International Journal of Computer Information Systems and Industrial Management Applications.
ISSN 2150-7988 Volume 13 (2021) pp. 200-208

Received: 14 April 2021; Accepted: 7 June 2021; Published: 6 August 2021

Using Motion Graphic Video in Higher Education to Teach Programming

Ahmad Shaarizan Shaarani[1], Norasiken Bakar[2], Sazilah Salam[3] and Mohd Shazli Shahuddin[4]

[1,2,3] Faculty of Information and Communication Technology
Universiti Teknikal Malaysia Melaka
76100 Durian Tunggal, Melaka, Malaysia
shaarizan@utem.edu.my
norasiken@utem.edu.my
sazilah@utem.edu.my

[4] Politeknik Ungku Omar, Jalan Raja Musa Mahadi,
31400, Ipoh, Perak
shazli@gapps.kptm.edu.my

***Abstract*: The conventional teaching technique is no longer relevant to the new generation of students at any higher education institution. By using a new approach such as video-based teaching technology would be one of the answers to this problem. This research examines the effectiveness of motion graphic video in teaching programming students. This study focused on motion graphics in the form of videos that combine three (3) elements, namely image, sound, and motion. The main objectives of this study are to investigate the students' acceptance of motion graphics videos as an alternative method for teaching and learning programming courses in higher education institutions in Malaysia and to assess the students' understanding using motion graphics videos. The quantitative approach was used in the research case study to emphasize analytical measures and mathematical or numerical analysis of data obtained by questionnaires. The Chi-Square test was used to analyze quantitative results. The HTML web programming topic was used to test students understanding of the topic through motion graphic video learning based on Gagne's Nine Events of Instruction. The focus of the study was for higher learning institution students and the research samples were taken from one of the polytechnic MARA college students. The sample size for this study was 70 students from three separate classes who have taken part as respondents. The result of the study clearly demonstrated that the level of students' acceptance of using motion graphic video toward improving the students' understanding is high.**

***Keywords*:** Motion graphic, animated video, higher education, student acceptance, understanding level**.**

I. Introduction

Information technology may be employed efficiently during the teaching and learning process, making it a major benefit for 21st century education [1]. Now, rapid technological progress in the field of learning has become more complex, with students not only exploring new innovations, but also attempting to adapt to them [2].

At the present time, information can be accessed easily, but on the other hand, too much information can lead to a confusing state which make the audience lost their focus. Therefore, motion graphic video could be a solution in disseminating the information effectively and more presentably [3]. The question is whether motion graphic video could improve students' understanding in web programming course?

Unfortunately, the number of studies that investigate the effectiveness of using motion graphic video in teaching web programming are very limited. Motion graphic is a type of information with the combination of visual information and multiple media elements. It had been designed to enhance human ability to identify pattern and trends. In general, motion graphic can be divided into three (3) main categories which are static infographic, motion infographic and interactive infographic.

The aimed of infographic is to provide information communication process that ease to understand and effective by using graphical. This research is based on motion graphic in video form as studies shown that using motion graphic has several main advantages and attraction compared to the others type of infographic. This research investigates students' level of acceptance in using motion graphic video towards improving student understanding on Hyper Text Markup Language (HTML) division topic for higher institution. This topic was chosen based on prior study which indicate that division is among the difficult topic for students to understand. Several factors have been explored to identify the basic requirement or features in using infographic video as effective learning tool. By using quantitative research method, a sample size of 70 students was chosen to take part in this research. The

respondents were provided with motion graphic video that specifically focuses on HTML.

Questionnaires were given to students to get their feedback for measurement. All the respondents were diploma students majoring in Multimedia, study at polytechnic MARA college in Ipoh, Malaysia. Motion graphic video was used as the medium to attract students and to increase their understanding and attention on delivering course contents. Result from this research also will be the evidence for educators to deliver learning process using alternative platform. We believe that graphic which based on motion or video learning has better instructional tool as compared to the common conventional method.

Motion graphic video is one of the new educational environments that can help audience to simplify any complicated course into more understandable manner [4]. One of the biggest advantages of motion graphic video is that the author or developer will be able to integrate various types of media into a presentation such as texts, images, drawings, diagrams, sound, animation video. This study is meant to conduct the study on student acceptance in using motion graphic towards improving the student understanding on HTML specifically for division topic. This topic was chosen since the topic is among the hardest topic to understand by the students.

II. Literature Review

Motion graphic video is one of the new educational environments that can help the audience to simplify a complicated subject into more understandable form. One of the biggest advantages of motion graphic video is that the author/developer will be able to integrate various types of media into a presentation such as texts, images, drawings, diagrams, sound, animation, video etc.

