Title: Designing blended learning interventions for the 21st Century student

Authors: Saramarie Eagleton

Affiliation: Department of Human Anatomy and Physiology, Faculty of Health Sciences, University of Johannesburg, South Africa

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Contact information: S. Eagleton, Department of Human Anatomy and Physiology, Faculty of Health Sciences, University of Johannesburg, South Africa

Email: seagleton@uj.ac.za

Phone: +2711 559 6251

Fax: +2711 559 6558
ABSTRACT

The learning requirements of diverse groups of students in higher education challenges educators to design learning interventions that meet the need of 21st century students. A model was developed to assist lecturers, especially those that are new to the profession, to design meaningful learning interventions.

The aim of the model is to encourage methodical development of learning interventions, while the purpose is to provide conceptual and communication tools that can be used to develop appropriate operational learning interventions.

The main arguments of the model are to firstly determine the learning task requirements as these will inform the design and development of learning interventions to facilitate learning.

Delivery of the content is based on a blended approach.

**Key words:** instructional design; learning interventions; teaching strategies; learning strategies; blended learning
Learning requirements of diverse groups of students at institutions of higher education challenge those who are lecturing to design meaningful learning interventions that meet the learning needs of students. Digital technologies have brought new dimensions to how we approach learning, teaching, collaboration and communication in fundamental ways (18).

This proposed model for designing learning interventions has two main events: the first is to determine the learning task requirements and then to design and develop suitable learning interventions. The aim of the model is to encourage the methodical development of learning interventions; while the purpose is to provide conceptual and communication tools that can be used to visualize, direct, and manage processes to develop or select appropriate operational learning interventions for the 21st century student.

The paradigm shift in instructional design is to move from the step-by-step instruction which revolves around *when* and *how* students learn to *what* and *whether* students learn. The starting point is to have a clear picture of what is important for students to be *able to do*, and then to organize the learning interventions and assessment to ensure that this ultimately happens (49).

The main arguments of the model entitled ‘The Ds for Designing Learning Interventions’ are firstly to **determine** the learning task requirements as this will inform the needs for the **design** and **development** of the learning intervention to facilitate learning.

The model for ‘The Ds for Designing Learning Interventions’ as illustrated in Figure 1 was adapted from ‘3Ds for Designing Learning Interventions’ (14).
DETERMINING LEARNING TASK REQUIREMENTS

The three main events when determining learning task requirements are: to acquire a profile of the 21st century student, to establish the specific outcomes of the specific module based on the exit level outcomes, and to identify the prerequisites for the module.

Profile of a 21st century student

Higher education has to prepare a student for the workplace in the 21st century. This requires cognitive, affective, psychomotor and conative skills.
The cognitive skills needed are the ability to think which requires the development of logical and analytical skills according to the levels of complexity as outlined by Bloom’s taxonomy (2). Anderson et al. (2) added context to Bloom’s taxonomy by distinguishing between levels of knowledge as being factual referring to the basic elements students must know to be acquainted with a discipline to solve problems; conceptual referring to the ability to identify interrelationships among basic elements within a larger structure that enable them to function together; procedural which includes how to do something, methods of inquiry, criteria for using skills and metacognition, the awareness of one’s own cognition. They combined these cognitive processes with the knowledge levels to form a matrix. In Table 1 one example for each category illustrates how the matrix can be used.

Table 1 - The Cognitive Dimension

<table>
<thead>
<tr>
<th>The Knowledge Dimension</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyze</th>
<th>Evaluate</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factual</td>
<td>list</td>
<td>para-phrase</td>
<td>classify</td>
<td>outline</td>
<td>rank</td>
<td>categorize</td>
</tr>
<tr>
<td>Conceptual</td>
<td>recall</td>
<td>explains</td>
<td>show</td>
<td>contrast</td>
<td>criticize</td>
<td>modify</td>
</tr>
<tr>
<td>Procedural</td>
<td>reproduce</td>
<td>give an example</td>
<td>relate</td>
<td>identify</td>
<td>critique</td>
<td>plan</td>
</tr>
<tr>
<td>Metacognitive</td>
<td>proper use</td>
<td>interpret</td>
<td>discover</td>
<td>infer</td>
<td>predict</td>
<td>actualize</td>
</tr>
</tbody>
</table>

The affective domain refers to the way in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations and attitudes. The five major categories listed from the simplest behavior to the most complex are receiving and responding to
phenomena, valuing a particular phenomenon, organize values into priorities by contrasting
different values, internalize values (28).

