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The Needs in Developing 'Animation for Games' Learning for Game Design Program

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Abstract

Animation plays a vital role in game design and development, as it is a key aspect of creating a believable and immersive gaming experience. Unlike movie animation, game animations must look nice from the player's perspective. Unfortunately, there are misconceptions about animation for games contrasted to other animation outputs, even though the same tools and principles of animation apply to all mediums. This research aims to employ the six (6) disciplines of breakthrough learning for determining constructional needs in creating animation learning content for game design. Next, the Work Readiness Scale (WRS) focuses on the most necessary domains for successful entry into the game design settings. Employing the Fuzzy Delphi Method (FDM) with a five-point Likert scale, feedback was gathered from twelve experts, including academicians and industry professionals. The collected data analysis involved triangular fuzzy numbers and a 'defuzzifying' process to translate fuzzy data into crisp values. This process facilitated the ranking of items based on their importance and effectiveness. The study's findings underscore the growing importance of game design and animation in academic and industrial realms. It highlights the dynamic nature of the 6Ds and WRS domain disciplines that can be leveraged to enhance the learning experience. The insights from the FDM analysis, coupled with existing research, strongly advocate for a foundational understanding of game animation principles. It also stresses the need for specialization and developing core competencies crucial for industry success. By integrating these insights into the design of animation learning content for game design, educators and developers can ensure that the material is engaging, comprehensive, and effective in achieving learning objectives, thus preparing students and professionals for successful careers in the rapidly evolving game industry.

Keywords: Animation, Game Design, Instructional Learning, Fuzzy Delphi Method (FDM)

Introduction

Animation is not merely an aesthetic component in digital games; it is the foundation of immersion, believability, and player engagement. Unlike cinematic animation, which is designed for linear viewing, game animation must respond dynamically to player input and function seamlessly within real-time environments (Pluralsight, 2014). This distinction makes animation for games a specialized skill set that demands artistic creativity and technical precision. Its importance is underscored by the global game industry's rapid growth, where animation quality directly influences gameplay experience, user satisfaction, and market success (Wildan, 2021).

The need to study animation for games is particularly urgent in Malaysia and Southeast Asia, where the gaming and animation sectors are emerging as critical contributors to the digital economy (Azlimi et al., 2023; MDEC, 2023). Despite Malaysia's strong reputation in cinematic animation, research shows that graduates often lack the engine-ready competencies required for game production—such as real-time rigging, optimization, and interactive motion design (Brasfield, 2012). This gap not only limits graduate employability but also hampers the competitiveness of local studios in the global market. Addressing this challenge requires curriculum reform and targeted learning strategies that prepare students for the unique demands of game animation.

The significance of this study lies in its potential to bridge that gap. This research provides a framework that benefits multiple stakeholders by identifying structural learning needs and aligning them with work readiness skills. For students, it ensures that their training equips them with technical mastery and soft skills, improving career prospects in a competitive industry. It offers evidence-based guidance for universities to design curricula aligned with industry standards, accreditation requirements, and Malaysia's education blueprint (Ministry of Education Malaysia, 2015). The animation and gaming industry contributes to building a workforce capable of meeting global production standards while embedding local cultural narratives into games, thereby enhancing Malaysia's position in the creative economy.

Furthermore, the utility of this study extends beyond national borders. As game design education expands worldwide, models integrating competency-based frameworks with work readiness scales offer transferable insights for other developing economies facing similar challenges. The effectiveness of such an approach lies in its holistic design: fostering creativity, technical proficiency, and adaptability—three elements essential for long-term success in the fast-evolving game industry (Caballero et al., 2011; Wu & Tu, 2022).

In sum, this research is not only timely but also vital. It addresses an underexplored niche in animation education, highlights the necessity of aligning academic programs with industry expectations, and proposes solutions to prepare graduates for sustainable careers in the global game design ecosystem.

Background of Research

The Malaysian animation industry has ventured into game development, focusing on 3D games incorporating Malaysian culture and real-world situations (Dahlan et al., 2019). The growth of the esports and gaming industry in Malaysia has contributed to this development,

driven by the interest of the youth and government initiatives (Juhyeok, 2022). Additionally, adopting transmedia storytelling practices in the Malaysian animation industry has connected with the public's aspiration to preserve and promote Malaysian culture (Umar et al., 2020). However, there are barriers to the success of animation technopreneurship in Malaysia, such as limited access to financial resources, a lack of skilled talents, and bureaucratic procedures (Kamarudin et al., 2013). Despite these challenges, efforts have been made to introduce Malaysia's local cultural content in mobile games, showcasing elements of cultural festivals like the Chinese New Year (Chong et al., 2018).

