Skeletal Animation Movement: A Technique for Expressing Character Performance in 2D Animation "Lancang Kuning"

Anis Rahmi[1], Sandi Prasetyaningsih[2], Widya Putri Ramadhani[3]

{anis@polibatam.ac.id[1], sandi@polibatam.ac.id[2], widyaputri@polibatam.ac.id[3]}

Politeknik Negeri Batam, Department of Informatics Engineering, Indonesia[1,2,3]

Abstract. The distribution of Malay historical information in the Riau Islands poses challenges in retelling Lancang Kuning folklore due to diverse interpretations. Traditional methods like oral and written storytelling are insufficient. To address this, skeletal animation was developed but has limitations, such as manual adjustments on celluloid sheets, and demanding time and resources. Skeletal animation streamlines image manipulation, reducing memory usage. Lancang Kuning is controlled through code in Duik Bassel. This technique successfully applies 10 of 12 animation principles in the characters' movement. However, exaggeration and squash-and-stretch techniques need further exploration. In conclusion, skeletal animation advances Lancang Kuning folklore by overcoming historical information distribution challenges. While it incorporates most animation principles, additional research is needed for techniques like exaggeration and squash-and-stretch.

Keywords: Skeletal Animation, 2D Animation, Duik Bassel, Lancang Kuning Folklore

1 Introduction

Animation serves as a medium for conveying memories, emotions, and thoughts through storytelling, making it accessible to both children and adults. Unlike oral or written communication, animation has a unique ability to connect with diverse audiences[1]. It utilizes visual content, employing moving images to stimulate the audience's imagination.

The production of animation involves manipulating image components within character models or objects, a technique known as cut-out animation. However, this traditional method presents challenges when meticulously arranging character movement poses, requiring substantial planning, time, and a multitude of images to create the illusion of motion.

To address these challenges, plugins and additional computer programs are employed in the development of cut-out animation techniques. These tools assist in creating digital bones for moving cut-out images of characters or objects. The process of forming and aligning these digital bones with different image parts is referred to as rigging. Rigging is a pivotal component of the skeletal animation technique, which portrays character or object movements and transformations through a series of digital bones. This approach not only controls changes in

the image's shape to depict character movement but also reduces memory demands associated with storing numerous images on the computer.

Character animation, in both 2D and 3D contexts, involves bringing characters to life with distinct movements and characteristics[2]. Animators focus on conveying emotions through character movements[3]. Achieving this involves the combination of numerous images to create the illusion of character motion, thoughts, and consistent behavior on the screen.

The phenomenon of Lancang Kuning, often represented as a sailboat, is frequently encountered in the Riau Islands. This term is commonly featured in songs, dances, traditional healing ceremonies, and folklore. However, Lancang Kuning's meaning and significance have remained ambiguous, with different interpretations prevailing [4].

Lancang Kuning features five main characters, brought to life through animated videos. These five characters include two antagonists portrayed by Panglima Hasan and Batin Sanggoro, as well as three protagonists consisting of Panglima Umar, Siti Zubaidah, and Datuk Laksemana Alam. Each character embodies distinct coastal Malay cultural traits expressed through their visual characteristics, colors, dialogues, instrumentals, and acting movements.

Animating a character involves exploring various forms of motion that the character will enact. To achieve this, one must adhere to the fundamental principles outlined in the theory of the 12 principles of animation [5]. These principles encompass squash and stretch, anticipation, staging, straight-ahead and pose-to-pose action, follow-through and overlapping action, ease in ease out, arc, secondary action, timing, exaggeration, solid imagery, and appeal. The application of these principles aims to make character movements appear lifelike, adhering to the laws of physics, evoking emotional responses from the audience, and enhancing the character's appeal [6].

Generally, the application of the 12 principles of animation is most commonly employed in frame-by-frame techniques and motion graphics. Frame-by-frame animation entails creating the illusion of movement by gradually altering a character's pose at keyframes, manually using hand-drawn frames, corresponding to a timeline marking transitions. In contrast, motion graphics involve designing moving images using elements such as typography, illustrations, and photography.

