

The impact of interactive learning and digital technology in supporting creativity and improving teaching methods

Prof. Mona Abu Table

Dean of Faculty of Applied Arts, 6 October University (Egypt)

Mona.mostafa.Art@o6u.edu.eg

Prof. Samya Elshnawi

Professor in Printing, Publishing & Packaging department, Faculty of Applied Arts,
Helwan University (Egypt)

SAMIA_ALSHENAWI@arts.helwan.edu.eg

Abstract:

Interactive learning focuses on the interaction between teachers -students and students- students. Learning through digital technology media is considered as an important field and will continue as a basic domain in teaching method especially in learning skill.

The impact of images to build and reverse the common consciousness of visual culture. to understand how images can illuminate, expand, conceal, and challenge the worlds they represent. A learning environment for innovation, experimentation, participation and critical thinking should be provided through direct interaction and practice in studios and laboratories for advanced digital media such as desktop publishing, vector-based drawing, digital printing, 2D and 3D modeling using multimedia, animation and video.

The study problem is that there isn't integration and interaction between digital technology media and interactive learning, in terms of there is no sequence of elements, ideas and transition from one interactive educational goal to another.

The study aims to emphasize the effectiveness of digital technology media and interactive learning to develop undergraduate student's achievement and enhance teaching methods.

The importance of study is creating and structuring digital media as creative activity, supported by a number of dedicated tools that assist students to enhance their practices and understanding of digital technology, and to do this, a research project was implemented through three groups of students, where two teams of them submitted two applications for two parts of the project, and then the third team implemented and directed the final stage of it.

The study concluded that, the demand of most students are interested in interactive learning and achieve an added value for the educational output through their participation in the mechanisms of developing teaching methods, and proposing a set of standards for applying of digital technology to the benefit of the student and society.

Keywords:

Interactive learning, Multimedia, Animation.

المخلص:

يركز التعليم التفاعلي على التفاعل بين التكنولوجيا والأدوات والبرامج وتطبيقات الويب التي تدعم الإبداع. لذلك يجب توفير بيئة تعليمية للبحث والابتكار والتجريب والمشاركة والتفكير النقدي من خلال التفاعل المباشر والممارسة في الاستوديوهات والمختبرات للبرامج والوسائط الإلكترونية المتقدمة مثل النشر المكتبي والرسم المستند إلى المتجهات

والطباعة الرقمية والنمذجة ثلاثية الأبعاد باستخدام الوسائط المتعددة وتصميم صفحات الويب والرسوم المتحركة والفيديو.

وتكمن مشكلة البحث في أنه لا يوجد تكامل وتفاعل بين برامج التكنولوجيا الرقمية التي تؤثر على بعضها البعض، من حيث تسلسل العناصر والأفكار والانتقال من هدف تعليمي تفاعلي إلى آخر.

وتهدف الدراسة إلى التأكيد على فعالية التكنولوجيا الرقمية في التعليم لتطوير تحصيل الطلاب والتفاعل بين الوسائط المتعددة والرسوم المتحركة في إنشاء وتعزيز أساليب التدريس.

تكمن أهمية الدراسة في إنشاء وهيكله الوسائط الرقمية كنشاط ابداعي ، مدعوم بعدد من الأدوات المتخصصة التي تساعد الطلاب على تعزيز ممارساتهم وفهمهم للتكنولوجيا الرقمية. ولإجراء ذلك تم تطبيق مشروع بحثي من خلال ثلاث مجموعات من الطلاب حيث قدم فريقين منهم تطبيقين لجزئين من المشروع ثم قام الفريق الثالث بتنفيذ وإخراج المرحلة النهائية له. وقد توصلت الدراسة إلى إقبال معظم الطلاب على التعليم التفاعلي وتحقيق قيمة مضافة للمخرج التعليمي من خلال مشاركاتهم في آليات تطوير طرق التدريس، واقتراح مجموعة معايير لتطبيق التكنولوجيا الرقمية بما يفيد الفرد والمجتمع.

الكلمات المفتاحية:

التعلم التفاعلي ، الوسائط المتعددة ، الرسوم المتحركة.

