

USER-CENTERED DESIGN (UCD) AND GRAPHIC NOVEL APPROACH TO FOSTERING LGBTQ+ UNDERSTANDING IN THAILAND

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ABSTRACT

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This research investigates discrimination arising from limited knowledge and understanding of LGBTQ+ people within families, schools, and workplaces in Thailand. The aim of this study is to design, develop, and evaluate an illustrated e-book that effectively addresses gender equality concerns among young adults aged 18–24 in Thai society. The researchers applied a User-Centered Design (UCD) framework, taking user needs and goals into consideration throughout the development process. This research adopts graphic novels as instructional tools to design educational materials that promote positive attitudes toward LGBTQ+ people. A three-phase mixed-methods approach, aligned with UCD principles, was used. The study recruited 10 members of the target audience and nine LGBTQ+ people to identify user interests and preferences, developed an illustrated e-book based on their insights, and then quantitatively evaluated it through a survey of 100 young adults. Participants rated the e-book positively, reporting mean scores of 4.61/5 for design, 4.52/5 for layout and typography, and 4.53/5 for content. Furthermore, 97% of participants reported a better understanding of the LGBTQ+ community and indicated that they would recommend the e-book to others. This research contributes to existing scholarship by developing an illustrated e-book for LGBTQ+ education in Thailand that targets young adults through UCD. The design process, which involved members of the LGBTQ+ community, demonstrates how user engagement can help address sensitive social issues.

Keywords: User-Centered Design (UCD); LGBTQ; graphic novel; Thailand; youth; e-book

1. INTRODUCTION

In Thailand, there is some degree of public acceptance of LGBTQ+ people, but legal and other forms of discrimination remain in many areas of life. Research indicates that Thai society largely overlooks the inclusion of LGBTQ+ individuals within families and in educational and professional settings (Badgett & Sell, 2018; Newman et al., 2021). Numerous international and Thai studies demonstrate that LGBTQ+ individuals experience socially institutionalized discrimination, often practiced silently, as well as restrictive barriers to acceptance and understanding (Logie et al., 2016; Nemoto et al., 2012; Sapsirisavat et al., 2016).

The use of graphic novels to increase understanding has gained traction as a means of meeting educational needs. As noted by Carter (2007), graphic novels are increasingly appreciated for their ability to

engage diverse learners and are beginning to be recognized as a resource with significant pedagogical potential in the classroom (Carter, 2007; Gorman & Smith, 2003; Morrison et al., 2002).

To address these issues, this study applies User-Centered Design (UCD) guidelines as described by Norman (1986). This approach consists of four basic steps: identifying users, determining requirements, designing solutions, and evaluating the design to ensure the product is fit for purpose. Guided by these principles, the study aims to design, develop, and evaluate an illustrated e-book tailored to promote discussions on gender equality among young adults aged 18–24 years. The research, structured according to UCD principles, comprises three phases. Phase 1 consists of two sets of interviews: one with 10 late adolescents (aged 18–24 years) to explore their preferences as potential e-book users, and another with nine members of the LGBTQ+ community discussing their experiences in family, workplace, and educational contexts. In Phase 2, attention shifts to the development of the e-book illustrations, addressing the three dimensions of gender diversity identified in Phase 1. In Phase 3, UCD principles guide a quantitative evaluation of the e-book through an online survey of 100 respondents aged 18–24 years.

This research contributes to existing scholarship in two primary ways. It addresses the challenge of LGBTQ+ education and awareness in Thailand by offering an illustrated e-book tailored to engage and effectively reach young adults. Moreover, it demonstrates the application of UCD in the development of a sociocultural educational graphic novel. The design process, which included user interviews as well as input from members of the LGBTQ+ community, demonstrates how user involvement can support the evaluation of design outcomes and provides a framework for addressing sensitive social issues.

2. LITERATURE REVIEW

2.1 Challenges faced by LGBTQ+ young adults in Thailand

Although LGBTQ+ issues have received increasing attention in international research (Directorate-General for Justice and Consumers, 2017; Paternotte, 2016; United Nations, 2013; Weber, 2015), discrimination against LGBTQ+ people remains widespread. In Thailand, while there is some public acceptance, LGBTQ+ individuals continue to face discrimination in many areas of life (Badgett & Sell, 2018; Newman et al., 2021). This is particularly harmful for young adults aged 18–24 years, who are developing their identities and building their futures.

In educational settings, bullying and social ostracism are major forms of discrimination affecting Thai LGBTQ+ students (Cheung et al., 2020; Newman et al., 2021). A study at Mahidol University found that 56% of LGBTQ+ individuals reported being bullied, contributing to higher dropout rates (World Bank, 2018). The 2008 Basic Education Core Curriculum described gender diversity as “sexual deviancy,” and 64% of LGBTQ+ individuals reported that their curriculum lacked LGBTQ+ content (United Nations Development Programme, 2019).

In the workplace, young LGBTQ+ adults face barriers including harassment, hiring discrimination, and termination based on sexual orientation (Cheung et al., 2020; Meyer, 2003; Newman et al., 2021; Nemoto et al., 2012). World Bank (2018) reported that 41% of gay men, 25% of lesbian women, and 23% of transgender individuals conceal their identity at work, resulting in chronic anxiety that negatively affects mental well-being. Transgender young adults face additional challenges, they are unable to change identity documents in Thailand (Cheung et al., 2020; Newman et al., 2021).

Within Thailand’s family-oriented culture, LGBTQ+ young adults face considerable obstacles. A UNDP survey found that 48% of respondents experienced familial discrimination, and families frequently misperceive LGBTQ+ identity as a mental illness (Cardoso, 2009; Cheung et al., 2020; Davis et al., 2019; Guadamuz et al., 2015; Meyer, 2003; Newman et al., 2021; Nemoto et al., 2012). For young adults who still depend on family support, this rejection increases the risk of losing access to educational and social services.

