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Development of a 2D Animated Short Film on School Bullying Using Rigging and Tweening: A Descriptive Evaluation of Audience Perceptions

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ABSTRACT

This study reports the development of Phantom, a two-dimensional (2D) animated short film that addresses school bullying through a character-centred narrative and examines viewers' perceptions of its moral message and entertainment value. The production process followed the Multimedia Development Life Cycle (MDLC), comprising concept development, design, material collection, assembly, testing, and distribution. Character sketches and storyboards were prepared before character assets were rigged and animated using keyframes and tweening in Moho. The completed film has a duration of 7 minutes and 36 seconds and was exported in MP4 format at 1920 × 1080 resolution with a 16:9 aspect ratio. Audience evaluation involved 50 viewers who completed a 10-item, five-point Likert questionnaire. The overall weighted score was 2,167 out of 2,500, equivalent to 86.68%. The source manuscript also reports separate scores for moral-message perception and entertainment; recalculation of these subscale scores depends on confirming the original questionnaire's item-to-dimension mapping, which was not provided. The overall result indicates favourable self-reported audience perceptions. It does not establish changes in bullying knowledge, attitudes, or behaviour because the study did not report a pre-test/post-test design or a comparison group. The study contributes a documented 2D animation production workflow and preliminary descriptive evidence of audience reception. Further research should validate the questionnaire and use a stronger evaluation design to determine whether the film produces measurable educational outcomes.

Keywords:
2D animation; character rigging; tweening; school bullying; multimedia development; audience perception.

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INTRODUCTION

Bullying among school-aged children and adolescents is a persistent form of peer violence with consequences for physical, psychological, social, and educational well-being (Jennifer et al., 2006; Rahman & Nadhirah, 2022). It is not synonymous with an isolated disagreement: research definitions commonly require repeated aggressive behaviour, intentional harm, and an imbalance of power that makes it difficult for the targeted person to defend themselves (Menesini & Salmivalli, 2017, p. 241; Sabah et al., 2022, p. 16347). The US Centers for Disease Control and Prevention similarly describes youth bullying as unwanted aggressive behaviour involving a perceived power imbalance and repetition, with potential physical, psychological, social, or educational harm (Lim & Lee, 2021, p. 27; Prevention, 2024). These characteristics make bullying a social issue that requires communication strategies capable of representing both the visible acts and their less visible consequences for those targeted.

Animated short films offer one way to represent complex interpersonal experiences through character action, visual metaphor, sound, and temporal change. Unlike a static image, animation can depict the progression of an event, the recurrence of harmful behaviour, and changes in a character's emotional state (Boydell & Croguennec, 2022, p. 11473; Forceville & Paling, 2018, p. 118). However, the presence of movement does not automatically make an animation an effective educational medium. Ploetzner et al. (2020), in a systematic review of 194 studies, found that animation was more advantageous than static pictures when the changes occurring in space and time were themselves relevant to what viewers needed to learn. This suggests that animation design should be aligned with the communicative purpose of the narrative

rather than relying on visual motion or entertainment value alone.

A related technical challenge concerns the production of coherent character movement. In 2D character animation, the animator must coordinate character assets, poses, timing, and transitions so that movement remains visually intelligible and supports the intended action. Rigging provides a controllable structure for moving character components, while keyframe-based tweening generates intermediate states between selected poses (Ciccone et al., 2019, p. 1; Hecker et al., 2008). These tools can organise the animation workflow, but automated interpolation does not by itself guarantee expressive movement: the quality of the result also depends on pose design, timing, spacing, staging, and the principles of character animation. Lasseter (1987) established the continuing relevance of traditional animation principles to computer animation, including the importance of timing and the presentation of action. Thus, a production account should describe not only the software used but also how rigging and keyframe transitions are incorporated into the film-making process.

Research on bullying-themed animation and video provides evidence of both the potential and the limitations of audiovisual communication. Jennifer et al. (2006) evaluated a school activity day built around the non-verbal animated film Bully Dance. The activity combined film viewing with brainstorming, role-play, worksheets, and group discussion; although the programme was designed to address bullying behaviours and bystander responses, the study did not find a significant overall increase in anti-bullying attitudes. Migliaccio and Raskauskas (2013), by contrast, reported increases in bullying knowledge, attitudes toward victims, and knowledge of help-seeking after a classroom video-discussion intervention involving 81 students and pre-test/post-test assessment. Razzaq et al. (2022, p. 29528) examined a six-week cartoon-based anti-bullying literacy programme with 120 students in an intervention group and 40 in a comparison group; the cartoon was combined with teaching aids, worksheets, and activity-based learning. Taken together, these studies indicate that video and animation can contribute to bullying-related education, but the educational process often includes structured discussion, repeated exposure, or other instructional components rather than a single unaccompanied viewing.