1 Introduction:

According to the recent challenges, various professionals' disciplines face the requirements of work to solve problems, to increase the use of digital technology, organize the work that based on team relationships and develop the required capabilities for professional work and creativity. Where the education is the combination of theoretical knowledge, practical and self-knowledge, as the traditional education depends on giving theoretical knowledge at the beginning, followed by practical study, then some studies that strengthen self-knowledge. It has been shown that teaching in this way does not lead to the integration of students' knowledge. It was found that interactive learning merges the three forms of knowledge simultaneously, because it is based on solving problems. Since interactive learning can take place in small groups, therefore the integration of team members' knowledge leads to collaborate with each other. This is to move from traditional learning towards experiences that cultivate a genuine curiosity in students, so they are excited to explore subjects further. ⁽¹⁾

The teaching methods and presenting the information lead to the acquisition of knowledge, and the use of information achieve the application, remembering lead to analysis and evaluation. Traditional teaching methods (passive) do not lead to creativity of learning, while interactive participation in learning process results in higher retention of learning, (Figure1) and have an opportunity for the students to develop themselves through engaging in the learning. ⁽²⁾

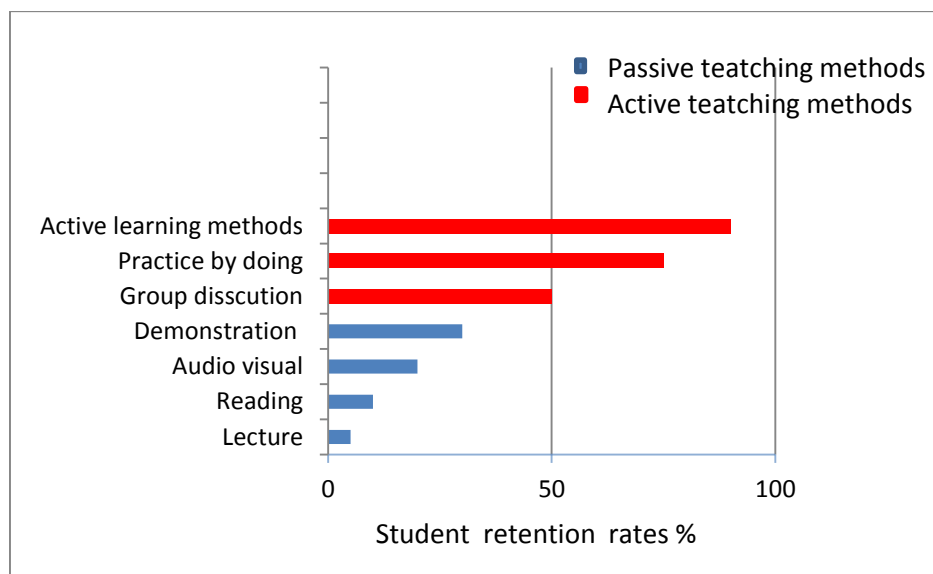


Figure1. The retention rate of students' information according to the learning methods

Creative education, continuous inventions and developments in all of digital technology media open new channels and opportunities to enhance teaching and learning methods. Multimedia-based education is a combination of interactive and non-interactive learning material in addition to stimulating and coherent graphics, videos and animated components. It has many advantages such as being convenient, vivid informative and interesting.

Using multimedia in the teaching support students to become critical thinkers, problem-solvers, more suitable to seek information and more motivated in their learning processes. Interactive learning and using digital technology media are trying to evaluate and improve students' ability to be interactive in the class. ⁽³⁾

Purpose of the study

This study aims to:

- Emphasize the effectiveness of digital technology media and interactive learning to develop student's achievement and enhance teaching methods to bridge the gap between knowledge acquisition and application.
- Identifying the elements and design structure can help the undergraduate students to improve their skills and performance.

Study Problem

In this study, the effects of interactive learning and digital technology media on students' academic achievement, learning motivation, retention and students' opinions were investigated in design courses. For this purpose, the main problem of the study was stated as that there isn't integration and interaction between digital technology media and interactive learning, in terms of the shortage of elements' sequence, ideas and transition from one interactive educational goal to another.

2 Methodology and case study

2.1 Design of study scheme

In designing the scheme, we selected four major specialized courses including graphic design, packaging design, multimedia, animation and web page. Then we carried out the project from the mentioned courses.

To investigate the learning achievements, innovation and learning skills of undergraduate students, flipped classroom design has been used, it was derived from the SPACE Learning Model.⁽⁴⁾ The sample comprised 63 undergraduate students, 43 students in the experimental group (23 students who had taught multimedia, animation and web page courses - 20 students who had taught packaging design course) and 20 students in the control group - who had registered on graphic design in the second semester.

Questionnaire has been distributed to all the students in the whole courses, The study conclusions has been determined from statistics and analysis of questionnaire survey results.

2.2 Design of questionnaire

Questionnaire set I

This set was given to 40 students (20 students from the experimental group who had studied packaging design course) and (20 students in the control group). We asked them to mark one answer for each question. The students used same questionnaire for receiving survey results in different viewpoints. The questionnaire was planned as:

Qu.1 In the interactive learning, do you learn from your colleagues in your courses? mark from (a. good, b. general, c. bad).

Qu.2 In your courses, what is the teaching method being important? mark from (a. Interactive teaching, b. traditional teaching; c. combination of them).

