THE ROLE OF SEMIOTIC THEORY WITHIN EDUCATIONAL INFOGRAPHIC IN HIGHER EDUCATION

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Abstract - this paper aims to explore the role of infographic in educational environment, in more depth; the role of opted visual semiotic shape within infographic in order to improve infographic design for higher education. It also addresses one of the biggest educational problems that face the higher education in Jordan by conducting infographic experiment as case study. Education in Jordan suffers from a weak educational system that uses traditional teaching methods and lacks interactive teaching and learning between the teacher and the students which is the key element to achieving better educational outcomes. Besides that, Education in Jordan tends to use the ordinary teaching techniques in a time where critical thinking and imagination became the core of the most recent educational theories and practices. According to a study conducted on Jordanian public university students to investigate the problems that face them, the results indicated that using instructional methods occupied the first big problems, thus the study recommended to design new and interactive educational programs and implement new teaching techniques in order to keep students on track with the most recent educational systems.

Index Terms- Semiotic, Visual communication, Infographic, Higher education.

I. INTRODUCTION

The role of selected visual semiotic shapes within infographic is important in order to improve infographic design for higher education. Infographic is becoming one of the most popular graphic design fields, and this refers to the two core desirable outcomes which are; the engagement of its components and the memorability of its elements which formulate the whole design, and that interpret the desirability of infographic by engaging complex data and arranging it in visualized memorable design, in aim to capture a reader’s attention while keeping the structure of these data stories with the fundamental of graphic design (Lin, Newman, Hong, & Landay, 2000). By using infographic data will be converted to visual communication form called "data visualization" through graphic design software, and by applying several graphical shapes such as pie charts, icons, decorative fonts, diagrams and illustration shapes to formulate the visual narrative by using online template available on websites like (ex.Piktochart, Pixlr and Infogr.am) or graphic design programs packages like (ex. Photoshop, illustrator, InDesign or any graphic software)(Matrix, S., & Hodson, 2014). Although Infographic is infant, its aspects allow it to spread using many sectors around the world, its flexibility to form infographic in multi visual formats encouraging a lot of sector to use it, especially that they provide clarity, aesthetics and textual harmony in order to optimize the perception of the presented information (Giardina & Medina, 2012). In 21st century, visual communication has been used commonly in image, particularly infographic, where its perception and understanding is a new and an active field for research, and this active movement of this research field refers to the increasing in information flow which may disturb the human brain. So infographic is an effective tool that assists readers and learners to realize and process the information quickly to keep up with information overflow, and clearly to complete the perceptual process, and this is in the heart of the infographic role, which will not only provide and arrange information, but also will make interest and motivation to people to explore more and more, consequently, infographic is an attractive, persuasive and quick tool and not only a story telling tool (V. siricharoen, 2014).

Finally we can analyze "infographic" as (information graphic), which describe as a type of pictures that merges graphic design with a collection of data in order to convey a messages to the audience briefly, and create a good communication (Smiciklas, 2012), in other words infographic is a modern way to visualize data in order to help the humans interpret information by visual communication form. (Wikipedia, 2014), this shape of visualized display also aims to show the information in quick and clear way (Education & Technology, 2014). Information graphic can also convert the complex data to an arranged and organized design, which can be modified upon request (Harrison & Reinecke, 2015). In fact, infographic may be supported by text to increase the level of the audiences perceiving process (Bladon & Poulin, 2014).

II. LITERATURE REVIEW

A. Visual Communication directions

1) The role of Visual literacy in visual communication
Visual literacy is defined as "the ability to understand, interpret and evaluate visual messages", there are also several definitions directed toward unified simple meaning; "the ability to read and write simultaneously", others defined it as visual literacy and it is more improved definition which defines visual literacy as the ability to learn visually in order to find solution for problems in visual perspective (Gray, 2012). During the 1980s and early 1990s, three aspects appeared and formed the concept of visual literacy, which are: human abilities, promotion of idea and teaching strategies, so depending on these aspects Braden and Hortin suggested the best definition by combined the three aspects as "visual literacy is the ability to understand and use images, including the ability of thinking, learn and express oneself in terms of images" (Lynch, 2009). The conveyed visual messages via visual communication process consist of two parts, sending and receiving, and the message lies in the meaning of conveyed image, hence, to make meaning of the image the receiver utilize critical skill to explore the image, and the following step is critique and reflects in aim to reach to meaning, and this steps encouraged Lapp et al 1991 to use the "intermediality" term to describe the status of combined needed literacy in considering the multimedia world. "Intermediality" means the bath that image uses to communicate sender and receiver, in order to interpret the meaning of image in the current of past in effective communication with the audience of receiver (Bamford, 2003). The concept of visual literacy appeared in 1969. The discussion about visual literacy theory between Griffin and Whiteside in 1984 created the necessity to make stimulated practical application taking into account three perspectives, the first is theoretical perspective that blends philosophical, psychological and physiological criteria of learning, the second is visual language perspective, which blends receiver and oriented approach relation committed to aiding people to be visually literate through effective, stimulated relation., finally, the presentational perspective, which blends presenter-oriented approach, and this refers to the developing of communication process by design of visual stimuli (Averinou & Pettersson, 2011). The deep and sustained visual form isn't restricted to particular area of curriculum, furthermore it's something should be taught at young age to achieve the intelligent of imaging from multi sources, and this is due to several visual sources: art history, aesthetics, cultural studies, media studies, instructional design, communication research and educational technology of this age (Bamford, 2003).