The broader evidence base reinforces the need to distinguish media production from intervention effectiveness. Moe-Byrne et al. (2022, p. 1010779) reviewed 38 controlled trials of video animation as an information tool. Animation favoured knowledge outcomes in 19 of the 30 studies that assessed knowledge, whereas findings for attitudes and cognitions were less consistent (six positive findings among 21 studies), and behavioural outcomes favoured animation in four of nine studies. The authors also reported that only four of the 38 trials were rated as having a low risk of bias. In the bullying-prevention field, Fraguas et al. (2020) synthesised 69 randomised clinical trials involving 111,659 participants and found statistically significant, although small, effects of school-based programmes on bullying and mental-health-related outcomes. More recently, Serritella et al. (2025) reviewed 65 studies of technology-based bullying and cyberbullying interventions, including fully digital and blended approaches. These reviews support the relevance of digital media, while also showing that robust claims about learning, attitudes, or prevention require outcome measures and evaluation designs that go beyond audience satisfaction.

Despite this growing literature, two strands of work are often considered separately: technical accounts of animation production, including rigging and tweening, and evaluations of video-based bullying education as part of structured interventions. The studies cited above provide evidence about animation principles or educational outcomes, but they do not describe the specific production workflow and post-viewing audience-reception profile of the Phantom short film (Gaffney et al., 2019, p. 27). The gap addressed here is therefore a focused documentation gap, not a claim that no previous bullying-themed animation exists. In particular, there is a need to connect the practical implementation of a 2D rigging-and-tweening workflow with a transparent description of how viewers rate the completed film, while keeping audience perception distinct from demonstrated educational or behavioural impact.

To address this gap, this study develops Phantom, a 2D animated short film about a secondary-school student named Silver who experiences repeated bullying. The narrative uses a recurring dark shadow as a visual metaphor for the cumulative burden of the experiences, while scenes involving family members and supportive peers provide contrasting narrative contexts. The film was produced using the six-stage Multimedia Development Life Cycle (MDLC): concept, design, material collection, assembly, testing, and distribution. Moho was used for character rigging and keyframe-based tweening; the completed film was then distributed online and evaluated through a 10-item, five-point Likert questionnaire completed by 50 viewers.

The study addresses three research questions: (RQ1) How were character rigging and keyframe-based tweening implemented within the MDLC workflow to produce the Phantom 2D animated short film? (RQ2) How were the bullying-related narrative and its visual motifs represented in the completed film? (RQ3) What descriptive patterns are observed in viewers' post-viewing evaluations of the film? The objectives are to document the production workflow and output characteristics, describe the visual narrative, and report the audience evaluation using the available item-level response data.

The principal contribution is an applied case study that links a documented 2D animation production pipeline with preliminary descriptive evidence of audience reception for a bullying-themed narrative. Technologically, the study records how character assets, rigging, keyframes, tweening, editing, and export were combined in a completed short film. Scientifically, it distinguishes the implementation of an animation technique and viewers' favourable post-viewing ratings from stronger claims about learning or bullying prevention. The study does not propose a new tweening algorithm, compare tweening experimentally with frame-by-frame animation, or test a controlled anti-bullying intervention. These unresolved questions define the limits of the present evidence and the

direction for subsequent technical and educational evaluation.

MATERIALS AND METHODS

The study combined multimedia product development with a descriptive post-viewing audience evaluation. Because the research concerns a digital animation artefact rather than a physical manufacturing process, manufacturing-specific variables such as workpiece properties, machine settings, sensor accuracy, energy use, and production yield were not applicable and were not measured. The methodological description below is restricted to the resources, production operations, output specifications, survey procedure, and analyses documented in the original study.

Materials, software, and development resources

The developed artefact was a 2D animated short film titled Phantom. The production resources reported in the source manuscript comprised character sketches, a written script, storyboard panels, textures, reference images, background assets, and other visual materials used during assembly. The character set included Silver, Ares, Alfred, Kell, Ricky, Bara, Silver's mother, and supporting characters. Moho was identified as the software used for character rigging and animation. The manuscript also reports scene editing, music integration, and visual effects, but does not identify the editing software or audio-production tools.

The study record does not specify the computer hardware, operating system, Moho version, editing-software version, display characteristics, audio format, or file bitrate. No physical workpieces, manufacturing machines, sensors, or laboratory instruments were used or reported. These omissions are stated explicitly because they limit exact software-environment replication; the authors should add the available configuration details from the original production records before journal submission.

Research design and multimedia development procedure

A developmental case-study design was used to create the film, followed by a descriptive survey of viewers. The production process was organised using the six-stage MDLC framework. The framework served as a project workflow rather than an experimental treatment: no alternative animation technique, control film, or comparison production group was included. The activities and outputs recorded for each stage are summarised in Table 1.

Table 1. MDLC stages, activities, and outputs documented in the development of Phantom.

MDLC stage	Activities and outputs
Concept	Defined the format as a 2D animated short film, the title as Phantom, the theme as school bullying, and the target audience as adolescents to adults. The story follows Silver and a recurring shadow associated with his bullying experiences.
Design	Prepared the script, storyboard, and character sketches. The storyboard specified the sequence and approximate timing of scenes.
Material collection	Collected character sketches, script, storyboard, textures, reference images, backgrounds, and other visual assets.
Assembly	Created character models, prepared character rigs, animated characters using keyframes and tweening, developed backgrounds, and combined scenes, music, and visual effects during editing.
Testing	Reviewed scenes against the storyboard and checked the exported video for playback or production errors. No formal expert validation or objective motion-quality metric was reported.
Distribution	Exported the film as an MP4 file and distributed it through YouTube on 17 July 2024. A survey link was circulated to collect viewers' evaluations.

