The Effectiveness of the Three-Dimensional (3D) Design Animation Programme in the Institutes of Higher Learning Malaysia

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Abstract. Three-dimensional (3D) animation is a new field that has piqued the interest of many students at the university, vocational, and school levels. No comprehensive study was conducted on the framework of effectiveness with regard to reaction, learning, attitude, and overall consequence of the 3D animation programme in the institutes of higher learning. The elements were assessed from the perspective of the stakeholders, who included final-year students, working graduates, academics, and industrial representatives. In this study, a qualitative method was used using the purposive sampling technique via the interview approach. This study included Malaysian public and private institutes of higher learning that offer animation programmes. Reaction, course subjects, duration, and academic expertise were the main concerns expressed by the four groups of respondents. Meanwhile, there was a dearth of understanding and knowledge in this subject in terms of the learning component. The respondents' main topics of discussion were attitude, self-ability, skills, and knowledge. The implications of this study contribute to the development of a framework for a guideline on the legislation and implementation of the 3D animation programme in institutions of higher learning in order to improve the programme. Stakeholder input should be considered when assessing the programme's effectiveness to ensure its direction in meeting current needs.

Keywords: Effectiveness, 3D animation Program, Graduate performance, creative industry, Kirkpatrick's Model Assessment.

1   Introduction

The animation industry is one of the fastest-growing industrial sectors, with enormous potential to expand in tandem with the advancement of electronics and digital technology. In Malaysia, there are approximately 200 registered companies with 114 registered directly under the animation subsector of the Creative Multimedia Industry Group (MSC Malaysia) category. These much-needed companies are supported by various parties [1]. To date, various efforts to develop this animation sector have been undertaken with regard to the development of human resources to meet workforce, creativity and skills requirements. Animation education in Malaysia is critical to the development of animation, comprising of tertiary education and training (IPT) in providing a skilled workforce for the industry's semi-skilled. [2]. Higher

learning institutions are one of the platforms to prepare students with skills and knowledge relevant to their chosen career field.

The program's effectiveness is measured by the program's learning outcomes. Learning outcomes are critical in determining the effectiveness of the programme being offered. These outcomes are visible as a result of a process of knowledge and experiences that affect a student's behaviour. According to Warner & Desimone [3], learning can be described as a "relatively permanent change" in a participant's various cognitive behaviours that can influence interactions in an environment. Learning is a process that changes a person, including the way that person thinks. According to Blanchard & Tachker [4], in general, education only focuses on the aspects of knowledge, skills and abilities in the field of training, which focus more on the aspects of knowledge and skills in one's profession and employment. According to Furniss [5], "the planning stage is critical because it is where producers and directors consult with one another to lay the groundwork for production." The production process will be followed for the implementation of actions for students. As a result, the use of efficient and skilled workforce is essential, as this process takes a long time. Werner & DeSimone [6] added, "a systematic and planned set of activities designed by an organisation to provide its members with the opportunity to learn the skills required to meet current and future job demands.".

A. 3D Animation Design Development Program in Malaysia

Recent graduates have only rudimentary knowledge of animation, storytelling techniques, cinematography, acting, and editing. The 3D animation design programme is a new field that is attracting many students from higher education, vocational schools, and schools, Miho Aoki.et.al, [7].3D animation education differs greatly from traditional art and science programmes. In Malaysia, 3D animation software is widely used in the architectural sector; however, content in the field of animation is still new and growing.

According to the president of the Malaysian Animation Association, Kamn Ismail (2010), in "Hala Tuju Animasi," graduates who are born are not taught with the most up-to-date software skills, and even the training provided is mixed and lacks specialisation. This situation is detrimental to the industry because these graduates must be re-trained. The industry would like to suggest that there is a need for standardisation in animation software training as well as specific programmes in Malaysian higher education. The study's challenges are related to the marketability and performance of students in comparison to industrial time. Furthermore, the teaching staff faces new and varied challenges in this field, which frequently change in accordance with current practise and in tandem with the creative industry. As a result of the rapidly changing requirements of computer software, the teaching staff requires a broad range of knowledge and skills to operate this curriculum programme. This is supported by a study by Schmidt, Jagger, McCambell & Slagel [8] stated that teaching 3D animation in educational institutions is difficult, but not impossible. The challenge will be to focus not only on computer software and equipment, but also on people, focus, work ethic, and time, which are more elusive sources.