The combined discrimination across these settings places LGBTQ+ young adults at serious mental health risk. Minority stress is associated with higher rates of depression and suicidal ideation among LGBTQ+ young adults (Baams et al., 2015; Hill et al., 2017; Meyer, 2003; Mustanski et al., 2014).

2.2 The need for positive educational resources for LGBTQ+ youth

The challenges outlined above highlight the need for positive educational resources for young adults. In Thailand, 64% of LGBTQ+ individuals reported that their curriculum did not include information on gender diversity (United Nations Development Programme, 2019). Without accurate resources, young people may develop misunderstandings that contribute to discrimination (Cheung et al., 2020; Newman et al., 2021). Moreover, socially institutionalized discrimination often operates in silence (Logie et al., 2016; Nemoto et al., 2012; Sapsirisavat et al., 2016), and positive educational resources can help break this silence.

Positive materials serve two purposes. For LGBTQ+ young people, seeing their experiences reflected in educational content provides validation and reduces isolation, as social support is a protective factor against depression (Baams et al., 2015; Hill et al., 2017; Meyer, 2003). For non-LGBTQ+ young adults, exposure to LGBTQ+ narratives can build empathy and challenge stereotypes shaped by cultural norms and the absence of inclusive education. Given these needs, well-designed materials addressing LGBTQ+ issues for Thai young adults aged 18–24 are clearly needed.

2.3 The history of LGBTQ+ graphic novels and comics

LGBTQ+ comics and graphic novels have a long history of representing the lives and experiences of sexual and gender minorities. According to Stein (2004), openly positive LGBTQ+ characters first appeared in comics after the Stonewall Riots in 1969, and the genre evolved from underground self-published works in the 1970s to widely recognized publications by the 1990s. These works address themes of identity, discrimination, civil rights, and coming out, allowing readers to engage with LGBTQ+ experiences through visual storytelling. This history shows that comics and graphic novels have long served as tools for promoting visibility and understanding of LGBTQ+ communities.

2.4 Utilizing graphic novels for LGBTQ+ understanding enhancement

The term “graphic novel” generally refers to book-length works in comic form, a form popularized by Eisner in 1985 with his book *Contact with God*. Eisner (1985) described graphic novels as a medium of expression and sequential art. The publishing sector for graphic novels has also shown stronger growth compared to traditional publishing (Gorman & Smith, 2003). In relation to LGBTQ+ topics, graphic novels and comics offer distinct advantages. Pedri and Velentzas (2020) argue that comics express identity and sexuality through the embodied representation of characters. This enables for rich portrayals of sexuality and intersecting identity aspects, challenging social taboos and stigma. Graphic novels and comics can also function as a form of resistance to the marginalization of sexually non-hegemonic identities. Through the integration of narrative and visual elements, they contest societal taboos and promote understanding of diverse lived experiences. For these reasons, graphic novels are well suited to addressing LGBTQ+ themes in educational contexts.

2.5 User-Centered Design application as design process

User-Centered Design comprises four main stages: defining a target market, identifying user characteristics, developing design strategies, and evaluation (Norman, 1986). This approach prioritizes user needs as the foundation of the design process and requires the participation of potential users to ensure the final product is usable (Norman, 1986). The users for this project were defined as young Thai adults (18–24 years old) who were interviewed to identify their preferences. An illustrated e-book was then created, followed by a quantitative evaluation. Throughout the process, the principles of UCD were applied.

3. RESEARCH METHODOLOGY

This research uses a mixed-methods approach based on Norman’s (1986) UCD principles. Following the four essential steps of UCD—recognizing the target audience, identifying user requirements and preferences, developing design solutions, and evaluating the design—the study is organized into three phases:

3.1 Phase 1: Target audience and interviews with LGBTQ+ participants (UCD principles: target market identification and user requirements/preferences definition)

Qualitative data were collected through two sets of interviews. The first set included 10 participants aged 18–24 years, who had experience with e-books and were representative of different genders. Semi-structured interviews were used to elicit preferences for e-book design, including eight illustration types and four layout types. The second set included nine LGBTQ+ individuals selected for their personal experiences in family, workplace, or school contexts. These interviews provided in-depth narratives to support content development and ensure that the design solutions are grounded in user experiences.

3.2 Phase 2: Developing design solutions—illustrated e-book (UCD principles: creating design solutions)

This phase focuses on the development of an illustrated e-book addressing three key gender diversity issues identified in Phase 1. Following UCD guidelines, the design process incorporates audience preferences alongside the lived experiences of the LGBTQ+ community, supporting a user-centered approach. This iterative process ensures that the design solutions address core user needs and requirements.

3.3 Phase 3: Target audience satisfaction evaluation of the e-book design (UCD principles: assessing designs)

A quantitative assessment was conducted via an online survey of 100 young adults aged 18–24 years, administered through Google Forms. The sample size was determined using Taro Yamane's formula (1967), based on Thailand's population of 6,083,528 individuals aged 18–24 years (National Statistical Office, n.d.), with a 90% confidence level and a 10% margin of error. This phase corresponds to the evaluative stage of UCD and aims to assess the extent to which the e-book achieves its purpose in addressing gender diversity issues among the intended audience. This mixed-methods framework, grounded in UCD principles, provides insight into audience preferences and LGBTQ+ lived experiences, ultimately resulting in an e-book that addresses gender diversity in a way that is relevant to young adults.