Animation production process and technical parameters

Character concepts were first developed as sketches and converted into digital character assets. During the assembly stage, character components were prepared for movement through rigging in Moho. The source article specifically documents rigging work on Silver's hair. Character movement was then created by defining an initial keyframe and a subsequent keyframe at a different position on the timeline. The software generated intermediate movement between the two keyframes; the procedure was repeated to construct the required actions. The available production record does not provide the number of bones or controllers, keyframe coordinates, interpolation curves, easing settings, frame counts, or frame rate.

Backgrounds, scenes, music, and visual effects were assembled during editing. The source manuscript identifies vignette, noise, colour adjustment, blur, and other scene-specific effects as part of the visual treatment. The final film was exported as an MP4 video with a resolution of 1920 × 1080 pixels and a 16:9 aspect ratio. Its reported running time was 7 minutes and 36 seconds. The frame rate, video bitrate, audio sampling rate, and compression settings were not reported.

The production characteristics treated as observable outputs in this study were the use of Moho for rigging and tweening, the completion of the film, its duration, container format, resolution, aspect ratio, and distribution date. The study did not measure production time, animator workload, number of keyframes, motion smoothness, rendering time, or file-compression efficiency. Consequently, no quantitative comparison of tweening efficiency or animation quality can be made. No process factor was deliberately varied, and no independent-variable experiment was conducted. For the audience component, the recorded response variables were the frequencies in the five Likert categories for each of the ten questionnaire items; the derived indicators were the item weighted score and item percentage index. No direct measure of learning gain, attitude change, or behaviour was collected.

Audience evaluation instrument and data-collection procedure

Audience evaluation was conducted after the film had been distributed online. The source manuscript reports 50 respondents and a questionnaire containing 10 items. Each item was rated on a five-point Likert scale: strongly agree (5), agree (4), moderately agree (3), disagree (2), and strongly disagree (1). The questionnaire was intended to capture viewers' evaluations of the film's moral message and entertainment value. The source manuscript states that each dimension contained five items, but it does not

provide the exact wording of the items or identify the item numbers assigned to each dimension.

The film link and questionnaire link were distributed after the film's YouTube release. The manuscript does not report the respondents' age, gender, educational status, location, recruitment method, sampling strategy, eligibility criteria, survey dates, viewing conditions, response rate, or whether responses were collected anonymously. Although the intended audience was described as adolescents to adults, this does not establish the demographic composition of the 50 respondents. These participant and administration details must be recovered from the original survey records and added before submission.

Production checking and evaluation procedure

Production checking was performed by reviewing the completed scenes against the storyboard and checking whether the exported video played as intended. Where a scene did not meet the planned sequence or showed an error, the relevant section was adjusted and exported again. This procedure represents an internal production check. The manuscript does not report independent expert review, formal usability testing, inter-rater assessment, frame-by-frame motion analysis, or a benchmark comparison with another animation workflow.

The audience questionnaire was used as a descriptive reception measure after viewing. It was not a pre-test/post-test instrument and did not include a control group or delayed follow-up. No validated knowledge scale, attitude scale, behavioural-intention measure, or observed bullying outcome was reported. Accordingly, the evaluation can describe viewers' ratings of the film but cannot establish learning gains, attitude change, or preventive effectiveness.

Data analysis, reproducibility, and research ethics

The questionnaire data were analysed descriptively using weighted Likert scores. For item i, the weighted score was calculated as the sum of the response frequency in each category multiplied by its corresponding weight:

$$S_i = \sum_{j=1}^{5} (f_{ij} \times w_j)$$

where S_i is the weighted score for item i, f_{ij} is the number of responses in category j for item i, and w_j is the category weight (5, 4, 3, 2, or 1). With 50 respondents and a maximum weight of 5, the maximum possible score for each item was 250. The item index was calculated as:

$$I_i\ (\%) = [S_i / (N \times 5)] \times 100$$

where N = 50. The overall index was calculated by dividing the sum of the weighted scores across all ten items by the maximum possible total score (10 × 50 × 5 = 2,500), then multiplying by 100. No inferential statistical tests were conducted because the available dataset contains post-viewing response frequencies only and no comparison or baseline observations. Dimension-level indices were not recalculated because the item-to-dimension mapping was not available for verification.

The source manuscript does not report the software used for survey tabulation, data cleaning, or statistical calculation; it also does not describe procedures for missing responses, duplicate submissions, outlier handling, or uncertainty estimation. The published response table contains 50 responses for each of the ten items, and the calculations in this manuscript were independently recomputed from those frequencies. The original questionnaire, anonymised respondent-level dataset, and analysis file should be retained and made available as supplementary material where consent and institutional policy permit.

The source manuscript does not provide an ethics approval or exemption statement, informed-consent procedure, or safeguards for respondents who may have been under 18 years of age. These details cannot be inferred and must be supplied by the authors from the original study documentation. If minors participated, the authors should report the applicable parental or guardian consent and participant assent procedures.