Text is the most widely used multimedia elements that can be found on all websites, animations, videos. Text is the most commonly used because it easily delivers information to the audience who use or read it. Text can be differentiated simply by choosing the right blending options, in terms of shadows, colour, outline, size, layout, position and font type. There are more than 100 types of them available on hardware devices pre-installed in any software such as Microsoft Office, and these fonts can also be downloaded from the internet.

Aside from text, images also commonly used as media for teaching and learning. There are two types images that are vector and bitmap. Images can be presented in 2D or 3D format, depending on the designer or artist who create the content. There are huge numbers of software that offer images for creating and editing tools. The most common and basic software editing tools, such as Paint, can be easily found as this software come with any desktop or personal computer available on the market.

The third media element that use in motion graphic video is sound or audio which also has a major impact on any learning content [5]. Sound can be used to further engage student in any learning content that they used. Sound files come in a variety of formats such as. WAV, .MP4, .MP3, .MP2M and .WMA. The MP3 is the most common or widely used since it has a small size and still delivers quality audio [6]. Sound is often used in video as background music or even as sound effects, which is largely used in animation [7]. Audio is also used in the web or software to help users know what they are doing. For example, if the desktop is switched on, there is a sound that indicates that it is on; the same goes for other hardware or devices. There are a lot of software that can be used to create, edit, and enhance sound files like Audacity, Adobe SoundBooth, RealPlayer, and more.

Video can be viewed in many multimedia applications including in motion graphic application [8]. Generally, video format is widely used as content in learning process. [9] mentioned that using videos in any teaching and learning process will encourage students to participate and engage in a variety of learning activities. Students are given time independently to carry out learning activities by using motion graphic video. Students are required to study prior learning materials, while in the classroom students are already aware and prepared in learning activities [10].

In addition, the use of animation in learning has become increasingly popular in education [11]. Educators can use animation as one of the alternative elements of the learning and teaching process. Animations that can also contain interactive effects, allow users to immerse themselves in animated action using the mouse and keyboard [12]. According to [13], factors to develop both live action and animated videos can increase students' attention. These elements can easily be included in any infographic course content considered to be semi-live and semi-animated videos.

This research will incorporate multimedia elements such as text, images, audio, video and animation to create motion graphic video. This research will also include short videos with a combination of photos related to teaching content. This motion graphic video features a series of videos that illustrate the actual programming technique using HTML language.

Nowadays information can be accessed easily, but too much information can leads to a confusing state and the audience can easily lost focus. Therefore, motion graphic video could be a solution in disseminating the information effectively and more presentable [14]. Motion graphic video could be the alternative ways in teaching basic web programming for the beginners [15]. Unfortunately, the number of studies investigated the effectiveness of motion graphic video in teaching basics web programming for learning environments is very limited.

A. Type of Infographic

An Infographic basically is the creative ways to represent the information by combining multiple elements, such as texts, images, illustrations, graphs, and diagrams. Infographic is like telling the complete story by summarizes it visually [16].

Previous studies by [17] have reported that infographics present viewers a story by visualizing intense, even complex information and processes on a certain subject in a manner to be easily understood and to create attention and curiosity. The primary aim of visualization is to communicate information effective way and easy to understand by using graphical means. Study shows that the audience tends to concern more on the important of data that are presented in a limited space using an artistic format [18].

The audience seem to feel more enjoyable to watch and the information can be acquired in short period of times, instead of reading the whole article in the fully text version. The serious discussions and analyses of infographic conducted by [19] has listed there are four (4) elements that able to make an infographic in perfect condition and the four components are data, design, story and shareability. Details explanation on the four components are elaborate as below:

- **Data**: use the relevant data with highly respected sources or prestigious.
- **Design**: the quality of being clear or clarity, in the other words the design must be simple to convey the message for the users to easily skim and scan.
- **Story**: an excellent infographic tells a significant story in an instant.
- **Shareability**: infographic should start with interesting questions to attract audience to search for the answers or solutions. Moreover, infographics should use minimal text and ensure the file is small as possible without having to sacrifice fidelity [20].

B. Motion Graphic Video versus Static Infographic

The fact is motion graphic video is not a replacement of static infographic but the enhancement version of static infographic in a new form with the integration of multimedia elements. According to [21], comparison between the effectiveness of animated and static infographic in learning show that it does not show much different result, however the respondents feedback state that static infographics is more informative and flexibility to visually navigate the entire poster graphics and text. Previous study by [22] suggest that static images is more effective than animation, it gives the students flexibility to discover the relations between the information according to learners' own phase or time. Both methods have their own advantages as stated in Table 1.