B. The Development of Animation in the Context of Industry

The term "creative industries" refers to a wide range of economic activities centred on the creation and application of new knowledge and information. According to Hesmondhlgh, the

creative industry is also connected to the cultural industry in European countries, as well as the creative economy. Howkins [9], and, more recently, the creative industry has been referred to as the "Orange Economy" in Latin America and the Caribbean. Buitrago & Duque [10], the creative industry has been identified as an important factor in the growth of the economy. According to Florida [11], a creative workforce is a significant economic resource, and industries in the 21stcentury will require knowledge generation in creativity and innovation. Recognising the enormous potential in the creative multimedia industry, the government has provided infrastructure and other incentives to grow this industry through MDEC (Malaysian Development Corporation). With this, more colleges and universities, both public and private, choose Creative Industry study programmes, and some even establish departments and faculties of Creative Industry. As a result, the creative industry is now regarded as one of the most important factors in the advancement of economic prosperity.

C. Graduate Performance And Marketability

The performance of graduates with regard to the results and quality are obtained by how they achieve and accomplish tasks assigned to them. Consumer marketability demands graduates who are capable and demonstrates strong skills, knowledge, attitude, and attention to business areas that the graduates can immediately apply to the organisation where they are hired, Mason, Williams, and Cranmer [12]. Graduates are also required be equipped with soft skills, the ability to work independently, information technology skills, leadership, decision making and intellectual skills to enable them to successfully acquire work. According to Lankard [13], graduate marketability is related to personal and interpersonal skills, as well as positive behavioural attitudes. He stated that in the ever-changing world of industrial employment, employers require employees who are more creative, flexible, and have strong interpersonal skills. Thus, previous research on graduate marketability discovered that employers require employees with positive attitudes, effective skills, problem solving skills, decision making, group work, enterprising, interpersonal, and even leadership skills (Greenan et al.al.[14] Kutscher [15]; Lankard 1994; Mobley [16]. The marketability of graduates can be defined as the self-worth of graduates and the use of skills or abilities possessed by graduates that can pique the interest of prospective employers in hiring them, Mohd As'ri Chik, (2009). The marketability of graduates can determine the effectiveness of a national education system.

Figure 2.2: Performance and Marketability of graduates Mohd As'ri Chick, (2009)

D. Kirkpatrick's Model Assessment

The research model is an integral component in a scientific research study. A general research model is a theory-based assumption or hypothesis about something. According to Stanovich [17], theory and model are a set of interconnected concepts that are used to explain data and predict future outcomes. Assessment is also a process that determines value based on the outcomes of learning objectives. The evaluation model is a method for measuring a program's effectiveness and is closely related to the learning outcomes obtained by graduates. According to Adam [18] assessment is a method of measuring student users' learning outcomes. Robert L.Thorndike & Elizabeth Hagen [19] stated that evaluating is also related to measurement.

A programme is conducted for four main reasons: (1) to determine the program's effectiveness; (2) to document programme objectives that have been met; (3) to provide information on existing services that are beneficial to consumers and customers; and (4) to use changes that can increase the program's effectiveness, Muraskin [20]. The final step in evaluating learning outcomes is to assess students' achievement or performance in meeting learning objectives. The process begins with learning objectives and concludes with an assessment of which objectives were met.

The Kirkpatrick Assessment Model was one of the first and most widely used in-training assessment models. Donald Kirkpatrick (1959) developed Kirkpatrick's Four of Evaluation to define the four levels of evaluation. Since 1959, the studies in this model have yielded a wealth of knowledge for training evaluation theory and have been empirically validated in the form of successful training effectiveness (Alliger and Janak, 1989; Miller, 1996; Holton, 1996; Bartlett, 1999; Brinkerhoff, 2005) [21]. This model is also frequently used because it is simple to apply and can help with the evaluation process of an exercise, Alliger and Janak [22]. The model is made up of four (4) evaluation assessments that are intended to be used to evaluate training programmes.

Stage I - Reaction: is a measurement that examines the trainee's perception of the exercise.
Intoxication II - Learning: This stage will evaluate what has been learned and stored throughout the learning experience.
Intoxication III - Behaviour change / application: Intoxication is the same as having a coach apply what is learned in the workplace; and
Intoxication IV - Outcome: this stage affects the effects of training, leading to positive work culture changes, Kirkpatrick [23].

