidayat, S. S. Rahim, S. Parumo, N. N. A'bas, M. A. Muhammad Sani and H. Abdul Aziz, Designing a Two-Dimensional Animation for Verbal Apraxia for Children with Verbal Apraxia of Speech. *Ingenierie des Systemes d'Information,* 27(4), pp. 645-651, 2022. https://doi.org/10.18280/isi.270415

[18] M. T. Hidayat, S. S. Rahim, S. Parumo, N. N. A'bas, M. A. Muhammad Sani and H. Abdul Aziz, Evaluation on the Effects of 2D Animation as a Verbal Apraxia Therapy for Children with Verbal Apraxia of Speech. *International Journal of Advanced Computer Science and Applications*, *13*(7), pp. 139–148, 2022. http://dx.doi.org/10.14569/IJACSA. 2022.0130719

[19] Barefoot Books. "Barefoot books singalong," accessible at https://www.youtube.com/watch?v=ynlmvWAdCug&list=PL0maGUp7cdUn5uuLnjsk1NvV2u5Yg5LAV&index=3, 2020.

[20] Terapi Austisme Online. "Terapi verbal huruf A, B, C, D, E," accessible at https://www.youtube.com/watch?v=k3W7zQiNl6c, 2017.

[21] N. N. A'bas, S. S. Rahim, M. L. Dolhalit, W. S. N. Saifudin, N. Abdullasim, S. Parumo, R. N. Raja Omar, S. Z. Md Khair, K. Kalaichelvam and S. I. Noor Izhar. Development and Usability Testing of a Consultation System for Diabetic Retinopathy Screening. *International Journal of Advanced Computer Science and Applications*, *12*(5), pp. 178–188, 2021. https://doi.org/ 10.14569/ IJACSA.2021.0120522

[22] N. N. .A'bas, S. S. Rahim, M. L. Dolhalit, W. S. N. Saifudin, N. Abdullasim, S. Parumo, R. N.Raja Omar, S. Z. Md Khair, K. Kalaichelvam and S. I. Noor Izhar, Web Usability Testing on Diabetic Retinopathy Consultation System. *Ingénierie Des Systè Mes d' Information*, *26*(3), 255–264, 2021. https://doi.org/10.18280/isi. 260302

[23] S. S. Rahim and T. W. Ching, "An interactive content development for depression awareness among tertiary students", International Journal of Advanced Computer Science and Applications, vol. 9, no. 9, pp. 78-87, 2018.

[24] Sivakumar, A., Willows, K., Behroozan, S., and Stairs, J. A multilingual sexual and reproductive health animation: a novel educational tool for newcomer patients. *Canadian Medical Education Journal*, *15*(1), pp. 83-85, 2024.

Feeley, T. H., Keller, M., and Kayler, L. Using animated videos to increase patient knowledge: a meta-analytic review. *Health Education & Behavior*, *50*(2), pp. 240-249, 2023.

[25] Nasruddeen, A., Newton, B., Sani, M. (2024).Effect of Animated Visuals for Teaching Medical Students in Gombe State University. Inter. J. Acad. Res. Educ. Rev. 12(2): 30-41