4. RESULTS

4.1 Phase 1: Results of interviews with the target audience

As part of the interviews, participants were shown eight illustration styles, four grid layout types, and three storytelling formats. For content analysis, the authors applied thematic analysis techniques and grouped similar responses through coding. This analysis was conducted collaboratively with three colleagues. The results are presented in Table 1.

Table 1: Target group interview results using thematic analysis and coding analysis

Themes	Original comments
1. Styles of illustrations	
Big and bold [4 mentions]	• The colors have many different shades, which represent the LGBTQ+ community. • From my perspective, the colors are inviting and bright, which makes them easier to read. • What I appreciate is that the anatomy is not lifelike; it is imperfect. This aligns with the theme of LGBTQ+.
Minimalist [3 mentions]	• That aesthetic is also appealing to me. Images should be kept to a minimum and avoid being flashy, instead striving for simplicity.
Comic [2 mentions]	• Comics are a genre that I enjoy. In my opinion, they are more accessible than many other styles. • It appears to have motion, which helps it avoid looking static.
2. Styles of layouts	
Manuscript grid [4 mentions]	• For me, the layout is both interesting and polished, optimal for reader navigation and comprehension. • Each component enhances clarity, engagement, order, and meaning.
Hierarchical grid [3 mentions]	• This can also add to the interest in the images and stories associated with them. • The other layouts seem to impose limits; this one allows for greater arrangement of components.
Modular grid [2 mentions]	• The arrangement facilitates legibility and ease of reading.
3. Styles of writing	
Informal, easy to understand [9 mentions]	• Polite speech is my least preferred type of language. I would choose something simple to read and easy to understand. • The vocabulary used should be simple and accessible. The messages should be clear, friendly, and easy to understand.
Storytelling [5 mentions]	• The content should be organized from broad concepts and then narrow down to LGBTQ+ family issues.
Explanations of group-specific terminology [3 mentions]	• Group-specific terminology can be used, but it should be explained.
4. Characteristics of an LGBTQ+ e-book	
Engaging content [7 mentions]	• Moving images do not capture my interest as much as written content does. • A well-written book is one that has engaging content.
Attractive cover and title [4 mentions]	• It should start with the title itself. • The title alone should be something that piques interest and compels readers to engage with the book.
Illustrations that support the story [3 mentions]	• Illustrations should support the text. Example images can better illustrate concepts, helping to simplify complex ideas and convey the intended message visually within seconds.

4.2 Phase 1: Results of LGBTQ+ participant interviews

In the first phase, the researchers conducted interviews with nine LGBTQ+ individuals. The interviews were structured around three themes: family, school, and workplace experiences. Participants were invited to share their experiences across these contexts, and the interviews were organized accordingly. The analysis focused on shared LGBTQ+ issues across time and context, which were synthesized into material for the design project. Table 2 presents the demographic profiles of participants and the three thematic groupings.

Table 2: Demographic profiles of LGBTQ+ participants

Family issues		School issues		Workplace issues	
Participant 1	30 years, Gay	Participant 4	26 years, Tomboy	Participant 7	26 years, Gay
Participant 2	30 years, Lesbian	Participant 5	25 years, Bisexual	Participant 8	25 years, Transgender
Participant 3	26 years, Tomboy	Participant 6	22 years, Tomboy	Participant 9	22 years, Bisexual

4.2.1 Family issues: All three LGBTQ+ participants (participant 1–3) reported low levels of family acceptance of their non-heteronormative sexual orientations, contributing to queerphobic family dynamics. As a result, issues arising from both participants' own families and their partners' families became the focus of this section.

4.2.2 School issues: The safety concerns experienced by participant 4–6 were linked to sexual harassment in school settings. Art experienced physical bullying and threats related to his LGBTQ+ identity. When such incidents occurred, teachers were unable to provide adequate support due to a lack of understanding of the circumstances. As a result, sexual harassment and insufficient staff awareness of LGBTQ+ issues emerged as the key school-related problems.

4.2.3 Workplace issues: Due to their LGBTQ+ status, participant 7 and 8 experienced a lack of recognition of their abilities by coworkers, highlighting the need for validation of their professional skills. At the same time, participant 8 and 9 reported verbal and physical sexual harassment in the workplace. As a result, the key issues identified in this context were sexual harassment and the failure to recognize the workplace capabilities of LGBTQ+ individuals.

4.3 Phase 2: Designing the illustrated e-book

Using data from both sets of interviews in Phase 1, the researchers developed and designed an electronic book to communicate gender diversity issues. The design steps were as follows.

4.3.1 Developing the storyline

The researchers found that interview data from the intended audience indicated a positive response to storytelling techniques. Based on participant feedback, it was suggested that the main characters in all three stories should have clearly defined genders. This approach enables the representation of a range of LGBTQ+ issues, as shown in Table 3.

Table 3: Story writing plan

Categories	Writing issues
Family	- Families do not accept having an LGBTQ+ member in the family - Families do not accept romantic relationships between people of different sexual orientations and gender identities - Non-heteronormative individuals are treated as if they need to earn their family's acceptance through various means
Schools	- Sexual harassment, both physical and verbal - School staff lack knowledge about the treatment of non-heteronormative individuals
Workplaces	- Sexual harassment, both physical and verbal - Non-heteronormative individuals (LGBTQ+) do not receive acknowledgement of their skills and contributions in employment settings

4.3.2 Design of illustrations and layout

Using data from LGBTQ+ participant interviews, the researchers developed the illustrations. The layout of the illustrated book was designed using Manuscript Grid and Hierarchical Grid systems. Prompt was selected as the secondary font, while TH Sarabun NEW served as the primary font. To enhance readability on digital devices, Kobayashi's (1987) color design principles based on harmonic color theory were applied, along

with a minimum font size of 14 pt. To represent emotions and situations, colors were selected to reflect the experiences of LGBTQ+ individuals. Sadness was depicted using cool tones such as purple, while warm colors such as red signified anger or dangerous situations (Kobayashi, 1987). Most readers preferred avoiding overly bright colors that may strain the eyes during e-book reading. In response, researchers applied principles of color design balancing bright tones with subdued and dark tones. The final design resulted in an illustrated book of 58 pages. The e-book was titled *Can You Hear Us?* and used typography for the title design, with rainbow colors aligned with the LGBTQ+ community's flag. This approach ensured that the intended audience could easily identify and understand the gender diversity issues addressed in the e-book, as shown in Figures 1 and 2. In addition, illustrations and stories themed around family, school, and workplace contexts are presented in Tables 4–6.



