$D^4 S^4$:
A Four Dimensions Instructional Strategy for Web-based and Blended Learning

Hamdy A. ABDELAZIZ
Associate Professor of e-learning and Training
Arabian Gulf University Manama,
KINGDOM OF BAHRAIN

ABSTRACT

Web-based education is facing a paradigm shift under the rapid development of information and communication technology. The new paradigm of learning requires special techniques of course design, special instructional models, and special methods of evaluation. This paper investigates the effectiveness of an adaptive instructional strategy for teaching and learning through the Web and blended learning environments. The central theme of this strategy is that instructional strategies give instructors and students a conceptual as well as a practical mode of delivery from which to teach and learn. Considering and applying new instructional strategy can help instructors to understand the uses of pedagogical content knowledge, as well as to reflect the role of technological content knowledge that can be adapted and/or adopted in teaching in all educational levels and environments.

The main objective of this paper was to develop a holonomic instructional strategy for Web-based and blended learning. This strategy is guided by the non-linear and interactive features of learning environments. The strategy is consisted of four dimensions: designing, developing, delving and distributing. In this new instructional strategy, learning is holonomic and adaptive. Learning occurs in an open learning environment, in which instructors are designing a shared vision, developing a sharable e-learning task, delving students' learning through scaffolding and salvaging students' knowledge. The expected outcome of this instructional strategy is that each learner will develop a cognitive schema to be used to organize and construct knowledge and meaning in similar context of learning which may increase the generalizability, trustworthiness and transferability of learning. The results of applying this new strategy showed that this strategy is effective on developing both achievement and deep learning levels among a sample of graduate students.

Keywords: Web-based learning, Blended learning, Instructional models, Instructional strategies, Adaptive learning, Deep learning, holonomic learning.

INTRODUCTION

Educational systems are facing what is called "Paradigm Shift". This shift occurs when difficulties or anomalies begin to appear in the functioning of the existing paradigm, which cannot be handled adequately and when there is an alternative paradigm that will account for all that the original paradigm accounted for.

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This shift, in turn, offers real expectation for solving the major difficulties facing the current paradigm (Schuyler, 1997).

Educational practices through the ages have been shaped by the dominant forms of communication, and the transitions from one age to the next age have caused great anxiety among educators of the time (Thornburg, 1996). While communication was an important skill in the industrial age, it has become the most important skill during the current age – the digital age. Web-based learning began with a poor initial pedagogical model of e-learning, based on a behaviorist and page-turning approach to learning. The reality is that Web-based learning is becoming integrated into portals and work flows, even though it is not necessarily labeled as e-learning. The lines are increasingly blurred between learning and working, and many aspects of learning that occur online are not being measured as such (Driscoll, 2008).

The effects on and changes in the labor market mean that some jobs are declining in significance; others are growing in importance, and others still require completely new or different skills and competencies. The size of the workforce employed in the service and technology industries, where high-level education and skills are required, will increase while the demand for low-skilled workers will shrink. Many employees are likely to change jobs, and possibly even careers, several times during their working lives. The changing nature of labor market trends has significant implications for education in general, and learning specifically, implying the need to provide lifelong learning, continuing and recurrent business and vocational education, and continued upgrading of knowledge and skills. Information and communication technology in schools and universities may help students succeed when they enter the world of work because "technology learning environments mirror the analytic, interpretive, creative, and expressive uses of information tools increasingly characteristic of sophisticated workplace settings" (Dede, 2000, p. 211).

Programs objectives should be developed to emphasize the basic work skills, life-long learning skills, and critical thinking skills for the digital generation. Currently, there is a growing demand for people who can use computer-based systems, multimedia-based systems, network-based systems, problem-solving skills, simulation-based software, and expert systems in personal life and career. Today's students live in a global-knowledge-based age.

They deserve teachers whose practices embrace the best that technology can bring to learning (International Society for Technology in Education (ISTE), 2002).

Colletta (2002) reported that technology can support learning in five ways:

> - creating more exciting curricula,
> - b) providing tools for scaffolding,
> - providing opportunities for feedback, reflection, and revision;
> - expanding opportunities for teacher learning, and
> - providing for local and global communication.

