When an Instructional Designer Hold the Strings of Puppets: A Qualitative Study of Using Visual Metaphor in E-learning Environment

Dalia Alyahya
Educational Technology Department, College of Education, King Saud University, Riyadh, Saudi Arabia
dmalyahya@ksu.edu.sa

ABSTRACT
Studies have shown the importance of visual metaphor in facilitating learning. Metaphor aids in communicating complex concepts in a clear manner, and enhances the learning experience. This study investigates graduate students' experiences and attitudes toward visual metaphors in an online learning environment. The visual metaphor used in this study was developed for an online instructional design course. Participants read the materials and were asked to respond to open-ended questions. The participants' responses were analyzed qualitatively. A within-case analysis was conducted, followed by a cross-case analysis, in order to study multiple cases. Evidence encountered suggests that visual metaphors assisted participants in fulfilling their educational goals. When interviewed, all participants appreciated the visual metaphors presented and stated that they preferred the presence of visual metaphors in the context of their studies. However, the participants had different perspectives on how the meaning of the metaphors could be perceived.

KEYWORDS: Visual Literacies, Visual Metaphor, Instructional Design, Online Learning, Higher Education

INTRODUCTION

Graphical metaphors have become an essential part of interfaces and computer communication, even though computers and the Internet began as numeric and textual tools. Visual instruction is an easier way to help students understand the concepts and facilitate learning. Administrators of online learning projects should emphasize, and consider requiring, students' use of visuals to reduce misunderstandings (Shih & Cifuentes, 2003). Moreover, the benefits of metaphors have appeared in research for many years and a use of metaphor for designing user interface is almost always recommended (Blackwell, 1998).

Many practitioners prefer the use of visual metaphor in learning because of all the evidence that demonstrates the effectiveness of the use of metaphor. Using visual metaphor for learning can make a difference to students' learning experience. Rieber and Noah (2008) illustrated how the use of metaphor results in an increased level of tacit learning, evidenced by greater scores on a special gaming task when used in conjunction with metaphor. Kartal and Uner (2017) found evidence that conceptual metaphors have positive effects on the learning of phrasal verbs. And Hube, Tremblay and Leigh (2015) found that metaphor functioned both as an educational and communication tool for students. According to Lakkoff and Johnson (1980), understanding takes place within a broad domain of experience and not in isolated concepts. Learners use information to help solve problems and develop and organize new information. Visual metaphors enable the learners to understand such abstract concepts in terms of familiars and well understood knowledge (see Figure 1).

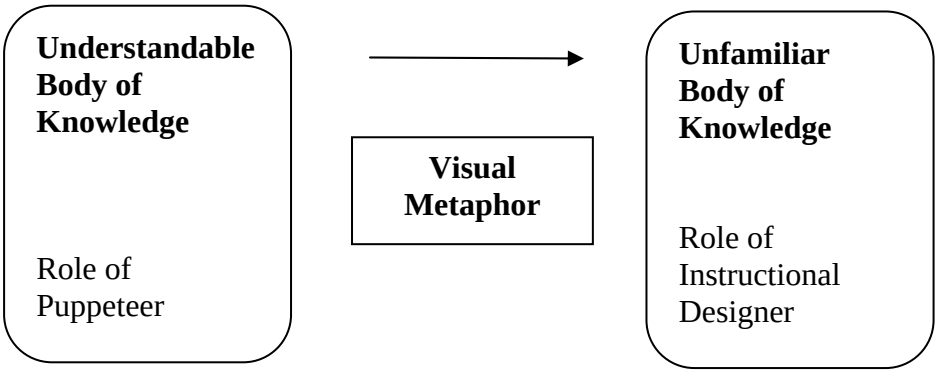

Figure 1. *The relationship between understandable and unfamiliar knowledge.*

Furthermore, using metaphors in education help individuals communicate complicated concepts, and influence

how people behave in the world (Lakoff & Johnson,1999).

