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iJEP International Journal of Engineering Pedagogy

iJEP | eISSN: 2192-4880 | Vol. 15 No. 5 (2025) | OPEN ACCESS

https://doi.org/10.3991/ijep.v15i5.53579

PAPER

Improving 3D Animation Education: A Case Study of Curriculum Development in Jordan

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ABSTRACT

This study explores the various factors that influence the development of 3D animation skills, focusing on the role of acting skills, instructor feedback, and the understanding of emotions in improving students' animation outcomes. The primary goal is to propose methods for enhancing the pedagogy of 3D animation subjects. This study adopts a quantitative research design, analyzing the grades of 97 students and the responses to a survey administered to 50 students. Descriptive, correlation, and regression analyses are employed. Findings from our quantitative analysis indicate a strong positive correlation between students' acting skills and the produced quality of animation and a moderate positive correlation between observing human emotion and improved acting skills. These findings highlight the importance of integrating acting techniques into the animation curricula. The study offers actionable insights to improve 3D animation curricula and enhance the educational practices in 3D animation, leading to the development of professional animators.

KEYWORDS

3D animation, acting skills, curriculum design, education, human emotions, instructor feedback

1 INTRODUCTION

Animating is considered a challenging process that requires extensive technical abilities, creativity, and a deep understanding of human movement and emotion [1]. This complexity stems from the need to merge artistic vision with technical knowledge, a combination essential for creating believable characters and relatable performances. For example, animators must learn the twelve principles of animation [2]. These principles are closely tied to the laws of physics, enabling animators to produce smooth and realistic motion by applying some important concepts such as timing, anticipation, squash and stretch, and overlapping action [3]. Additionally, animation concepts—such as line of action, silhouette, and asymmetry—are vital to

Marar, R., Alhyari, N., Tedmori, S. (2025). Improving 3D Animation Education: A Case Study of Curriculum Development in Jordan. *International Journal of Engineering Pedagogy (iJEP)*, 15(5), pp. 89–107. https://doi.org/10.3991/ijep.v15i5.53579

Article submitted 2024-12-07. Revision uploaded 2025-04-04. Final acceptance 2025-04-04.

ensure that every pose in an animation sequence is dynamic, clear, and conveys the intended action or emotion [4].

Before the rise of digital technologies, traditional animation techniques, such as hand-drawn frame-by-frame animation and stop motion, which involved physically manipulating objects or models to create the illusion of motion, formed the foundation of animation [2]. Although these techniques required a lot of time and careful attention to detail, they played a key role in shaping the principles and methods we rely on in modern animation [1]. With the evolution of 3D animation, animators now face additional complexities, such as mastering the use of 3D software, navigating 3D space, adapting to tight production timelines, and being mindful of cultural differences among their audience [5]. John Lasseter, a pioneer in the animation industry, highlighted the dynamic relationship between art and technological advancement, stating that "art challenges technology and technology inspires the art" [2]. These advancements require animators to go beyond just mastering software; animators need to create engaging scenes that resonate emotionally with audiences [3]. For instance, research highlights that the ability to convey emotion through movement and facial expressions is a crucial factor in capturing audience attention [6], [7], [8].

As animation expands into diverse fields, such as entertainment, game development, education, advertising, healthcare, architecture, and virtual reality, the demand for skilled animators has grown exponentially [9]. This growth underscores the increasing complexity of animation production and also highlights the need for a strong educational foundation for aspiring animators.

One critical challenge in animation education is teaching students how to create lifelike performances through acting. Acting enables animators to replicate human motion and emotion, both of which are essential for crafting relatable and engaging characters. Actors, as storytellers, bring life to characters by using gestures, facial expressions, and body language, which often convey emotions more effectively than words [10], [11]. Despite the importance of these skills, university curricula often fail to emphasize acting tasks and body language concepts, creating a gap in education that limits students' ability to produce emotionally engaging animations [12].

In addition to this gap, educators face numerous obstacles, such as the absence of standardized curricula for animation across institutions, which leads to inconsistent training and forces educators to independently balance theoretical knowledge with industry-relevant practical skills [13]. Limited access to advanced technology and resources, coupled with large class sizes, further complicates efforts to provide personalized feedback and foster creativity [14].

Furthermore, educators have to balance teaching technical skills and creative principles with adapting to modern formats of education, such as online and blended learning. These formats require innovative teaching strategies to keep students engaged and assure the development of skills [15]. A lack of qualified educators trained in both technical and creative aspects of animation further restricts the ability to bridge the gap between academic learning and industry requirements [16]. This often results in a workforce that is not prepared to meet the expectations of the evolving industry.

Bridging this gap requires incorporating acting and body language into animation education. Encouraging animators to act out their own references and perform scenes can deepen their understanding of these principles and improve the quality of their animations. Moreover, another significant issue in animation education is the lack of continuous feedback during the animation development process, which further hinders students' ability to refine and improve their work [17], [18], [19].

To address these challenges, this study examines how integrating acting tasks and continuous feedback into animation curricula can improve students' ability to understand and convey the emotions, intentions, and nuances required to create believable characters. Specifically, this study aims to answer the following questions:

RQ1: What is the correlation between students' acting skills and the quality of their animation projects?
RQ2: What is the relationship between the impact of the instructor's feedback and the importance of the perceived feedback?
RQ3: What is the impact of studying human emotion on acting skills?