Qu.3 In your courses, do you think digital technology media help to go through learning material at home after lectures? mark from (a. very good, b. good, c. general).

Qu.4 In teaching process, how is the benefits from multimedia and interactive learning? mark from (a. very useful, b. useful, c. not useful).

Qu.5 In the teaching process, how is the interaction between you and your colleagues? mark from (a. good, b. general, c. bad).

Qu.6 For teaching effect, what is your evaluation to these courses? mark from (a. good, b. general, c. bad).

Qu.7 Do you think digital technology media teaching can replace the traditional method? mark from (a. good, b. general, c. bad).

Qu.8 (In multimedia and animation learning), How can you organize activities in these courses? mark from (a. self-study, b. with colleagues, c. both of them).

Questionnaire set II

This set was given to 63 students two weeks after the students had filled the Questionnaire set I. The students used same questionnaire for receiving survey results in different viewpoint. For all courses, the following questions were planned as:

Qu.1 Do you think using interactive learning improved your efficiency compared to traditional way of learning? mark from (a. improved a lot, b. improved, c. somewhat improved).

Qu.2 In a good quality learning material, the more important for you is: (Optimal amount of information, data base and structure design) mark from (a. very good, b. good, c. general).

Qu.3 In general, what do you prefer to use in learning? mark from (a. search in the browser, b. lecture notes, c. combination of them).

Qu.4 There are simulations in your courses, did you find them valuable for your learning? mark from (a. very good, b. good, c. general).

Qu.5 How many times have you spent in media for your learning? mark from (a. 5 times, b. more than 5times, c. 2-4 times).

Qu.6 Using navigation in your courses relatively easy and intuitive? mark from (a. very good, b. good, c. general).

Qu.7 Is it good for using flipping classroom for lecturing? mark from (a. good, b. general, c. bad).

2.3 Statistics of survey results

The frequency statistics were completed according to selection results of 63 students. The result of questionnaire set I (table 1) and questionnaire set II (table 2).

Table 1. The survey result of Questionnaire set I

Qu.No	Question	Answer	Total
Qu.1	In the interactive learning, do you learn from your colleagues for your courses?	good	20
		general	17
		bad	3
Qu.2	In your courses, what is the teaching method being important?	Interactive teaching	13
		traditional teaching	10
		combination of them	17
Qu.3	In your courses, do you think digital technology media help to go through learning material at home after lectures?	very good	17
		good	13
		general	10
Qu.4	In teaching process, how is the benefits from multimedia and interactive learning?	very useful	15
		useful	22
		not useful	3
Qu.5	In the teaching process, how is the interaction between you and your colleagues?	good	19
		general	12
		bad	9
Qu.6	For teaching effect, what is your evaluation to these courses?	good	30
		general	10
		bad	-
Qu.7	Do you think digital technology media teaching can replace the traditional method?	good	22
		general	18
		bad	-
Qu.8	(In multimedia, animation and webpage learning), how can you organize activities in these courses?	self-study	15
		with colleagues	15
		combination of them	10

Table 2. The survey result of Questionnaire set II

Qu.No	Question	Answer	Total
Qu.1	Do you think using interactive learning improved your efficiency compared to traditional way of learning?	improved a lot	33
		improved	20
		somewhat improved	10
Qu.2	In a good quality learning, the optimal amount of information, data base and structure design are important for you?	very good	25
		good	20
		general	18
Qu.3	In general, what do you prefer to use in learning?	search in the browser	23
		lecture notes	10
		combination of them	20
Qu.4	There are simulations in your courses; did you find them valuable for your learning?	very good	40
		good	20
		general	-
Qu.5	How many times have you spent in media for your learning	5 times	24
		more than 5 times	9
		2-4 times	30
Qu.6	Using navigation in your courses relatively easy and intuitive?	very good	34
		good	20
		general	10
Qu.7	Is it good for using flipping classroom for lecturing?	good	40
		general	20
		bad	-

As can be noticed from **Table I, II** and **Chart 2, 3**

- Digital technology media resources and interactive learning create learning achievements and skills of undergraduate students than the traditional way.
- Learning time is maximized when the multimedia and interactive teaching are given as activity project, and this activity can be made easily by means of digital video and animation. This approach could save the time spent in traditional learning (passive) and increase the practices.
- When a class is being conducted for 120 minutes, average of attending students in learning were 60%. This percentage improved by applying interactivity.
- Flipping classroom based interactive learning helps students to participate actively with there colleagues and this resulted in retention.
- Multimedia and animation adapted in the interactive learning highly affected the student's participation and motivation in class discussion than being a passive audience.