Lakoff and Johnson (1980) defined the concept of metaphor as a novel or poetic linguistic expression where one or more words for a concept are used outside of its normal conventional meaning to express a similar concept. Many studies into metaphor have explored linguistic rather than visual metaphors. However, Sering (2006) stated that "the definition of visual metaphors stand in relation to linguistic ones" (p. 231). He also indicated that "in linguistics the form has taken a simple, defined rule A is B. This rule influences research into visual metaphor that attempts to find a visual equivalent of the linguistic form" (p. 243). Furthermore, he indicated that each of the simple form elements A and B is a result of interactions and interrelationships of a complex network of domains. These metaphors are grounded in systematic correlations within our experience (Lakoff & Johnson, 1980). As a result, Sering (2006) defined visual metaphor as a term used to describe how visuals are organized as a means of sharing.

Metaphors can be constructed in different ways. One of the most noticeable metaphors is where a physical object is further specified as being a person. Human beings use their experience of human motivations, characteristics, and activities to allow us to realize a wide variety of experiences with nonhuman entities (Lakoff & Johnson, 1980).

Metaphorical concepts can hide an aspect of our experience as a conduit metaphor (Lakoff & Johnson, 1980). This is illustrated by the following complex metaphor: ideas (or meaning) are objects, linguistic expressions are containers, and communication is sending. Also, metaphor allows us to understand one domain of experience in terms of another. This substantiates the suggestion that learning takes place in terms of entire domains of experience and not in terms of isolated concepts (Lakkoff & Johnson, 1980).

Gentner, Ratterman, and Forbus (1993) add that a metaphor is just a representation of the facts. For this reason, it is important for teachers to avoid using misguided metaphors and to be sure that their students are able to make appropriate and strong connections between the analogs and the target.

Some metaphors may be more attractive than others because of their accessibility, flexibility, imaginativeness, or aesthetic value (Safard, 1998). Analogies, like metaphor, draw comparisons from one thing to another. "Drawing an analogy between a problem situation and another situation sometimes provides insight into how a problem can be solved" (Ormrod, 1999, p. 375). It is important to use analogy correctly, because if used inaccurately it may result in approaching the problem incorrectly. People may draw inappropriate parallels, even if they identify a truly analogous situation. They might try to find an analogy that is similar to the problem in terms of superficial features without establishing deep connections (Ormord, 1999, p. 376). Also, analogical thinking limits the search for solutions to situations that have something in common with the one currently undertaken (Woolfolk, 1998).

Many prefer the use of visual metaphor in learning because of all the evidence that demonstrates its effectiveness. There are many different theories as to how people learn. Teaching and learning activities can be designed and implemented to take differing principles and processes of learning into account. Visual metaphors can be used in instruction as visual code or to reduce cognitive load or even to give cues to retrieve information from long-term memory as in information processing theory.

Informational processing theory describes the human brain as similar to a computer, with brain having three main storage areas: (1) sensory (2) short-term memory (3) long-term memory. In the sensory register, only a portion of the information is attended to and transferred to short-term memory. The information from short-term memory is encoded and stored into long-term memory. In long-term memory, the information will be retrieved when appropriate cues are provided (Tabbers, Martens, & Merrienbor, 2004).

Knowledge is stored in long-term memory as packets of information. Those packets are organized in categories that are connected in systematic and predictable ways. Learners use those organized packets of information to solve problems and develop and organize new information through learning and experience. Working memory capacity is limited; high levels of information processing and storage with such a limited capacity for memory might cause an increased cognitive load (Resier & Dempsy, 2007). Cognitive load theory defines as "extraneous load" the unnecessary memory load caused by the presentational format of instructions (Tabbers, Martens, & Merrienbor, 2004). However, working memory capacity can increase if the elements related to the information processed have previously been stored in long term memory. In other words,
"sophisticated and automatic schemata [packets of information] free a learner's working memory capacity, allowing processes such as comprehension and reasoning to occur" (Resier & Dempsy, 2007, p. 39).

One study investigated the generalizability of the modality and cuing effects on classroom setting focusing on the cognitive load theory. Students using visual material spend significantly less time on the instructions, which only strengthens the conclusion that they have really outperformed their colleagues in the audio conditions (Tabbers, Martens, & Merrienbor, 2004).

Mayer (1997) found that using the coordinated presentation of explanations in a visual format (illustrations) was effective. Also, Zhu and Grabowski (2006) found that combining instruction with more related explaining visuals leads to more effective instruction. He further indicated that placing text and visuals side by side encourages learners to read the instructional text as well as build referential connections between the instructional text and graphics.