Malaysian children and teenagers are exposed to a vast market of 2D and 3D games, but only a small percentage are locally developed (Suzana et al., 2023). Research by Kamaruddin et al. (2013) highlights a significant gap in the output of games from animation ventures, with games accounting for the lowest proportion of their outputs at only 17.2%. This underscores the urgent need for focused research to enhance animation's efficiency within the game production process. Therefore, there is a need for a study focusing on animation to improve the efficiency of the game's production processes. On the other hand, beyond the scope of production, there is an identified discrepancy in animation education, particularly concerning the skills deemed necessary for entry-level positions within the industry. A survey comparing perspectives among undergraduate students, postgraduate students, and industry professionals, conducted by Brasfield (2012), uncovered substantial disparities in opinions on essential learning and skills for newcomers. These findings point to a critical need for adjustments in animation education to bridge the gap between academic preparation and industry expectations, alongside fostering a better comprehension of the distinct needs and challenges associated with animation for video games.

Therefore, the research will attain the following research objectives, which aim to employ the six (6) disciplines of breakthrough learning by Polluck et al. (2010) to determine structural needs in creating animation learning content for game design. Next, the Work Readiness Scale (WRS) by Caballero et al. (2011) focuses on the most necessary domains for successful entry into the game design settings. Finally, anonymous questionnaires will be used to obtain expert consensus on the effectiveness of the learning intervention.

The Research Objectives

i. To identify the structural needs for creating Animation for Game learning content.
ii. To identify the most significant domains for successful entry into the game design setting.

The research aims to answer the following research questions:

i. What key structural components are necessary for integrating animation into game design learning content?
ii. What significant domains must new entrants be ready for successful integration into the game design industry?.

Incorporating the needs in developing the ‘Animation for Games’ Learning for Game Design Program into the university curriculum for game design programs promises substantial benefits. It aims to ensure that the content and pedagogical approaches are in harmony with the Programme Standards in Creative Multimedia, as outlined within the Malaysia

Qualification Framework by the Ministry of Education Malaysia (2015). This alignment promises to elevate the academic rigor and relevance of game design programs and contribute significantly to the broader field of creative multimedia education, ensuring graduates are well-equipped to meet the industry's evolving demands.

This dynamic underscores the imperative for a strategic alignment between the employment needs of the animation and video game sectors. Collaboration between the animation industry and Institutions of Higher Learning (IHLs) is crucial for ensuring that educational programs are responsive to the evolving demands of both fields. Such partnerships are essential for fostering an environment where continuous professional development opportunities—including reskilling, upskilling, and retraining in animation for games are readily available. By maintaining a proactive stance on educational and training opportunities, the animation industry and academic institutions can collectively enhance their contribution to the broader creative economy, ensuring a steady pipeline of skilled professionals ready to meet the challenges of the animation and video game industries.

Literature Review

The significance of animation in game design learning has surged in prominence within academic circles, emphasizing the critical role it plays in shaping the educational landscape for aspiring game designers. In recent years, innovative teaching strategies have been used to enrich the learning experience in this dynamic field. Among these, Wu and Tu (2022) stand out for their novel approach, which integrates alternating peer teaching with progressive project-oriented learning into the digital animation game production curriculum. This method enables students to thoroughly comprehend and apply the knowledge and skills necessary for producing digital animation games. Further enriching the practical side of game design education, Dhule (2022) delves into the intricate process of animating various player actions for platformer games, including running, jumping, and staying idle. These contributions underscore the importance of hands-on experience in mastering game mechanics and animation techniques.

Expanding the educational perspective, Rahayuningtyas et al. (2020) offer an insightful analysis of the curriculum and the accomplishments of graduates from animation game study programs. Their research provides valuable guidance for novices entering the animation industry, highlighting the academic pathways that lead to success. On a related note, Pasqualotto et al. (2022) explore the broader cognitive benefits of video gaming, discussing how engaging with video games can enhance brain plasticity and facilitate learning processes. They emphasize the importance of maintaining motivation, ensuring skill mastery, and promoting knowledge transfer. These studies collectively paint a comprehensive picture of how animation can seamlessly integrate into game design education. They advocate for a balanced educational approach that combines theoretical knowledge with practical application, aimed at developing both the technical prowess required for game production and learners' cognitive development.

Table 1
Highlights the diverse approaches and insights from recent research on the role of animation in game design education, from practical skill development to cognitive benefits.