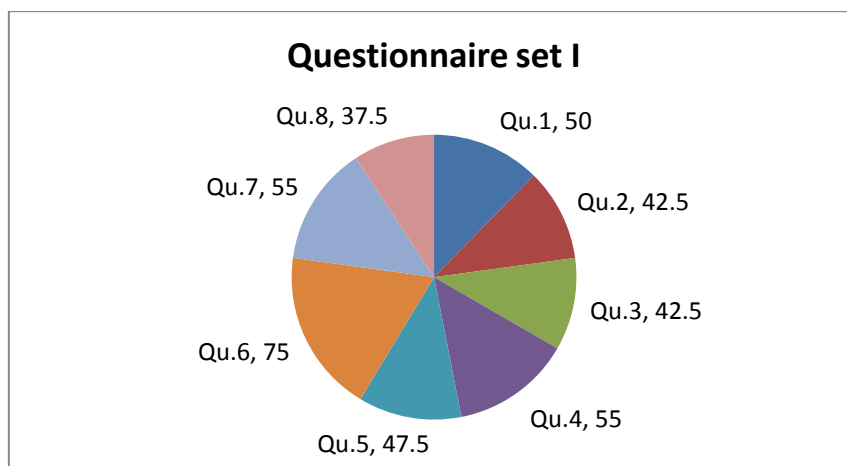


Figure2. Students answer percentage according to Questionnaire set I

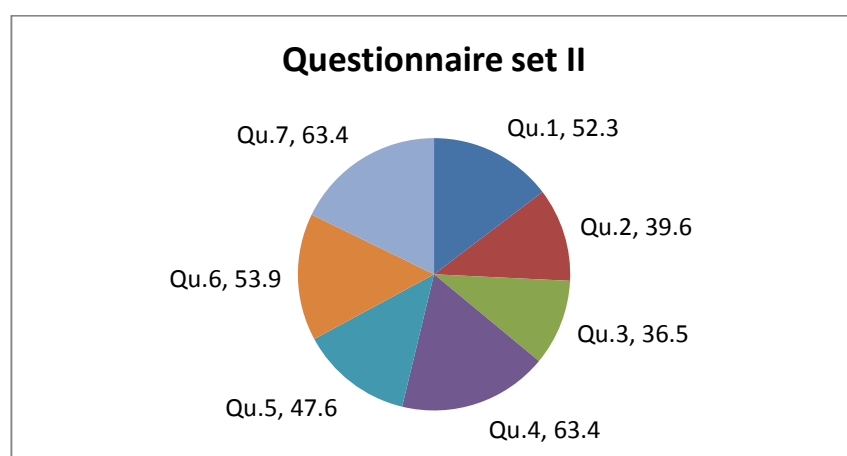


Figure3. Students answer percentage according to Questionnaire set II

3 Methods and procedures

3.1 Design based on Concept

The concept was designed and organized by control group students - who had registered on graphic design. They developed a simple descriptive framework to create and interact with graphical method.

Students has used graphic design software (Illustration and In design) to draw the ideal graphic freely. They represented two-dimensional and three-dimensional space and use their imagination to create the poster.

3.2 Design based on Content

Students has created design-based content properties, title, subtitle and images within content elements. They assigned different numbers of colors to the content using linguistics relationships to establish their design for creating interesting confrontation image.

3.3 Information transfer

Graphic, text, and color are three elements of poster design. Graphic is the most important one. Its idea expresses the theme directly and affects the transmission and communication of information, (Figure 4).



Figure 4: Visual information transmission of the poster

3.4 Graphical and packaging process

This process was designed and organized by experimental group students - who had studied packaging design. They established packaging design project by determining the principles and structure.

The principles for poster and package design are: (Figure 5).

- Concentrate the depth and volume of content in one message
- Streamline visuals and design for clarity
- Plan for interaction between all elements



Figure 5. Graphical process and presentation for Poster and Packaging design

3.5 Reifying design elements

We are interested to enhance students flipping their conceptual design into actual software code. Students in the experimental group who had studied multimedia, animation and web page courses create referable design, with clearly identified.

Reifying the design executed by multimedia and web page. Poster and package design primarily based on multiples required to set all the parameters, including CMYK color, values, font sizes, line widths and dimensions. Student has a tool that let them treat these parameters as variables, instead of being hard-coded and they could simply amendment.

3.6 Using code to reify the design

Reifying design in code allows students manipulate additional properties as well as produce new components that admit advanced relationship. For example, create a website layout for visualizing alternative websites, (Figure 6).