Online learning has become one of the most helpful and powerful ways to connect knowledge across the globe. Technology plays a key role in the delivery of distance education. The key to effective distance education is to focus on the needs of the learners and the requirements of the content, and then selecting the delivery system (Biner, Bink, Huffman, & Dean, 1997). Without employing appropriate theories and instructional strategies in harmony with the unique features of the internet, the expectations of higher learning outcomes will not be reached (Neo & others, 2012). However, not much is known about the use of visual metaphor in an online learning environment. The literature demonstrates that the characteristics of an online learning environment can have a great impact on student satisfaction. Involving instructor support, personal relevance, and real life examples related to student experiences in an online learning environment contributes to student satisfaction, and will increase student motivation, participation, and ultimately, learning experience (Sahin, 2007).

Studies show that the use of visuals in online learning environments reduce misunderstandings and facilitate learning. Johnson (2007) found that when using visuals in online learning, students' achievements were significantly enhanced. He also recommended that college students be provided with less verbal and more visual instructions.

The purpose of this study is to investigate graduate students' experiences and attitude toward visual metaphors in an online learning environment. This was obtained through investigating the following two research questions: what are graduate students' experiences of using visual metaphors in an online learning environment? And, what are the students' attitudes toward visual metaphor in online learning environments?

METHOD

Participants

In this study, a convenience purposeful sampling approach has been used (Creswell, 1998) to select participants. Creswell (1998) stated, "The more cases an individual studies, the greater the lack of depth in any single case" (p.63). Based on that, the intended participants were four students (see Table 1). Each participant was given a pseudonym to ensure anonymity. All participants were graduate students in the university's college of education.

Table 1. *Overview of Participant Information*

Participants	Gender	Age	Students Level	Number of previous online courses taken
John	Male	35 - 45	Ph.D.	3
Sara	Female	35 - 45	M.A.	1
Elizabeth	Female	25 - 35	M.A.	1
Maria	Female	25 - 35	M.A.	2

Instrument

The data source used in this study is an interview. According to Creswell (2005) "a qualitative interview occurs when researchers ask one or more participants general, open-ended questions and record their answers" (p. 214). Moreover, the visual metaphor used in this study was included in the interview guide to ensure that participants know exactly what is meant by the metaphor. The interview ensured that all relevant topics were discussed (Merriam, 1998). The interview included open-ended questions, such as "did the visual metaphor help you understand the instruction? How?" Table 2 illustrates how the relationship between the research questions and the interview questions will be used in this study.

Table 2 *The Relationship Between Research Questions and Interview Questions*

Research Questions	Interview Question
1. What are graduate students' experiences in using visual metaphor in an online learning environment?	Did the visual metaphor help you understand the instruction? How? Did you think that visual metaphors distract your understanding? Why? Did you think that visual metaphor delivered the wrong message? How? Do you think that you would have understood the instruction with the same quality if the visual metaphor had not been presented? How? What are the strengths of visual metaphor? What are the weaknesses of visual metaphor? What suggestions do you have for using visual metaphor? Talk about your overall experience in using visual metaphor.
2. What are students' attitudes toward visual metaphor in an online learning environment?	Did you prefer to have visual metaphor in the instruction? Why? What is your attitude toward visual metaphors?

Procedure

The study took place at a mid-sized university in the western region of the United States. The visual metaphor used in this study was developed for an instructional design course. The metaphor used in this study was an instruction presented online via the online learning management system "Blackboard". The intended class is an instructional design course. The goal of this class is to teach graduate students the role of instructional design and how to create effective, efficient, and appealing self-directed learning units. The visual metaphor that had been used in this course is "puppeteer" (see Figure 2). The idea is that the puppeteer is the instructional designer and the puppets are the instructional design elements. This figure also represents the four steps within the visual metaphor: sizing up the learner, stating the outcome, making it happen, and knowing what the learner knows.