The structure of this paper is as follows: Section 2 outlines the literature review, Section 3 discusses the methodology used for data collection and analysis, Section 4 presents the discussion, and Section 5 presents the conclusions and future work.

2 RELATED WORK

The literature review section explores the key themes underlying this study and is structured into four relevant subsections. These subsections provide a comprehensive basis for understanding the context of this study.

2.1 Methodological aspects

The literature review for this study was selected through a systematic process that was used to identify relevant studies. Academic databases such as Scopus, Web of Science, and Google Scholar were used to search for articles and books published between 2015 and 2025. Keywords such as "acting skills," "animation education," and "education improvement" were applied in various combinations. Inclusion criteria focused on studies relevant to animation education and acting performance, while exclusion criteria omitted articles unrelated to the study topic or written in languages other than English. The review aimed to include comprehensive and up-to-date studies of the field by integrating empirical studies, theoretical frameworks, and emerging trends, reflecting the current state of the art.

2.2 Enhancing educational practices

There are a lot of factors that affect the educational process in this age. One of those important factors is the COVID-19 pandemic. Educators faced the challenge of adjusting traditional methods to fully online environments. The authors of [20] focus on a case from a Greek university, where MS Teams was utilized as the sole platform for synchronous lectures and assignments to streamline the learning process. Statistical, correlational, and cluster analyses were conducted in this study to gain insights into the online learning experience. The goal of their study was to explore which variables have a significant relationship. Additionally, the authors attempted to categorize students based on their diligence, communication skills, and ability to apply knowledge. By analyzing survey data, the researchers identified key factors, such as task organization, resource quality, and platform familiarity, that influenced students' learning experiences. Findings revealed that students who were more

engaged with the online platform were more likely to perform well and feel confident in their abilities. Additionally, cluster analysis highlighted the importance of diligence, communication skills, and knowledge application in creating a successful online learning environment, emphasizing the need for thoughtful implementation of digital tools in education.

Kanetaki et al., [21] in their research, tackled the challenges that COVID-19 laid for educators and focused on enhancing a Mechanical Engineering CAD course in higher education. Statistical analysis was applied, and findings revealed a significant improvement in students' spatial perception of 2D drawings.

In [22], Kanetaki et al., investigated the impact of using different teaching methods, such as MS Teams and Moodle, on students' academic performance in a similar mechanical engineering CAD course. Statistical analysis was conducted on 36 variables from a post-course questionnaire that revealed eight significant factors influencing student achievements. These factors showed that students in MS Teams and mixed MS Teams/Moodle groups found the module more enjoyable and had a better understanding of specific contents.

Furthermore, the authors of [23] explore the correlation between entrepreneurial mindset and entrepreneurial intention for engineering and non-engineering students to examine potential entrepreneurial gaps among future engineers. Statistical and Structural Equation Models (SEM) were performed on a survey of 112 participants. Results showed that engineering students have lower entrepreneurial intention compared to non-engineering students. In addition, engineering students demonstrated a weaker entrepreneurial mindset. The study highlighted the importance of the correlation between developing an entrepreneurial mindset in engineering students and enhancing their entrepreneurial intentions. The authors concluded that universities should foster the necessary skills to encourage entrepreneurial thinking for their engineering students.

Alhyari et al., [24] in their study, hypothesize that using animated graphics as a learning format, instead of text-based approaches, will enhance students' engagement, improve their understanding, and boost academic performance while reducing their anxiety. To evaluate this, the authors tested their hypothesis in an Object-Oriented Programming course. Sixty students took part in the experiment and were equally divided into two groups. Group 1 was exposed to animated graphics material, while Group 2 was provided with text-based material. After the material delivery, both groups took a ten-question multiple-choice assessment, which was reviewed for content validity and internal consistency. Following the assessment, students completed an anxiety questionnaire to measure their anxiety levels during the test, allowing for a comparison between the two groups. The results obtained revealed that the group who used animated graphics had significantly lower anxiety levels and higher engagement, confidence, and ease of comprehension compared to those using text-based material. The authors also reported a positive correlation between engagement and comprehension, as well as between confidence and performance, within the animated graphics group.

2.3 Improving animation education methods

Schiffer [25] presents an innovative method for creating realistic facial animations for characters in games. He achieves this by using an emotion model-based animation controller, along with actor video ensemble and recurrent neural networks as part of the experimental methodology. The proposed technology uses a

recurrent neural network that uses LSTM cells to generate original facial expressions based on a set of emotions displayed in videos acted out by the actor. This methodology combines conventional acting techniques with machine learning training for neural networks to achieve perfectly accurate face animations that closely represent the intended emotions. This study demonstrates the exciting potential of combining actor preparation methods with deep learning models to create high-quality, independent facial animations of game characters. These animations maintain accuracy levels above 80% for specific emotional expressions. The authors use actor preparation and rehearsal techniques to create a comprehensive video collection, which then has been used to train the neural networks. Through the implementation of acting principles, the system can create first-class independent facial animations that increase the authenticity and emotional expression of game characters, providing a viable approach for future game development.