Author (s)	*Focus*	*Methods Used*
Wu and Tu (2022)	In this paper, the authors developed the teaching strategies of alternating peer teaching and progressive project-oriented learning, applied them to the digital animation game production curriculum design, and conducted experimental research.	• Alternating peer teaching • Progressive project-oriented learning
Dhule (2022)	The paper discusses creating player actions in a platformer game. It emphasizes the importance of mastering animation for common game mechanics.	• Creation of various player actions in platformer games (running, jumping, idling) by pressing various keyboard keys.
Rahayuningtyas et al. (2020)	The curriculum in the Animation Game program is designed for graduates with diplomas (D1, D2, D3, and D4). The program prepares graduates for roles such as 2D/3D Animator, Character Designer, Game Designer, etc	• Qualitative study case with a descriptive approach • Documentation and interviews were used to collect data
Pasqualotto et al. (2022)	The paper discusses the potential of video games to enhance brain plasticity and learning. It highlights the challenges and game design elements needed for effective learning.	• Review of game design elements and psychological constructs for learning objectives. • Discussion of potential pitfalls and paths forward for consistent impact.

The expansion of educational perspectives in animation for game design learning aligns seamlessly with applying the six disciplines of breakthrough learning outlined by Polluck et al. (2010). These disciplines, which focus on setting clear outcomes, designing the learning experience, delivering for application, driving learning transfer, deploying performance support, and documenting results, can significantly inform the instructional needs of developing animation learning content for game design. By leveraging these disciplines, educators create a structured and effective learning environment that imparts the necessary knowledge and skills in digital animation and game production and ensures these skills are directly applicable and transferable to real-world scenarios. This approach aligns with the innovative teaching strategies highlighted by Wu and Tu (2022) and others, emphasizing a curriculum that combines theoretical knowledge with practical application.

Furthermore, the Work Readiness Scale (WRS) by Caballero et al. (2011) provides a valuable framework for identifying the key domains essential for a successful transition into game

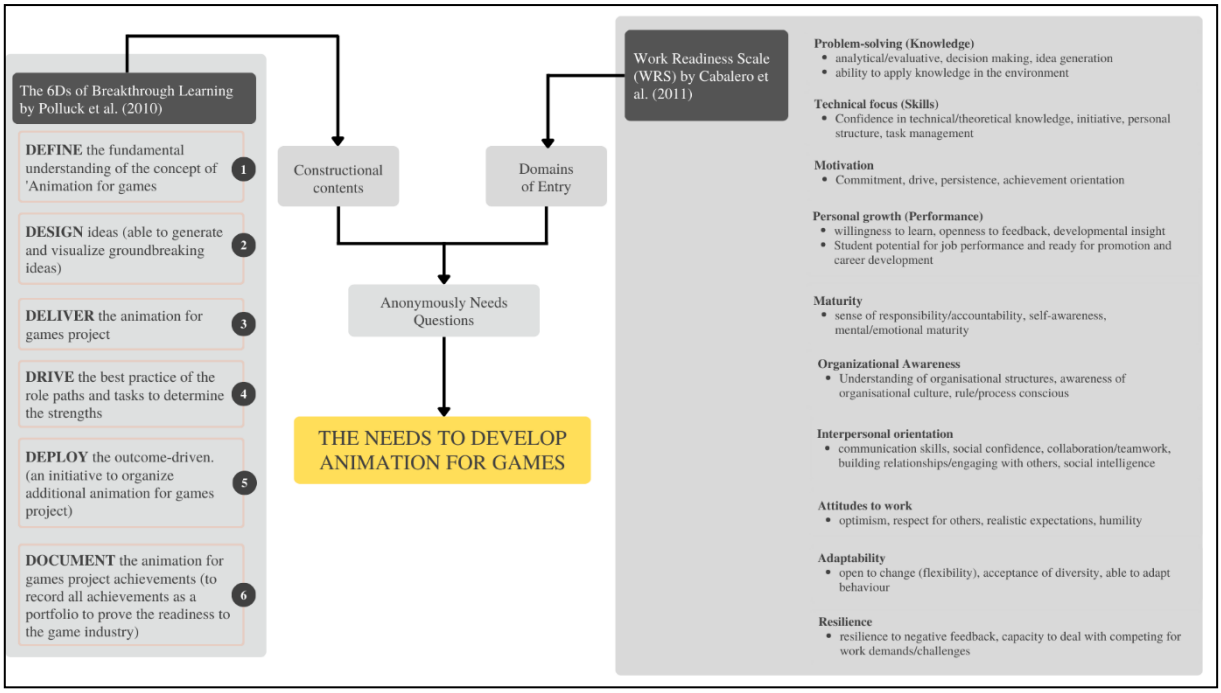
design careers. This scale can help educators tailor their teaching strategies and content to meet the industry's specific needs, ensuring students are proficient in the technical aspects of game design and animation and equipped with the soft skills and professional competencies required for workplace success. By integrating the WRS into the curriculum design, educational programs can foster a comprehensive skill set that encompasses both game design's creative and professional dimensions. Additionally, anonymous questionnaires to gather expert consensus on the effectiveness of these learning interventions offer an evidence-based approach to validate and refine educational practices. This method ensures that the curriculum remains aligned with industry standards and meets the evolving needs of both students and employers, thereby enhancing the overall quality and relevance of animation in game design education.