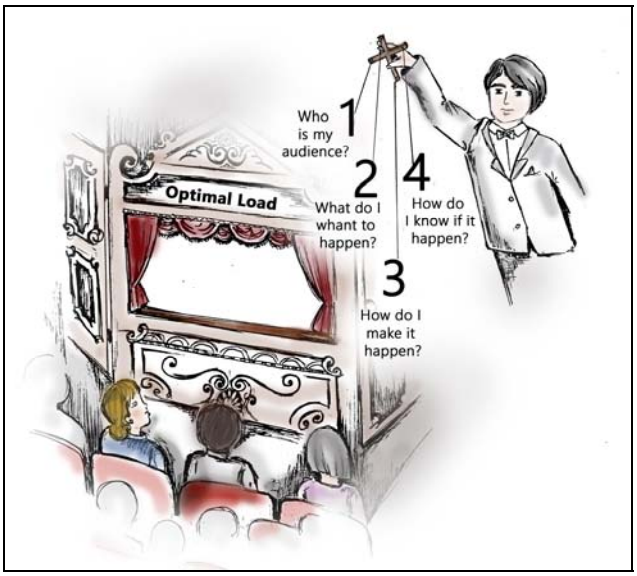

Figure 2. *The Role of Instructional Designers Represented by the Puppeteer and its Four Steps*

During the course of the study, which was 1 semester, students were required to go through three steps located in the Blackboard. These links were “start here,” “go to class,” and “post homework.” The instructor's weekly posts contained visual metaphors in addition to text explanations. These posts focused on the role of instructional designers in comparison with the role of the puppeteer. Furthermore, to assist students' learning, a weekly puppeteer map was provided to show student progress within the course.

During the final week of the course, students were asked to complete a face to face visual metaphor interview. The data collected was in the form of an interview, that contained approximately 10 questions. Participants were asked about their attitudes and experiences with the visual metaphors and to what extent the metaphors supported their learning.

Data analysis

The information gathered from the data collection method provides insight into graduate students’ experiences and attitudes toward the visual metaphor in an online learning environment. Participant’s responses to the open-ended questions are analyzed qualitatively. The transcript of the interview data for each participants was examined and themes were developed. According to Creswell (1998), the typical method for analyzing multiple cases is to conduct a within-case analysis followed by a cross-case analysis. The within–case analyses smooth the progress of describing each case and facilitate a way of finding themes. While the cross-case analysis looks for similar themes and patterns across all of the cases in the study. The steps used to analyze the data in this study are as follows:

Open coding: the within-case analysis started with open coding. This step involves searching through the entire data set and assigning coding. For each student response, the researcher reads and codes the data at least twice.
Case comparison: This steps focuses on the themes that emerge from each of the cases compared. Similarities and differences between the cases are identified.
Conclusion generation: uncertain conclusions become visible during the analysis of the data. Then, the conclusion is supported through consistent evidence.
To insure the accuracy and credibility of the findings, triangulation strategy is conducted during both within and across case analysis. Moreover, the written data is coded on two occasions by different researchers subsequently, the coding is compared to ensure its reliability.

RESULT

This section presents the results of four cases that provided data for this study.

Table A shows the relationship between the research questions and the interview questions. After collecting the data, the researcher found an overlapping between some of the students' answers. This was taken in consideration in analyzing the results.

Students’ experiences in using visual metaphor:

The participants in this study shared some common opinions in their learning experiences and learning techniques. The first case was John. He provided more data than each of the other cases. This case was perceived as a model for defining codes (Moore, 1998). He found that the metaphor was helpful. He stated that the visual metaphor (puppeteers) helped orient him on each unit and helped him to see what the instructor focused on in each particular unit. It also helped him to have an overview of instructional design. He thinks that the puppeteer made it easier to stay on track with what the instructor wanted them to do. John seems to use the visual metaphors very often and to benefit from them. John also said that the visual metaphor sometimes impeded the understanding for some students, but not his understanding. He thinks that some students will get an incorrect message or create a mental image inconsistent with the target concept.

> One of the risks incurred in using a visual metaphor is some students will get caught up on real or imagined inconsistencies such as “Does the teacher just pull the students’ strings?” “Are the students just puppets?” “Are students just passive observers?” etc.

John also believed that there is no perfect metaphor. He thinks that the best metaphor will be disliked by a small portion of the population: it might help 80% of students, might not help, or even hurt, 15% of the students, and might be distracting to 5% of the students.

Moreover, john thought the puppeteers provided an effective conceptual framework without using instructional design terminology, as he thought that the use of specialized terms could make it more difficult to step back and

see the bigger picture. He also thought the visual metaphor freed up cognitive processing capability to focus on the task by making it easy to keep aware of how the specific unit fitted into the whole task.