Limited documentation exists on applying the 12 animation principles in skeletal animation, which uses digital bones to streamline character movements and save time. However, this technique faces challenges in achieving complex transformations like stretching and squeezing. To address these limitations, the author conducted research on applying the 12 principles to skeletal animation. The Duik Bassel plugin in After Effects aids in creating and controlling digital bones for Lancang Kuning characters[7]. While it helps with character movement, it may not fully align with all 12 animation principles, especially for irregular transformations. Exploring character movements using this plugin is crucial to assess its compatibility with the 12 principles, particularly those related to character acting.

2 Literature Review

2.1 Lanchang Kuning

Lanchang Kuning is a film produced by Cathay-Keris and directed by M. Amin, released on January 1, 1962. This black-and-white film recounts an ancient Malay folklore, reflected in the ship-shaped lettering of its title image. Comparing "Lanchang Kuning" with the animated work "Lancang Kuning" reveals differences between the two. "Lanchang Kuning" is a live-action black-and-white film by Cathay-Keris, featuring native Malaysians portraying the characters. The film incorporates props, costumes, and accessories symbolizing Malay culture. Characters engage in scenes with Malay dialogue, accompanied by instrumental music and sound effects from traditional Malay musical instruments like the flute, tambourine, talempong, gambus, and nafiri. In contrast, "Lancang Kuning," the animated adaptation, presents the story in vibrant color. Although character names differ in the film due to Malaysian modifications, the animated "Lancang Kuning" adheres to the Bukit Batu Siak version of the folk tale[8]. This version shares several similarities as it traces the essence of the story, based on the original history of the Lancang Kuning folklore, once part of the Riau Lingga Johor Kingdom.

2.2 Acting in Animated Films

Acting in animated films is the art of imbuing characters or objects with action and behavior. Animators are entrusted with breathing life into these entities through their movements[9]. Effective acting can captivate the audience, evoke reactions, elicit empathy, and make characters appear as though they think, feel, and react within the realm of animation. Key considerations in animation include portraying mental processes, emotions, and bodily gestures, cultivating an empathetic connection that conveys a character's vitality and capacity to think, feel, and emote. Ed Hooks, in his book "Acting for Animators," elucidates fundamental acting theories for animators, spanning character movements to facial expressions, crucial for constructing scenes in films.

2.3 Theory of 10 Principles of Animation

The 12 animation principles enhance character animation in "Lancang Kuning." Anticipation prepares for main actions, while Staging conveys traits. Follow Through and Overlapping Action depict movements and timing. Slow-in and Slow-out create motion realism. Arcs bring fluidity to walking scenes. Secondary Action enriches the plot. Timings control speed and portrayal. Exaggeration emphasizes expressions. Solid Drawing and Posing convey thoughts. Appeal embraces diversity. These principles captivate the audience, breathing life into the characters.

2.4 Riau Malay Personality System

In the creation of the animated film "Lancang Kuning," the Malay personality system plays a significant role in shaping each character's actions and behaviors. Malays value self-knowledge, humility, and simplicity[10]. They exhibit tolerance, emphasizing harmony and reciprocity in interactions. There's a belief that fate cannot be changed, leading to a pragmatic view of wealth. Malays express emotions through music and poetry but prioritize finding joy over mourning[11]. In interactions, they may resort to silence as a form of protest or distancing in cases of perceived disrespect[12].

2.5 Skeletal animation

Skeletal animation in computer-generated imagery involves two key components: a surface representation for drawing objects like the character's skin (mesh) and an interconnected bone structure for animating the object on the character's bone frame. This technique allows for the creation of a simplified skeleton, encompassing essential parts of an animated character's bone structure, capable of simulating various jointed objects, from human and animal limb movements to machines. The process of crafting a character's skeleton through skeletal animation comprises several steps.

The initial step involves defining and identifying the character or figure's framework, highlighting the bone parts responsible for controlling the object's movements. This serves as the foundational stage in creating a character's skeletal structure as in the following image:

Fig. 1. the skeletal structure to be created for a character or animated figure.

The skeleton is the central component in skeletal animation technique, comprising a series of interconnected bones that can be arranged sequentially[13]. Typically, an object or an animated character's body consists of several crucial joints or vertices, with primary joint characteristics commonly located in areas like the hips, knees, neck, and other key joints. These skeleton were processing into animations by ilustrating the character poses into frame by frame drawing techniques using Duik Bassel plugin in After Effect[14].