Relating this to pursuing the research, a framework illustrated the 6Ds, with the WRS articulating the developmental needs in developing the 'Animation for Games' Learning for Game Design Program. The integration challenges involve ensuring that the contents of Animation for Games align with the program competencies and that instructional strategies are developed to deliver the practical and soft skills outlined in the WRS. This framework supports a holistic educational strategy combining the acquisition of complex skills in animation and game design, as outlined by the six disciplines, with the soft skills and professional readiness emphasized by the WRS. The mapped framework for this comprehensive learning experience is illustrated below:

Fig. 1 The mapped framework of the 6Ds with the WRS articulated the need to develop the 'Animation for Games' Learning.

The study highlights the growing importance of game design education in Malaysia, a developing field compared to established areas like film and animation. According to new research by Azlimi et al. (2023), there is a chance to create specialized education programs for game design that meet the industry's specific needs. This could help grow Malaysia's game industry. The research points out that schools and universities in Malaysia are already using game elements like points, badges, and leaderboards to make learning more engaging. This approach shows the potential benefits of tailoring education to match the game industry's needs. The study also notes how using game design for educational, business, and medical purposes can be informative and fun. This collective data underscores the potential for shaping and designing game education programs in line with industry needs that could help the gaming sector in Malaysia expand.

Adapting the 6Ds to the specific area of Animation for Games dissects the identification of the key structural needs for creating and integrating Animation for Game Design learning content. Employing a dual-dimensional approach (need to learn? & need more to learn?) explains a two-part strategy tailored to enhance education in Animation for Games. This approach breaks down into two key questions: "Needs to Learn?" and "Need More to Learn?" to differentiate between foundational and advanced learning opportunities, ensuring a comprehensive educational approach.



"Needs to Learn" focuses on gathering expert opinions to identify the foundational domains essential for beginner Game Design. This section aims to pinpoint the basic knowledge and skills every student should acquire to effectively understand and engage with game animation. Educational research highlights the importance of establishing foundational, solid competencies in any learning environment. By providing immersive and engaging experiences, foundational learning motivates students and enhances their learning process (Ibrahim & Jaafar, 2009). These competencies ensure that students develop a solid knowledge base, which is crucial before progressing to more advanced domains in game design.

"Need More to Learn" explores how deeply foundational domains should be studied and strengthened beyond the basics. This part focuses on identifying advanced learning opportunities, such as specialized courses, workshops, or additional resources for students looking to deepen their knowledge in specific areas of game design. Advanced learning opportunities are crucial for students who have mastered the basics and are ready to engage in more specialized areas. These opportunities allow students to develop advanced skills in game animation, preparing them for more complex challenges in the field.

The distinction between "Needs to Learn" and "Needs More to Learn" reflects students' varied knowledge levels and competencies in game animation. Some students may require reinforcement of foundational skills, while others are ready to engage with more advanced topics. Educational research on differentiated instruction supports tailoring the curriculum to accommodate this diversity, emphasizing the need for personalized learning paths that meet the unique needs of each student (Finegold & Notabartolo, 2008). These two guiding questions—"Needs to Learn" and "Need More to Learn"—map out the essential entry-level knowledge needed in Game Design and the paths available for advanced learning. This comprehensive approach ensures that students grasp the foundational concepts while also providing opportunities for specialization. The insights gathered through this framework can help shape future educational programs and research, creating a benchmark for curriculum development in Animation for Games.

Incorporating Work Readiness Skills (WRS) into university curricula is essential for preparing students to succeed in today's competitive job market, especially in game design. WRS, including critical skills such as independent learning, teamwork, and communication (Ellis, 2023), are crucial for students to effectively navigate traditional and remote work environments (Beal, 2023). Identifying key WRS domains that can be integrated into a multidisciplinary game design program holds significant potential for improving pedagogical practices and curriculum development. Universities must equip students with discipline-specific knowledge and transferable skills, enabling a seamless transition from academia to the professional world (Ashleigh et al., 2021).