RESULTS

The results are presented in the order of the research questions. Section 3.1 reports the completed film and the documented implementation of rigging and tweening (RQ1). Section 3.2 describes the visual narrative and the use of visual motifs to represent bullying (RQ2). Section 3.3 reports the item-level audience evaluation derived from the 50 respondents' Likert responses (RQ3).

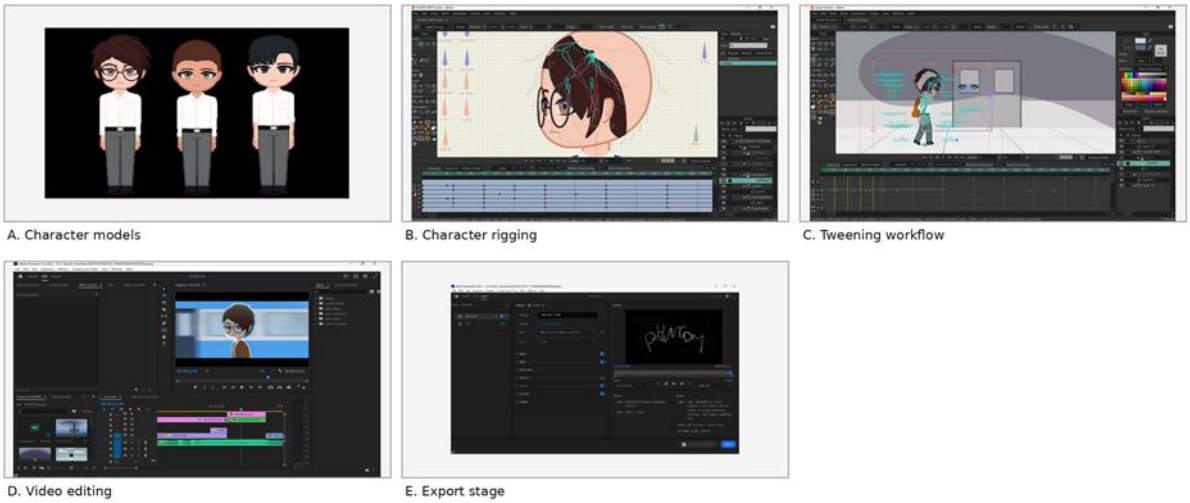
Production output and implementation of rigging and tweening

The principal output was Phantom, a two-dimensional animated short film with a reported running time of 7 minutes and 36 seconds. The film was exported as an MP4 video at 1920 × 1080 pixels (Full HD) with a 16:9 aspect ratio and was distributed through YouTube on 17 July 2024. Moho was used for character rigging and keyframe-based animation. The original manuscript does not specify the frame rate, Moho version, exact export bitrate, or a verified public URL for the film; these technical details are therefore not inferred here.

Table 2. Technical characteristics of the Phantom animated film.

Characteristic	Reported specification
Film title	Phantom
Media format	2D animated short film
Running time	7 min 36 s
Video container	MP4
Resolution	1920 × 1080 pixels (Full HD)
Aspect ratio	16:9
Rigging/animation software	Moho
Distribution channel and date	YouTube; 17 July 2024

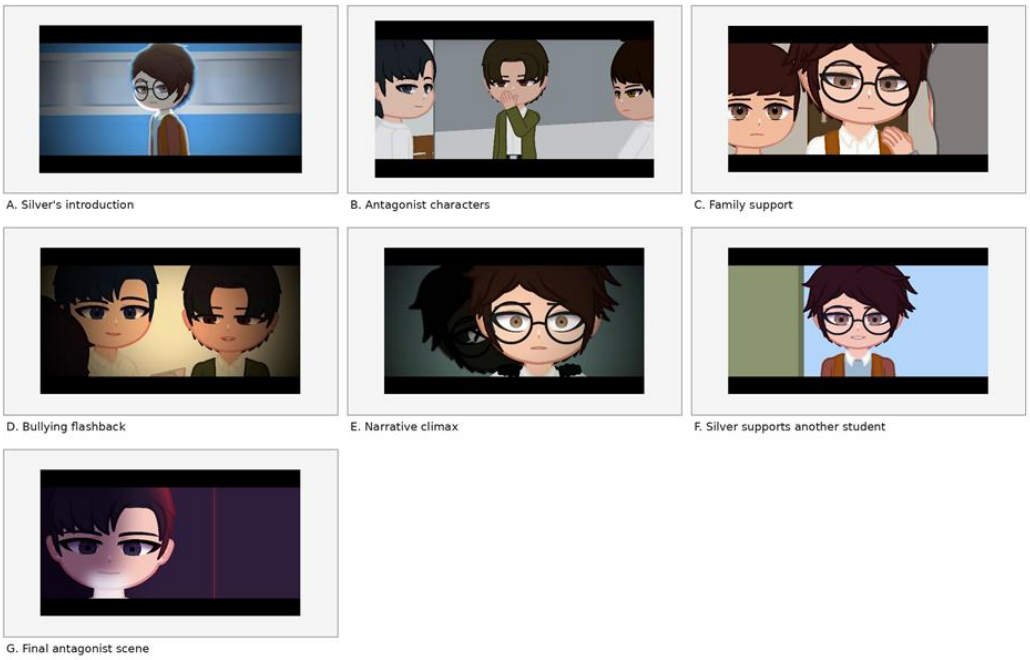
The production evidence documents a sequence from character modelling to rigging, tweening, editing, and final export. Figure 1 consolidates the screenshots presented separately in the source article. The character-model image shows the designed appearances of Silver, Ares, and Alfred. The rigging screenshot records the preparation of Silver's hair for movement. The animation-interface screenshot documents the character movement workflow, while the editing and export screenshots show the final assembly and output stages. These images substantiate that the stated production stages were carried out; they do not, by themselves, quantify animation smoothness, production efficiency, or technical quality.