Curtis et al., [26] present a method specifically developed to generate autonomous characters that can portray emotions and behaviors convincingly. The system utilizes reinforcement learning (RL) and generative animation to provide action, emotion, and attention signals depending on the character's motivational drivers. This ensures the conversion of these signals into expressive, biophysical movement in real time. The key design elements for creating believable entities are coherence of identity, self-propulsion, contingent interaction, self-motivation, attentiveness, emotion, and explainability. The stylized quadruped character in a virtual environment received positive scores from research study participants for its animacy and emotional experience. This indicates that the method is useful in developing credible autonomous characters. The study focuses on the acting principles that determine how a character can effectively convey emotions and capture attention based on its motivations and surroundings. This technique emphasizes the connection between a character's conduct and their personal experiences, aiming to maintain the viewer's suspension of disbelief in order to create a believable and relatable character portrayal.

A study by Kammerlander et al., [27] explores the integration of virtual reality (VR) and motion capture (mocap) technology to improve the acting process for characters with various proportions. The study focuses on the difficulties that actors face in conventional motion capture environments, such as performing in empty areas without building real sets or costumes and interacting with virtual individuals. The authors propose a VR platform that enables actors to engage in a collaborative virtual world in which they can observe their own and their co-actors' virtual avatars from a first-person perspective. The study reveals that experienced actors who use VR technology express a much higher degree of ownership over their virtual bodies and a full engagement in the virtual environment, which improves performance and reduces post-processing work. This proves that VR can help improve acting in motion capture by providing better context and more realistic interactions and animations, especially for characters of various sizes.

2.4 The role of acting in enhancing animation education

Ed Hooks, a prominent figure in the animation industry, has always emphasized that understanding and applying concepts from acting can significantly enhance the quality of animation. Hence, in 2023, he published his popular book "Acting for Animators" [28]. In his book, Hooks provides animators with practical advice and techniques to improve their character performances by applying principles of acting. The book covers concepts such as character motivation, body language, and

emotional expression. These concepts help animators to create more believable and engaging animations.

Kennedy [29], in his research, provides a preliminary exploration into strategies for creating effective reference performances for animation, which refers to recordings of individuals performing physical and emotional cues that animators employ to enhance the believability of animated characters. Specifically, the study focuses on evaluating the impact of acting experience on the quality of reference performances by comparing three types of participants: actors with no animation experience, animators with no acting experience, and individuals with both acting and animation experience. Clear methods were employed to assess the creative choices and performance utility of each participant in producing a short, realistic 3D animated film. The findings suggest that acting experience significantly enhances the effectiveness of reference performances. This limited data provides an initial suggestion that acting experience is an essential precondition when producing useful reference performances for the type and style of animation explored in this study.

Arby [30], in her research endeavor, investigates how an Acting in Animation course impacts animation students' ability to use movements and facial expressions in 3D character animation. The researcher focuses specifically on whether students can improve their animation skills and the quality of the animations they produce by understanding acting techniques related specifically to body movements and emotions, such as facial expressions and vocal expressions. Using theories based on the 12 principles of animation, the methodology adopted by the researcher involves interviews with experienced animators, observations of the animation process, and analysis of animations. The aim is to identify effective acting strategies and provide practical guidance for enhancing animation skills in the Acting in Animation course. The author concludes that although the students have shown to improve both their hard skills in animating and their communication and social skills after taking the Acting in Animation course, integrating acting techniques into animation classes can be challenging due to the students' shyness and lack of script understanding. The author acknowledges that many students also struggle with on-camera acting, indicating a need for specific training. The study highlights issues such as stage fright and social anxiety, emphasizing the need for acting training for animators and recommending further research.

Weinbren [31] investigates the process of combining Stanislavsky's acting techniques with modern digital media technology to develop a realistic virtual actor. The method consists of four steps: identifying crucial challenges and determining the target audience (the challenge), specifying objectives and examining innovative possibilities (the exploration), involving stakeholders and improving the content (the interactions), and producing, refining, and collecting feedback (the delivery). The results indicate that the utilization of Stanislavsky's concepts, including his notion of "perezhivanie" (experiencing), combined with real-time 3D computer graphics, animation, and machine learning, can generate virtual performers proficient in authentically portraying unexpected actions and emotions. This method demonstrates how virtual performers can become believable and relatable to viewers by creating a sense of aliveness.

3 MATERIALS AND METHODS

This study focuses on three research questions: first, the relationship between acting skills and animation quality; second, the impact of instructor feedback and

its perceived importance; and third, the impact of studying human emotion on acting skills.

3.1 Instructor's teaching approach

This study adopts an innovative approach to teaching 3D animation courses that incorporates body language information, acting tasks, and instructor's feedback into animation courses.

Throughout the course, the instructor offered valuable body language and facial expression information through explanations, lecture notes, and videos. Additionally, the instructor presented insights into animation techniques by demonstrating character animation in front of students and sharing their own acting references and animation projects. Based on the given information, students were asked to create their own acting references for their animations. The instructor then provided students with comprehensive and constructive criticism on their acting references. If the acting reference was not sufficient, students were required to react and resubmit their reference for further feedback. Once the acting reference was approved, students proceeded to the animation phase, during which they continued to receive instructor feedback. If the final animation met quality standards, it was submitted; otherwise, students revisited the feedback phase to refine their work. Figure 1 sums up the flow of the educational process used in 3D animation courses.