John has used visual metaphor in teaching. He felt that from his experience using metaphor might provoke a negative reaction from students if overused. He gave an example of how an effective metaphor works. He said.

> For example, in teaching organizational culture an iceberg metaphor works well to help people understand the concept. With an iceberg ¾ of the ice is underwater and so is not visible. Organizational culture is made up of some visible parts such as artifacts, but contains a great deal of less obvious pieces such as beliefs and underlying assumptions that are not obvious to the observer or even to members of the organization. As a result of the movie "Titanic", people understand the concept of part of the iceberg not being visible and so can readily envision how a significant part of organizational culture is not readily visible either. Again, as long as it is not over used it can be very effective.

John also mentioned that the metaphor should be well chosen. He said that the visual metaphor should be representative of the whole task and not contain easily misleading elements.

Sara was another student involved in this class. She had the idea of "learning can be fun". From her experience, she said that metaphors often help understanding, which she used for her own learning, teaching, and observation. She also found metaphor to be an intriguing way of understanding and interpreting new concepts. She felt a somewhat subliminal message of learning as entertaining was especially appropriate.

Moreover, she found that a visual metaphor is a process of making connections. Sara said that the strength of the visual metaphors is in the illustration of interrelationships. For example, what the puppeteer does to one part of the puppets affects the reset of the puppets, as well as affecting other aspects of the puppets show.

Sara then talked about the weaknesses of visual metaphor. She thinks that the metaphors need to be similar enough to the new materials being presented so as to aid an understanding rather than detracting from it. No metaphor is going to perfectly reproduce and represent the new material: there are limits to how far metaphor can be used and extended. Sara is satisfied with using visual metaphors but she is visual metaphor might not be as effective for the visually impaired. In her opinion learning styles need to be a consideration: audio learners, for example, might not find visual metaphors as effective.

While talking about her experience teaching, Sara said:

> "The old adage that "a picture is worth a thousand words" certainly illustrates how visual metaphor can make a concept clearer, much as a lens helps bring something into focus. It is important that the metaphor be understood by the audience, or you end up trying to explain two new concepts! However, used appropriately, I find it can be a very effective tool for understanding, illustrating, visualizing and remembering new information".

Elizabeth agreed with all students that the puppeteers help her to see the content in a different light and support her understanding of the content. She said that the puppeteer helped to orient her in the unit of study. Elizabeth understood the main idea that the puppeteers were meant to represent instructional designers, working behind the scenes. However she found the meaning of the four parts confusing:

> "My interpretation was that what the puppeteer was holding should align with the ABCD model we were learning, but instead I had to translate the numbers 1, 2, 3 and 4 into the appropriate ABCD meaning. 2) If you interpret this as the instructional designer being like a puppeteer and working behind the scenes that is OK, but elaborating it further with the additional pictures caused confusion for me. I found focusing on A B C D and what they meant much easier without the visual metaphor. additional pictures caused confusion for me. I found focusing on A B C D and what they meant much easier without the visual metaphor".

Elizabeth was confused between the ABCD steps (which together represent Step 2 of this ID model: Stating the Outcome) with the whole instructional design steps which are: 1) correspond with understanding the learning material, 2) what do I want to have happen? 3) how do I make it happen? 4) how do I know if it happens?

She agreed with the other participants that visuals metaphors should be used, developed and created very carefully or they can cause increased cognitive load and confusion. She said that if she doesn't understand the metaphor very quickly then she has to work at interpreting it, which adds extraneous cognitive load. She also thinks that visual metaphors can support intrinsic cognitive load by adding or clarifying one's interpretation of

content or the context in which content is presented. It is also a way to present a lot of information, but only if the user understands the metaphor.

Elizabeth also thinks that visual metaphors could have limitations. They can take time to think through and create. And she believes that, when teaching using metaphors, it is important that the learners (users) have a similar understanding of the metaphor to prevent divergent interpretations of the metaphor's meaning, which could create confusion around the point or idea being presented metaphorically. In addition to that she thinks that metaphors cannot elicit an idea if the idea it is not readily apparent. As a teaching aid, learners should have a similar understanding of the metaphor if it is being used to present concepts, content or ideas.