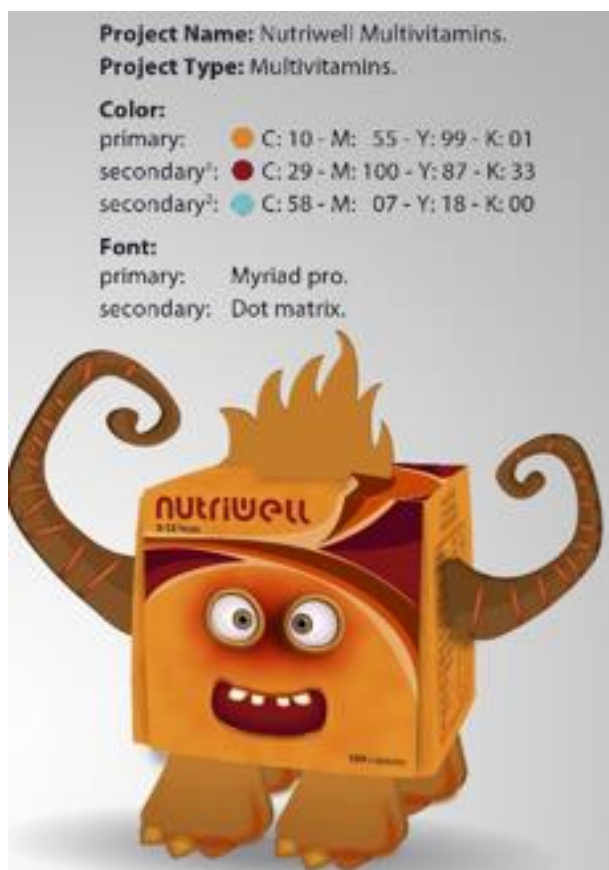


Figure 6. Using code to reify the design

3.7 Direct coding

Basically images are the collections of several pixels with colors. In computer graphic, direct coding is an algorithm that provides some amount of storage space for each pixel so that the pixel is coded with a color.

For embedding a graphic image representation into a two-dimensional matrix code, students modified the characteristic values of individual pixels in the image according to the values of a provided two-dimensional matrix code image. ⁽⁵⁾ (table 3).

Table 3. Direct coding of poster colors with 3 bits

Bit 1:r	Bit 2: g	Bit: b	Color name
0	0	0	Black
0	0	1	Blue
0	1	0	Green
0	1	1	Cyan
1	0	0	Red
1	0	1	Magenta
1	1	0	Yellow
1	1	1	white

3.9 Screen design features

Students created unique design components for website that based on shifting and rotating elements between contents. Special attention was given to a common cartoon character that usually kids like such as: vivid colors and animation using to make it more attractive.

Main Screen: It can be seen in (Figure 7), the main screen was linked to the basic components of the selected data. The character was designed by using a combination of different elements which are:

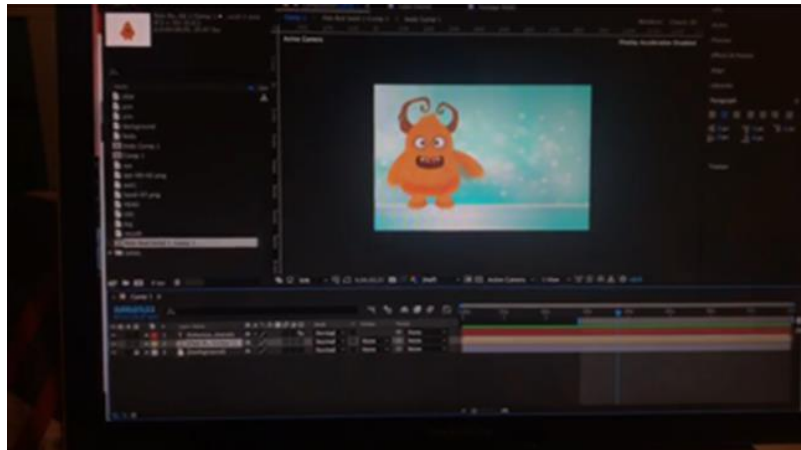


Figure 7. The main user interface for the animation

Text: Two types and sizes of fonts are used, clear and easy to read. Varying font's size and style was utilized for text to be more catchy.

Graphic: One of the most cartoon characters that kids know and admire is associated with simple drawings to represent the topic.

Animation character sets: In developing and keeping the design components with text, students convinced to distinguish between the content and appearance. By content, they mean the character that make up the words and other units as symbols, (Figure 8, 9).