3.2 Research questions

The study questions (RQs) were developed to align with the sequence of the instructor's teaching approach, focusing on evaluating the effectiveness of the educational process and its ability to achieve the intended learning outcomes. The study questions were designed as follows:

- RQ1 investigates the relationship between students' acting skills and the quality of the produced animations, with the hypothesis that improved acting skills will lead to more engaging animations.
- RQ2 inspects the influence of instructor feedback on students' development, highlighting its value and role in the educational process.
- RQ3 examines the connection between understanding human emotion in enhancing acting skills and recognizing the importance of acting skills in animating characters.

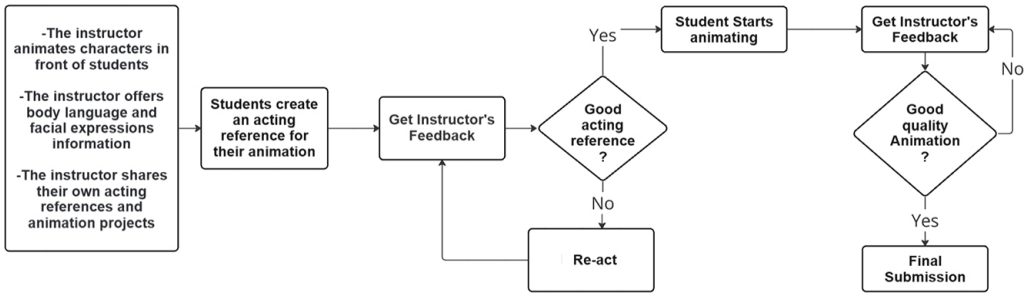

Fig. 1. Teaching process used in 3D animation courses

Together, these three questions address vital pillars of the animation educational process, aiming to assess how the integration of acting skills, instructor's feedback, and observing emotions can enhance the animation educational process.

3.3 Participants

Data was gathered from students enrolled in two courses, the 3D Animation course and the Selected Topics in Computer Animation course, over seven semesters between 2022 and 2024 in the Computer Graphics and Animation Department. The study focused on third- and fourth-year university students, aged 21 to 22, primarily consisting of Jordanian citizens. The total sample used for calculating students' scores consisted of 97 students, including 27 males and 70 females, all of whom were enrolled in these courses during the study period.

For the survey, only students who had not yet graduated were contacted. As a result, 50 students, comprising 16 males and 34 females, were successfully reached and invited to take part in the survey. The remaining 47 students from the initial sample were excluded from the survey as they had graduated by the time survey data collection began. A non-random convenience sampling method was used, focusing on the availability of students still enrolled at the university [32]. Figure 2 shows the scores and survey demographics.

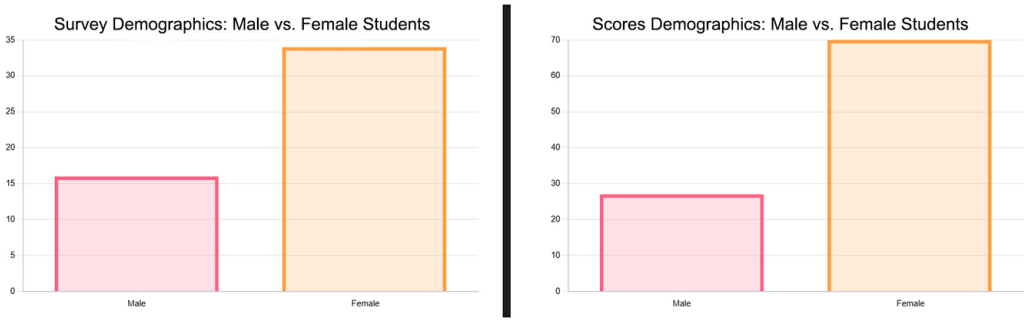

Fig. 2. Scores and survey demographics

3.4 Ethical approval

Permission to conduct this study was obtained from the Computer Graphics and Animation Department. The study involved analyzing students' academic scores and survey responses, ensuring full compliance with ethical research practices. All students provided their permission and consent after being informed about the study's objectives, the use of their data, and their rights to confidentiality and anonymity. Participants were assured that their data would be used solely for research purposes and handled securely to protect their privacy.

3.5 Data collection

The study used two primary types of data: students' grades and survey responses. Grades were collected from two key assignments: the acting reference for the final

exam and the final animation projects. These grades acted as quantitative indicators of how well students could apply acting skills in their animation projects, showcasing their understanding and execution of these skills. Performance-based assessments, such as grades, are recognized as reliable measures for evaluating student outcomes in higher education [33].

Additionally, quantitative data were gathered through an online survey designed to address the study questions. The survey focused on measurable factors that impact the effectiveness of animation curricula, including the role of instructor feedback, the importance of observing human emotions, and the integration of acting techniques into teaching methods. Surveys are a widely accepted tool in educational research for gathering structured, quantifiable insights that can guide curriculum development [34].

3.6 Assessment

This study analyzes the roles of acting skills, instructor feedback, and the observation of human emotion in the educational process. The analysis focused on students' acting task scores, animation project scores, and survey responses.

Acting task and animation project scores

- Descriptive Analysis: Summarize students' overall performance, offering insight into their accomplishments in both the acting and animation projects.
- Correlational Analysis: Examined the relationship between acting task grades and animation project grades to identify significant associations.
- Regression Analysis: Predicted animation project grades using acting task grades to assess how well acting proficiency forecasts animation quality.