Nowadays, students live in an environment rich of multi-visual shape to deal with, they also confront and make meaning and knowledge by images and visual media. For this reason, visual culture that surrounds them and the visual literacy competency sets them as top priorities for the 21st century to equip learners with the abilities to interpret, evaluate and utilize visual material in taught courses (Hattwig et al., 2012).

III. THE POTENTIALS OF INFOGRAPHIC

A. Simplify via Infographic

Recently, infographic as new graphic technique has exploited in aim to present information from quantitative data to abstract concepts explaining for wide beneficial users. The term of infographic is shortened to act information graphic, even infographic as graphical poster, or animated representing, and the main role of infographic is to summarize information and include explanations about concepts or phenomena. In addition to that, users will be able to acquire complex idea simply and perfectly by using graphical effects, and this is the core intention of using infographic (Andrist, Chepp, Dean, & Miller, 2014). According to McCormic, DeFanti and Brown visualization is the study of mechanism which gives people the ability to consider, use and communicate visual information, according to this definition, visualization consists of analyzing visual shapes (image for example) and visual shape understanding (Lohse, Biolsi, Walker, & Rueter, 1994).

Infographic as a type of visual communication attempts to achieve the communication process for spectators, particularly for learners; in a manner they would understand the information easily and quickly, by multi-visual shapes such as image, charts, type design and more. Furthermore, Infographic is able to optimize the quality of learning through two aid tools; the first tool is considering infographic as visual communication tool and by this, physical connection between learners with information will easier. The second tool is using infographic as learning tool; content is interpreted visually such as word maps, course introductions, visual examples and overall view about the course and concluding the lecture. All these issue support education process as well as the students understanding (Vanichvasin, 2013).

B. Interaction via Infographic

The exploring of visualized information involves interactive communication between the viewer and the visualized information or infographic; interaction is considered here as a main and core part of represented info, which can be displayed in different graphical forms. Also by achieving interaction aspect of infographic, viewer can see and compare several graphical shapes at the same time, consequently, acquiring the knowledge (Dilla, Janvrin, & Raschke, 2010). Infographic as visual form, acts as interface or mediator go-between viewer and collection of organized data, which previously was complicated, inaccessible, and difficult to understand, and this
explains the popular definition of infographic: utilizing computer support to produce visual shape, interactive communication between individuals and visual representation of abstract and organized data to extend the understanding space (Houser, 2014). Nowadays, accelerated technology tools’ merits make visual forms desirable for individuals, particularly infographic, as its widespread keeps growing stronger and not weaker due to the interactive graphic, audio-animation and more forms for infographic tools with multi visual fiction for the viewers (Jabr, 2013).

C. Perception Via infographic

Study examined the insertion of infographic in reusable learning objects (RLO) and traditional didactic lectures (TDL) in aim to develop the perception and knowledge about using plastic food containers in microwave oven. Empirical test was applied to compare the effects of infographic intervention in education process for mentioned subjects and for the traditional didactic lectures (TDL) in Clemson university; and the judgment was made by comparing the pre-score and post score for the students samples, that indicate increasing in result after using infographic. The analysis of the test also showed that the right answers of samples with merged (RLO) and infographic were more than that in (TDL) method. In addition to that, the study indicated that infographic intervention (RLO) improved the symbol recognition and health perception of safety uses of plastic food containers which is the aim of the lectures. Accordingly, infographic has been found as one of the most effective ways to develop and optimize the knowledge in several topics in an effective manner (Khateeb, 2016). Furthermore, this ability of infographic encouraged (Houser) to describe infographic as protean in nature coming in variety of forms and pass through multi functions, from learning to knowledge gaining along with the happiness of knowledge perception (Houser, 2014).