Motion Graphic Video	Static Infographic
1. Transform static into motion for better user understanding. 2. Great explanation process. 3. Integration of media. 4. Great to watch, video/animation is always the best medium to evoke emotion.	1. Flexibility to navigate the whole graphic poster. 2. Low cost. 3. Can be printed. 4. Easily share, due to small sizes of data.

Table 1. The differences between motion graphic video and static infographic.

[14], [23] reported that, the presentation of infographics data and textual information mostly is represented by using icons, images, colors and elements of visual design. This appealing visualize information has the capability to guide and attract the attention of the audience, and therefore can be utilized as learning material with the potential to increase knowledge acquisition.

III. Research Scope and Objectives

A. Scope of Study

This research was conducted to study the students' acceptance of using motion graphic video in teaching HTML web-programming language for higher education institution. The research was focus on web programming HTML division topic in producing World Wide Web course. The aspect that we considered is on the students' feedback after undergoing the teaching and learning process using motion graphic video to increase students' understanding on HTML division topic. The result of this study can provide the significant changes on new method of web programming course learning process as compared to the traditional way of teaching and learning process.

The respondents for this research are 70 students at polytechnic MARA college in Ipoh randomly selected from three separate classes. Division topic for web programming language using HTML was covered in the infographic video material. The infographic animated video was used by the respondents as the main material for learning this specific topic. The purpose of the study is to consider the students' acceptance in using motion graphic towards improving the students' understanding on HTML division topic.

This research provide an advantage since students now live in a tech-savvy era. This research can be applied and tested to determine whether the results are favorable to the students or otherwise.

B. Significant of Study

The finding of this study can be used to improve teaching and learning process not only for polytechnic MARA college but also in other higher education institutions in Malaysia as well. This is because due to the same generation group of students enters the other institutions. Those generation of students have similar patterns of learning style [24]. Today's generation of students (gen Y and gen Z) seems to easily get bored and distracted with the information and other matters that occur around them, especially the entertainment and information through social media using mobile gadgets [25].

Furthermore, this study will encourage the faculty academic administration as well as the lecturers to be drawn to this new method of teaching which will focus on a student-centred approach. Hopefully, this approach will increase the

effectiveness of teaching techniques that can benefit the students in general. Additionally, this study can help boost the lecturers' confident level and students' attention in the class and upgrade the way of learning activities. The results of this study have provided some insights and information on how polytechnic MARA college investigates the improvement of students' abilities in writing HTML with Cascading Style Sheets (CSS) and other languages as well. Finally, the result of this study also hopefully will increase in students' technical and academic competencies, enhancing students' independence as well as level of interaction and cooperation between students and lecturers.

C. Research Objectives

The purpose of this study is to proof the effectiveness of using infographic video in teaching programming course for higher education students. In particular, the specific objectives of the research are:

- to investigate the level of students' acceptance on motion graphic video as a new method in learning process.
- to analyse the level of students' acceptance on the element that should be include in motion graphic video.
- to evaluate the level of students' understanding on HTML topic based on motion graphic video approach.

IV. Problem Background

In general, this study was conducted on the factors or situations that took place at polytechnic MARA college Ipoh, where the academic management claimed that using a new video-based teaching technology would have a major impact on students' performance and understanding. The management also claimed that the conventional teaching technique was no longer relevant to the new young generation (gen Z). Based on this preliminary study through observation and interview sessions, this research tries to find the concrete answer to support the initial problem which brought by the academic management staff at Polytech MARA college.

Previous researchers have conducted few studies related to infographic that can enhance the learning process, but those studies did not specifically relate the concept of improving students' understanding and performance (student result) for web programming course at higher learning institutions. As for example, a similar research conducted by [26] aims to investigating the effectiveness of using infographics as an approach to teach the programming fundamentals on developing analytical thinking skills for high school students in the city of Makkah. The result finding from [27] study shown that infographics is effective on simplifying concepts and interesting method that extend the students minds ability to perform faster than the traditional methods.

In another study on animated Islamographics data collection instrument for getting the level of acceptance from the users has shown the result of animated infographic were accepted by the Muslim and able in convincing to the non-Muslim [26]. The studies by [4] on principles and rules for creating excellent infographics that communicate information successfully and effectively has shown the result that animated and static infographic were effective in increasing the knowledge and comprehension.

Result from these three findings show that infographic learning method can bring the positive impact to the users or leaners, but there is still lack of evidence that support the fact that by using motion graphic, the students' grade will be increased. In other words, animated learning process using video infographics could give an impact or increase the effectiveness of students' performance.