Survey responses

- Descriptive Analysis: A descriptive analysis was conducted on the survey responses to provide a general understanding of the impact of acting on animation, the influence of instructor feedback on students' outcomes, and studying human emotions on acting skills.
- Correlational Analysis: Responses explored the relationship between the impact of the instructor's feedback and the importance of the perceived feedback, as well as the relationship between studying human emotion and acting skills.

Survey details. The survey consisted of five sections and 14 questions, using a 5-point Likert scale to quantify students' perceptions and experiences [35]. This approach allowed for statistical analysis to connect feedback and techniques to student performance.

3.7 Reliability and validity

To ensure the reliability of the study, the grading rubric for both acting and animation assignments was applied consistently to all students, following predefined evaluation criteria. Cronbach's alpha was calculated to measure the reliability of the samples used.

– Students' Scores: Cronbach's alpha = 0.774, Sample Size = 97 indicates an acceptable level of reliability for the two items (Acting Skills Score and Animation Quality Score).
– Survey: The Cronbach's alpha = 0.803, Sample Size = 50, indicating an acceptable internal consistency.

In terms of validity, the survey questions were carefully designed to align with the study questions, ensuring they accurately captured students' perceptions of the factors being studied. This study has several limitations, including the need for a larger student sample size to enhance the reliability and generalizability of the results. Additionally, response bias may be a concern, as respondents could provide socially desirable answers rather than honest ones, potentially affecting the accuracy of the data.

4 MAIN RESULTS

The following statistical analysis, including regression, correlation, and analysis of variance (ANOVA), was conducted using the SPSS software tool.

4.1 RQ1 analysis results

Let us remind RQ1: "What is the correlation between students' acting skills and the quality of their animation projects?"

Table 1 sums up the descriptive statistics for acting skills and animation quality.

Table 1. Descriptive analysis for "Acting Skills and Animation Quality Scores"

Statistics	Acting Skills Score	Animation Quality Score
Students' Count	96	96
Mean	7.95	23.51
Standard Deviation	1.88	4.23
Minimum Score	1	4
25th Percentile	7	21
Median	8	24
75th Percentile	10	27
Maximum Score	10	30

The results of the descriptive statistical analysis show a comprehensive breakdown of the distribution of acting skills and animation quality scores for 97 animation students. As shown in Table 1, the mean value of the acting skills is 7.95, with a standard deviation of 1.88, which displays a notable distribution around the mean. The minimum score was 1, and the maximum score achieved by students was 10, which demonstrates a variety of abilities for students. The median value is 8, with an interquartile range (IQR) of 7 to 10, indicating that most students scored quite high on acting skills.

Similarly, the mean score for Animation Quality was 23.51, with a standard deviation of 4.23, indicating higher diversity in performance than Acting Skills. The values varied from 4 to 30, indicating a wide variety of animation skills across students. The median score was 24, with an IQR of 21 to 27, showing that a considerable number of students created high-quality animations. These descriptive data show a strong performance in both acting abilities and animation quality among the students, with significant variation in individual results. Figure 3 shows the histogram distribution of the acting skills scores and the animation quality scores.

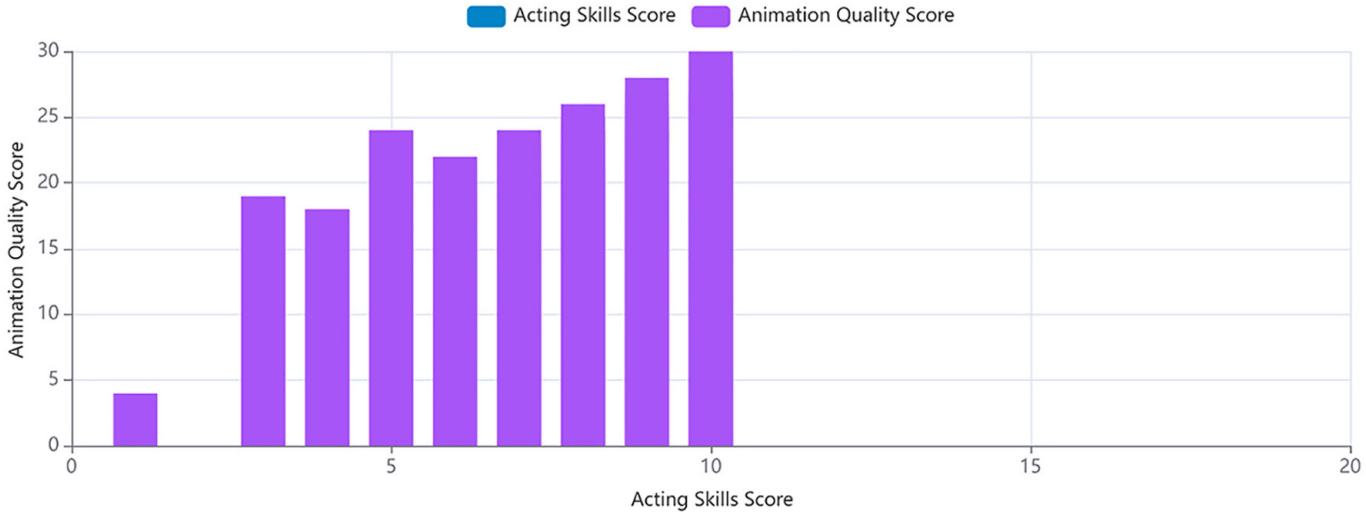

Fig. 3. Histogram of "Acting Skills and Animation Quality"

Table 2 shows the descriptive analysis for the survey question results.