According to Azian Ahmad and Norfadhillaton Zahari [24] evaluating the effectiveness of the programme is important in terms of training and can benefit users as well as a department. Kirckpatrick [25] also demonstrated that organisations that manage training must determine whether or not training should be continued. The Kirkpatrick evaluation model outlines four critical levels of evaluation in determining the effectiveness of a participant's reaction training programme, the learning that occurs during attitude training, and the training outcomes toward the organisation. A study conducted by Kamarulzzaman Abdul Manan, Shuhaida Md Nor & Bahyah Omar [26] have found that the Kirkpatrick test model used in the measurement of a programme varies by four levels. However, only levels one and two of the study programmes are used to see the process of learning acceptance, while levels three and four are used to see the program's continuity with the behaviour and the results applied in the industry.

Figure 2.4: Kirkpatrick's four -stage evaluation model

Level 1 :Reaction
(a) Key Question: Did the student achieve the desired outcome of the programme study? (b) Timing: Usually done 3 month - 2year after learning experience
(c) Data source: Participant/employer/advisor survey/ Focus group/Interview/concrete indicator/previous data
Level 2 :Learning
(a) Key Question: Are the newly acquired skills, knowledge or attitude used by the learner after the learning programme is complete?
(b) Timing: Usually done 3 month - 2year after learning experience
(c) Data source: Participant/employer/advisor survey/ Focus group/Interview/concrete indicator/previous data
Level 3 : Behaviour
(a) Key question: Did the student achieve the desired learning objective (s)
(b) Timing: Usually done immediately or soon after learning.
(c) Data source: Test, assignments, discussions, Q&A
Level 4 : Result
(a) Key question: What was the student's reaction to the learning environment?
(b) Timing: Usually done immediately or soon after learning event (s).
(c) Data source: Data survey, focus group, interviews, previous data

2 Research Objective

The primary goal of this study is to examine the effectiveness of the 3D animation design programme in Malaysian higher education through the four elements of reaction, learning, attitude, and behaviour, as well as the overall outcome of the study programme. The objectives of this study are as follows:

1) To learn about students' perspectives on the 3D animation design programme used in Malaysian higher education;

2) To study the perspectives of graduates who have worked in the 3D animation design programme that they pursued in Malaysian higher education;

3) A survey of academic staff on the 3D animation design programmes available in Malaysian higher education; and

4) To ascertain the industry's perspectives on 3D animation design programmes in Malaysian higher education in relation to the industry's current needs.

3 Research Design

This study focuses on a case study using the qualitative method. This study meets the criteria for a qualitative study as defined by Merriam [27] with the first question focusing on each individual and each of these target groups in relation to the 3D animation programme. Second, the study respondents were chosen based on their intent to obtain a variety of possible data or relevant information. Third, this study employs an inductive approach to each, resulting in the development of concepts and categories of the phenomena posed by the data collected during the site study. Fourth, the understanding of the issues and phenomena studied is based on the researcher's interpretation of the experience and the researcher's point of view. Fifth, the study's findings were presented in a narrative format, bolstered by quotations from the respondents' own words. In short, the features offered provide an understanding of the process as well as various forms of user group perspectives and experiences with this 3D animation programme. Four levels of questionnaires guide the research process: (1) What are the final-year students' thoughts on IPT's 3D animation programme? (2) What are the perspectives of the graduates working in 3D animation related to the 3D animation programmes they completed at IPT? (3) What are academics' thoughts on the 3D animation programmes offered in Malaysian higher education? and (4) What are the 3D animation industry's perspectives on the 3D animation programmes in line with the industry's current needs?

The selection of these qualitative case study methods can also be attributed to educators' desire to investigate, make findings and interpretations, and conduct research to test hypotheses (Miles & Huberman, Merriam, Van Maanen) [28]. These actions are consistent with the study's format, which is an exploratory study that seeks to elicit the experiences and perspectives of each group of respondents interested in the efficacy of 3D animation programmes. Case studies were conducted in six Malaysian higher education institutions as well as four 3D animation companies. The primary data sources were final-year students, academics, working graduates, and industry representatives. Furthermore, the study employed a total of 40 people, including 15 final-year students, 9 graduates with experience in 3D animation, academics, and industry representatives. Overall, respondents have 3D animation background.