Figure 1: Front cover of the e-book with title



Figure 2: Examples of e-book layout with illustrations

Table 4: Illustrations and stories in the family theme



1. Non has a family of three members, including his mother and an older brother. By birth, Non is the youngest child. From a very young age, Non shows many traits that are traditionally considered feminine.



2. Non does not enjoy playing football or participating in other stereotypically "boyish" games that are common among children his age. Instead, he prefers to play with dolls alongside his female friends. This often results in his older brother ridiculing and insulting him by using the term "toot," a derogatory label for gay men. Nonetheless, at this stage, Non does not yet understand the concept of gender diversity.



3. Over time, Non becomes more aware of LGBTQ+ identities. He goes through a stage of exploring his sexuality and ultimately concludes that he is attracted to men and identifies as gay. After completing his degree and starting work, Non's mother frequently asks, "When will you have a girlfriend?" or "When will you get married?" In response to this ongoing pressure, Non feels compelled to answer and chooses to disclose his sexual identity to her.



4. As expected, Non's mother opposes this and expresses her rejection of gender-diverse individuals. However, this does not change Non's determination to be accepted by his family. Non continues to approach his family in every possible way.



5. He even introduces his then-boyfriend to his family. After several years, Non's family comes to accept his sexual orientation. However, this acceptance is not mutual, as his boyfriend's family does not recognize their relationship. They experience intense sociocultural scrutiny, which ultimately leads to the end of Non's relationship with his boyfriend.



6. On the day Non's relationship ends, he decides to tell his mother the truth in person. To his surprise, his mother comforts him, saying, "Don't be sad. No matter what your gender is, as long as you live a happy life, that is enough."

Table 4: Illustrations and stories in the family theme (continued)



7. At last, Non feels that he can be open about his gender identity and senses that he is accepted by his family.

Table 5: Illustrations and stories in the school theme



1. Rin is a girl from the provinces who has just transferred to a school in Bangkok. As soon as she arrives, Rin becomes very close to a new classmate named Fern. However, because Fern's outward appearance is somewhat tomboyish, the two are often teased by their classmates, who suggest they are a couple.



2. One day, Rin's family sees a photo of Rin and Fern together on social media and becomes very upset. They call Rin back to their home in the province and force her to swear before the family altar that she will never have a same-sex partner. As a result, the friendship between Rin and Fern gradually fades. However, Rin does not believe that same-sex relationships are wrong.



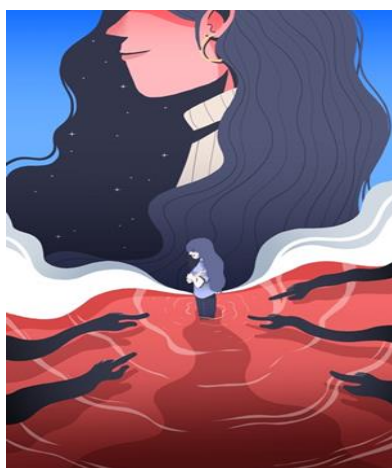
3. Eventually, Rin starts dating a girl who pursues her. However, instead of this relationship being accepted by those around her, Rin faces sexual harassment. One day, after a late school event, Rin has to stay overnight at a close female underclassman's house, along with a male senior student they both know.

Table 5: Illustrations and stories in the school theme (continued)

4. Late at night, an unexpected incident occurs when the male senior appears to attempt to sexually assault Rin. She resists, and as she begins to cry out for help, the senior stops. He says, "I just wanted to prove that Rin still has feelings for men," and quickly leaves. After the incident, the senior behaves as if nothing happened. Rin continues to encounter men who approach her with various intentions.



5. One day, Rin's male friend can no longer tolerate the situation and gets into a fight with other men who approach Rin with sexually harassing words and behavior. The incident escalates and is referred to the school disciplinary office. However, the teachers do not appear to understand situations involving LGBTQ+ individuals, dismissing it as a fight over a girl. Moreover, when Rin's family learns about the incident, instead of supporting her, they blame her, saying her behavior is the reason she encounters such situations. As events unfold, Rin can only hope that Thai society will become more open-minded toward LGBTQ+ individuals, as what she has experienced—regardless of sexual orientation—is something no one should have to endure.

Table 6: Illustrations and stories in the workplace theme

1. Bua, a recent university graduate, begins her first job at a creative company. Bua identifies as a transgender woman. On her first day, her coworkers appear to be accepting of her, but an older employee, P' Yot, seems to take an immediate dislike to her.



2. Moving forward, Bua's work life is not as ideal as she anticipated. P' Yot continually verbally harasses her in both a condescending and sexual manner. Despite warnings from other coworkers, these efforts appear futile as he does not pay attention to them.