D. Increase Attention via infographic

By the time, accumulated information requires the effective communication, accordingly, there is noted increasing in using infographic as educational tool, also, overloading of information may cause banishment for the attention, so infographic through emerging visual form into education process, can convey informational message perfectly with shorter attention and maximum meaning for wild audience (Carroll, Cunningham-, & Bellows, 2015). In study that used multimodality in aim to adapt with new technology merits, Dusenberry, Hutter and Robinsin established new systems to be utilized in education process, and the new system depends on three modals which are: infographic, research interview and software demonstration. In order to support students, and call their attention through unfamiliar teaching methods. Students who make assignments via infographic could engage with the ability of summarizing, analyzing and storytelling visually. Moreover, in multimodal, infographic as core component increased the willingness and raised the interest of the students to think of taught subjects in different way by reflection their thoughts on infographic assignment. Some students were under new modal test and stated that writing report can be more useful by using lesson taught with infographic. And this attention is referred to the nature of infographic in abstract and eliminates unnecessary details from the topic and leaves readers with high level of attention and understanding of topics (Dusenberry et al., 2015).

B. Semiotic Approach within Educational Materials

Without minimum doubt, semiotic system /semiosis is part of modern classroom even by students who convert the text to semiotic signs system through interaction debates, and exploit them in nonverbal communication. In recent decade, writing only had become unusual manner in taught courses. Other resources aside from writing have appeared, web and online resources created new production for teachers, paralleled to these varieties of recourse; image has grown increasingly in order to involve and carry the meaning. These changes and movements act as responder for the didactic and semiotic explanation. In fact there are two marks of these changes, uses of digital media rather than text books, and tending to use images instead of writing as carrier of meaning for learning representation. Semiotic plays a significant role in cognition and perceiving generally, and in education specifically, it is notable in (Peirce’s, 1868) statement; “we don’t have the power of thinking without signs”; sign is the core of the semiotic. (Luis Radford) studied the suitability of semiotic in mathematics in education, in aim to create a link between the cognition processes when utilizing signs, and how the latter can facilitate thinking, his platform starts with his belief that individuals shall be engaged with action that helps and leads them to receive meaning, intent here is semiotic (Varelius J., 2014).

IV. METHOD

A. Framework based on model

Framework is a guideline utilized in order to determine the effective channels on education environment or learners. Framework has powers that have impact on learning process through interactive relationships by upgrading the education system (Nugraini, 2014). To develop the education system several procedures should take place, and these procedures include linked relationships. Indeed, the model corresponds to this
ASSURE model (figure 1) developed through Heinich, Russell, Molendo and Smaldino in (1999) as instructional model in order to plan suitable course and technology means to force the education process and gain the most perfect planning. ASSURE acronym has expressed about six steps or procedures; 1-(A) Analyze: Analyze learners' characteristic 2-(S) State objectives; Taught course should include specific goals and every single lesson should have the same thing as particular cause. 3-(S) Select media and material: Chosen media and material, Heinich et al (1999) determined two directions for this point:  
- Select the method to present instruction.  
- Select most suitable media for selected method. Media maybe encompass multimedia forms (internet resources, DVDs, software, video, visual printout, text) on other words; combination of several media types. 4-(U) Utilize media and material: Achieving desired objectives and aiming to achieve objectives by applying selected material in learning process, 5-(R) Require learner participation: students consider lectures meaningfully when they are active and contributory in lecture. Merge new technology forms with actual learning process will facilitate understanding of acquired knowledge by student, and this is one of most significant priorities of learning system. 6-(E) Evaluate and revise: for perfect view of the outcomes of the technological implementation, permanent evaluation of student performance and learning process, and the best evaluation way is as (Molepo and Mothudi) mentioned: Was the media appropriate, Are there other technological solution may utilize better than that were already used? (Molepo & Mothudi, 2014).

According to ASSURE model this study adopts the ASSURE procedures as a guide map to apply infographic technology in learning process by achieve visual communicational aid which enables students to engage with modern style in education. ASSURE model focus initially on analyzing learners and their educational demand in order to develop instructional method. Furthermore ASSURE model is usually used by tutors with main goal which is “gaining use of media-multimedia effectively within instructional process (Kumar, Ochoa, & Edwards, 2012).

B. Selection of population and sample
The population of this research consists of first year students within two colleges in Applied Science Private University (ASU). The two selective colleges will be: Economic College and Information Technology College, groups were chosen purposively through hierarchy form of (ASU) university. Furthermore, the sample consisted of (120) students who were selected by purposive approach which aims to gain information from sample groups; these groups have the ability to provide the required information for researcher (Sekaran, 2003). There are two types of taught courses in classrooms; scientific and humanistic; (60) students from scientific courses and humanistic courses were chosen to be prepared to take certain subjects by infographic tools.