Furthermore, this concept never been tested on web programming topic. The others problem is there are still lack of evidence on specifying the right features or elements that should be included to develop the decent motion graphic video learning method. These studies have contributed to provide more information and evidence to support that motion graphic video in teaching web programming for higher education students is effective.

V. Research Methodology

In this study, quantitative methods have been applied to emphasize on objective measurements and the statistical, or numerical analysis of data collected through questionnaires. Quantitative research focuses on gathering numerical data and distributed to across groups of respondents and being analysed by using three (3) methods which are frequencies method, mean & standard deviation method and Chi-square test. The overall population for this research is higher learning institution students which focused on the polytechnic MARA college, Ipoh students for publishing World Wide Web course of 6 classes with 138 students in one single semester. A sample of 70 students were chosen to be respondents for this research. All the respondents were selected randomly without bias.

This study was analysed by measuring the acceptance level through quantitative method using statistical analysis software. Research process is adopted from Technology Acceptance Model (TAM) that was used to study the users' attitude toward using a technology. This measurement of attitude has a direct impact on the actual use, which serves as an indicator for the technology acceptance. TAM is derived from the Theory of Reason Action (TRA) that focus more on the behavioural intention. Since the target group is familiar with online tools, we choose to conduct an online survey. The online survey is made up of 34 questions that include multiple-choice questions, rating scale questions and leading questions.

The collected data was analysed using quantitative method by performing the t-Test analysis by using SPSS software. There were four phases of data collection which describe as follow:

Phase 1: In this phase, 34 research question have been developed and divided into four categories, "SECTION A:

Demographic information", "SECTION B: Respondents' knowledge on division", "SECTION C: Motion graphic knowledge" and "SECTION D: Respondents' opinion". 70 students were selected from one single semester of study who undergo publishing World Wide Web course.

Phase 2: A motion graphic prototype with the title "Introduction to division" was distribute to the targeted respondents. The respondents were given questionnaire survey during class session. The purpose of this questionnaire is to collect the data related with the factors that influence the level of students' acceptance using infographic video as learning method. An example of the infographic video interface is shows in Figure 1.

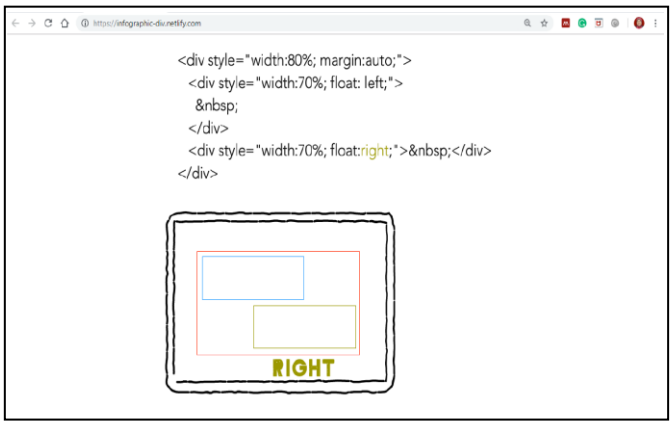

Figure 1. Testing data- load current (amperes)

Phase 3: The data was collected to identify the level of students' acceptance. Based on the questionnaire, we try to investigate the elements that attract students into motion graphic video learning process and to compare the understanding on the topic given using motion graphic video with the normal teaching and learning process. The data was analysed to find the correlation of motion graphic video with learning process via the Gagne's Nine event of instruction.

Phase 4: The collected data was calculated using SPSS statistical software and the result was analysed and interpreted to map with the listed objectives. There were three methods that have been applied to analyse the data received from the respondents:

- Frequencies Method
- Mean & Standard Deviation Method
- Chi-Square Test

VI. Data Analysis and Findings

The findings relate to the research questions that guided the study. Data were analysed to identify, describe, and evaluate the students' acceptance on learning approach using motion graphic video. Data were obtained from self-administered questionnaires, completed by 70 respondents (n=70). A total of 70 questionnaires were received, and all 70 questionnaires were usable for this study and met the required inclusion criteria. This represented 50.72% of the overall students' population in one semester at polytechnic MARA college, Ipoh.

The questionnaire was developed using multiple Likert scale statements to determine the student acceptance on learning approach using motion graphic video. Cronbach's alpha test was conducted with the acceptable reliability value is 0.7. The calculated alpha for the survey was 0.826 indicating that the questionnaire has a high degree of internal consistency and validity.

RQ1: What is the level of students' acceptance on motion graphic video as a new method in learning process?