Note. Compiled from the production screenshots in the original article (original Figures 5–8 and export-stage screenshot).
Figure 1. Selected production stages of Phantom: (A) character models; (B) character rigging; (C) tweening workflow; (D) video editing; and (E) export stage.

Visual narrative and representation of bullying

The film uses a recurring dark shadow as a visual metaphor for the continuing psychological burden associated with Silver's bullying experiences. The narrative moves from the introduction of Silver, through scenes involving antagonistic peers and family support, to flashback and crisis sequences. The selected frames in Figure 2 illustrate how character placement, colour treatment, and visual effects are used to distinguish narrative situations. The antagonist scene introduces Alfred and his peers as the source of the bullying. The family scene uses a warmer visual treatment and presents Silver with supportive family members. In contrast, the flashback and climax frames use darker tones, vignette, and other effects to communicate distress and the protagonist's negative thoughts. The final narrative frame shows Silver helping another student who is experiencing bullying. The source article also describes a post-credit image of Alfred in a dark setting, suggesting that the antagonist's accountability remains unresolved within the story. These are descriptions of the film's visual and narrative construction; the study did not report a separate content-analysis or expert-rating procedure for evaluating the accuracy or impact of these representations.



Note. Selected from the original article's Figures 9 and 12–17. Panel descriptions follow the accompanying scene explanations in the source manuscript.
Figure 2. Representative narrative frames from Phantom: (A) Silver's introduction; (B) antagonist characters; (C) family support; (D) bullying flashback; (E) narrative climax; (F) Silver supporting another student; and (G) the final antagonist scene.

Descriptive audience evaluation

Audience evaluation involved 50 respondents who had watched the film. The questionnaire comprised 10 items rated on a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). The source article reports that the questionnaire was intended to assess the moral message and entertainment value. However, it does not reproduce the wording of the 10 items or identify which item numbers belong to each dimension. Accordingly, the response frequencies can be recalculated at the item level,

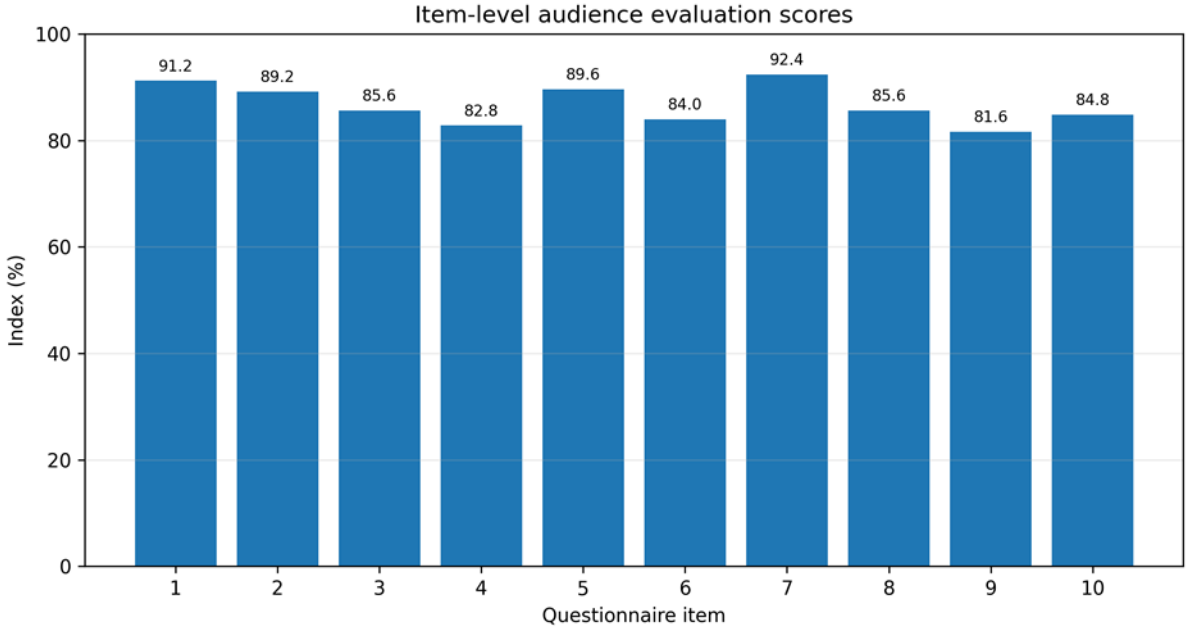
whereas the reported dimension-level scores cannot be independently verified. For each item, the weighted score was calculated by multiplying the number of responses in each category by its Likert weight and summing the products. Because each item received 50 responses, the maximum possible weighted score was 250. The item index was calculated as: **Item index (%) = (weighted score / 250) × 100**

Table 3. Response frequencies and item-level audience evaluation indices (N = 50).