Table 2. Descriptive analysis for survey results

	N	Minimum	Maximum	Mean	Std. Deviation
Influence of Acting on Character Movement	50	1	5	3.88	0.77

The descriptive analysis of the survey questions indicates that the influence of acting on character movement has a mean score of 3.88 and a standard deviation of 0.77. This indicates that students view acting as highly influential on character movement, supporting the descriptive analysis results of the acting scores and animation quality. It further demonstrates that acting skills influence the animation of the animated character.

Furthermore, the average score percentages for female students were as follows:

- Acting Reference percentage: 82.86%.
- Animation Project percentage: 80.00%.

Good performances, defined as grades of 70% or higher, according to the university's grading system, were achieved by 58 females for the acting score and 56 females for the animation score out of the 70 females.

On the other hand, male students' score percentages were as follows:

- Acting Reference percentage: 62.96%.
- Animation Project percentage: 70.37%.

Good performances were achieved by 17 males for the acting score and 19 males for the animation score out of the 27 males.

This indicated that female students performed better on average in both acting and animation projects compared to male students. Figure 4 shows the percentages of the scores for males and females.

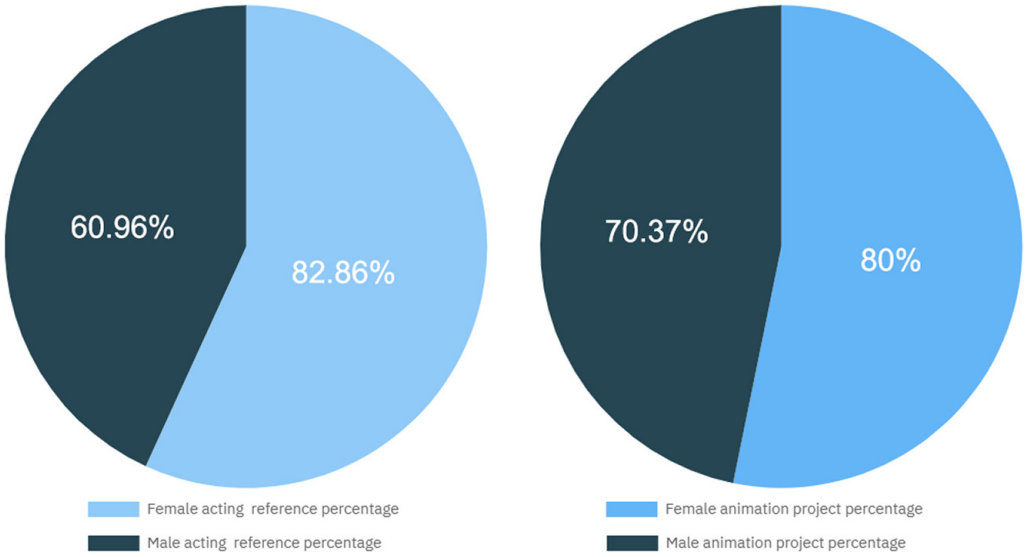

Fig. 4. Percentages of the scores for males and females

To answer RQ1, a correlational analysis is performed to further examine the relationship between acting skills and animation quality. Table 3 shows the correlational relationship.

Table 3. Correlation analysis results

Correlation Coefficient Used	Relationship	Correlation Coefficient Value	P-Value Sig. (2-tailed)	N
Pearson correlation coefficient	Acting Skills & Animation Quality	0.858*	<0.001	97

Note: *Correlation is significant at the 0.05 level (2-tailed).

A Pearson correlation coefficient is calculated and is found to be r = 0.858, indicating a very strong positive correlation between the acting skills & animation quality. This suggests that students who scored higher in acting skills tended to produce higher-quality animations. The p-value is less than 0.001, which is statistically significant at the 0.01 level (99% confidence interval). This indicates that it is unlikely that this correlation occurred by chance; hence, there is a statistically significant relationship between each two variables. This confirms your earlier findings, reinforcing the relationship between acting skills and animation quality. Figure 5 shows the scatter plot illustrating the relationship between acting skills and animation quality.

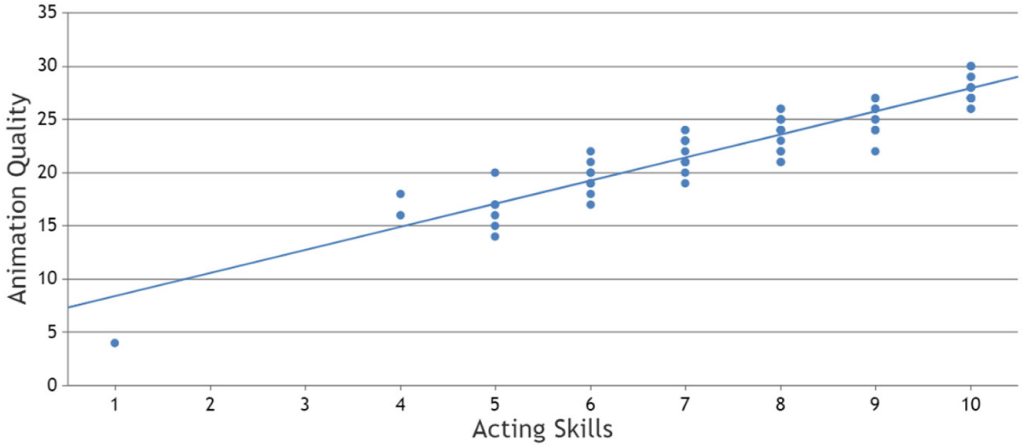

Fig. 5. Scatter plot illustrating the relationship between acting skills and animation quality