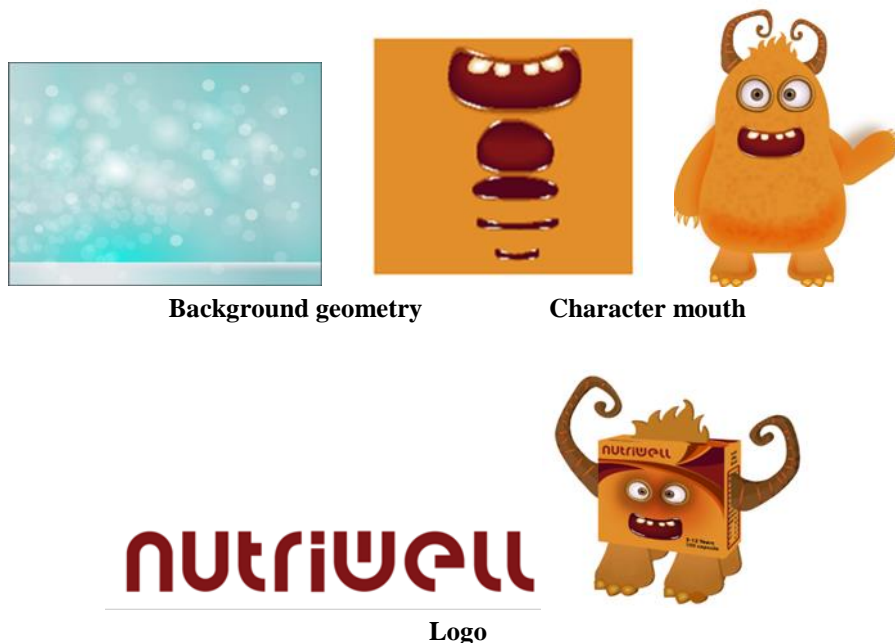


Figure 8. Idea development for Animation

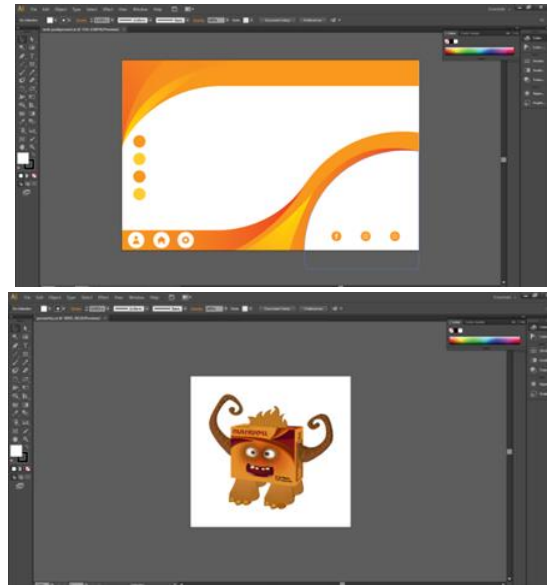
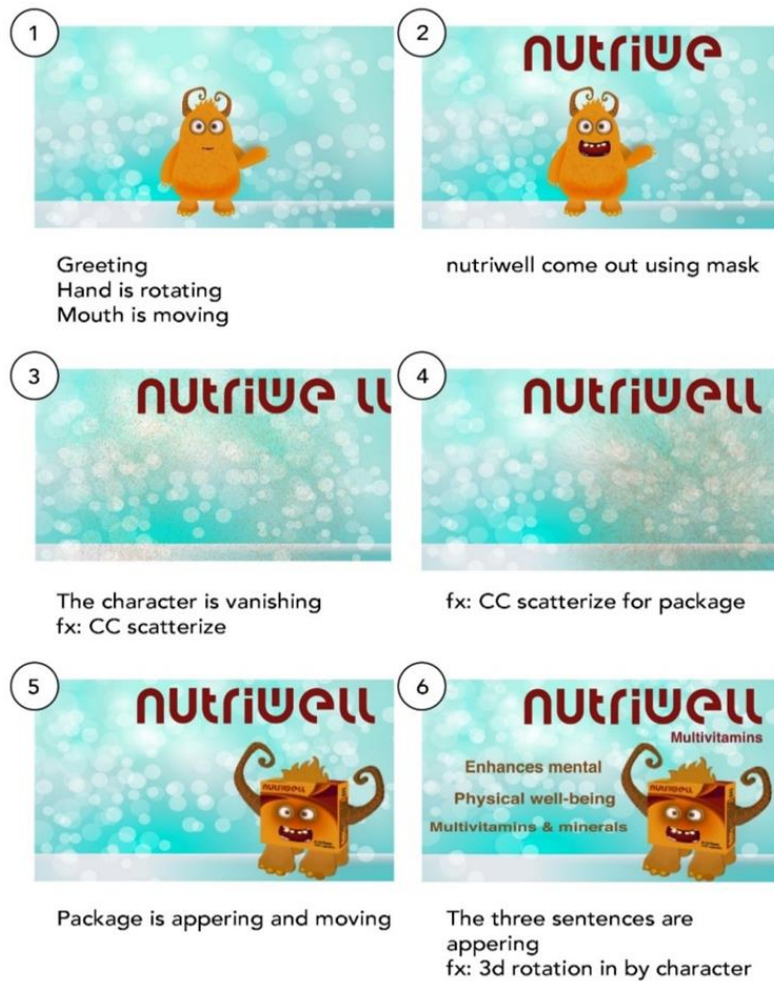


Figure 9. Idea development for Web Pag

Storyboard: Relationship among content parameters, (Figure 10).