Item	SA	A	MA	D	SD	Weighted score	Index (%)
1	32	16	1	0	1	228	91.2
2	29	17	3	0	1	223	89.2
3	19	26	5	0	0	214	85.6
4	19	22	7	1	1	207	82.8
5	29	18	1	2	0	224	89.6
6	21	20	8	0	1	210	84.0
7	35	11	4	0	0	231	92.4
8	20	25	4	1	0	214	85.6
9	18	19	12	1	0	204	81.6
10	19	24	7	0	0	212	84.8

Note. Each item had 50 responses. SA = strongly agree; A = agree; MA = moderately agree; D = disagree; SD = strongly disagree. Weighted score = 5(SA) + 4(A) + 3(MA) + 2(D) + 1(SD).

As shown in Table 3 and Figure 3, the item-level indices ranged from 81.6% to 92.4%. Item 7 had the highest index (92.4%; weighted score = 231), whereas Item 9 had the lowest index (81.6%; weighted score = 204). Across all 10 items, the total weighted score was 2,167 out of a maximum of 2,500, giving an overall index of 86.68%. The arithmetic mean of the ten item indices is also 86.68%, because each item had the same number of respondents and the same maximum score.



Note. Redrawn from the response frequencies in the original article's Table 3. The values are item indices calculated against a maximum score of 250 per item.

Figure 3. Item-level audience evaluation indices for the 10 questionnaire items.

The original article additionally reports an overall rounded result of 87%, with 88% for the moral-message dimension and 86% for entertainment. The recalculated overall result (86.68%) is consistent with the reported rounded overall value. However, the two dimension-level values cannot be checked against the published response table because the item-to-dimension allocation and the wording of each item are not provided. They are therefore recorded here as values reported by the original authors, not as independently verified subscale calculations. The available data support a description of favourable post-viewing responses; they do not establish an increase in knowledge, a change in attitudes, or a reduction in bullying behaviour.

DISCUSSION

This study examined Phantom as both a multimedia artefact and a communication product addressing school bullying. The findings should be interpreted at two distinct levels: (i) the documented feasibility of producing a 2D animated short film through a workflow combining character rigging and keyframe-based tweening, and (ii) viewers' post-viewing evaluations of the film. The distinction is important because evidence that a film has been produced and positively rated does not, by itself, demonstrate that it changes knowledge, attitudes, or bullying-related behaviour.

Technical implications of the rigging and tweening workflow

The production evidence shows that Phantom was developed through a staged workflow in which character concepts were translated into digital assets, selected character components were rigged in Moho, and movement was generated by placing keyframes along the timeline and

interpolating the intervening frames. Figure 1 documents the transition from character modelling to rigging, animation, editing, and export. In particular, the rigging screenshot records the preparation of Silver's hair, while the animation-interface screenshot provides visual evidence of the subsequent keyframe-based movement process. The completed artefact was exported as a 1920 × 1080 MP4 video with a 16:9 aspect ratio and a duration of 7 min 36 s.

This workflow is consistent with the broader principle that computer animation adapts established principles of drawn animation to digital production. Lasseter (1987) explains that principles such as timing, spacing, anticipation, and the staging of action remain relevant when animation is implemented computationally. In Phantom, rigging and tweening provide the production mechanism for moving character assets between defined poses; however, interpolation alone does not guarantee expressive or convincing motion(Even et al., 2023, p. 412; Safonova & Hodgins, 2007, p. 107). The perceived quality of movement also depends on the placement of key poses, temporal spacing, trajectory, and the relationship between movement and narrative intention(Gemeinboeck, 2021, p. 577916; Safonova & Hodgins, 2007, p. 107). The manuscript documents the use of keyframes and automatic in-between generation, but does not report interpolation curves, frame rate, keyframe density, or a formal assessment of motion quality. The result therefore supports the feasibility of applying rigging and tweening in this production, rather than a claim that the technique is more efficient or produces better motion than frame-by-frame animation.

The distinction between animation as a production technique and animation as a communication medium is also important. Ploetzner et al. (2020), in a review of 194 studies, found that animation is particularly useful when the changes represented over space and time are themselves relevant to what viewers need to understand. This finding offers a useful interpretive lens for Phantom: the progressive appearance of the shadow, changes in character posture, and transitions between scenes make temporal and emotional development visible. Nevertheless, Ploetzner et al. (2020) review concerned instructional animations and learning outcomes; it should not be treated as direct evidence that the aesthetic or narrative choices in Phantom improve anti-bullying knowledge. Rather, it supports the more limited argument that animation can make selected changes perceptible when those changes are central to the intended message. At the same time, the technique of rigging and tweening used in Phantom differs from fully hand-drawn cel animation, in which every drawn frame is controlled individually to convey expressive timing and weight (Hosen et al., 2021, p. 159; Schulz et al., 2019, p. 2). Rigging and tweening therefore trade some of this granular control for efficiency, relying on predefined part relationships and automated in-between generation to produce motion at a scale that frame-by-frame production rarely allows(Ciccone et al., 2019, p. 2; Holden et al., 2016, p. 1168).