Elizabeth believes that metaphors should elicit an idea in the learners mind quickly, and that she needs to be purposeful and very deliberate and thoughtful when looking for metaphors to present ideas, concepts or content. Because, as she said, she does not have time to think through various metaphors for presenting concepts, content or ideas.

Maria agreed with the other participants that the visual metaphor was helpful to understand the written explanation. She preferred to use the instruction with the visual metaphor than without using the visual metaphor. She stated that it helped present the information in a way that she could understand it better and also see how the different parts of the instruction are connected. She also mentioned that, if the visual metaphors had been presented without the written explanations, they would have clouded her understanding of the idea being presented. Maria felt that by highlighting each of the steps in the puppeteer metaphor it helped to focus on the aspect of the instruction that was being taught. She believes that, because she is a visual learner, the metaphor did help her understand the instruction better. She stated that "visual metaphors help in creating an optimal balance between the instruction, the learner, and the environment".

Maria, as with the other participants, thinks that if visual metaphors are not carefully designed they could be distracting to the learner and may lead to cognitive overload. She also stated that metaphors should be simple, used sparingly, and we should only include them in instruction if they will help create optimal load.

Maria also talks about her experience using metaphor. She indicated that she does not use metaphor very often but when she does she has to be very careful. She said:

> "I am also very careful when I do use them by making sure that they are necessary and would enhance the instruction. One of those times was when I used them in designing Public Speaking instruction for my Freshman Communications class. The young age of the audience made it necessary to include visual metaphors in the instruction to help them understand, chunk, store, and recall the information easily."

From the cases above, themes emerged that answered the first research question in this study. Cross-case comparison strategy was used by looking for similarities and differences. This procedure led me to see patterns of experiences among the participants. The following are some patterns that emerged during the data analyses. The name of the themes has been taken from the exact words of the participants.

"Help to understand"

All the participants thought the metaphors that have been used in this study were helpful. John and Sara agreed that the metaphor helped to organize the whole task of instructional design. Maria stated that the metaphor helped her to understand the information. Elizabeth agreed that the metaphor was helpful to orient her in the unit of the study and help her to understand the idea of the instructional designer being like a puppeteer and working behind the scenes. However she misunderstood step 2 of this ID model: Stating the Outcome.

"New knowledge"

John and Sara believe that metaphor can be a suitable way to represent new knowledge by providing a framework within which to present it. Sara and Elizabeth agreed that metaphor should be understood by the audience simply, rather than having to explain two concepts.

"Cognitive load"

John, Elizabeth, and Maria agreed that the metaphors helped to create an optimal load. They were an easier way to stay on track and let them focus on how each unit fitted into the whole task. It also supported intrinsic cognitive load by adding the subject's interpretation of the content in another concept.

"Making connections"
Sara and Maria mentioned that the visual metaphors helped them to understand how different parts of the instructions were connected. For example Sara stated "what the puppeteers does to one part of the puppet affect the rest of the puppets, as well as affecting other aspects of the puppets show."
"Easy"

All participants agreed that metaphors are an easy way to help learners understand concepts. They also agreed that visual metaphor should designed well in order to be an easy and successful instructional tool for learners. For example, Elizabeth described how she felt satisfied when she can quickly establish a metaphor's meaning without spending too much time interpreting it.

"Limitation"
All participants think that metaphors have some limitation: a poor selection of metaphor can be distracting for everyone, no metaphor is going to perfectly represent new ideas, and it can sometimes take time to think through and create metaphors.

"Not distracted"
All participants stated that the visual metaphors did not distract their understanding. On the contrary they saw them as being helpful. Elizabeth added, "if I find it not supporting my understanding or if it add to my cognitive load, then I just ignore it".

"Experience"
John, Sara, and Maria personally used metaphors in teaching or presentations. They agreed that visual metaphor was an effective way to facilitate learning. For example, John indicated how the visual metaphor helped him to explain the idea of teaching organizational culture using the metaphor of an iceberg.

Students' attitudes toward visual metaphor:
John enjoyed the metaphor presented and he found it helpful. Many words in his response represented his satisfaction such as "I found the metaphor helpful", "I definitely preferred to have a visual metaphor", "The metaphor worked well for me", "I like visual metaphors, provided there are not a lot of inconsistencies", "but the visual metaphor made it easier to stay on track", "They help learners better understand", "as long as [the visual metaphor] is not over used it can be very effective".