The National Research Council (NRC) has also reported that there are five ways that instructional technology can be used to help meet the challenges of establishing effective learning environments (NRC, 2001, p. 243):

- ➢ Bringing real-world problems into classroom through the use of videos, demonstrations, simulations, and Internet connections to concrete data and working scientists.
- ➢ Providing "scaffolding" support to augment what learners can do and explain about on their path to understanding. Scaffolding allows learners to participate in complex cognitive performances, such as scientific visualization and model-based learning, which is more difficult or impossible without technical support.
- ➢ Increasing opportunities for learners to receive feedback from software tutors, teachers, and peers; to engage in reflection on their own learning processes; and to receive guidance toward progressive revisions that improve their learning and reasoning.
- ➢ Building local and global communities of teachers, administrators, students, parents, and other interested learners or groups.
- ➢ Expanding opportunities for teachers' learning.

Thus, this paper attempted to design a new instructional strategy based on the non-linear and interactive features of the digital learning and instruction through the Web. The premise of this new instructional strategy was based on the belief that adaptive learning environments are important medium in teaching and learning process and need to be integrated into Web-based instruction more than ever before. Adaptive learning environments introduce another source of knowledge, skills and values. The introduction of an adaptive and interactive source of learning means that instructors may spend less time presenting knowledge to groups of students and more time facilitating small groups work and guiding students to appropriate resources of curriculum. This shift will more likely involve a change in all instructional practices and delivery of Web-based and blended learning. This shift will also keep our learning from or with the Internet and the Web more molecularized and holonomic than ever before.
The holonomic concept is shifting Web-based learning environment from ordinary one into an adaptive and effective learning environment. According to NRC, effective learning environments are consisted of four basic components:

- ➢ *knowledge-centered* wherein the emphasis is on understanding rather than remembering;
- ➢ *learner-centered*, wherein individual learners' personal and cultural backgrounds and learning styles are valued;
- ➢ *community-centered*, wherein learning activities are collaborative and foster a community of practice and inquiry that involves legitimate peripheral participation; and
- ➢ *assessment-centered*, wherein formative assessment is used to make students' thinking visible to them and evaluations are performance-oriented (Rhodes, 2011, p. 2).

One of the most important measures taken to ensure quality of instruction is the use of instructional design models and strategies to meet the special requirements of teaching context. Instructional design offers a framework for planning, developing, and evaluating instruction based on learner's needs, content requirements and delivery methods.

THEORETICAL BACKGROUND AND LITERATURES REVIEW
DEFINITION AND IMPORTANCE OF INSTRUCTIONAL DESIGN

Reigeluth (1999) argues that instructional design theories are design oriented and offer probabilistic (as opposed to deterministic) methods to increase the possibility of attaining learning goals. He views instructional design as primarily a prescriptive enterprise aimed at a set of principles to be used to guide the development of optimal learning solutions. In this regard, Dick & Carey (2001) offer three major reasons for performing the principles of instructional design. The first reason is it focuses instruction on defined outcomes instead of offering good activities without any specific desired learning results. Secondly, it supports the connection between each component of instruction, especially the linkage between the instructional strategy and the desired learning outcomes. Instruction is thus focused on the skills and knowledge to be taught to achieve the defined learning goals. The third reason is that it makes instruction empirical and replicable. Empirical means that instruction is defined in a way that its variables can be analyzed and the effect of each variable can be determined. Replicable implies that instruction is based on a systems approach, which can be repeated at another time or location with similar results. According to Gustafson & Branch (2002), the role of models in instructional development is to provide us with conceptual and communication tools that we can use to visualize, direct, and manage processes for generating episodes of guided learning; allow us to view both the linear and concurrent aspects of instructional development; and to allow us to select or develop appropriate operational tools.

Bailey & Hahn (1999) used a generic five instruction system design (ISD) approach, namely, "analysis, design, development, implementation, and evaluation," as the organizational framework to present their process model. They also added several modifications compared to other systematic ISD models. These modifications were:

- the addition of a team/ project definition step,
- the addition of a vision and pedagogical philosophy,
- the replacements of goal analysis and objectives with performance outcomes,
- the addition of an interface design step,
- the addition of an integration of communication tools step,
- the early use of formative evaluation and usability testing, and
- the longer phased implementation step (Bailey & Hahn, 1999, p. 302).

The uniqueness of the Bailey and Hahn's model is that it emphasizes:

- the early vision and pedagogical step,
- performance outcomes,
- problem analysis instead of task analysis, and
- the effective integration of communication tools.