Interviews were conducted with four groups of respondents who were chosen using the purposive sampling technique, in which the individual's chosen user group is based on population criteria. These four respondents represented five higher education institutions that offer 3D animation design courses, as well as four Malaysian 3D animation companies. Interview questions will be used to ask semi-structured questions to respondents in order to determine their points of view on the change in the efficiency of a 3D animation design programme. Interview questions were posed to four distinct groups of respondents.

4 Evaluation

A. Analysis on reaction Assessment

Kirkpatrick's response into five main factors that influence the level of reaction is the first level of evaluation. Fun learning, course subject, programme timeline, facilities and location, and lecturer expertise are all factors. Fun learning factors toward students, working graduates, and

academics indicate that they enjoy learning. While in the industry, the results on the fun factor at the stage level are uncertain. The subject course factor provided indicates that it is less suitable. According to the results of their teaching staff, the course subject offered is appropriate for the programme. On According to the results of their teaching staff, the course subject offered is appropriate for the programme. On the Course subject factor, there is an agreement among students, working graduates, and industry that the course subject offered in this 3D animation programme is less suitable. This is due to the fact that students must take a variety of elective subjects in order to graduate.

While academics stated that the subjects offered in the 3D animation programme are appropriate because the institution provides students with a variety of skills and knowledge to help them be more multitasking and competitive. The third factor is the Timeline programme; there is agreement among the three groups of respondents, students, working graduates, and industry, that the timeline for the 3D animation programme is inadequate. However, the academic staff stated that the timeline is in accordance with the needs of the programme learning outcomes. Users, working students, and academics all have similar views on the Facility and Location factors. This is due to the fact that there are locations and facilities at altitude, as well as some factors that cannot provide a conducive learning environment and equipment. The industry demonstrates that it needs to be improved in order to improve student outcomes.

The final factor is Lecturer expertise, where students and working graduates agree that academic staff expertise influences teaching and learning factors. The extensive knowledge of the teaching staff provides students with clarity and understanding to the subject. According to the industry, teaching staff should always have the necessary knowledge and skills for current learning needs and situation.

B. Table 1: Analysis on reaction Assessment

	Final year student	**Working Graduates**	**Academic Staff**	**Industry**
Fun learning	Happy	Happy	Happy	Not sure
Course subject	Not suitable	Not suitable	Suitable	Not suitable
Program timeline	Not suitable	Not suitable	Suitable	Not suitable
Facilities and location	Lack of support	Lack of support	Lack of support	It needs to be improved
Lecturer expertise	The need for lecturers skilled	The need for lecturers skilled	Lecturer skilled	Lecturers know about current needs

C. Analysis Level of Learning and Teaching

Kirkpatrick's response into two main factors that influence the level of learning is the second level of evaluation. Understanding and experience with self-improvement are important factors. These understanding factors, which are examined at the learning level, clearly demonstrate the understanding in the 3D animation learning programme. According to student and academic staff statements, the teaching and learning in the 3D animated programmes are clear and easy to understand. However, statements made by working graduates for the program's teaching and learning are unclear due to industry requirements. While the industry stated nearly the same

thing as the graduates who work, they are unsure about the level of understanding of graduates who graduated in this field. This demonstrates that there are differences in the outcomes of programme comprehension at the institutional and industry levels.

The second factor of experience in self-improvement indicates that students are insecure and still require training and guidance while working in the industry. Working graduates demonstrate that there is a significant difference between training and skills learned through industry practise. They still need to be retrained to meet the demands of the industry. According to the academic staff, each student has been given basic skills and knowledge in preparation for the industry. They should conduct in-depth research on their own in accordance to the need of the industry. According to the industry, students' training and skills are inadequate, and they should be more focused and not give additional work to the industry to retrain graduates, which will cause project delays.

Table 2: Analysis Level of Learning and Teaching

	Final year student	Working Graduates	Academic Staff	Industry
Understanding	Clearly	Unclear by industry requirement	Clearly	Not sure
Experience in self-Improvement	Not convinced	Not the same	Basic skills and knowledge	Not convinced

D. Analysis level of behaviour

Kirkpatrick's response into two main factors that influence the level of behaviour is the third level of evaluation. Self-efficacy, as well as skills and knowledge, are important factors. The self-efficacy factor indicates that students still require additional practise and are not yet ready for the industry level. Working graduates expressed a similar opinion, stating that they still require training after graduation because it is dissimilar to the needs of the industry. Academic staff point out that study demands provide students with basic training and knowledge to prepare them for the industry, while industry staff point out that many of their graduates are still uncertain of their direction and skills after graduation.