The psychomotor domain refers to physical movement, coordination, and use of the motor-
skill areas. The development of these skills require practice and is outlined in Dave’s taxonomy
(11). He uses the following levels imitation, manipulation, precision, articulations, and
naturalization to illustrate the complexity of psychomotor activities.

The conative needs according to Snow refer to the will, desire, drive, level of effort, mental
ergy, intention, striving and self-determination to perform at the highest standard possible
(47).

Kolbe (26) compared the roles of the cognitive, affective and conative domains in education.
Table 2 is a summary of his comparison (40).

Table 2 - Kolbe’s comparison of the cognitive, affective and conative domains

<table>
<thead>
<tr>
<th>Cognitive</th>
<th>Affective</th>
<th>Conative</th>
</tr>
</thead>
<tbody>
<tr>
<td>To know</td>
<td>To feel</td>
<td>To act</td>
</tr>
<tr>
<td>Thinking</td>
<td>Feeling</td>
<td>Willing</td>
</tr>
<tr>
<td>Thought</td>
<td>Emotion</td>
<td>Volition</td>
</tr>
<tr>
<td>Epistemology</td>
<td>Aesthetics</td>
<td>Ethics</td>
</tr>
<tr>
<td>Knowing</td>
<td>Caring</td>
<td>Doing</td>
</tr>
</tbody>
</table>
How to design a blended learning environment to incorporate these requirements will be elaborated on in the section on developing instructional strategies.

**Identifying prerequisites for a module**

The construction of new knowledge depends on existing schemata into which new concepts can be assimilated. When learning interventions are designed these need to be identified and students need to be alerted to refresh their memories regarding specific concepts. The required knowledge could be from the same module or from supporting modules. Transfer of knowledge does not happen automatically for most people. This will require scaffolding which can be reduced as students become more competent. The challenge is that deep learning comes from the ability to accommodate (transfer) new information into the existing schemata and then to be able to apply this in authentic situations (14).

**Establishing the learning outcomes**

The design of specific outcomes for a module has to be based on the exit level outcomes of the qualification. The expected outcomes for the module need to be benchmarked for the specific qualification and level of study. This approach is in line with the constructivist view that learning needs to ‘spiral up’ from what is already known (27, 49).

The students need to be informed what they should be able to do and which values need to be instilled. The learning interventions should be planned to ensure that students are equipped with knowledge, competence and qualities needed for success in the various roles they will play once they qualify. The learning program should be structured in such a way that the outcomes can be achieved and maximized for all students (27).
DESIGNING THE LEARNING INTERVENTIONS

In higher education there is concern to improve students’ achievements through focused well-planned learning interventions (23). These learning interventions need to cultivate whole-brain learning; strengthening students’ preferred modes of learning and helping them to develop the alternative modes of learning. The student profile can be used to inform these needs.

When learning interventions are designed the personality traits, information processing strategies and environmental preferences need to be taken into account. Personality traits that influence learning show correlations with cognitive strategies. A strong positive correlation has been shown for judging students to be sequential learners and to be left-brain dominant; while their perceiving peers tend to be global learners that are right-brain dominant (14).

Designing learning interventions that take differences in information processing into account requires consideration of both how information is perceived as well as how it is cognitively processed.

Designing learning interventions to accommodate perceptual preference takes visual, auditory and kinesthetic students into account. Visual students prefer diagrams and schematic representations of information. They can extract detail from background information. They understand better if they can see the body language of the lecturer. Visual students normally prefer to study in a quiet environment (57). Auditory students prefer verbal instruction in the form of a lecture or a discussion. They find it hard to study from notes only. They learn best when they discuss information or work in groups. Distinctions that are important to them include pitch, tempo, volume, rhythm and resonance. They prefer to study in a noisy environment, as sounds can evoke memory of information (29; 56; 57). Kinesthetic students prefer to be
involved in real life experiences. They learn from external stimuli and movement. They are often risk takers and tend to be disorganized. They use highlighters and pictures to study. They learn best when there is music in the background and snacks are available (56; 57).