Unlike the traditional ISD models, the theoretical base of Bailey and Hahn's model was mainly constructivism. However, the Bailey and Hahn's model did not provide solutions for instruction through adaptive learning environments, such as the Internet and the Web environment. In this regard, Heide & Henderson (2001) reported that there are a number of important reasons for adaptive models of instruction:

- ➢ **our students live in a world of technology,**
- ➢ **new technologies can enrich and expand learning, increase the productivity of teachers and students, and enhance their lives beyond the classroom,**
- ➢ **research continually provides us with new information on how we learn and how technology can be of assistance in the teaching/learning process,**
- ➢ **there is an ever-widening diversity of student needs in every classroom and these students have different learning preferences, and**
- ➢ **the workplace demands a new repertoire of skills and competencies.**

What shall we do when information is doubling every 73 days or less? One rational answer is to train students to learn how to learn and contribute to other students learning in an ever-changing society. In order to develop such instructional model, we need to adopt a student-centered curriculum and materials where students can become adept to new information in light of their own needs based on their academic and culture background. (Gillani, 2003, p.4). Many of current Web-based instructional models could be characterized as e_3 –learning (e sub-three learning) (Merrill, 2008, p. 397):

- ➢ *Enervative*, **which, rather than promoting skill acquisition, actually interferes with the learning that should occur.**
- ➢ *Endless*, **which leads to boredom by being too passive, devoid of interaction, allowing learners to disengage, thereby failing to gain the desired skill acquisition.**
- ➢ *Empty*, **which fails to implement those instructional strategies that have been found to be necessary for learning to occur and may be, at its worst, information alone-transferred to the Internet without appropriate demonstration, practice, feedback, learner guidance, or coaching.**

In summary, the Internet and the Web are the driving force of the future of the educational delivery, in which the learners are allowed to choose and change not only the location and people, but also the time that learning takes place. The instructional environments became non-linear and concurrent than ever before. Therefore, it is questionable whether any new instructional strategy will support the non-linear and concurrent features of Web-based instruction and learning to educate our students to be life-long learners and successful contributors to other students learning. Such holonomic model will make student not only responsible for his own learning but also other students' learning as well. Nowadays, students are learning in a technology-rich environment that is collaborative and knowledge building. Thus, technology-rich environment requires a special type of holonomic and adaptive instructional strategy. The main features and components that can be used to visualize, direct, and manage the process of Web-based and blended learning according to this new strategy are presented in this paper.

PEDAGOGICAL PHILOSOPHY

Constructivist and connectivist perspectives were adopted as a theoretical framework for this holonomic instructional strategy. Constructivism has a substantial impact on views pertaining to the conditions and instructional strategies essential to build and organize learners' knowledge.

And connectivism has considerable views regarding how to contribute, delve and support other people learning. According to Gustafson & Branch (2002), the role of models in instructional development is to provide us with conceptual and communication tools that we can use to:

> ➢ visualize, direct, and manage processes for generating episodes of guided learning; (b) allow us to view both the linear and concurrent aspects of instructional development; and
> ➢ allow us to select or develop appropriate operational tools.

As the World Wide Web (WWW) and the Internet have become the common tools of instruction in the digital age, the linear features of the traditional models no longer fit or meet the "learning focused" instructional environment. Perhaps the most important of all implications is that much of the designing should be done by the learners while they are learning, with help from a computer system and/or the teacher and other students generating options. Web-based learning environment is providing creative solutions to qualify and quantify learning through the following strategies (Horton, 2008):

> ➢ *Increasing knowledge* by making it more accessible to people.
> ➢ *Capturing knowledge* by making it easier for people to record what they know.
> ➢ *Refining knowledge* so it is expressed in a way that's useful to others.
> ➢ *Sharing knowledge*, which involves making knowledge accessible, keeping knowledge chunks small and easy to find and quick to use and reusing knowledge.
> ➢ *Applying knowledge*-that is, acting on the messages in the content.
> ➢ *Pedagogical Assumptions*
> ➢ With the rapid growth in computer technology and multimedia, instruction should be designed in a way that makes it subject to a sequence of quick tryout and revision cycles.
> ➢ Instruction should be a self-regulated process taking place through the learner who is motivated to explore problems and situations.
> ➢ In order for students to learn through the Web as a constructivist learning environment, the learning environment should be shifted to a learner-centered rather than teacher-centered environment.
> ➢ Students and teachers must enter into a collaboration or partnership with technology and multimedia to create a virtual community that supports the learning process.
> ➢ Computer technology and multimedia help in developing multiple perspectives through the learners' exposure to multiple points of view or resources.
> ➢ The variables that have more effect on learning than the teacher are the learners and the environment that produces learning.
> ➢ Learning and instruction in the digital age are characterized as self-regulated, self-paced, self-prescribed, collaborative and autonomous learning.
> ➢ Students in a Web-based environment are able to work at a pace consistent with their rate of learning, have more time for reflection, feel more in control of the learning process, and engage in more self-directed and independent learning (Thomson, 2010).