3 Research Methodology

This research employs artistic research with a qualitative approach. The method used here is artistic research, involving the creative process of exploring the movement of 2D characters in animation to achieve 10 principles of animation. Artists and practitioners investigate their creative process, considering it as research[15]. This method is ideal for providing new information about art. It's useful for projects aiming to describe, explore, or discover[16].

The complete process of creating the Lancang Kuning animation is depicted in the following chart that is shown in Fig. 2.
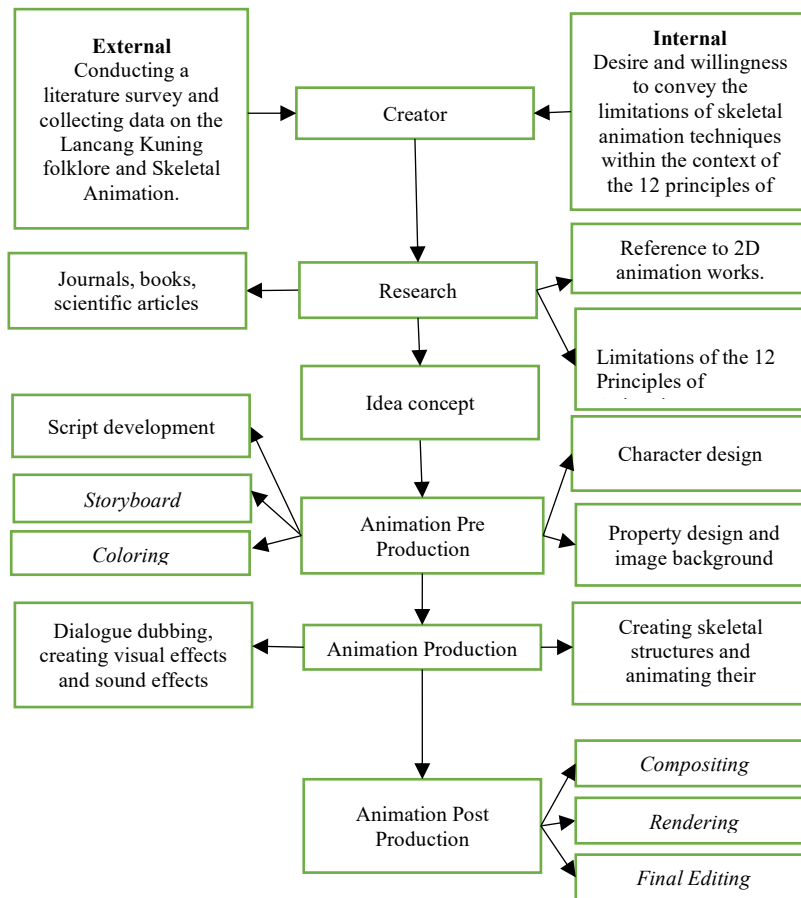
External
Conducting a literature survey and collecting data on the Lancang Kuning folklore and Skeletal Animation.

Internal
Desire and willingness to convey the limitations of skeletal animation techniques within the context of the 12 principles of

Creator

Journals, books, scientific articles

Research

Reference to 2D animation works.

Limitations of the 12 Principles of

Idea concept

Script development

Storyboard

Coloring

Animation Pre Production

Character design

Property design and image background

Dialogue dubbing, creating visual effects and sound effects

Animation Production

Creating skeletal structures and animating their

Animation Post Production

Compositing

Rendering

Final Editing

Fig. 2. The Process Chart for Creating Lancang Kuning Animation

In Fig.2. The author's journey began with a desire to address challenges in skeletal animation and the 12 animation principles. These challenges included time-intensive 2D animation, resource demands, and labor-intensive frame-by-frame movement creation. The breakthrough came when the author explored digital bone representations and their potential to streamline animation. This idea was inspired by successful short-form animated series on YouTube. The author adopted an Arts-based Research approach, resulting in Lancang Kuning animated videos as artistic expressions. Expert opinions will be sought on character movements, and audience feedback will be collected through questionnaires. The research phase involved gathering references on 2D animated films using skeletal animation in folklore themes. Movement techniques and the application of the 12 animation principles were examined, and input was gathered from discussions with industry professionals. This approach highlights the potential benefits of skeletal animation, including cost efficiency and improved resource and time management in animation production.