A regression analysis (refer to Table 4) is performed to further explore the relationship between acting skills and animation quality.

Table 4. Regression analysis summary

R	R^2	Adjusted R^2	Standard Error of Estimate
0.859	0.737	0.734	2.214

The regression model demonstrates a strong ability to predict Animation Quality Score based on Acting Skills Score, as indicated by the following metrics:

- R = 0.859: Indicates a very strong positive correlation between Acting Skills Score and Animation Quality Score.
- R^2 = 0.737: Suggests that 73.7% of the variation in Animation Quality Score is explained by Acting Skills Score, showcasing a robust fit.
- Adjusted R^2 = 0.734: Confirms the generalizability of the model by accounting for sample size.
- Standard Error of the Estimate = 2.214: Reflects that, on average, the actual Animation Quality Scores deviate from the predicted scores by approximately 2.214 points.

These results highlight the model's strength and reliability in explaining and predicting Animation Quality Scores based on students' Acting Skills Scores. Table 5 shows the results of the ANOVA test.

Table 5. Results of the ANOVA test for the regression model

Model	Sum of Squares	df	Mean Square	F	Sig. (p-value)
Regression	1292.878	1	1292.878	263.703	<0.001
Residual	460.861	94	4.903		
Total	1753.740	95			

From Table 5, the high F-statistic indicates that the regression model fits the data well. Furthermore, the model is statistically significant, meaning "Acting Skills Score" significantly predicts "Animation Quality Score."

Table 6 shows the regression coefficients indicating the effect of "Acting Skills Score" on "Animation Quality Score."

Table 6. Regression coefficients indicating the effect of "Acting Skills Score" on "Animation Quality Score"

Predictor	Unstandardized B	Coefficients Std. Error	Standardized Coefficients Beta	t	Sig. (p-value)
(Constant)	7.915	0.983		8.053	<0.001
Acting Skills Score	1.957	0.121	0.859	16.239	<0.001

From Table 6, these results collectively suggest that acting skills have a strong, statistically significant impact on animation quality. The regression analysis provides insights into the magnitude of this relationship, the baseline animation quality, and the proportion of variability in animation quality explained by acting skills.

4.2 RQ2 analysis results

Let us remind RQ2: "What is the relationship between the impact of the instructor's feedback and the importance of the perceived feedback?"

Table 7 shows the descriptive analysis for the survey question results.

Table 7. Descriptive analysis for survey results

	N	Minimum	Maximum	Mean	Std. Deviation
Impact of Instructor Feedback on Acting	50	2	5	4.10	0.81
Helpfulness of Instructor's Acting References	50	2	5	4.22	0.89
Importance of Acting Feedback	50	1	5	4.22	0.93
Preference for Acting in Curriculum	50	1	5	3.92	0.94

The descriptive analysis of the survey questions indicates that the impact of instructor's feedback to students has a mean score of 4.10 and a standard deviation of 0.81, indicating a high perceived value among students. Helpfulness of Instructor's Acting References has a mean score of 4.22 and a standard deviation of 0.89, which suggests that showing the instructor's own acting reference and animation projects are highly valued resources. Importance of Acting Feedback has a mean score of 4.22 and a standard deviation of 0.93, which is considered extremely significant for the learning process. Preference for acting in the curriculum has a mean score of 2.70 and a standard deviation of 0.94, which shows that there is a strong preference for incorporating acting into the curriculum, reflecting its perceived educational value.

To answer RQ2, a correlational analysis (refer to Table 8) is conducted to examine the relationship between the impact of instructor feedback and its importance.

Table 8. Correlation analysis results

Correlation Coefficient Used	Relationship	Correlation Coefficient Value	P-Value Sig. (2-tailed)	N
Pearson correlation coefficient	Impact of Instructor Feedback on Acting & Importance of Acting Feedback	0.293*	0.039	50

Note: *Correlation is significant at the 0.05 level (2-tailed).

The Pearson correlation coefficient for the relationship between the impact of instructor's feedback and its importance is 0.293, indicating a weak positive correlation between the two variables. This suggests that the feedback process still has potential for improvement.

The p-value is less than 0.05, which means the correlation is statistically significant at the conventional 5% level. This indicates that it is unlikely that this correlation occurred by chance.

4.3 RQ3 analysis results

Let us remind RQ3: "What is the impact of studying human emotion on acting skills?"

To answer RQ3, correlational analysis is conducted to examine the relationship between the influence of acting on character movement and time spent studying human emotions (refer to Table 9).