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PEDAGOGICAL PRINCIPLES

To engage learners in knowledge construction, facilitate tests of their understanding, and prompt reflection on the knowledge generation process, constructivists and connectivists recommend the creation and use of holonomic and adaptive learning environments. Such learning environments should:

> - engage learners in activities authentic to the discipline in which they are learning,
> - provide for collaboration and the opportunity to engage multiple perspectives on what is being learned,
> - support learners in setting their goals and regulating their own learning, and
> - encourage learners to reflect on what and how they are learning (Driscoll, 2002).

To enhance the knowledge base for the new strategy, the following two areas of constructivist design principles and practices were used as bases for the $D^4 S^4$ strategy. Those two practices are: Cognitive Apprenticeship (Collins, 1988) and Anchored Knowledge in Authentic Situations (Vanderbilt, 1993).

COGNITIVE APPRENTICESHIP

Collins (1988) defined the value of the cognitive apprenticeship through a set of features to assist the design, implementation, and evaluation of technology integration in the learning environment. These features contain:

> - *situated learning*: learning knowledge and skills in context that reflects the way the knowledge and skills will be useful in real life;
> - *modeling and explaining*: showing how the process unfolds and providing reasons why it happens that way;
> - *coaching*: facing to observe students at work while providing hints or scaffolds for assistance when they need;
> - *reflection on performance*: students recalling their actions and analyzing their performance jointly;
> - *articulation*: assisting the students in explaining and thinking about their processes to become part of their knowledge base; and
> - *exploration*: encouraging students to try different methods and strategies to see the effects.

ANCHORED KNOWLEDGE IN AUTHENTIC SITUATIONS

The Cognition and Technology Group at Vanderbilt (1993) has worked for several years to design, implement and evaluate classroom projects based on the principles of anchored instruction and situated learning. They produced realistic contexts to encourage the active construction of knowledge by the learner. These contexts were as authentic as possible by recreating situations that the learner could interface with in the real life situations. They named these scenarios "anchors" that would give a content-rich environment for exploration related to the needed topics and skills.

This exploration was encouraged so the learner could visit and revisit specific areas as necessary for knowledge construction. As they progressed in their studies, they have created and implemented student generated, community–based projects that were distributed via telecommunications and two-way video conferencing. These projects continue to focus on situated learning environments developed by the learner in which to anchor the learning.

In addition, the new D^4S^4 holonomic strategy of Web-based and blended learning is guided by Merrill's e^3-learning (e to the third power learning) design themes. These three themes are: effective, efficient, and engaging (Merrill, 2008). The main dimensions of suggested $D^4 S^4$ strategy are presented in Figure 1.

We may notice from Figure: 1 that the D^4S^4 strategy is an adaptive and evolving strategy in which both instructors and students are playing an integral role to qualify learning. In this new instructional strategy, learning is holonomic and vision-driven. Learning occurs in an open learning environment, in which instructors and learners are designing a shared vision, developing a sharable e-learning task, delving learning through scaffolding and distributing learning throughout salvaging knowledge.