By aligning these work readiness skills with industry needs, educational institutions can enhance student employability and ensure a successful transition into the workforce. Integrating WRS into the early stages of a game design program allows for a more comprehensive approach, ensuring that students are prepared to meet the industry's technical and professional demands. This strategy also ensures graduates receive a well-rounded education, helping them succeed in various game design and animation roles. Universities must ensure graduates have discipline-specific and transferable skills to effectively bridge the gap between study and work (Ashleigh et al., 2021). Integrating work readiness skills into pedagogy and aligning them with industry needs is crucial for enhancing students' employability and successful transition into the workforce. This approach could yield insights into which WRS domains are universally acknowledged as essential and should, therefore, be integrated into the early stages of the educational program. Ensuring students receive comprehensive and high-quality animation education for games is critical to addressing these consequences.

Methodology

In this study, selecting the expert panel is an important consideration, as the experts should have relevant knowledge and experience in the field and be able to provide valuable insights that can inform the development of the new module. In addition, it may be important to ensure that the panel includes individuals with diverse perspectives and backgrounds to capture various viewpoints and opinions. This study identifies experts based on their academic qualifications, years of experience in game design or animation, and familiarity with Malaysia's educational landscape. Once the panel is formed, a questionnaire designed to address the research question is distributed to the experts. The questionnaire employs fuzzy scaling, allowing experts to respond in fuzzy linguistic terms such as "Ineffective," "Somewhat Ineffective," "Moderately Effective," "Effective," and "Very Effective" to account for the subjectivity and vagueness inherent in such judgments.

A set of needs analysis questionnaires based on domains from the six (6) disciplines of breakthrough learning by Polluck et al. (2010) and the Work Readiness Scale (WRS) by Caballero et al. (2011) were ranked by the experts of eight (8) academicians and four (4) industry panels. Respectively, the 6Ds' domains will identify the structural needs for the instructional content of the module. At the same time, the WRS ranked the most significant domains for successful readiness entry into the game design setting.

In studies utilizing the Fuzzy Delphi technique, the number of experts as study respondents is based on Jones and Twiss (1978), which states that the number of experts for Delphi studies

is 10 to 50. This affirmation of the number of experts for this method is also consistent with previous research views that the permissible number of experts is 10 to 15 if there is high consensus and uniformity among the experts (Adler & Ziglo, 1996). In this study, the total number of experts involved was twelve (12); the panel of experts combines academic excellence with industry expertise. The academicians contribute to understanding theoretical knowledge and research, while the industry practitioners bring invaluable practical experience and insight.

The panel of experts comprises academicians and industry practitioners, each with over five (5) years of experience. Among the academicians, two associate professors lead in game technology and 3D animation, contributing to curriculum development and research. Two senior lecturers specializing in 3D animation teach advanced animation techniques and supervise projects. A senior lecturer and two lecturers in game design and animation focus on game mechanics, narrative design, player experience, and a balanced mix of theory and practical skills. On the other hand, the industry practitioners include two animators with experience in creating character animations, special effects, and environments for games and films. Additionally, two directors offer leadership in game and animation, game design and technology, overseeing projects and advancing innovations such as AR/VR and AI in-game settings.

The Fuzzy Delphi Method (FDM)

This study used the Fuzzy Delphi Method (FDM) with five (5) Likert scales to get a consensus from twelve (12) experts: academicians and game industry players. The collected data was analyzed using a triangular fuzzy number, and the ranking of each item was determined using the 'defuzzifying' process. The data will identify the structural needs for creating Animation for Game learning content and the most significant domains for successful entry into the game design setting. The outcome of this FDM technique is a clearly defined set of needs for module development, which lays the foundation for the subsequent phases.

The Fuzzy Delphi Method (FDM) is a pivotal instrument for systematically collecting data from various experts. Procedures must be followed to obtain the study results using the Fuzzy Delphi approach. The FDM has been used in similar studies to obtain expert consensus on various aspects such as curriculum design, assessment methods, and the development of educational tools (Liu et al., 2023; Vasodavan et al., 2021; Yeh et al., 2024). The Fuzzy Delphi Method has proven valuable in obtaining expert consensus in complex educational research projects. Its ability to handle uncertainties and diverse opinions makes it suitable for obtaining reliable and consistent educational results.

The FDM process began with identifying the panel of experts selected for their relevant knowledge in game design and animation. Next, a questionnaire was distributed to elicit responses using fuzzy linguistic terms. The expert panel's responses were collected and analyzed using triangular fuzzy numbers, facilitating consensus through defuzzification. The resulting crisp values were ranked, allowing for a systematic assessment of the most essential learning components. The FDM recommendations are based on the opinions of experts acting as respondents on a quantitative basis. A number of needs analysis questionnaires were given to each expert, who was required to agree on each item on a scale of 1 to 5. The data from the Likert scale were then converted to a fuzzy scale. A series of expert questions is

formulated using a five-point Likert scale. To make it easier for the expert to respond to the questionnaire, the researcher substituted a scale ranging from one to five for the fuzzy value, as shown in Table 2, for each of the five linguistic scales that follow.