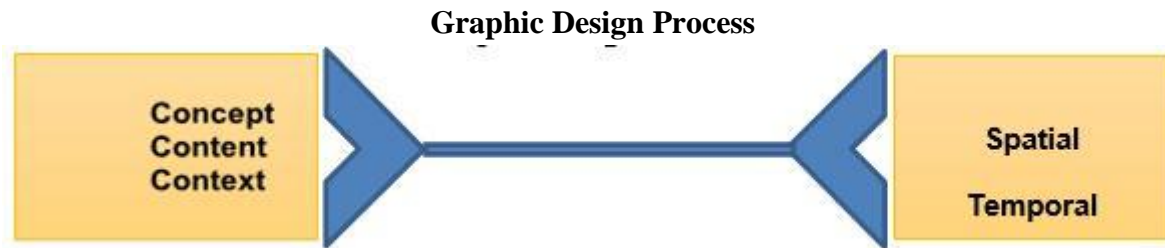


Note: The project include:
Background with moving bubbles
Audio.mp4
mp3 music sound

Figure 10. Storyboard

Web page process design:

Students create their framework that identifies the main types of inputs and outputs to interact with graphical method. They based three main types of inputs: concepts, content properties and context constraints then mapped these inputs to spatial and temporal output properties. (Figure 11) ⁽⁶⁾.



Relationships among properties

Figure 11. Graphic design based on inputs and outputs

The process was created by using concepts as basic input, some elements are specific, such as logo, other elements are more abstract such as titles and typography. Students follow up the substrates to shape spatial and temporal properties for a website.

Students developed the visualization tools to see how webpage content has changed and examined the relation of website's particular qualities such as visual appeal and dimensions, (Figure 12).

The developments included image formats for high-resolution and improved back-ends that enable dynamic and customized page. Design guidelines extending from web design standards:

- Spacing consistency.
- Typeface consistency.
- Color consistency.

For spacing consistency; students used the margin attributes of adjacent elements for validation. The margins of horizontally distributed elements were the same. Finally, they checked the font and color attributes for typeface and color consistency.

Typeface consistency; each font has a different style and emotion; the choice of font illuminates a great influence on the overall scene of the final web page presentation.

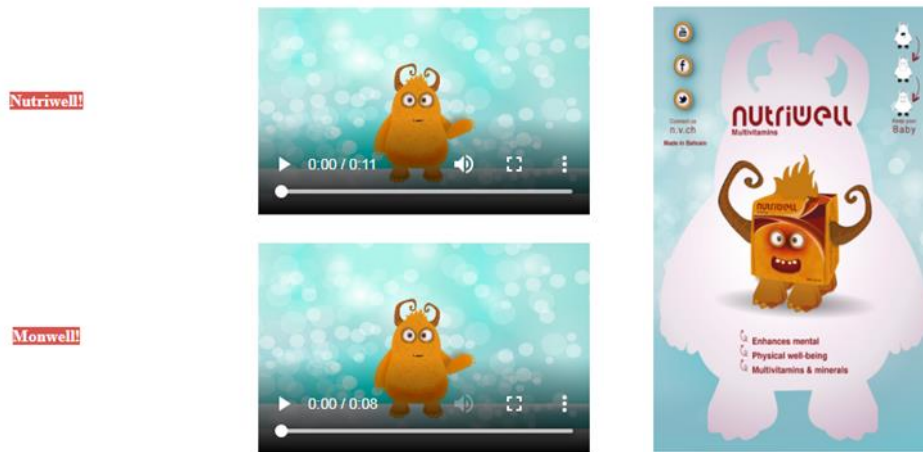
The applications of colors in both web design and graphic design share numerous similarities and follow the basic theory of color such as hue, lightness, purity, coolness and warmth.





Structure shape:

The shape of the packaging is designed on a cartoon character where it affects and attracts the attention of the children as they are the target group. it also contains a separate components to form the cartoon character.



functionality:

Product packing to protect show the product and can also reused again as can be recycled.



Figure 12. Final Web page

Page resource:

```

<h1>Welcome to nutriwell company</h1>
<h3>Multiwitamin, for children</h3>
<table style="width:80%;">
<tr>
<td style="width:60%;height:300px;"></td>
<td style="width:40%;height:300px;"></td>
</tr>
<tr>
<td style="width:60%;height:450px;"></td>
<td style="width:40%;height:450px;"></td>
</tr>
</table>
```

<th colspan="3">

 </th>

<th colspan="3" style="text-align:left;">
<h2>Structure shape: </h2></th>

Video: In this process, students in control group and students in experimental group who was taught packaging design could be more effective in increasing motivation and ensuring retention in learning and improve their skills, (Figure 13,14). (This video was created and organized by experimental and control groups).