3.1 Character Design

Following the completion of the synopsis and story script, the next stage in the process is the design phase for the five animated characters in Lancang Kuning. The author created the character designs to be displayed in a 3/4 perspective to effectively convey the characters' attributes when utilizing skeletal animation techniques. The designs representing each character model (dummy) are depicted below:
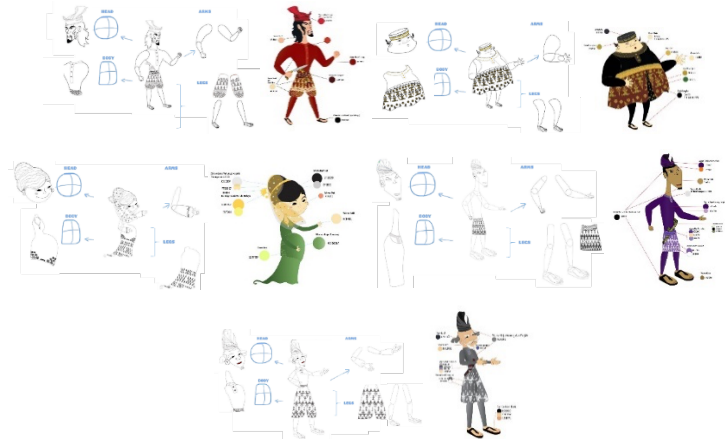

Fig.3. P The designs representation of 5 characters model

4. Implementation and Result

The movements of the 5 Lancang Kuning characters, employing skeletal animation techniques, adeptly incorporate the 10 principles of animation, elucidated as follows:

1) Arcs

The motion patterns of living creatures rarely adhere to straight lines; instead, they typically follow curved trajectories known as arcs. Arcs play a pivotal role in imbuing animated objects with a lifelike quality during action sequences in Fig.18. Devoid of arc-shaped movements, the animated character motions would appear rigid and unnatural.

Fig. 18. Curved motion path in Panglima Umar's walking step

Commander Umar and Hasan's hand movements when swinging their swords to stab pirates. When swinging the sword at the enemy, the heads and hands of the two Commanders move in a curved pattern around Frame 2290 to 2340 on Deck scene.

2) Anticipation

The principle of movement that shows anticipatory (preparatory) movements before starting the main action carried out by the character.

Fig. 19.   War Shot against pirates on the ship

Panglima Umar and Panglima Hasan's hands are in a posture which is part of the 10 basic techniques of Malay pencak silat while both of them are getting ready to swing their hands first before thrusting their swords at the lanun. These anticipation movements can be seen in frame 2348. The tidal stance has the characteristics of one leg going backwards followed by the other leg being in a forward position then the position of the right or left hand tilted parallel to the chest, the palm open in a position towards the enemy or while holding a Malay weapon (badik) and the other hand acts as a repellent or defensive shield.

3) Straight Ahead Action and Pose-to-Pose

Pose to pose shows the action depicted from the beginning, middle to the last image, while straight ahead is the principle when moving animated objects whose movements cannot be predicted, such as animated fire, blood, dust, water and explosions.

Fig. 20. Commander Umar took a bold stance

Commander Umar's action of stabbing the pirate on the ship embodies the principles of "Straight Ahead Action" and "Pose-to-Pose." The initial pose is depicted as Commander Umar assumes a stance, drawing from one of the ten fundamental techniques of Malay pencak silat in readiness to confront the enemy in frame 2290. In the middle pose in frame 2303, we witness Commander Umar's hand parrying the enemy's advancing sword. Finally, in the concluding pose, Commander Umar thrusts his badik at the adversary in frame 2354. These three fundamental poses serve as a foundation for the author to incorporate additional movements, refining the overall sequence. The "Pose-to-Pose" technique is employed to meticulously orchestrate the sequential phases of action within a scene, while "Straight Ahead" facilitates the creation of unforeseeable elements, such as the depiction of blood spurting after the enemy is stabbed, intensifying the dramatic impact.

4) Follow through and overlapping action

The principle of "follow through and overlapping action" is exemplified in the rolling motion of Mak Tua's hair, serving as a secondary object, and the movement of Mak Tua's head, the primary object. As Mak Tua walks to the right after handing the betel to Datuk and exits the scene, her head tilts forward, causing her hair to sway backwards with a gradual deceleration

around frame 5740 to 5780. Subsequently, the hair roll reverses its motion, moving forward as Mak Tua lowers her head.