Table 2
Level of Agreement and Fuzzy Scale (Adopted from Jamil et al., 2014)

Linguistic variables	*Fuzzy scale*
Strongly disagree	0.0, 0.0, 0.25
Disagree	0.0, 0.25, 0.5
Neither agree nor disagree	0.25, 0.5, 0.75
Agree	0.5, 0.75, 0.10
Strongly Agree	0.75, 1.0, 1.0

The FDM technique employs a Likert scale ranging from 1 to 5 in the questionnaire to gather expert feedback on the essential components of an 'Animation for Games' learning module. This scale allows experts to express their level of agreement with the identified developmental needs for the module in a straightforward manner. Expert input is crucial in determining the importance and relevance of each domain, which helps guide a focused and data-driven approach to curriculum development. By analyzing these responses through the FDM process, the study can pinpoint the most critical aspects of game animation education and ensure the learning module is tailored to meet academic and industry needs.

Findings

The adapted questionnaires on the 6Ds to the specific area of Animation for Games dissect the identification of the key structural needs for creating and integrating Animation for Game Design learning content. Employing a dual-dimensional approach (need to learn? & need more to learn?) explains a two-part strategy tailored to enhance education in Animation for Games. The results of the breaks of two key questions: "Needs to Learn?" and "Need More to Learn?" are as follows:

Table 3
The FDM results table on the 6Ds Domain is used to construct the contents of the 'Animation for Games' learning module.

6D Domains	Needs to Learn	Ranking	Status	Needs MORE to Learn	Ranking	Status
	Defuzzification			Defuzzification		
D1: Define the fundamental understanding of the concept of 'Animation for the game'	0.76667	1	Accept	0.6	3	Accept
D2: Design ideas. (able to generate and visualize the groundbreaking ideas)	0.68333	2	Accept	0.65	2	Accept
D3: Deliver the animation-game projects. (at least one (1) animation-game project ready)	0.58333	5	Accept	0.68333	1	Accept
D4: Drive the best practices of the role paths and their tasks to determine the strengths	0.66667	3	Accept	0.58333	4	Accept
D5: Deploy the outcome-driven initiative. (an initiative to organize additional animation-game projects)	0.61667	4	Accept	0.6	3	Accept
D6: Document an animator-ready for the game	0.76667	1	Accept	0.65	2	Accept

The table presents two primary columns: "Needs to Learn?" and "Needs MORE to Learn?" aligned with the 6D game design learning domains. Under "Needs to Learn?":

1. D1: Define the fundamental understanding of the 'Animation for the game' (Defuzzification 0.76667, Ranked 1, Status Accept). This domain is considered the most crucial foundational knowledge for newcomers in game design.
2. D2: Design ideas, which involve generating and visualizing groundbreaking ideas (Defuzzification 0.68333, Ranked 2, Status Accept). This is considered essential but slightly less so than D1.

3. D3: Deliver the animation-game projects, meaning to have at least one animation-game project ready (Defuzzification 0.58333, Ranked 5, Status Accept). Although it's the lowest in essential foundational knowledge, it's still critical.
4. D4: Drive the best practices in the industry (Defuzzification 0.66667, Ranked 3, Status Accept). This is ranked third in importance for foundational knowledge.
5. D5: Deploy the outcome-driven initiative (Defuzzification 0.61667, Ranked 4, Status Accept). This suggests it's important to understand how to organize additional animation-game projects.
6. D6: Document an animator-ready for the game (Defuzzification 0.76667, Ranked 1, Status Accept). This ties in with D1 for the most essential foundation.

For "Needs MORE to Learn?" the domains imply areas for deeper study and advanced learning opportunities:

1. D1 and D6 show less need for advanced study (both with Defuzzification 0.6, Ranked 3 and 2 respectively, Status Accept), perhaps because D1 and D6 were so fundamental that they don't require as much additional depth once grasped.
2. D2 (Defuzzification 0.65, Ranked 2, Status Accept) and D3 (Defuzzification 0.68333, Ranked 1, Status Accept) jump to the top, suggesting that once the basics are covered, these areas hold the most potential for further specialization or advanced learning.
3. D4 (Defuzzification 0.58333, Ranked 4, Status Accept) seems more established, with less need for additional depth than others.
4. D5 (Defuzzification 0.6, Ranked 3, Status Accept) is seen as essential for further learning but is not the highest priority.