Skills and knowledge are the second factor in the behaviour assessment stage. Students and working graduates share the belief that computer software skills and knowledge are critical in this field. Students must have a thorough understanding of and proficiency with a wide range of computer software in the field of 3D animation. Meanwhile, working graduates stated that understanding computer software is critical and should be mastered thoroughly before entering the industry. This is due to significant differences in software usage that vary greatly between institutions and industries. Academic statements on skill and knowledge also state that learning and teaching are not limited to a single field of knowledge. Students should be provided with a wide range of knowledge and skills in educational institutions in order for them to be more competitive. The brand industry, on the other hand, agrees that students should be more focused and given more in-depth knowledge and skills in this field.

Table 3: Analysis Level of behaviour

	Final year student	Working Graduates	Academic Staff	Industry
Self-efficacy	Still needs practice	Need training again	The basis for the industry	Not sure of the direction
Skills and knowledge	Computer software animation	Computer software animation	Diversity abilities	Attitude, knowledge and skills

E. Analysis level of results

Kirkpatrick's response into the main factors that influence the level of behaviour is the third level of evaluation. The factor Improvement and confidence reveals a difference of opinion among the four respondents. Students stated that they are overall less confident in the industry and that they still require training to become more confident in the industry. Working graduates express the overall skills and knowledge of the current institution is contrary to industry practise. They require training for their skills while working in the industry in the early stage. While academic staff stated that this 3D animation programme in general requires specialisation so that teachers and students can focus on the needs of this field. According to the industry, this programme is still insufficient to produce quality employees to meet industry requirements and remain competitive in the face of globalisation.

Table 4: Analysis Level of result

	Final year student	Working Graduates	Academic Staff	Industry
Improvement and confident	Less confident	Not the same in the institute	It needs to be 3D specialization animation	Not enough for animation programs

5 Conlusion and recommendations

The conclusion and recommendations at the reaction evaluation stage reveal that there are issues with the course duration and the academic staff's expertise. According to the study findings, the recommendation is to standardise the courses offered, particularly in the use of animation software, in institutions of higher learning in accordance with current industry needs. Review the period of critical subjects and offer them over a long study period. Academics must be given current exposure and training. In the process of study and learning, participation should be done between educational institutions and industry experts to make students more exposed to the knowledge and skills implemented in the industry. Conclusions and recommendations in the learning evaluation stage show that fewer have clear issues of understanding, experience and self-improvement. The research results proposed that academic programmes can extend the training period for students in the industry to allow them to understand the real situation in this industry. Students should also be assigned a mentee mentor from the industry to help them develop knowledge and skills. Furthermore, the course offerings at the institution should be more relevant to the current needs of the industry in order to keep up with progress and technology in the industry and make graduates competitive with the current requirements.

Conclusions and recommendations from the attitude assessment stage reveal that students, graduates, academics, and industry have issues with self-efficacy as well as skills and knowledge. This refers to the proposed addition to the 3D animation programme that should focus more on basic 3D animation skills as well as new technologies in line with industry necessities. The overall outcome evaluation stage is where the final conclusions and recommendations are. This 3D animated programme has issues with improvement and overall results. This refers to the industry's involvement. Together with the institution, we can help improve the quality of graduates who are better suited to today's needs. Furthermore, the overall impact will be able to be produced if this 3D animation programme is more focused on skills and knowledge specific to this domain, allowing students to focus on the program's outcomes.

The programmes available in the field of 3D animation are still unclear, and no specialisation is available at the tertiary level in Malaysia. This is demonstrated by the fact that, in Malaysia, the level of animation studies is to provide more practise studies at each level covering the entire range of available animation subjects. As a result, there are several research issues, and it is a major factor in the effectiveness of this 3D animation design programme. The results of a focused qualitative method search using the Kirkpatrick assessment model through four assessments of reactions, learning, attitudes, and overall outcomes discovered that 3D animation programme designs available in various tertiary institutions were reviewed to improve marketability and graduate performance in line with current needs. This situation is closely related to determining the program's results in terms of graduates' marketability and performance in the field of 3D animation. An evaluation of the program's effectiveness is critical in determining the country's educational development and future.

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