Fig. 21.   The movement of mak tua's hair

5)   Staging

The Lancang Kuning animation consistently employs the staging principle in all its scenes. This approach is designed to guide the audience's focus by employing camera movements that reveal the narrative through the unfolding actions. Below is a table illustrating the implementation of staging principles, accompanied by detailed explanations. In each scene, the poses, actions, camera configurations, backgrounds, and stage elements work cohesively to vividly convey the characters' temperament, reactions, and attitudes. These staging elements can be seen in frame 2347.

Fig. 22. War Shot against pirates on the ship

The two commanders alternated in thrusting their blades at the pirates. The sequence of stabbing the enemy commenced with Commander Umar, positioned on the right side of the screen, as he engaged in a fierce battle with the adversary. Subsequently, Commander Hasan's stabbing action unfolded on the left. The camera perspective adopted a medium shot to clearly depict the intense confrontation between the two commanders and their foes aboard the ship. Through the setting and scenes, the characters of the courageous Commanders were effectively portrayed as they valiantly responded to their adversaries.

6)   Timing

A notable instance of effective timing can be observed in the scene featuring Commanders Umar and Hasan on the beach following their encounter with the pirates. Commander Umar's running sequence appears seamless, characterized by a wide range of movements spanning from his initial pencak silat stance to the concluding posture where he sits gracefully with aslender body position. These movements were shown around frame 3598 to 3878. In this final pose, he rests on the tips of both heels, creating a subtle yet distinct curvature in his posture as shown in Fig,23.
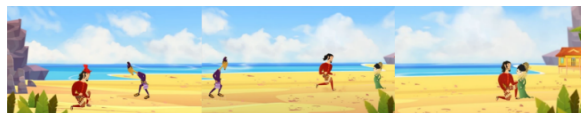

Fig. 23.   The timing is applied in the scene of Commander Umar and Hasan on the beach

7) Solid Drawing

The utilization of solid drawing is evident in the design of the seven characters within the animation. Solid drawing entails employing fundamental drawing principles, such as shape, weight, and volume, to craft the illusion of a three-dimensional object. In the realm of 3D animation, careful consideration must be given to how characters are posed, ensuring that the poses contribute to establishing balance and weight in the overall composition. In each character design, the author opts for a 3/4 angle presentation such as Sanggoro's inner confrontation with the fishermen scene in frame 6220, meeting of Malay kings in Frame 5837, Siti and Umar's meeting releases longing for each other in frame 4705, Mak Tua serves Tapak sirih for Datuk in frame 5660. Those scenes implies effectively imbuing the characters with three-dimensional depth and enhancing their visual appeal, as opposed to having them face squarely forward in a perpendicular orientation.

Fig. 24.   Application of solid drawing in the design of 7 figure images

8) Appeal

The principle of appeal is found in 7 animated characters, namely Datuk Laksemana, Panglima Umar, Panglima Hasan, Siti Zubaidah, Batin Sanggoro, Mak Tua and the fishermen of Tanjung Jati. The seven characters were created based on their type, nature, background and behavior.

Fig. 25.   The principle of appeal is found in 7 figures

9) Secondary action

Secondary action aims to complement and intensify the main action or with the intention of directing the audience's attention to another action. The secondary action can be seen in the movement of Commander Hasan, who fell and slipped after running through a puddle of water inside the ship around frame 2560 to 2612.

Fig. 26. The secondary action lies in Panglima Hasan's motion when he falls and slips

The subsequent secondary action occurs in scene 2, where the Commander is poised to leap into the sea. Commander Umar initiates the activity of jumping into the sea. Prior to that, a primary movement unfolds: the bending of the knees forward, constituting the initial action, with the body inclining forward in frame 2970. This main action is succeeded by the movements of the hands and other body parts, preparing for the leap into the sea, serving as secondary actions. Commander Hasan mirrors this sequence with similar actions.

Fig. 27. Commander Umar preceded the leap towards the sea

10) Slow in and slow out

The utilization of acceleration and deceleration becomes evident as Commander Umar rushes toward his wife. Acceleration manifests as the initial burst of speed when commencing the running motion start frame 3720 to 3840. Conversely, deceleration becomes apparent during the landing phase, as there is a gradual slowing down of leg movement in frame 3850.

Fig. 28. The application of acceleration and deceleration is evident in the scene where Commander Umar runs toward his wife.