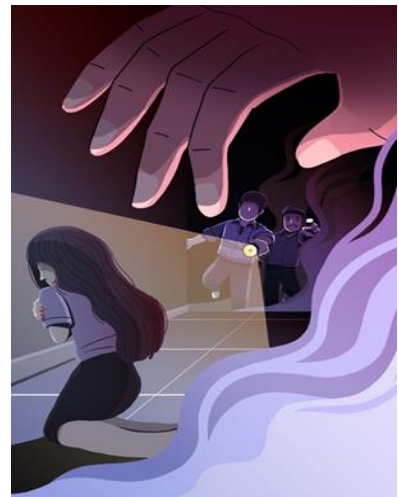
3. P' Yot becomes increasingly relentless in his harassment and begins teasing Bua daily. When Bua does not engage with his behavior, he becomes more emboldened.

Table 6: Illustrations and stories in the workplace theme (continued)

4. While Bua is in the restroom, she overhears P' Yot talking about her with his friend. P' Yot states that he does not like LGBTQ+ people and feels uncomfortable around them. He also does not accept Bua's work capabilities from the first day they meet. To justify his behavior, he states: "Hiring these kinds of people damages the company's image."



5. Bua's close male friends also become targets of P' Yot's bullying, as he begins asking them whether they share the same "taste" because they often spend time with Bua. Bua considers these actions problematic and feels sorry for her friends, as she believes they may suffer consequences for supporting her.



6. One day, Bua is assigned to work with P' Yot by the company owner. During this period, she tries her best to focus on her work. While working overtime one night, P' Yot approaches her desk and sexually harasses her. Bua is shocked and tries to resist, resulting in a struggle that knocks several items off her desk. As a security guard walks through the area, he notices the incident.



7. Afterward, the conflict between Bua and P' Yot escalates and is brought to the attention of the company owner, who places P' Yot on leave. However, the matter remains unresolved. P' Yot becomes furious with Bua and plans to ambush her after work. Fortunately, a colleague who leaves with Bua intervenes and prevents P' Yot from harming her.



8. Following these events, P' Yot is dismissed from the company. According to Bua, the incident serves as a reminder that people need to change their perceptions and attitudes and learn to coexist with LGBTQ+ individuals. They are ordinary people who do not deserve violence, discrimination, or doubts about their professional abilities.

4.4 Phase 3: Target audience satisfaction evaluation of the e-book design

A quantitative approach was used to measure target audience satisfaction with the e-book. The assessment was conducted through an online Google Forms survey with 100 respondents. Selection criteria focused on male and female readers aged 18–24 years who had prior experience reading e-books. Sample size determination followed Taro Yamane's (1967) formula, using a 90% confidence level and a 10% margin of error.

Respondents evaluated the e-book based on its story content, design components, and treatment of gender equality issues. A total of 106 respondents participated. Their demographic profiles and satisfaction evaluation are presented in Tables 7 and 8.

Table 7: Demographic profiles of 106 participants

	Number	Percentage
Gender		
Male	24	22.6%
Female	82	77.4%
Age		
18–20	30	28.3%
21–24	76	71.7%
Education		
Highschool	11	10.4%
Bachelor's degree	84	79.3%
Higher than bachelor's degree	8	7.5%
Other	3	2.8%
Experience in reading e-books		
Yes	101	95.3%
No	5	4.7%

Table 7 indicates that most respondents (71.7%) were aged 21–24 years, while the remaining 28.3% were aged 18–20 years. There were more female respondents (77.4%) than male respondents (22.6%). Most respondents (79.3%) were Bachelor's degree, followed by 10.4% in the high school graduates. In addition, 95.3% of participants reported prior experience in reading e-books, while 4.7% reported no such experience.

Table 8: Summary of target audience satisfaction evaluation of the e-book design based on Likert rating scales

Topics	$\bar{X}$	S.D.	Meaning
1. Illustrated electronic book design			
Illustrated book color tones are attractive and interesting	4.66	0.60	Very satisfied
Illustrations are interesting	4.64	0.58	Very satisfied
Illustrations effectively communicate e-book content	4.51	0.64	Very satisfied
Total mean	4.61	0.61	Very satisfied
2. Layout and typography			
Layout design is appropriate and interesting	4.54	0.59	Very satisfied
Font characteristics are readable and appropriate	4.50	0.63	Very satisfied
Total mean	4.52	0.61	Very satisfied
3. Content			
Content presentation increased understanding of LGBTQ+ issues	4.56	0.59	Very satisfied
Electronic book content presentation is interesting	4.55	0.69	Very satisfied
Content amount per page is appropriate for reading	4.54	0.59	Very satisfied
Electronic book content presentation is credible	4.47	0.66	Satisfied
Total mean	4.53	0.63	Very satisfied
4. Desirability			
Yes	103	97%	
No	3	3%	

Scale or criteria of interpretation: 4.50–5.00 = Very satisfied; 3.50–4.49 = Satisfied; 2.50–3.49 = Moderately satisfied; 1.50–2.49 = Less satisfied; 1.00–1.49 = Least satisfied.

5. DISCUSSION

5.1 Illustrated electronic book design

The color tones received the highest mean score of 4.66/5, along with “illustrations are interesting” and “illustrations effectively communicate e-book content,” which received scores of 4.64/5 and 4.51/5, respectively. These findings confirm the initial interviews that identified a “Big and bold” illustration style, indicating that the intended meaning of the illustrations was effectively executed and well received. Overall, the mean score (4.61/5) indicates strong appreciation for the design. The high rating for the color scheme also

suggests that the design successfully addressed the emotional aspects of LGBTQ+ experiences and therefore met expectations (mean = 4.66/5). This aligns with findings from Newman et al. (2021) and United Nations Development Programme (2019) regarding mental health concerns among the LGBTQ+ population in Thailand. Selecting colors that align with characters' emotional journeys helps bridge the gap between content and audience, thereby enhancing empathy and understanding. The mean scores for illustration interest (4.64/5) and communication effectiveness (4.51/5) further support the importance of visual elements in youth engagement, as noted in several studies (Kasemsarn & Nickpour, 2017; Kasemsarn & Sawadsri, 2024; Smiciklas, 2012). This study focuses on LGBTQ+ education and demonstrates that appropriate visuals can clarify complex social issues for adolescents and young adults. Kasemsarn (2024) also recommends developing character depictions that closely resemble the age and context of intended readers. The findings further corroborate Alqudah et al. (2019), who argue that integrating text and images improves comprehension compared to text alone and can be effectively applied in teaching LGBTQ+ issues.