The data collected from the research question one was analysed by means and standard deviation. In this study, the level of students' acceptance on motion graphic video as a new method in learning process is characterized by three levels which are low, moderate, and high. Low level of acceptance is shown by a mean interval of 1.00 to 2.00. While mean interval of 2.10 to 2.99 shows the moderate level of acceptance and mean interval of 3.00 to 5.00 shows a high level of acceptance. Result for descriptive analysis is shows in Table 2.

The result indicates that the level of students' acceptance on using motion graphic video for web programming division topic is high.

Sample questions	Number of respondents	Means	Standard deviation
Rate your first reaction towards the infographics video	70	4.21	0.679
How would you rate the quality of the video?	70	3.80	0.773
Rate the difficulty level of learning division <DIV>, before learning the infographic video	70	3.21	0.899
Rate the difficulty level of learning division <DIV>, after learning the infographic video	70	3.77	0.783

Table 2. Descriptive analysis result.

RQ2: What is the level of students' acceptance on the element or features that should be include in motion graphic video?

Based on motion graphic learning environment, Gagne's theoretical framework was applied for motion graphic video prototype. Based on the cognitive perspective of learning that emphasized on the effectiveness of the instructional design in Multimedia, event of instructions includes the following events:

- Event 1: Gaining attention
- Event 2: Inform learners of the objectives
- Event 3: Stimulate recall of prerequisite learning

- Event 4: Presenting the content
- Event 5: Providing learning guidance
- Event 6: Eliciting the performance
- Event 7: Providing feedback
- Event 8: Assessing performance
- Event 9: Enhancing retention and transfer

Based on the above event, data is collected and being analysed by using three methods namely frequencies method, mean and standard deviation method and Chi-square test. Events 1, 2, 4, 5 and 7 were measure using frequency method to measure respondents' acceptance on the element or features that should be including in motion graphic video. The measurement was set into low and high. Above 50% of cumulative result is considered as the item is accepted, while below 50% of cumulative result is considered as the item not accepted or rejected. Figure 2 below shows the acceptance result.

Event 3 which is stimulate recall of prerequisite learning. In this study, the level of event 3 was characterized by three levels where low level of acceptance is shown by a mean interval of 1.00 to 2.00. While mean interval of 2.01 to 2.99 shows the moderate level of acceptance and mean interval of 3.00 to 5.00 shows a high level of acceptance for stimulate recall of prerequisite learning. The test result indicates the mean value of 3.79 and 0.657 for the value of standard deviation. This indicates that the knowledge of respondents regarding the division topic after going through the animated video is high.

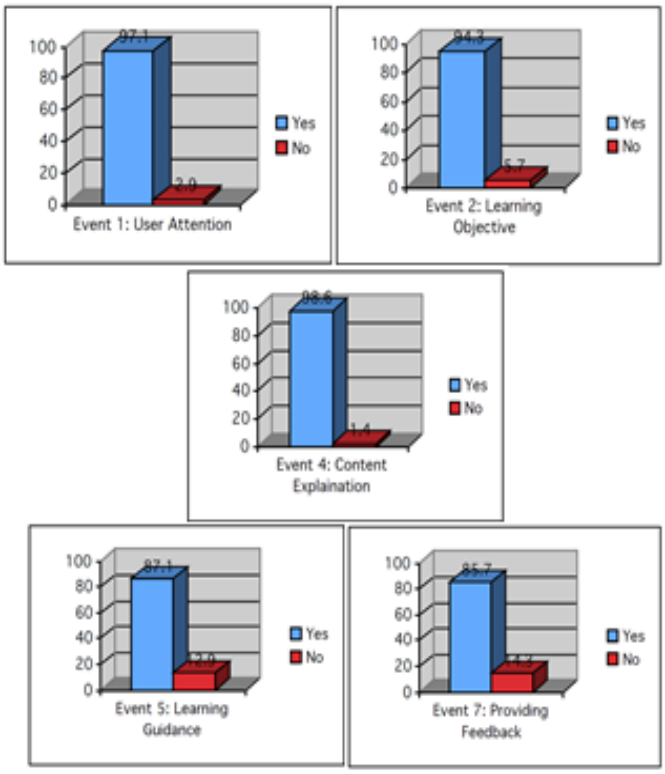

Figure 2. Graphs of acceptance result for event number 1, 2, 4, 5 and 7 based on Gagne's theoretical framework

Events 6, 8 and 9 were measured using Chi-square test. The α significance level was set to 0.05 (α = 0.05). Overall, the result indicates that the respondents' performance and retention rate were improve based on simple test questions on division topic after study the infographic video.

RQ3: What is the level of students' understanding on HTML topic based on motion graphic video approach?