According to this new instructional strategy, instructor is cognitive coach who is helping learners to do planning and reflecting conversation throughout their learning. These planning and reflecting conversations will support both individual and group learning functions among learners. They will maximize the probabilities of creative problem and task solutions that are needed for learning context or situation. The expected outcome of this process is that each learner will develop a cognitive schema to be used to organize knowledge in similar context of learning which may increase the generalizability, trustworthiness and transferability of learning functions. In $D^4 S^4$ instructional strategy, pedagogy must lead technology and information alone is not instruction. Table 1 presents instructors and students' role according to $D^4 S^4$ strategy.
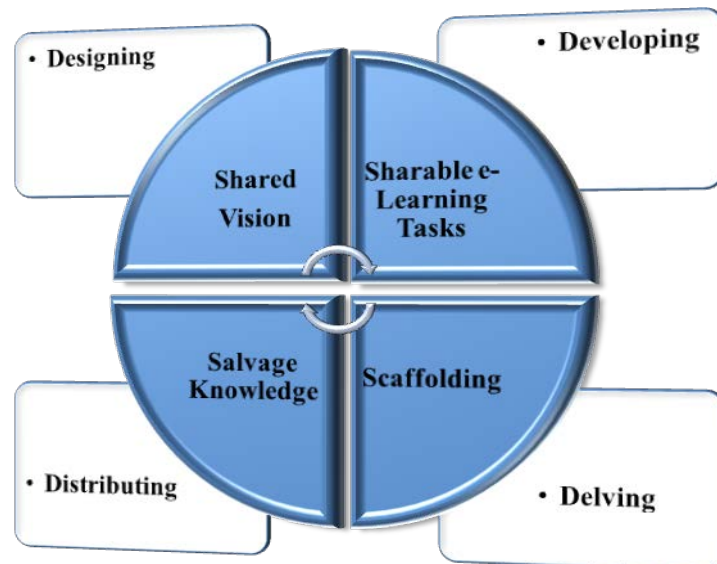

Figure: 1
$D^4 S^4$ main dimensions

THE PROBLEM

Web-based and blended learning are facing a paradigm shift. This shift needs specific types of teaching and evaluation strategies.

This shift will more likely involve a change in all instructional practices and delivery of Web-based and blended courses. The current instructional strategies of Web-based and blended course could be characterized as e_3 –learning (e sub-three learning) *enervative*, *endless*, and *empty* (Merrill, 2008, p. 397).

Therefore, it is questionable whether any new instructional strategy will support the non-linear and concurrent features of Web-based and blended learning to educate our students to be life-long learners and successful contributors to other students learning.

The current research was conducted to measure the effectiveness of a new instructional strategy on improving graduate students achievement and deep learning levels.

Research Hypotheses

- There is no significant effect for using $D^4 S^4$ as a new instructional strategy on developing graduate students achievement in a blended course.
- There is no significant effect for using $D^4 S^4$ as a new instructional strategy on developing deep learning levels among graduate students in a blended course.

Research Design and Procedures
Participants
The target population of this research is all available graduate students in Arabian Gulf University during fall semester, 2012. The accessible population was all graduate students in Distance Teaching and Training Program at the time of conducting this research.

A sample of 33 participants from this accessible population was selected in convenience to participate in this research.

They were divided into two groups, the experimental group (18) students and the control group (15) students. Permission to collect the data from this sample was approved by before conducting this research.

Research Variables
Independent variable: The new suggested instructional strategy ($D^4 S^4$)
Dependent Variables: - Students' Achievement- Students' Deep Learning Level.

Design
A control-group pretest-posttest design was applied in this research to measure the effect of the new instructional strategy on developing achievement and deep learning levels among a convenience sample of graduate students.

The dependent variables in this research were measured by Achievement Test in "Writing Interactive Materials Course" and Deep Learning Scale.

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Instruments
Achievement Test

The Achievement Test is self-reporting test consisting of 5 types of assessment. It was developed by researcher to measure mastering of expected "writing interactive materials" skills. These five types of assessment were as following:

> *Authentic evaluation* (in this assessment, students were asked to evaluate an existing unit based on the principles and standards of writing interactive materials.
> *Developing an instructional unit* (in this assessment, students were asked to develop an instructional unit based on what has learned of writing interactive materials standards and methods.
> *Students' presentation* (in this assessment, students were asked to give a 10 minutes presentation regarding his work in previous assessments).
> *Every-day hands-on activities* (in this assessment, students were asked to write every-day reflection about text-book chapters and his extra reading and telecommunication activities).
> *Final exam* (MCQs) (20 online format MCQs questions were given to all students in the end of class period).

Deep Learning Scale
Approaches and Study Skills Inventory for Students *(ASSIST)* was used to measure students' ability of deep learning.

This scale is consisting of four dimensions:

> Seeking Meaning;
> Relating Ideas;
> Use of Evidences; and
> Interest in Ideas.

(ASSIST) is self-reporting test consisting of 52 items. It was developed by Webster (2002) to measure learners' ability to deep learning.

ASSIST depends on actual score of between 1 and 5 for each of the fifty two statements.