5. Conclusion

The animated video Lancang Kuning serves as a captivating means to convey historical stories, rich in cultural values and moral messages. It presents the Lancang Kuning historical narrative through 2D skeletal animation, making historical information more engaging and accessible, particularly to modern audiences who prefer digital media over traditional reading. This multimedia approach integrates text, graphics, visual effects, audio, lighting, and character movements to effectively communicate historical knowledge.

The skeletal animation technique employed in this project allows for the creation of intricate movements using a series of bone representations, significantly reducing the need for extensive image frames and minimizing memory storage requirements. It streamlines the animation production process by efficiently transforming bone controllers (rigging) into complex character movements. By doing so, it optimizes resource utilization and expedites animation development.

The skeletal animation technique seamlessly incorporates ten out of the twelve principles of animation, including arcs, anticipation, straight ahead action and pose-to-pose, follow through and overlapping action, staging, solid drawing, appeal, secondary action, timing, and slow in and slow out. These principles enhance the authenticity and realism of character movements, ensuring that Lancang Kuning's characters exhibit lifelike actions. However, the application of the Exaggeration and Squash and Stretch principles remains a challenge due to their complex

nature, which necessitates further exploration and manual hand-drawing to achieve elasticity and exaggeration in movement poses. When seeking expert assessments of the character movements based on these principles, time constraints limited the depth of evaluation, as experts had demanding schedules at the animation studio. Consequently, a more comprehensive assessment of character movements and their adherence to the twelve principles of animation was not feasible under these circumstances.

References

[1]. D. Gibson,2019. Why Animation is Important, Stone Soup . [Online] Available at: https://stonesoup.com/post/why-animation-is-important/ [Accessed 24 March 2020].

[2]. Bancroft, T., 2016. Creating Characters with Personality. Watson-Guptill.

[3]. Hooks,E., 2017. Acting for Animators. Abingdon, Oxon: Routledge, Taylor & Francis Group.

[4]. Samin, R and Khodijah.2019. Kearifan Lokal Industri Perkapalan Masyarakat Melayu Bintan Kepulauan Riau Studi Perahu Lancang Kuning. Tanjung Pinang: UMRAH Press.

[5]. Thomas, F. and Johnston, O. 1995. *The Illusion of Life: Disney Animation.* Universitas Michigan*:* Disney Editions. pp. 47.

[6]. Thomas, F. and Johnston, O. 1995. *The Illusion of Life: Disney Animation.* Universitas Michigan*:* Disney Editions. pp. 34-35.

[7]. RxLaboratory, 2021. Duik Bassel.2. [Online] Available at: http://duik.rxlab.guide/constraints.html [Accessed 20 March 2021].

[8]. Samin, R and Khodijah.2019. Kearifan Lokal Industri Perkapalan Masyarakat Melayu Bintan Kepulauan Riau Studi Perahu Lancang Kuning. Tanjung Pinang: UMRAH Press.pp.40-74.

[9]. Boardwell, D.2017. *Film Art an Introduction*. New York: McGraw-Hill Education.

[10]. Thamrin, H. 2018. *Antropologi Melayu.* Yogyakarta: Kalimedia.pp.135.

[11]. Thamrin, H. 2018. *Antropologi Melayu.* Yogyakarta: Kalimedia.pp.140-145.

[12]. Effendy, T. 2013. *Lambang dan falsafah dalam seni bina Melayu.* Pekanbaru : Yayasan Tenas Effendy.

[13]. G. R. Putra, H. Rante and M. H. Assidiqi, "Animated Video Using Duik Bassel Rigging Toolset on Tuberculosis Education," 2021 International Electronics Symposium (IES), Surabaya, Indonesia, 2021, pp. 349-355, doi: 10.1109/IES53407.2021.9594031.

[14]. Smith, C., 2022. American Graphics Institute. [Online] Available at: https://www.agitraining.com/adobe/after-effects/classes/what-is-after-effects [Accessed 28 March 2022].

[15]. G. Guntur, Metode Penelitian Artistik. Surakarta: ISI Press, 2016. Accessed: Mar. 08, 2023. [Online]. Available: https://penerbitan.isi-ska.ac.id/

[16]. P. Leavy, Method Meets Art: Art-Based Research Practice, Third Edition. New York: Guilford Press, 2020.