This study used defuzzification to determine which educational domains in-game animation were essential ('Needs to Learn') and which domains required more advanced learning ('Needs MORE to Learn'). The domains with higher defuzzification scores were considered more critical and were thus given higher priority in the educational curriculum for game design.

On the other hand, incorporating work readiness skills (WRS) into university, the Work Readiness Skill (WRS) results can be seen as follows:

Domains	Defuzzification scores	Ranking	Status
Attitudes to Work	0.7333	1	Accept
Technical Focus	0.7	2	Accept
Adaptability	0.7	2	Accept
Problem-solving	0.6833	3	Accept
Motivation	0.6833	3	Accept
Personal Growth	0.6833	3	Accept
Maturity	0.6833	3	Accept
Resilience	0.6167	4	Accept
Interpersonal Orientation	0.5833	5	Accept
Organizational Awareness	0.5	6	Reject

The Fuzzy Delphi Method (FDM) results offer an understanding of the most essential skills and attributes for work readiness in animation for game design. The factor that received the highest score, at 0.7333, was "Attitudes to Work." This suggests that experts in the field

place a premium on a positive work ethic and consider it the most critical attribute for work readiness in game design. The high score indicates that fostering a constructive attitude towards work should be a primary focus in educational and learning programs.

"Technical Focus" and "Adaptability" are closely followed, each scoring 0.7. The almost equal importance attributed to these factors implies that technical acumen and the ability to adapt to changing circumstances are considered second only to a positive work attitude. These attributes could be considered the pillars upon which other skills are built, and they should be given significant attention in any curriculum or training module. Tied for the third rank are "Problem-solving," "Motivation," "Personal Growth," and "Maturity," with each score of 0.6833. While these factors are highly valued, they are considered slightly less critical than technical focus and adaptability. This suggests that while problem-solving and motivational skills are important, they may be seen as complementary to the core skills of technical focus and adaptability.

Next, "Resilience" scored 0.6167, indicating that while it is important, it is not a top priority. This suggests that, although valuable, resilience may be seen as a skill that complements other, more critical skills rather than being a focal point. "Interpersonal Orientation" received a score of 0.5833, indicating that social skills, while important, are not a top priority. This could suggest that the field may be more task-oriented and that social skills, although beneficial, are not the main focus for work readiness. Lastly, "Organizational Awareness" (Q16) scored the lowest at 0.5 and was the only factor to be rejected. This suggests that understanding the broader organizational context is the least important attribute for work readiness in animation for game design. This could indicate that the focus is more on individual skills and characteristics than on understanding the organizational landscape.

Discussion

The insights drawn from the FDM analysis offer a compelling blueprint for academic institutions aiming to craft a game animation curriculum that mirrors professional expectations and demands. This discussion delves into how the findings direct the structuring of a curriculum that provides a pathway from academic learning to industry excellence in game design. The discussion categories are as follows:

Structural Needs for Animation in Game Design (Emphasis on Fundamental Skills and Theoretical Knowledge)

A foundational pillar for aspiring game animators is a robust understanding of the field's core principles. The data underscores the importance of beginning education, emphasizing the fundamental concepts of game animation (D1) and the critical ability to document processes and ideas effectively (D6). These findings resonate with the industry's call for professionals who possess theoretical knowledge and excel in articulating their ideas and translating them into tangible outputs. The FDM analysis stresses starting with a solid foundation in game animation and the ability to document processes and ideas effectively. This approach resonates with earlier research by Wu and Tu (2022), which focuses on integrating peer teaching and project-oriented learning to ensure a deep understanding of digital animation game production. Both views highlight the importance of a strong theoretical knowledge base and practical skills.

Advancing from Basics to Specialization

As the research indicates, once students have a solid grasp of the basics, they should be directed toward more intricate and specialized areas of game animation. This advancement is especially true for domains like project delivery (D3) and innovative design (D2), marked for further learning. These competencies are vital for those who wish to enter and excel in the industry, as they address the ability to complete projects from inception to delivery and continually push the envelope with creative solutions. The FDM findings and previous studies advocate advancing beyond basic knowledge toward specialization. The FDM analysis suggests focusing on project delivery and innovative design, while Dhule (2022) emphasizes mastering animation for common game mechanics. This progression from foundational skills to more specialized knowledge is crucial for preparing students for industry challenges.