Entering a score of '5' indicates that learners are a master of the skill or always practice the habit of deep learning. Entering a score of '1' indicates that learners do not employ or never practice the habit of deep learning. For the purpose and context of current research *ASSIST* was translated into Arabic Language. It was applied on a pilot sample of 20 graduate students to compute its reliability coefficient.

A Cronbach's Alpha of .79 was estimated for the Arabic version of *ASSIST.* Permission to use the *ASSIST* was granted by the author.

Materials and Procedures
For implementing the new strategy for teaching Web-based and blended courses, the researcher developed the following matrix to explain both Instructors and students' role according to D^4S^4 strategy.

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Table: 1
Instructors and students' role according to $D^4 S^4$ strategy

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Dimensions	Instructor Role	Student Role
$D^1 S^1$	1. Selecting Web-based course materials 2. Stating goals and missions 3. Socialize learning 4. Shaping group dynamic regulations	1. Design a learning vision 2. Develop self-study action plan 3. Delve course goals, objectives, conditions 4. Distribute personal expectations to other learners
$D^2 S^2$	1. Sequencing Web-course content 2. Stating learning tasks 3. Show how to do learning tasks 4. Standardize students' mission	1. Design individual and co-learning tasks 2. Develop self-generated ideas 3. Delve other students' ideas 4. Distribute common understanding (meaning making) of other learners' ideas
$D^3 S^3$	1. Sort common ideas 2. Seriate students' work 3. Storm students' power through expanded activities 4. Stimulate students to organize well-structured knowledge	1. Design new lines of common understanding of course materials 2. Develop subsumption of new concepts 3. Delve new connected ideas 4. Distribute new well-structured knowledge with other students
$D^4 S^4$	1. Symbolize structured knowledge 2. Summarize learning tasks/solutions 3. Shape holonomic understanding of course applications 4. Share a new revised vision	1. Design mind-maps for whole ideas and concepts getting from the course. 2. Develop connected ideas with other courses being taught (generalizability) 3. Delve organized knowledge for new meaning (building trustworthiness) 4. Distribute well-preparing values with other students (transferability of learning)

RESULTS

Results Related to the First Hypothesis

The first hypothesis stated: There is no significant effect for using $D^4 S^4$ as a new instructional strategy on developing graduate students achievement in a blended course.

To test this hypothesis, the researcher computed descriptive statistics and conducted a one way analysis of covariance (ANCOVA) to eliminate the effect of pre-testing. Tables 2 and 3 present the findings of descriptive and inferential statistics respectively.

Table: 2
Descriptive Statistics for Group Scores on the Achievement Test

Group	Mean		Std. Deviation	
	Pre	Post	Pre	Post
Experimental Group *N*= 18	21.17	84.00	6.94	6.77
Control Group *N*=15	19.73	60.67	3.26	9.69

Note: Means were derived using a 100 points total score.
The pre-testing score was measured by MCQs test.

Table: 3
One-way ANCOVA for between Groups Differences on the Achievement Test

Source	Type III Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Pretest	11.908	1	11.908	.171	.682	.006
Group	4438.354	1	4438.354	63.909	.000	.681
Error	2083.425	30	69.448			
Total	6549.879	32				

Table: 2 shows that the post-achievement test in the experimental group scored higher than the control group in the post-testing (*M*= 84.00 and 60.67) respectively. There were less variations existing among students in the experimental group (*SD* =6.77) than students in the control group (*SD* = 9.69) in the post-test.

In addition, table 3 shows that there was a significant difference between the experimental group and the control group. This difference was in favor of the experimental group (*F* (1, 32)=63.909; *p*=.000). Also, table 3 shows that the amount of variance in the dependent variable (Achievement test) that was accounted for by the independent variable (the new instructional strategy) is equal to 68%. These findings explain that the new strategy has a significant statistical and practical effect on students' knowledge and skills of writing interactive materials. Based on these findings, we can reject the first hypothesis.

Results Related to the Second Hypothesis

The second hypothesis stated: There is no significant effect for using D^4 S^4 as a new instructional strategy on developing deep learning among graduate students in a blended course. To test this hypothesis, the researcher computed descriptive statistics and conducted a one way analysis of covariance (ANCOVA) to eliminate the effect of pre-testing. Tables 4 and 5 present the findings of descriptive and inferential statistics respectively.

Table: 4.
Descriptive Statistics for Group Scores on Deep Learning Scale (ASSIST)

Group	Mean		Std. Deviation	
	Pre	Post	Pre	Post
Experimental Group *N*= 18	144.61	229.39	12.35	18.408
Control Group *N*=15	145.80	163.87	11.01	25.773

Note: Means were derived using a five-point Likert type scale.