Visual storytelling and the representation of bullying

The film's recurring dark shadow provides a visual motif through which repeated bullying experiences are represented as an accumulating burden. This motif is reinforced by the contrast between darker, cooler scenes associated with fear and distress and warmer scenes depicting family support. As shown in Figure 2, the narrative moves from Silver's introduction and encounters with antagonistic peers to family interactions, flashback sequences, a crisis scene, and an ending in which Silver supports another student. The combination of recurring imagery, colour contrast, and character action gives the film a coherent visual vocabulary for distinguishing threatening and supportive contexts.

This approach is comparable in purpose, although not identical in design, to the animated short film Bully Dance examined by Jennifer et al. (2006);(El-Hameed, 2024). Their study used a non-verbal animation to introduce bullying behaviours, coping strategies, and the role of bystanders, but the film was embedded in a structured activity day that included discussion and group tasks. Importantly, the authors did not find a significant overall increase in anti-bullying attitudes after the activity day. They suggested that the intervention may have influenced knowledge and understanding more than attitudes. This result cautions against assuming that a bullying-themed animation automatically produces a change in viewers' attitudes. In relation to Phantom, the shadow metaphor and the final scene of peer support should therefore be understood as narrative devices intended to prompt reflection, not as demonstrated mechanisms of attitude change.

The ending of Phantom also raises an interpretive issue. Silver's decision to help another student can be read as a prosocial response that positions a former victim as a potential source of support (Francisco et al., 2024, p. 179; Schrijvers et al., 2018, p. 25). At the same time, the post-credit depiction of Alfred appears to leave the antagonist's accountability unresolved. This ambiguity may be intentional as a narrative device, but it could also weaken or complicate the moral message if viewers interpret the ending as suggesting that bullying has no consequences. The article does not report audience responses to this specific scene. Future screenings should therefore include a short facilitated discussion or a comprehension item addressing responsibility, bystander action, help-seeking, and the difference between supporting a victim and resolving the underlying bullying situation. Such prompts would help ensure that the film's emotional impact translates into a clearer understanding of the difference between individual support and collective responsibility, a distinction that the school-based intervention literature also emphasises when it stresses bystander roles and safe reporting pathways (Gaffney et al., 2021, p. 45; Menabò et al., 2023, p. 264).

Interpretation of audience evaluation in relation to previous studies

The 50 respondents produced an overall questionnaire index of 86.68%, with item-level indices ranging from 81.6% to 92.4% (Table 3 and Figure 3). Item 7 recorded the highest index (92.4%), while Item 9 recorded the lowest (81.6%). These results indicate favourable post-viewing evaluations among the respondents who completed the survey. They provide preliminary evidence that the film was generally received positively, but the result should be described as audience evaluation or

perceived acceptability rather than as proof of educational effectiveness.

The distinction is consistent with the wider evidence on animated video as an information medium. Moe-Byrne et al. (2022, p. 1010779), in a systematic review of 38 controlled trials, reported that animation was associated with greater knowledge in 19 of the 30 studies that assessed knowledge. However, positive findings were less consistent for attitudes and cognitions (6 of 21 studies) and behaviour (4 of 9 studies); the review also identified substantial risk-of-bias concerns in many included studies. Similarly, Ploetzner et al. (2020) emphasised that the benefits of animation depend on the relationship between the dynamic information represented and the learning task. Together, these reviews suggest that positive reception of an animated video should not be conflated with measurable learning or behavioural change.

Studies specifically addressing bullying-themed videos provide a useful comparison. (Migliaccio & Raskauskas, 2013) evaluated a classroom video-discussion intervention involving 81 students in Grades 4–6 and reported post-intervention gains in bullying knowledge, attitudes toward victims, and knowledge of whom to approach for assistance. (Razzaq et al., 2022, p. 29527) examined a six-week anti-bullying video-literacy programme with 120 students in the intervention group and 40 in a comparison group. Their cartoon-based programme was accompanied by repeated screenings, worksheets, activities, and pre-test/post-test assessment. These studies are relevant because they show how video or animation can be incorporated into a broader educational intervention. However, their designs and procedures differ from the Phantom evaluation, which reports a post-viewing Likert questionnaire and does not document a comparison group, baseline measure, or facilitated learning activities. Consequently, their educational outcomes cannot be attributed to Phantom or directly compared with its 86.68% perception index.

Evidence from broader anti-bullying intervention research reinforces this distinction. Fraguas et al. (2020) synthesised 69 randomised clinical trials involving 111,659 participants and found statistically significant effects of school-based anti-bullying interventions on bullying and mental-health-related outcomes. Serritella et al. (2025), in a systematic review of 65 studies on technology-based approaches, identified a range of technology-enabled and blended protocols, including interactive tools such as serious games and virtual reality. These reviews concern structured interventions rather than the acceptability of a single short film. They therefore support positioning Phantom as a possible communication resource within a wider prevention or classroom programme, not as a stand-alone intervention already proven to reduce bullying.