1) Participant’s students
In this research, true experimental approach will be utilized to be applied on selective courses on two selective groups; control group and experimental group, in two different colleges. Instructional methods (textbooks, data show, white board, etc.) will be present in the first selected group, the control group, while designed instructional courses will be implemented in the second group, the experimental group, including infographic techniques which will exploit in the classroom for certain courses. A comparative study will be conducted on the finding of the two groups. (WALLIMAN, 2011). Participant students in this study will be from first year level, selected students were justified by including mixed student from all departments in two colleges. Furthermore, participant students vary from high, medium and low visual literacy and technological skills according to courses tutors. Accordingly, (60) students from Economic college were selected as sample distributed on (2) class-rooms, (60) students were selected from Information Technology colleges as sample also distributed on (2) classrooms.
All participant students will be taught using with existed methods, which serve the purpose of the study to compare existing methods with methods supported with abundance visual environment acted by infographic. Participant will be divided into two groups: experimental and control; same students will take part as shown in figure 1:

1. Control group for each college: by giving them the selected taught subjects using ordinary methods usually used in their lectures. Each group consists of (30) students.
2. Experimental group for each college by involving the similar group to same subjects but now with implementing infographic representing; representation of taught subjects take into account increasing the visual forms during lecturers. Each group consists of (30) students.

C. Data collection
In this study data collection consists of:
1. Interviews: In this study, interview will conducted to investigate questions. Interviews are dividing to two parts:
   • Personal interviews: semi-structured interviews will be conduct on participant students with mixing standardized and open ended questions, direct personal questions will be asked in order to investigate the study issue. (Kothari, 2004) Interviews will be proceeded post of instructional infographic forms implementation during lectures to determine mutual opinions of whole infographic design with regard to students.
   • Focus interview: the main purpose of this type of interviews is to collect opinions from tutors who have required experience to determine the differences that happened to students after launching infographic forms in certain taught subjects (Walliman, 2011). Furthermore, by focus interview, researcher will confine discussed infographic forms by tutor’s opinions on desired infographic forms for students to be utilized in current taught subject.
2. Questionnaire: Survey questionnaire instrument will be used in this study to collect quantitative data, due to the nature of this study which focuses on the effects of multi-infographic forms and its role in learning process; student’s opinions will be collected by set of questions including several choices, and the respondents will be requested to select best for them in order to make data quantifiable (Walliman, 2011). Questionnaire is made in three sections; pre-infographic implementation, during instructional lectures and post-infographic implementation. Numeric data will be collected from questionnaire according to students responses (Creswell, 2009) ; these preferences are referring to the taxonomy of infographic visual forms. Questionnaire used in this study depends on related questionnaire in literature review; simplicity and retention in learning process through infographic (Vanichvasin, 2013) , increase attention of students after using infographic as visual attractive forms in the education system (Dusenberry, Hutter, & Robinson, 2015). Furthermore, questionnaire will also refer to interactions between presented visual form represented by infographic and viewer represented by students (Jabr, 2013), also perception scale by integrating infographic with traditional learning method will be used(Houser, 2014).

On other hand, the questioning will be developed in corporation with infographic visual communication experts. Validity and reliability will be also achieved through expert’s investigation and monitoring.

Observation: Researcher will use direct observation to measure interaction level between tutor and students during representing the contents of taught subject by multi infographic categories. Tutors will also conduct quiz for (5 min) to determine the most effective category of infographic; the quiz will be for every involved categories. Researcher also will detect with the tutor any issue to comprehend selective subject and use multi infographic categories in aim to observe simplify scale referring to students and tutor feedback.

D. Validity and Reliability
Regarding to quantitative data, reliability and validity is substantial, and the chosen strategy aims to achieve validity which means measuring what study proposes to measure, while reliability aims to measure the consistency and stability of items of research instruments (Dawson, 2002).
1) Reliability
There are several strategies to measure reliability, in this study internal consistency will be used. Internal consistency measures will be used if the items are equal in consistency across the test. Internal consistency assumes that items of the study shall be correlated because it measures the same construct (Kimberlin & Winterstein, 2008). In addition to that, this study will use Cronbach Alpha to gain statistical internal consistency (Creswell, 2009), Cronbach is the most common technique to measure the consistency item that use multi scaled points. Also with higher coefficients level the measuring of instruments will be high level of reliability (Sekaran, 2003).

2. Validity
Content validity, is whether the items in research's instruments can measure the content that researcher wants to measure (Creswell, 2009). In other words, content validity reflects the accuracy of the items in measuring concepts or variables of the research (Sekaran, 2003). In this study, content validity will be used, and due to non-existence of statistical technique to measure if the contents represent or cover the test...
area, content validity frequently depends on experts in different research fields to make validity (Kimberlin & Winterstein, 2008). Therefore, this research has three experts in visual communication design who will judge the validity of instruments.

REFERENCES


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