5.2 Layout and typography

The results on layout and typography support existing literature on design aimed at maximizing reader engagement. High ratings for "layout design is appropriate and interesting" (4.54/5) and "font characteristics are readable and appropriate" (4.50/5) align with findings by Azlan (2019) and Kasemsarn (2022). These studies emphasize the importance of careful planning of layout elements, including text, columns, images, and white space, to enhance visual appeal and reading effectiveness. The results particularly support Azlan's (2019) assertion that reader engagement depends on well-designed layouts. Feedback from the initial target audience interviews also indicated satisfaction with the use of Manuscript Grid and Hierarchical Grid systems in the early e-book drafts, suggesting that these layout choices were appropriate. This highlights the importance of involving target users in the design process to ensure the final product meets their expectations. These findings contribute to existing research by applying established design principles to an e-book addressing LGBTQ+ issues among Thai adolescents. The high satisfaction scores suggest that attention to layout and typography in materials addressing sensitive social topics can improve their effectiveness. Overall, the findings indicate that applying sound, research-informed design principles enhances reader engagement and satisfaction, even in complex or sensitive subject areas.

5.3 Content

The rating "Content presentation increased understanding of LGBTQ+ issues" received the highest score (4.56/5), indicating that the UCD approach was effective in developing materials that both educated and resonated with learners. This aligns with the core principle of UCD, which prioritizes user needs and interests at the outset of the design process (Norman, 2017; Tongsubanan & Kasemsarn, 2025). Further support for effective user involvement is reflected in the ratings for "electronic book content presentation is interesting" (4.55/5) and "content amount per page is appropriate for reading" (4.54/5). These results suggest that incorporating user feedback and iterative design refinement contributed to a product that met audience expectations. The rating for "electronic book content presentation is credible" (4.47/5) underscores the importance of incorporating real-life experiences from LGBTQ+ participants. Overall, these findings validate the application of UCD principles (Norman, 2017) in the development of educational materials addressing sensitive social issues. By involving both LGBTQ+ participants and the target audience throughout the design process, the researchers were able to develop an e-book that enhanced awareness, maintained user interest, and was perceived as credible.

5.4 Desirability

The recommendation rate of 97% for the illustrated e-book indicates strong alignment with McGinley's (2012) concept of desirability in innovative product design. This factor not only reflects usability but also demonstrates perceived value and appropriateness (McGinley, 2012). It also supports Carter's (2007) findings on the effectiveness of graphic novels in accommodating diverse learning styles, as well as Gorman and Smith's (2003) observation that visual storytelling enables readers to comprehend a substantial portion of content through images. The e-book's positive reception further suggests its effectiveness in making LGBTQ+ topics more visually, cognitively, and emotionally accessible, thereby enhancing recall and engagement. These findings reinforce existing research on the educational value of graphic novels and their capacity to communicate complex social issues. Overall, the design choices and narrative format used to engage young adults with sensitive subject matter demonstrate potential to foster understanding and empathy, thereby achieving the educational objectives of the e-book.

6. CONCLUSION

This research addresses discrimination against LGBTQ+ people in Thai families, schools, and workplaces, together with limited public awareness of LGBTQ+ issues. Guided by the principles of UCD, the study aimed to design, develop, and evaluate an illustrated e-book that addresses gender equality concerns among young adults aged 18–24 years. The findings demonstrate the effectiveness of UCD in incorporating graphic novels into educational materials while meeting user needs throughout the design process.

This research followed a three-phase approach based on the UCD framework. First, user needs were identified through interviews with LGBTQ+ community members (nine participants) and a general audience (10 participants). Second, an illustrated e-book was developed based on these insights, with family, education, and workplace issues identified as the three principal themes. Finally, in line with UCD principles, the e-book was evaluated through a quantitative assessment involving 100 young adults. The significance of this study lies in several aspects. It demonstrates the effective application of UCD principles in developing a graphic novel for social education, serving as a communication tool for complex issues faced by LGBTQ+ individuals. The high levels of acceptance and understanding also suggest potential for broader impact. This research shows how UCD, combined with graphic novels, can be used to address sensitive social issues, and its cultural relevance to Thai audiences indicates potential applicability in other contexts. The study proposes an appropriate LGBTQ+ educational resource for Thai audiences and confirms the value of applying UCD principles and illustrated e-books in addressing social issues. High satisfaction scores, increased understanding, and willingness to recommend the resource suggest that this integrated approach may contribute to building a more inclusive society, particularly among young people.

6.1 Study limitations

First, the Zoom interviews conducted during the 2021–2022 COVID-19 pandemic in Thailand may have limited the depth of interaction, posing a challenge for qualitative data collection. Second, the lack of local literature on graphic novels addressing LGBTQ+ issues in Thailand required reliance on international sources, which may not fully reflect the Thai context of gender diversity.