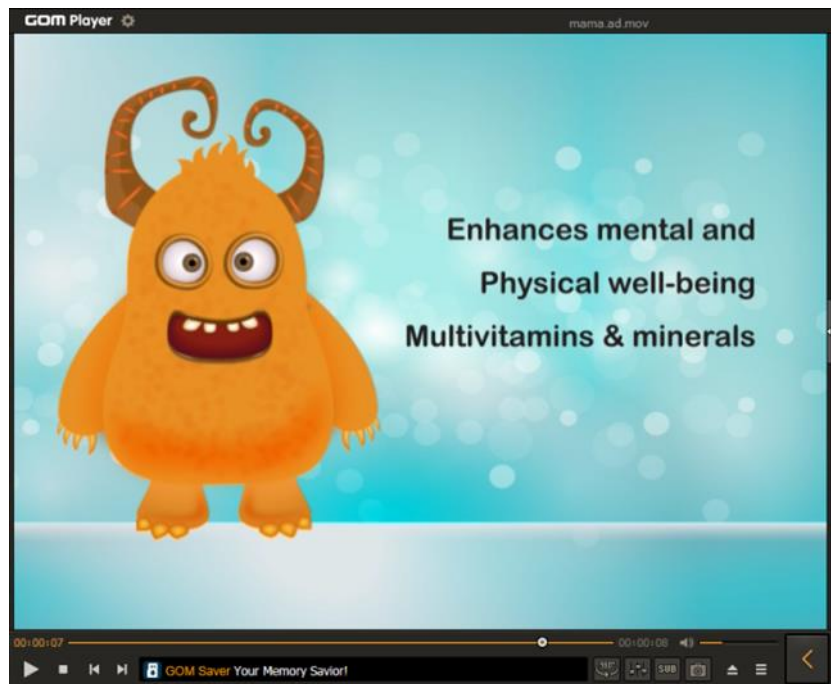


Figure 13. Final video step 1



Figure 14. Final video step 2

Results and dissection

- According to the study objectives, it was observed and recognized that the undergraduate students' results using interactive learning and digital technology media were higher than students who taught using traditional classrooms in terms of their learning achievement results, innovation and learning skills.
- Moreover, Teaching is not only depending on the flow of knowledge but also on the interaction and the emotional communication between both student – teacher and student – student.
- Flipping classroom helps in improving the students' critical thinking and motivation. In addition, applying learning management enhanced the students' content knowledge and this resulted in their interaction in their classroom activities.
- Students' self-education became more efficient by using and sharing both the interactive learning and the digital media technology, as using technology in classrooms' activities makes student more passionate and affected positively on the student's enthusiasm and interest in studying.
- Using case study during learning activities allows the students to think, analyze and solve problems as the student could compare concepts or opinions which are similar to the teacher's case study, such as courses development components and problem perception.
- After achieving the suggested navigation technique, students can easily use new presentation methods like mind maps instead of paper reports. Furthermore, group members are responsible for their own missions or tasks.
- Brainstorming and small groups' discussion could be used as a possible method and a problem solving technique to improve the project presentation quality where the students can achieve the goal of both communication and education.
- The classroom activities also include the method of sharing knowledge between the teacher and the students to encourage them give their opinions and explaining the content they got using the "Kahoot" application as a way to motivate students and give them an opportunity to review and understand more the content.
- Finally, as evaluating the students' work is the last part in learning procedure; We gave students the opportunity to comment on their classmates' work as this feedback is considered as a new starting point to develop their work hereafter.

Conclusion

As explained in the study, we have to provide a challenge learning environment, and despite the fact that results showed improvements in students learning skills, however, this is not a study for replacement of traditional education. Rather, interactive enhanced learning can provide a very useful alternative for traditional education especially in cases where it is not applicable to teach through traditional methods.

Multimedia technology combined with the characteristics of the art design course leads to optimize the teaching effectiveness of the creative thinking, and analyzes the innovative application strategies of teaching methods.

The flipped classroom design heightens students' learning, innovation and creative thinking, communication problem-solving, and working participation. The techniques in this procedure improved students' procedure in terms of knowledge-seeking.

In this case study, we have identified a set of generic *axioms of creativity learning challenge*, which are applicable to all creative domains. These are:

- (A0) Learning challenge is identified by objectives in teaching methods,
- (A1) The value of creativity is determined by the society it receives it, and
- (A2) Innovative approach is an emergent phenomenon.

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