The original manuscript also reports rounded scores of 88% for the moral-message dimension and 86% for entertainment. These dimension-level results cannot be independently recalculated from the published frequency table because the wording of the 10 questionnaire items and their allocation to the two dimensions are not supplied. They should therefore remain identified as values reported by the original authors until the original questionnaire is checked. Even if the item mapping is confirmed, the percentages remain descriptive ratings: they do not show that viewers' understanding improved relative to a baseline, nor do they establish that viewers would behave differently in a real bullying situation.

Contribution and implications for practice

The contribution of this study is best understood as an applied multimedia-development case that links a documented 2D production workflow with preliminary audience-reception data for a bullying-themed narrative. The study shows how character rigging and tweening can be incorporated into a short-film production pipeline and how visual motifs can be used to organise a narrative about repeated peer victimisation, distress, and peer support. It also provides an initial descriptive account of how a group of viewers evaluated the completed film. The contribution is not a new tweening algorithm, a validated measurement instrument, or causal evidence of bullying prevention.

For educational practice, Phantom may be considered as a discussion starter within a facilitated session. A teacher or trained facilitator could pause after selected scenes and invite viewers to identify the behaviours shown, consider the roles of the perpetrator, target, and bystander, discuss safe help-seeking, and reflect on the final scene. This proposed use is consistent with video-based bullying programmes that combine viewing with structured discussion and activities (Jennifer et al., 2006; Migliaccio & Raskauskas, 2013; Razzaq et al., 2022, p. 29535). It should not be presented as an intervention protocol tested by the current study. If used with adolescents, the screening should be accompanied by age-appropriate facilitation, a content notice for distressing scenes, and clear information about available support channels.

For future animation research, the production contribution could be made more reproducible by reporting the Moho version, frame rate, rig structure, keyframe placement, interpolation or easing settings, number of animated sequences, production time, and editing specifications. A comparative technical evaluation could then assess motion smoothness, continuity, production effort, or animator workload against an alternative workflow. Such measures would allow subsequent studies to move beyond a description of software operations toward a testable evaluation of the production method.

Limitations and directions for further research

Several limitations constrain the interpretation of the findings. First, the manuscript does not report the respondents' demographic profile, recruitment procedure, sampling strategy, viewing conditions, or response rate. The representativeness of the 50 respondents therefore cannot be assessed. Second, the exact wording of the questionnaire items and the mapping of items to the moral-message and entertainment dimensions are unavailable. Third, no evidence is reported regarding expert review, content validity, construct validity, or internal consistency of the instrument. Fourth, the evaluation is based on post-viewing responses and does not include a pre-test, comparison group, delayed follow-up, or behavioural measure. Fifth, the production process is not evaluated using objective technical indicators or independent expert ratings. These limitations mean that the results should be interpreted as preliminary descriptive evidence of audience perception and production implementation.

A stronger follow-up study should first provide the complete questionnaire and establish its content validity and reliability. It should then recruit a clearly defined target population and use a pre-test/post-test design, preferably with a comparison condition, to assess changes in bullying knowledge, attitudes toward victims, bystander intentions, and help-seeking knowledge. A delayed follow-up would help determine whether any observed changes persist. If the intended outcome is behavioural prevention, the study should include validated behavioural or school-level measures and, where feasible, evaluate the film as part of a structured programme rather than as a one-off viewing. These improvements would allow the research to distinguish production feasibility, audience acceptability, learning outcomes, and actual preventive effects.

CONCLUSION

This study documented the development of Phantom, a 2D animated short film about school bullying, using the six-stage MDLC framework. Character assets were prepared, rigged in Moho, and animated through keyframe-based tweening. The final film has a duration of 7 minutes and 36 seconds and was exported in MP4 format at 1920 × 1080 resolution with a 16:9 aspect ratio. Descriptive analysis of responses from 50 viewers produced an overall index of 86.68%. The source manuscript also reports separate indices for moral-message perception and entertainment; those subscale values cannot be independently verified without the original questionnaire and item-to-dimension mapping.

These findings suggest favourable self-reported audience perceptions of the film. They do not demonstrate that viewing Phantom increases knowledge, changes attitudes, or reduces bullying behaviour. The study's contribution is therefore a documented multimedia production workflow accompanied by preliminary audience-reception data. Future work should report complete respondent and instrument information, establish questionnaire validity and reliability, and evaluate educational outcomes using a pre-test/post-test or controlled design.

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Declaration of Competing Interests

The authors declare that they have no conflicts of interest that could have influenced the research, development, evaluation, or publication of this study.

CRediT Author Contributions

Aulia Nanda Rusanti contributed to the conceptualization, methodology, software development, animation production, data collection, and manuscript preparation.

Agusdi Syafrizal contributed to supervision, methodology, and critical revision of the manuscript.

Subhan Hartanto contributed to supervision, validation, and critical review of the manuscript.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The data include the audience evaluation results obtained from 50 respondents using a 10-item, five-point Likert-scale questionnaire, subject to applicable consent requirements and institutional policies.

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