6.2 Implications

Educators could use similar graphic novel-based materials as an adjunct to lessons aimed at fostering awareness and inclusivity regarding LGBTQ+ issues. This may be incorporated into existing subjects, such as social studies or health education, or as part of broader diversity and inclusion policies. In addition, this model may support human resource managers in developing more engaging training materials on diversity and inclusion. Scenarios may draw on real-life experiences of LGBTQ+ employees in various workplace settings to promote understanding among colleagues. Topics could include inclusive workplace practices, LGBTQ+ organizational rights, and the prevention of harassment and discrimination.

6.3 Future studies

Future studies should consider cross-cultural adaptation to evaluate the effectiveness of this e-book format in different cultural contexts. This may include translating and culturally adapting the material for specific countries or regions, as well as assessing its impact across diverse settings. In addition, comparative media effectiveness research could be conducted to compare illustrated e-books with other formats, such as traditional text-based materials, videos, or interactive websites, in presenting LGBTQ+ themes. Finally, future research may examine age group variations by exploring how this approach can be adapted for different age groups, ranging from children to older adults. This could include investigating the visual and narrative adjustments required to address LGBTQ+ issues appropriately across developmental stages.

DECLARATION

1. Conflict of interest

The authors declare no conflict of interest.

2. Generative AI and AI-assisted technologies in the writing process

The authors acknowledge the use of Claude (Anthropic), and Grammarly in the preparation of this manuscript. Claude AI was used to refine sentence structure and ensure consistent tone and style. Grammarly was used for final grammar and punctuation checks. The output from these AI tools served as initial drafts, which were then thoroughly reviewed, verified, and edited by the authors to ensure accuracy and alignment with the original research content. All content was carefully reviewed and rechecked by the authors.

3. Data availability statement

The data that support the findings of this study are available from the corresponding author, Kittichai Kasemsarn, upon reasonable request.

4. Ethics statement

The authors have obtained informed consent from all individuals included in this study.

5. Funding

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6. Contributor Role Taxonomy (CRediT)

Nuttcha Sumthong: Conceptualization, Writing – original draft, Methodology, Formal analysis, Investigation, Writing – review & editing.

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REFERENCES

- Alqudah, D., Bidin, A. B., & Md Hussin, M. A. H. B. (2019). The impact of educational infographic on students' interaction and perception in Jordanian higher education: Experimental study. *International Journal of Instruction*, 12(4), 669–688. <https://doi.org/10.29333/iji.2019.12443a>
- Azlan, A. (2019). *A study on illustration for traditional Malay poem book layout design* [Undergraduate honors thesis, Universiti Teknologi MARA]. Perpustakaan Tun Abdul Razak. <https://ir.uitm.edu.my/id/eprint/28389>
- Baams, L., Grossman, A. H., & Russell, S. T. (2015). Minority stress and mechanisms of risk for depression and suicidal ideation among lesbian, gay, and bisexual youth. *Developmental Psychology*, 51(5), 688–696. <https://doi.org/10.1037/a0038994>
- Badgett, M. L., & Sell, R. (2018). *A set of proposed indicators for the LGBTI inclusion index*. World Bank. <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/608921536847788293/>
- Cardoso, F. L. (2009). Recalled sex-typed behavior in childhood and sports' preferences in adulthood of heterosexual, bisexual, and homosexual men from Brazil, Turkey, and Thailand. *Archives of Sexual Behavior*, 38, 726–736. <https://doi.org/10.1007/s10508-008-9312-6>
- Carter, J. B. (2007). Transforming English with graphic novels: Moving toward our "Optimus Prime". *The English Journal*, 97(2), 49–53. <https://www.jstor.org/stable/30046788>
- Cheung, D. H., Boonmongkon, P., Ojanen, T. T., Damri, T., Samoh, N., Cholratana, M., Ratchadapunnathikul, C., Gilman, S. E., Sass, J., & Guadamuz, T. E. (2020). Peer victimisation and depression among gender conforming and non-conforming Thai adolescents. *Culture, Health & Sexuality*, 22(7), 808–821. <https://doi.org/10.1080/13691058.2020.1737235>
- Davis, J. D., Miles, G. M., & Quinley III, J. H. (2019). "Same same, but different": A baseline study on the vulnerabilities of transgender sex workers in the sex industry in Bangkok, Thailand. *International Journal of Sociology and Social Policy*, 39(7–8), 550–573. <https://doi.org/10.1108/IJSSP-01-2019-0022>
- Directorate-General for Justice and Consumers. (2017). *List of actions by the Commission to advance LGBTI equality*. European Commission. https://commission.europa.eu/document/download/c307e4dd-43b6-4970-9f45-03e07d8aae98_en?filename=lgbti-actionlist-dg-just_en.pdf
- Eisner, W. (1985). *Comics & sequential art*. Poorhouse Press.
- Gorman, M., & Smith, J. (2003). *Getting graphic! Using graphic novels to promote literacy with preteens and teens*. Linworth.
- Guadamuz, T. E., Goldsamt, L. A., & Boonmongkon, P. (2015). Consent challenges for participation of young men who have sex with men in HIV prevention research in Thailand. *Ethics & Behavior*, 25(2), 180–195. <https://doi.org/10.1080/10508422.2014.949721>
- Hill, R. M., Rooney, E. E., Mooney, M. A., & Kaplow, J. B. (2017). Links between social support, thwarted belongingness, and suicide ideation among lesbian, gay, and bisexual college students. *Journal of Family Strengths*, 17(2), Article 6. <https://doi.org/10.58464/2168-670X.1350>
- Kasemsarn, K. (2022). Creating a cultural youth tourism eBook guidelines with four design factors. *The International Journal of Visual Design*, 16(2), 31–51. <https://doi.org/10.18848/2325-1581/CGP/v16i02/31-51>