Sara also saw the visual metaphors as an entertainment tool with which to learn. She also liked the way that the metaphor had been used. Sara pointed to her satisfaction many times in this study: " Yes, I found it helpful", "because I personally like metaphor, I like symbols and puzzles", "as I use metaphor personally a lot, I enjoy metaphor", "In fact, I felt a somewhat subliminal message of learning as entertaining was especially appropriate. Learning CAN be fun!", "Actually, I really like metaphor, and I like making connections, and I like the process of searching for appropriate and sometimes novel metaphors to relate to a particular idea, concept, etc", "I find metaphor helpful, useful, and enjoyable", "I also find metaphor helpful just in everyday life, in interactions with people and with my environment. It is a way of engaging in life rather than passively watching it pass by".

From her responses Maria seemed very satisfied. She said that well-designed visual metaphors could be beneficial in instructional design, especially in situations where they can be adapted to enhance a particular subject matter or topic of instruction.

Elizabeth also liked the metaphor, stating that "I like them and try to use them when possible". However, compared to the other participants she was enthusiastic but not as emphatic: "it can sometimes help me see the content in a different light or support my understanding of the content."

Themes emerged in the cases above that helped to answer the second research question in this study. By using a cross-case comparison strategy I looked for similarities and differences. Following are some patterns that emerged during the data analyses. Naming the themes has been taken from the exact words of the participants.

"Like"
All the participants thought that used of visuals metaphor in online learning environment was interesting and they liked it.

"Preference"
All the participants except one preferred the use of visual metaphors in their learning. John preferred the visual metaphor, as it provided a basic conceptual framework without using instructional design terminology, which could be more difficult. Elizabeth didn't prefer using visual metaphor because she thought that the content was simple enough without it.

DISCUSSION

This study explored student's experiences and attitudes toward the use of visual metaphors in an online learning environment. Although participants in this study shared some similar opinions, they have different perspectives. This data was concluded based on the questions stated in Table 2: *The Relationship Between Research Questions and Interview Questions.* These results are also associated with the literature review that correlate with visual metaphors.

The overall data concludes visual metaphors in this study helped the participants in order to pursue their goals within the course. All the participants liked the metaphors and preferred to use them during instruction. Based on the interview results the researcher finds that all students understood the idea of metaphor very well. Furthermore, one case interpreted a different meaning than the one the metaphor was designed to facilitate. According to Elizabeth's responses it seems that she got the wrong message from the visual metaphors presented. This supports previous literature which shows the importance in teachers avoiding using misguided metaphors that can lead to inappropriate meaning (Gentner, Ratterman, and Forbus, 1993). Due to the depth of the metaphor, Elizabeth showed confusion and interpreted the visual metaphor and its steps in an incorrect manner. This can be supported from John's experience in his suggestion that "when using metaphor in class don't become too enamored with it. If you focus on the metaphor so much it will irritate students rather than facilitate the student's learning". Maria also stated that metaphors should be simple and used sparingly in order to be effective. Even though Elizabeth was confused, the majority of participants got the right message from the visual metaphor. This proves and concludes the visual metaphors presented in this study are well designed.

Regarding the students' attitude, the data showcases that all participants liked the visual metaphors and enjoyed them. Sara, for example, stated more than once that she enjoyed the visual metaphors used in this study because it motivated her engagement during the semester. This finding supported Sahin's study where he indicated that providing real life examples related to student experiences in an online learning environment contributed to student satisfaction, and will increase student's motivation, participation, and ultimately learning experience (2007).

The metaphors used in this study helped to create an optimal load for the participants. This is evident in John's assertion without them it would be "more difficult to step back and see the big picture". This particular finding is consistent with the literature. Analogical thinking limits the search for solution, which reduces cognitive load (Woolfolk, 1998).

Previous studies show that the use of visuals in online learning environments facilitate learning. Johnson (2007) found that using visuals in online learning significantly enhanced students' achievement. In this study, the visual metaphor helped learners to understand the instruction and to facilitate learning.