The data collected from the research question three was analysed by two method means and standard deviation method and frequency method.

Similar to RQ2 the level of students' understanding on HTML topic based on motion graphic video approach was set to low, moderate, and high. Low level of acceptance is shown by a mean interval of 1.00 to 2.00. While mean interval of 2.01 to 2.99 shows the moderate level of acceptance and mean interval of 3.00 to 5.00 shows a high level of acceptance.

The test result indicates the mean value of 3.90 and 0.745 for the value of standard deviation. This was again showing that the level of students' understanding on HTML topic based on motion graphic video approach is high.

Two other questions were asked to the respondents which are "Does motion graphic video is more informative as compared to normal class slide?" and "Do you think motion graphic video is easier to remember as compared to normal class slide notes?". Most of the respondents agree and said "Yes" to both questions. Figures 3 and 4 below show the percentage of the acceptance result from the respondents.

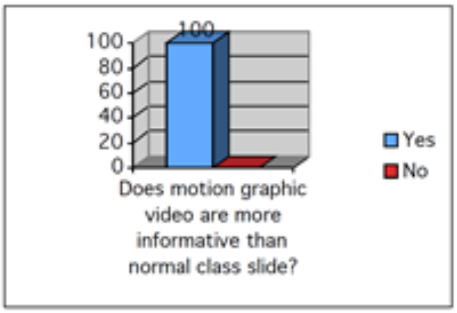

Figure 3. Motion graphic video is more informative

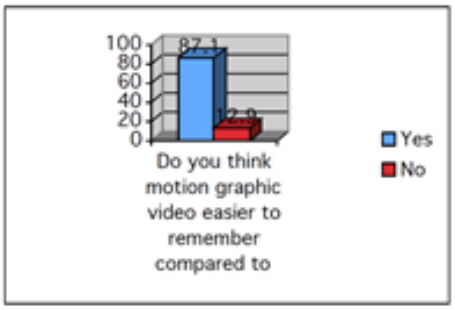

Figure 4. Motion graphic video is easier to remember

VII. Conclusion

This paper has presented that using animated infographic video to teach programming course is effective and can be used as one of the alternative approaches to teach students at any higher education institute in Malaysia. Result of the study clearly demonstrated that the level of students' acceptance

using motion graphic video toward improving the students' understanding is high.

All three (3) objectives listed in this study were successfully achieved where the level of students' acceptance and understanding were increased. The first objective is to investigate the level of students' acceptance on motion graphic video as a new method in learning process which look into several similar previous findings, examples, and related studies to understand more on the accurate level of students' acceptance before coming out with list of questionnaires. This is to ensure the reliability and the instrument used tailored to the objectives listed.

The second objective mentioned is to analyze the level of students' acceptance on the elements that should be used in motion graphic video was achieve based on the data analysis. The description and reasoning are based on the elements listed and being used in the animated infographic video itself. The last objective is also achieved through questionnaire analysis which asked students perception whether they understand better using motion graphic as compared to their traditional way of learning by just reading the notes particularly for Hypertext Markup Language (HTML) for division topic.

In general, this study has clearly demonstrated that the level of students' acceptance in using motion graphic video towards improving the student understanding on HTML is high. The results of this study also found that learners are more likely to understand information with the use of effective visual communication in video form or known as motion graphic video. Learners also felt that instructors should emphasize the use of attractive colours with voice over to produce a systematic and effective delivery of information in the future. Nevertheless, the respondents collectively agreed that the use of motion graphic video as a tool to facilitate learning is very appropriate and effective as it does not only simplify the learning information but also able to attract students' attention.

The finding of this study has contributed to the improvement of education techniques not only at polytechnic MARA college but also in other institutions as well. This is because due to the same set of generations of students enters any institution which result similar patterns of learning style. Result of this study also could encourage the instructors and faculty administration to consider this new method of teaching which will focus on a student-centered approach. Using animated and video infographics to teach programming course could enhance the effectiveness of teaching strategy that will benefit the students.

In addition, result of this study help to boost the lecturers' confident level and students' attention in the class and upgrade the way of learning activities. The results of this study also provide some insights information on how educational institution can improve students' abilities in writing HTML and other programming languages as well.

Furthermore, the finding of this study has contributed to the understanding of Malaysian students' level of understanding towards new methodology of learning web programming at higher education institutions in Malaysia. By knowing the level of the students' acceptance in motion graphic video as a new learning method will also help educators to identify their students' understanding so that they can plan and design suitable activities to enhance students understanding particularly in web programming course or other programming courses as well.