- Kasemsarn, K. (2024). Applying classic literature to facilitate cultural heritage tourism for youth through multimedia e-book. *Heritage*, 7(9), 5148–5173. <https://doi.org/10.3390/heritage7090243>
- Kasemsarn, K., & Nickpour, F. (2017). Inclusive digital storytelling to understand audiences' behaviours. *The International Journal of Visual Design*, 11(4), 35–51. <https://doi.org/10.18848/2325-1581/CGP/v11i04/35-51>
- Kasemsarn, K., & Sawadsri, A. (2024). Universal design for learning (UDL) in heritage education: A multimedia approach to 'Phra Aphai Mani'. *Heritage*, 7(10), 5907–5931. <https://doi.org/10.3390/heritage7100277>
- Kobayashi, S. (1987). *A book of colors: Matching colors, combining colors, color designing, color decorating*. Kodansha International.
- Logie, C. H., Newman, P. A., Weaver, J., Rongkrachon, S., & Tepjan, S. (2016). HIV-related stigma and HIV prevention uptake among young men who have sex with men and transgender women in Thailand. *AIDS Patient Care and STDs*, 30(2), 92–100. <https://doi.org/10.1089/apc.2015.0197>
- McGinley, C. G. (2012). *Supporting people-centred design through information and empathy* [Doctoral dissertation, Brunel University]. Brunel University Research Archive (BURA). <http://bura.brunel.ac.uk/handle/2438/7591>
- Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin*, 129(5), 674–697. <https://doi.org/10.1037/0033-2909.129.5.674>
- Morrison, T. G., Bryan, G., & Chilcoat, G. W. (2002). Using student-generated comic books in the classroom. *Journal of Adolescent & Adult Literacy*, 45(8), 758–767. <https://www.jstor.org/stable/40012828>
- Mustanski, B., Andrews, R., Herrick, A., Stall, R., & Schnarrs, P. W. (2014). A syndemic of psychosocial health disparities and associations with risk for attempting suicide among young sexual minority men. *American Journal of Public Health*, 104(2), 287–294. <https://doi.org/10.2105/AJPH.2013.301744>
- National Statistical Office. (n.d.). *Statistical data*. Ministry of Digital Economy and Society. https://www.nso.go.th/nsoweb/index?set_lang=en#gsc.tab=0/
- Nemoto, T., Iwamoto, M., Perngparn, U., Areesantichai, C., Kamitani, E., & Sakata, M. (2012). HIV-related risk behaviors among kathoey (male-to-female transgender) sex workers in Bangkok, Thailand. *AIDS Care*, 24(2), 210–219. <https://doi.org/10.1080/09540121.2011.597709>
- Newman, P. A., Reid, L., Tepjan, S., & Akkakanjanasupar, P. (2021). LGBT+ inclusion and human rights in Thailand: A scoping review of the literature. *BMC Public Health*, 21(1), Article 1816. <https://doi.org/10.1186/s12889-021-11798-2>
- Norman, D. A. (1986). Cognitive engineering. In D. A. Norman & S. W. Draper (Eds.), *User centered system design: New perspectives on human-computer interaction* (pp. 31–61). CRC Press.
- Norman, D. A. (2017). *User centered system design: New perspectives on human-computer interaction*. CRC Press.
- Paternotte, D. (2016). The NGOization of LGBT activism: ILGA-Europe and the Treaty of Amsterdam. *Social Movement Studies*, 15(4), 388–402. <https://doi.org/10.1080/14742837.2015.1077111>
- Pedri, N., & Velentzas, I. (2020). Sexuality and mental illness in comics: Notes towards an introduction. *Journal of Graphic Novels and Comics*, 11(4), 357–372. <https://doi.org/10.1080/21504857.2020.1773885>
- Sapsirisavat, V., Phanuphak, N., Keadpudsa, S., Egan, J. E., Pussadee, K., Klaytong, P., Friedman, M. R., van Griensven, F., Stall, R., & The FAITH Study Team. (2016). Psychosocial and behavioral characteristics of high-risk Men Who Have Sex with Men (MSM) of unknown HIV positive serostatus in Bangkok, Thailand. *AIDS and Behavior*, 20, 386–397. <https://doi.org/10.1007/s10461-016-1519-2>
- Smiciklas, M. (2012). *The power of infographics: Using pictures to communicate and connect with your audiences*. Que Publishing.
- Stein, M. (2004). *Encyclopedia of lesbian, gay, bisexual, and transgender history in America*. Thomson Gale.
- Tongsubanan, S., & Kasemsarn, K. (2025). Developing a design guideline for a user-friendly home energy-saving application that aligns with User-Centered Design (UCD) principles. *International Journal of Human-Computer Interaction*, 41(12), 7424–7446. <https://doi.org/10.1080/10447318.2024.2398324>
- United Nations. (2013). *Free and equal campaigns*. <https://www.unfe.org/>
- United Nations Development Programme. (2019). *Tolerance but not inclusion: A national survey on experiences of discrimination and social attitudes towards LGBT people in Thailand*. United Nations. <https://www.undp.org/publications/tolerance-not-inclusion/>
- Weber, S. (2015). Daring to marry: Marriage equality activism after Proposition 8 as challenge to the assimilationist/radical binary in queer studies. *Journal of Homosexuality*, 62(9), 1147–1173. <https://doi.org/10.1080/00918369.2015.1037127>
- World Bank. (2018, March 26). *Economic inclusion of LGBTI groups in Thailand*. <https://www.worldbank.org/en/country/thailand/publication/economic-inclusion-of-lgbti-groups-in-thailand/>
- Yamane, T. (1967). *Elementary sampling theory*. Prentice Hall.