Table: 5

One-way ANCOVA for between Groups Differences on Deep Learning Scale (ASSIST)

Source	Type III Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Pretest	2018.609	1	2018.609	4.644	.039	.134
Group	34165.142	1	34165.142	78.592	.000	.724
Error	13041.402	30	434.713			
Total	50185.879	32				

Table: 4 shows that the post-deep learning mean score in the experimental group is higher than the mean score for students in the control group (M=229.39 and 163.87) respectively. There were less variations existing among students in the experimental group (SD =18.408) than the control group (SD =25.773) in the post-test. In addition, table 5 shows that there was a significant difference between the experimental group and the control group. This difference was in favor of the experimental group (F (1, 32)=78.592; p=.000). Also, table 5 shows that the amount of variance in the dependent variable (Deep Learning Scale) that was accounted for by the independent variable (the new instructional strategy) is equal to 72%. These findings explain that the new strategy has a significant statistical and practical effect on students' deep learning ability of writing interactive materials. Based on these findings, we can reject the second hypothesis.

DISCUSSION AND CONCLUSION

Web-based and blended courses are facing many challenges. To overcome these challenges, instructors should give thought and care to new instructional strategies which may help in solving some problems of students' performance and increasing the probability of deep learning among online learners. The findings of this research revealed that there is a new opportunity to improve students' achievement and ability to be self-directed, life-long and deep learning learners by integrating the proposed instructional strategy.

The new strategy developed in this research (D^4S^4) is consisted of four dimensions: designing, developing, delving and distributing. In this new instructional strategy, learning is holonomic and adaptive. Learning occurs in an open or blended learning environment, in which instructors are designing a shared vision, developing a sharable e-learning task, delving students' learning through scaffolding and salvaging students' knowledge.

This new strategy is found to be effective in delivering Web-based and blended courses. The results of this research show that there is a significant difference between the experimental and the control group in both achievement and deep learning readiness scale. This difference was in favor of the experimental group which used the proposed strategy. This finding is similar to the findings of Tutty & Klein's (2008), Merrill's (2008) and Rhodes's (2011) study.

The results of current research are important indicators to the effectiveness of the usages of computer technology and web applications in teaching practices. This result is also an indicator of using resource-based learning in educational sittings.

Resource-based learning is becoming life-style learning since the creation of the web and the internet. The internet and the web are expanding resources of inquiry-based learning. The current result is another indicator for Web-based and online instructors to increase building a community of inquiry among all learners through establishment of learners' shared vision. Building a community of inquiry between online learners has become one of the most wanted applications of social media tools and modes. The contribution of this research is that it qualifies the instructional practices of Web-based and blended learning throughout the integration of this new instructional strategy in delivering all subject matters in undergraduate or graduate level.

RECOMMENDATIONS

Based on research findings, the following recommendations are suggested for improving the quality of delivering Web-based and blended courses:

- ➢ There exists a real need for examining the effect of using D^4S^4 strategy on delivering other online or blended courses.
- ➢ There exists need for investigating the impact of using D^4S^4 strategy on developing team-working skills among undergraduate students taking online or blended courses.
- ➢ A qualitative study is needed to explore the best practices of using D^4S^4 strategy on developing creative thinking skills among graduate or undergraduate learners studying online or blended courses.
- ➢ Further research should address the applications of community of inquiry-based and resource-based learning as vision-driven models at college level.
- ➢ Finally, more studies should examine the impact of D^4S^4 strategy on developing teaching and classroom management skills among online educators.

BIODATA and CONTACT ADDREESSES of the AUTHOR

Dr. ABDELAZIZ got his PhD from University of Arkansas, USA. His main major is Curriculum and Instruction Design. His areas of interest are:

Instructional Design, Pedagogical and Technological content knowledge, quality of online and web-based learning, online assessment, e-training, m-learning, adaptive learning design.

Dr. Abdelaziz is working as director of distance teaching and training program, Arabian Gulf University, Bahrain.

Hamdy A. ABDELAZIZ
Associate Professor of e-learning and Training
Arabian Gulf University
P.O. Box: 26671
Mobile: +97336167049
Fax: +97317239594
Manama, KINGDOM OF BAHRAIN
Emails: hamdyaaa@agu.edu.bh or yasmallah@hotmail.com

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