In short, motion graphic video method is one of the most influential factors and as a useful predictor of students' success in learning web programming. Although all the listed objectives were achieved, there are still few setbacks that needs to be improved and enhanced further for the future studies.

Acknowledgment

The authors would like to take this opportunity to recognise the guidance, assistance and support provided by Universiti Teknikal Malaysia Melaka (UTeM) and Politeknik Ungku Omar in making this research possible. The authors also wish to express their appreciation to all Politeknik Ungku Omar students who participated in this research project. Finally, special thanks go to the Pervasive Computing & Educational research group, Fakulti Teknologi Maklumat and Komunikasi (FTMK) and UTeM Research and Innovation Management (CRIM). This project also supports by grant which is short grant 27/02/2013 until 31/03/2016 entitled "Model for engaging meaningful learning using iPad & flipped classroom: a case study at UTeM" and "Digital aspects of 4IR cross-creative learning environment for autism using robots", 15/02/2019 until 14/02/2022 (MRUN-RAKAN RU 2019 - 003/3).

References

[1] L. J. O'Neal, P. Gibson, and S. R. Cotton. "Elementary School Teachers' Beliefs About The Role of Technology in 21st-century Teaching and Learning", *Computers in the Schools*, 34(3), pp. 192-206, 2017.

[2] S. A. Popenici, and S. Kerr, "Exploring The Impact of Artificial Intelligence on Teaching and Learning in Higher Education", *Research and Practice in Technology Enhanced Learning*, 12(1), pp. 1-13, 2017.

[3] L. Amali, N., N. Zees, and S. Suhada. "Motion Graphic Animation Video as Alternative Learning Media", *Jambura Journal of Informatics* 2, pp. 23-30, 2020.

[4] H. Muhammad. "The Development and Effectiveness of Motion Graphic Animation Videos to Improve Primary School Students' Sciences Learning Outcomes", *International Journal of Instruction* 13, no. 4, 2020.

[5] T. Virtanen, M. D. Plumbley, and D. Ellis, "Introduction to Sound Scene and Event Analysis", In *Computational analysis of sound scenes and events*, pp. 3-12, 2018.

[6] M. G. Jones, and L. Harris, "Audio and Video Production for Instructional Design Professionals", *Design for Learning*, 2021.

[7] S. N. Baharudin, and K. Zulkiflei, "Using Multimedia to Promote Students' Learning and Understanding of

English Literature in Secondary School", *International Journal of Academic Research in Business and Social Sciences*, 9(2), pp.106-114, 2019.
[8] S. Cunningham, and I. McGregor, "Subjective Evaluation of Music Compressed with The ACER Codec Compared to AAC, MP3, and uncompressed PCM", *International Journal of Digital Multimedia Broadcasting*, 2019.
[9] L. C. Lin, I. C. Hung, and N. S. Chen, "The Impact of Student Engagement on Learning Outcomes in a Cyber-flipped Course", *Educational Technology Research and Development*, 67(6), pp. 1573-1591, 2019.
[10] L. Deslauriers, L. S. McCarty, K. Miller, K. Callaghan, and G. Kestin, "Measuring Actual Being Actively Engaged in The Classroom", *Proceedings of the National Academy of Sciences*, 116(39), pp. 19251-19257, 2019.
[11] C. Xiang, "Reflections on the Joint Cultivation of Undergraduate Animation Education in China and Thailand", *International Journal of Learning and Teaching*, 6(2), p. 129, 2019.
[12] T. Ge, Y. Zhao, B. Lee, D. Ren, B. Chen, and Y. Wang, "Canis: A High‐Level Language for Data‐Driven Chart Animations", In *Computer Graphics Forum*, 39(3), pp. 607-617), 2020.
[13] H. Kim, E. C. Lee, Y. Seo, D. Im, and I. K. Lee, "Character Detection in Animation Movies Using Multi-Style Adaptation and Visual Attention", *IEEE Transactions on Multimedia*, 2020.
[14] M. Meijers, P. van Oosterom, M. Driel, & Šuba, R. "Web-based dissemination of continuously generalized space-scale cube data for smooth user interaction". *International Journal of Cartography*, 6(1), pp. 152-176, 2020.
[15] A. S. Hapsari, and M. Hanif. Motion Graphic Animation Videos to Improve the Learning Outcomes of Elementary School Students. *European Journal of Educational Research*, 8(4), pp. 1245-1255, 2019.
[16] M. Lu, C. Wang, J. Lanir, N. Zhao, H. Pfister, D. Cohen-Or, and H. Huang. "Exploring visual information flows in infographics". In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, pp. 1-12. 2020.
[17] B. Dur, I.U. "Data visualization and infographics in visual communication design education at the age of information", *Journal of Arts and Humanities* 3, no. 5, pp. 39-50, 2014.
[18] W. Siricharoen, V. "Infographics: the new communication tools in digital age", In *The international conference on e-technologies and business on the web (ebw2013)*, pp. 169-174. 2013.
[19] J. Kennedy, P. Abichandani, and A. Fontecchio, "Using infographics as a tool for introductory data analytics education in 9–12", In *2014 IEEE Frontiers in Education Conference (FIE) Proceedings*, pp. 1-4, 2014.
[20] R. Krum. *Cool infographics: Effective communication with data visualization and design*. John Wiley & Sons, 2013.
[21] D. Ismaeel, and Al Ensaf, M. "The influence of interactive and static infographics on the academic achievement of reflective and impulsive students." *Australasian Journal of Educational Technology* 37, no. 1, pp. 147-162, 2021).
[22] A. Bongers, B. Beauvoir, N. Streja, G. Northoff, and A. Flynn, B. "Building mental models of a reaction mechanism: the influence of static and animated representations, prior knowledge, and spatial ability", *Chemistry Education Research and Practice* 21, no. 2, pp. 496-512, 2020.
[23] R. B. Trelease. Essential e-learning and m-learning methods for teaching anatomy. In *Teaching Anatomy*, pp. 313-324, 2020.
[24] D. Samsudin, and T. Hardini. "The Influence Of Learning Styles And Metacognitive Skills On Students'critical Thinking In The Context Of Student Creativity Program." *International Journal of Education* 11, no. 2, pp. 117-124, 2019.
[25] P. Tuomi, and J. Multisilta. "Comparative study on use of mobile videos in elementary and middle school." *International Journal of Computer Information Systems and Industrial Management Applications*, no.4, pp. 255-266, 2012.
[26] N. Rahim, N. "An Islamic Animated Infographic Model for Da'wah Dissemination: A Case Study of Prophet's Sunnah in Eating and Drinking", *Faculty of Creative Technology and Heritage*, 2017.
[27] D. Alyahya, M. "Infographics as a Learning Tool in Higher Education: The Design Process and Perception of an Instructional Designer", *International Journal of Learning, Teaching and Educational* Research 18, no. 1, 2019.