IMPLICATIONS

Metaphor is widely used and has appeared in instructional design research literature for many years. This study adds to the body of knowledge surrounding the use of visual metaphor in learning. This study will help researchers and professionals in the field of educational technology to understand the conditions and experiences of using visual metaphor in an online learning environment. In addition, the results of this study will help educators realize the necessity of using metaphor for online learning and to assess the learning tools being used to ensure their effectiveness.

REFERENCES

Blackwell, A. F (1998). *Metaphor in diagrams*. Cambridge: University of Cambridge.
Clark, R. C., & Mayer, R. E. (2011). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning.* John Wiley & Sons.
Creswell, J. W., (2005). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* Upper Saddle River, New Jersey: Pearson Education.
Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions.* Thousand Oaks, CA: Sage.
Gentner, M.J. Rattermann, & K. Forbus. (1993). The roles of similarity in

transfer: Separating Retrievability From inferential soundness. *Cognitive Psychology, 25*.

Hube, A., Tremblay, K., Leigh, K. (2015). Hidden Stories: Uncovering the Visual Metaphor for Education and Communication. *College Student Journal, 49 (2),* 181-186.

Johnson, G. (2007). Learning style under two web-based study conditions. *Educational Psychology, 27 (5), 617-634.* (see Appendix B)

Kartal, G., Uner, S. (2017). The Effects of Conceptual Metaphors on the Acquisition of Phrasal Verbs by Turkish EFL Learners. *European Journal of Foreign Language Teaching, 2 (2).* Available at: <https://oapub.org/edu/index.php/ejfl/article/view/685>. Date accessed: 25 Nov. 2017.

Lakoff, G., & Johnson, M. (1999). *Philosophy in flesh: The embodied mind and its challenge to western thought.* New York.

Lakoff, G., & Johnson, M. (1980). *Metaphors we live by.* Chicago: University of Chicago.

Mayer, R. E. (1997). Multimedia learning: Are we asking the right questions? *Educational psychologist, 32 (1), 1-19.*

Merriam, S.B. (1998): *Qualitative Research and Case Studies Applications in Education.* San Francisco: Jossey-Bass Publications.

Moore, J. (1998). *The Implementation of an Electronic Performance Support System for Teachers: an Examination of Usage, Performance, and Attitude*. Unpublished doctoral dissertation. Athens: University of Georgia.

Neo, M., Neo, K. y Tan, H. (2012). Applying authentic learning strategies in multimedia and Web Learning Environment (MWLE): Malaysian students' perspective. *Turkish Online Journal of Educational Technology*, 11 (3), 50-60.

Ormrod, J. E. (1999). *Human learning.* New Jersey: Prentic Hall, Inc.

Reiser, A. R., & Dempsey, J. F. (2007). *Trends and issues in instructional design and technology* (2nd ed.). Pearson Education, Inc. Upper Saddle River: New Jersey.

Rieber, P. Noah, D. (2008). Games, Simulations, and Visual Metaphors in Education: Antagonism between Enjoyment and Learning. *Educational Media International , 45 (2),* 77-92.

Sahin,I. (2007). Predicting students satisfaction in distance education and learning Environments. *Turkish Online Journal of Distance Education*, 8 (2),113-119.

Serig, D. (2006). A conceptual structure of visual metaphor. *Studies in Art Education a Journal of Issues and Research, 47(3),* 229-247.

Shih, Y. D., & Cifuentes, L. (2003). Taiwanese international phenomena and issues in United States-Taiwan telecommunications partnership. *Educational Technology Research and Development, 51 (3),* 82-102.

Sfard, A. (1998). On two metaphors for learning and dangers of choosing just one. *Educational Research, 27* (2), 4-13.

Tabbers, H. T., Martens, R. L., & Merrienboer, J. J. (2004). Multimedia instructions and cognitive load theory: Effects of modality and cueing. *British journal of educational psychology, 47*. 71-81.

Woolfolk, A.E. (1998). *Educational psychology* (7th ed.). Boston: Allyn and Bacon.

Zhu, J., & Grabowski, B (2005). *The effects of various animation strategies in facilitating the achievement of students on tests measuring different educational objectives*. Ames, IA: M. Simonson and M. Crawford 27th Annual Proceedings: Selected Papers Presented at the 2004 National Convention of the Association for Educational Communications and Technology.