Core Competencies for Game Design Professionals

The emphasis on "Technical Focus" and "Adaptability" reveals the industry's need for technically skilled and agile professionals. The curriculum must foster these traits, preparing students to solve complex problems and adapt to game design's fast-paced, evolving nature. Moreover, fostering "Motivation" and promoting "Personal Growth" are critical for student engagement and holistic development. Emotional intelligence and personal maturity prepare students for the professional world's realities, equipping them to navigate the challenges of the game design landscape with resilience and interpersonal finesse. The FDM analysis introduces the need for technical focus, adaptability, resilience, and interpersonal skills as part of game design professionals' core and secondary competencies. This aligns with the broader educational perspectives of Rahayuningtyas et al. (2020) and Pasqualotto et al. (2022), emphasizing cognitive benefits, motivation, skill mastery, and knowledge transfer. Both approaches recognize the importance of a holistic educational strategy fostering technical and soft skills.

Integrating Work Readiness into the Curriculum

Regarding professional areas like game design, secondary skills like resilience and people skills are still helpful, but not seen as core competencies. In specialized areas, primary skills like technical knowledge in animation or game mechanics are often the most important for success because they directly affect the ability to do key tasks (Katz, 1955). Secondary skills are also essential because they help people deal with problems and work well with others. For instance, technical skills are needed to make complicated game animations, but resilience helps people deal with failures, and interpersonal orientation encourages good teamwork (Goleman, 1995). Emotional intelligence and teamwork are important secondary skills that help people use their main technical skills more effectively in creative and fast-paced fields where adapting and working with others are key to long-term success (Clarke, 2008; Cherniss & Goleman, 2001). Adding secondary skills to game design classes might not be the main focus, but it does make students better able to adapt, work together, and do well in complex work settings. So, secondary skills are just as essential as primary skills when it comes to making sure that grads are not only technically skilled but also ready to succeed in the game design industry, which is collaborative and constantly changing (Cherniss & Goleman, 2001; Goleman, 1995).

Organizational Awareness: The Bigger Picture

The table results show that "Organisational Awareness" is unimportant for students new to game design. On the other hand, as professionals move up in their jobs, they need to know more about the organization's environment. Organizational awareness may not be the main focus at first, but it should be taught to students as they move up in their jobs to get them ready for leadership and management roles (Hogan & Kaiser, 2005). This fits the idea that technical and creative skills are important initially, but wider skills like organizational awareness are needed for long-term job success in creative fields (Avolio & Bass, 2002).

In shaping the next generation of game designers, educators must prioritize a curriculum that evolves from imparting foundational knowledge to developing advanced, specialized skills. Doing so ensures that graduates are ready to step into the industry and primed to lead and innovate. The FDM results are a testament to the efficacy of a curriculum meticulously aligned with the industry's structural needs, enhancing students' employability and success in the vibrant game animation field. In synthesizing the FDM analysis with previous research, it becomes clear that there is a consensus on several key principles for developing effective game design education programs. These include the necessity of strong foundational knowledge, the progression to specialized skills, the development of core and secondary competencies, and the integration of work readiness into the curriculum. Both perspectives advocate for an educational approach that is dynamic, student-centered, and aligned with industry expectations, ensuring that graduates are well-prepared to navigate the complexities of the game design profession.

Conclusion

As a reflection upon the evolving landscape of game design education, it is clear that the field has transitioned from traditional pedagogies to more innovative and interactive teaching strategies. This shift underscores the increasing significance of game design and animation in academic spheres, highlighting the dynamic nature of this discipline. Through the insights drawn from the FDM analysis and previous research, this study has consistently emphasized the need for a foundational understanding of game animation principles, a progression toward specialization, and the cultivation of core competencies essential for industry success.

However, study exploration also uncovers limitations, including the restricted scope of data sources and the challenges of generalizing findings across diverse educational and cultural contexts. These gaps point towards fertile grounds for future investigation, particularly in areas like integrating emerging technologies, longitudinal success tracking of graduates, and developing more inclusive and adaptive teaching methods.

Crucially, the path forward underscores the indispensable value of collaboration between academia and the game design industry. Such partnerships are paramount for curriculum development, ensuring educational frameworks adapt to technological innovations and market demands. This collaborative approach enriches the curriculum and enhances the relevance and applicability of the skills imparted to students.

In conclusion, shaping future curricula in game design education is both a challenge and an opportunity. It invites educators to impart technical and creative skills and instill in students the resilience, adaptability, and continuous learning ethos required in the ever-

evolving game industry. As we forge ahead, the role of educators extends beyond teaching; it encompasses inspiring the next generation of game designers to navigate the complexities of the field with innovation, dedication, and a spirit of perpetual growth. The blueprint for game design education, thus, is not just about crafting skilled professionals but about nurturing visionary creators who are ready to lead and redefine the boundaries of what games can be.

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