Author Biographies

Ahmad Shaarizan Shaarani is a senior lecturer at Faculty of Information and Communication Technology, UTeM Malaysia. He received his BSc. (Hons) in Information Technology from Universiti Utara Malaysia (UUM) in 1996, his MSc. in Information and Communication Technology from Rochester Institute of Technology (RIT), New York, USA in 1998. Currently he is doing his PhD in Computer Science at Universiti Teknikal Malaysia Melaka. His research focuses are on human computer interaction, affective computing, massive open online courses and flipped learning.

Norasiken Bakar is an Associate Professor at the Faculty of Information and Communication Technology, UTeM Malaysia. She received her B.A (Hons) Science Computer and Mathematic from Universiti Kebangsaan Malaysia (UKM) in 1991, her M. A in Education in Management and Administration from Universiti Teknologi Malaysia (UTM) in 2000, and her PhD from Universiti Kebangsaan Malaysia. Her research focus is in multimedia-based instruction design, design, and development 2D and 3D courseware, design and development massive open Online courses, 3D assistive learning tools, flipped classroom and educational technology.

Sazilah Salam is a Professor of Computer Science at the Department of Interactive Media, Faculty of Information and Communication Technology, Universiti Teknikal Malaysia Melaka, and a Visiting Professor at the Web Science Institute, Faculty of Engineering and Physical Sciences, University of Southampton, United Kingdom. She obtained her BSc. (Hons.) in Computer Science from Universiti Teknologi Malaysia, Kuala Lumpur, and PhD in Multimedia

Information Systems from University of Southampton, UK in 1997. Her current research work focuses on MOOC observatory, semantic Web, learning analytics, pervasive computing, and assistive technology. She is active in doing research on latest education technology including mobile system & application, gamification, cooperative learning, flipped learning that apply & integrate augmented reality, speech recognition, cloud-based conversational robot, and wearable technology to increase the efficiency of learning & teaching.

Mohd Shazli Shahuddin is a senior lecturer at Ungku Omar Polytechnic at Ipoh, Perak, Malaysia. He received his BSc. in Multimedia System from Multimedia University, Malaysia (MMU) in 2014, his MSc. in Information & Communication Technology from Universiti Teknikal Malaysia Melaka in 2018. Currently he is a dean at department of creative multimedia, Ungku Omar Polytechnic, Perak. His research focuses are in digital photo-media, game design, World Wide Web, and database programming.