Table 9. Correlation analysis results

Correlation Coefficient Used	Relationship	Correlation Coefficient Value	P-Value Sig. (2-tailed)	N
Spearman's rho	Influence of Acting on Character Movement & Time Spent Studying Human Emotions	0.33*	.019	50

Note: *Correlation is significant at the 0.05 level (2-tailed).

Spearman's rho correlation of 0.33 between the influence of acting on character movement and the time spent studying human emotions indicates a moderate positive correlation. This suggests that the more time students spend observing and studying human emotions, the greater the influence on their acting skills.

The p-value is less than 0.05, which means the correlation is statistically significant at the conventional 5% level. This indicates that it is unlikely that this correlation occurred by chance; hence, there is a statistically significant relationship between each two variables.

In summary, the results indicate a significant and strong positive correlation between acting skills and animation quality, the significance of instructor feedback in improving student outcomes, and the impact of understanding human emotions on acting proficiency. These findings collectively underscore the importance of integrating acting and feedback-based approaches in animation education.

5 DISCUSSION

For RQ1, the descriptive analysis highlights strong overall performance in both acting skills and animation quality among the students, with female students outperforming male students in both areas. Acting skills displayed a median score of 8 and a relatively narrow interquartile range, suggesting consistent proficiency among most students. In contrast, animation quality demonstrated a broader distribution, reflecting greater diversity in animation capabilities. These findings suggest a strong foundational skill set in both acting and animation, with notable variation in individual performance levels. Survey results further emphasize the significant

influence of acting on character movement, with students rating its impact highly (mean score of 3.88).

The correlational analysis revealed a strong positive correlation ($r = 0.86$) between acting skills and animation quality, highlighting that students with stronger acting abilities produce higher-quality animations. This statistically significant relationship ($p < 0.001$) underscores the critical role of acting skills in animation, as previously suggested by the descriptive analysis. These findings reinforce the importance of integrating acting tasks and body language information into animation curricula to enhance the quality and believability of animated characters.

The regression analysis confirms a strong and statistically significant relationship between acting skills and animation quality, with the model explaining 73.7% of the variance in animation quality scores ($R^2 = 0.74$). The standardized coefficient ($\beta = 0.859$) underscores the strength of this positive relationship. For every 1-point increase in acting skills, animation quality increases by 1.957 points, illustrating the practical importance of acting proficiency in creating high-quality animations. The model's statistical significance ($p < 0.001$) and high F-statistic further validate its reliability, while the adjusted R^2 indicates that the findings are generalizable. These results emphasize the critical role of acting skills in enhancing animation quality.

These results are consistent with the study [30], which highlights that acting experience enhances animation performances, as well as with the study [29], which concludes that better acting experience improves reference performances in animation.

For RQ2, the results of the descriptive analysis highlight the critical role of instructor feedback in enhancing students' acting skills and learning experiences. The high mean scores for the impact of instructor feedback (4.10), the instructor showing their acting references (4.22), and the importance of acting feedback (4.22) emphasize their significance in the educational process. Furthermore, the preference for incorporating acting into the curriculum (mean = 2.70) underscores its perceived educational value among students.

The correlation between the perceived impact of instructor feedback and the importance of acting on feedback ($r = 0.29$) indicates a weak positive relationship; its statistical significance ($p < 0.05$) confirms that this relationship is unlikely to have occurred by chance. These findings suggest that while instructor feedback is valued, its role in enhancing the perceived importance of acting feedback is limited, highlighting an area for potential instructional improvement. Constant improvements are essential for the educational process. In [20], the researchers highlighted the importance of educational improvement, where findings revealed that students' learning experience is influenced by many factors related to the use of online platforms.

For RQ3, a moderate positive correlation ($r = 0.33$) between the influence of acting on character movement and the time spent studying human emotions suggests that increased focus on observing and understanding emotions positively impacts students' acting abilities. The statistical significance of this correlation ($p < 0.05$) confirms that the relationship is unlikely to have occurred by chance. These findings highlight the crucial role of understanding human emotions in improving acting proficiency, reinforcing the value of integrating such elements into animation education.

6 CONCLUSIONS

This study highlights the significance of integrating acting tasks and body language information into 3D animation education. The objective of this study is to answer three main research questions, which were selected based on the instructor's teaching approach.

Our analysis findings regarding RQ1 indicated a strong positive correlation between acting skills and animation quality, highlighting the importance of including acting tasks and body language information as significant components in animation curricula. In addition, regarding the results of RQ2, the analysis demonstrated that the instructor's feedback is significantly valued by students, although the results suggested that the feedback process could be improved in the future to enhance the educational process. Lastly, the results regarding RQ3 showed that studying human emotions positively influences acting skills, which in turn contributes to improved character animation.

These findings not only provide valuable insights for educators in the field of animation but also offer practical recommendations for curriculum design. Incorporating body language education, acting assignments, and comprehensive feedback into teaching methodologies can improve educators' ability to prepare students for the challenges of the animation industry, ensuring they are equipped with the skills needed to excel in various professional settings.

The limitations of this study include the need for a larger sample size of students that would generate more reliable and generalizable results. Additionally, this study area has not been previously explored by researchers and educators, resulting in a limited amount of literature available on the subject. Future research should investigate additional factors to enhance the animation curriculum and refine the instructor feedback process. Addressing these areas could lead to innovative teaching practices that advance the dynamic field of 3D animation education.

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