The cognitive information processing strategies are used to organize and store perceived information. Information processing involves a cycle of events (3) as is illustrated in Figure 2 (16).

Fig. 2 Information processing cycle

A student can start learning at any point in the cycle depending on their information processing preference. The learning cycle fits into the four quadrants of brain processing as described by Herrmann (24). Left-brain dominant students are analytical and logical and should be challenged to approach new content by inquiry and critically thinking about new concepts. Their right-brain dominant peers who prefer a more holistic approach should be challenged to think laterally and learn by solving problems about new concepts. Alternating these approaches will ultimately lead to whole brain development as students will be using both their left and right brain strategies.
Environmental needs of the different groups of students will assist with planning the setting during learning interventions. The importance of considering environmental needs of students was elaborated on by Carbo, Dunn & Dunn (7).

Environmental elements that influence learning include sound, light, temperature and the design of the learning space. Students are either stimulated or inhibited by the environment in which they are trying to learn. Their reactions are determined by their biological makeup.

While some students need sound, either noise or music to learn, others need silence to be able to study. The light intensity has an effect on the ability to learn; while some students prefer bright light, others need dim light to optimize their learning. Heat perception also varies amongst people. Physical discomfort interferes with the ability to concentrate. Students differ in their ability to sit and study at a conventional desk, study on a bed or lounge chair, a couch or on the floor. Students squirming in their seats to try to find a comfortable position are often accused of fidgeting and urged to sit still. Student’s environmental needs are important to them and are beyond their control (7).

DEVELOPING LEARNING INTERVENTIONS

The challenge is to develop teaching and learning strategies using appropriate resources to encourage students to use all four quadrants of the brain facilitate learning.

Teaching strategies

Lecturers all too often go into classrooms to teach, assuming that all they need is expert knowledge of the discipline to be a competent lecturer. The time has come to practice evidence-based teaching (31).
A myriad of theories and models have been published to suggest improvements to teaching strategies. The emphasis shifted from behavioral theories to cognitive theories and currently mostly emphasizes constructivist teaching strategies. Recent research in instructional design also stresses the difference between learning interventions that lead to deep learning as opposed to superficial learning (6). These teaching theories are all important, however, they should be used in combination to develop whole brain learning as illustrated by Figure 2 (16).

**Teaching strategies to develop logical thinking** – students use the logical quadrant of their brain to sense and experience information. A teaching strategy that can be used to support and develop logical thinking is inquiry. Inquiry involves more than asking questions; it requires of the student to get involved in seeking for information which will enable constructing of new knowledge and understanding by developing learning interventions that nurture an inquiring attitude (1, 17). Inquiry learning involves a context, framework and focus for questions at different levels of complexity. Well-designed inquiry learning leads to authentic knowledge construction by working within the conceptual framework and ‘ground rules’ of the specific discipline. The outcome of the inquiry goes beyond ‘what we know’ about a concept; by aggressive questioning it informs the students about how the concept is organized and how it relates to other concepts as well as how to communicate the information effectively, thus helping them to become problem solvers (17).

In the classroom the inquiry-based learning intervention needs to be initiated by engaging students in a conversation about what they already know about the concept. Alerting students to the link between what they already know and what is expected of them now will help them to identify gaps as well as misconceptions in their current knowledge and understanding of the concept. The students need to be given background on the topic of inquiry to enable them to
perceive and formulate meaningful inquiries. The information can be introduced in the form of a brief lecture, reading of journal articles or a section from a book or website. This is followed by clearly defining the outcomes that need to be reached with the inquiry, by which means it needs to be done (define a problem question; gather data; compare, organize and analyze data; create or support a proposition; or propose a solution) as well as how it needs to be reported. Students should not be left in the dark as to what is expected of them; they need to be provided with a supporting structure to focus their inquiry but which does not limit their creativity (25).

Teaching strategies to develop analytical thinking – students need to be challenged to use the analytical quadrant of their brain to nurture and develop critical thinking skills. In the learning cycle this quadrant of the brain is associated with reflecting and observing (16).

The strategy to developing critical thinking strategies is not to instruct students in critical thinking, instead the strategies should be modelled by ‘the guide on the side’ while the students take ownership of the direction of the investigation. Developing critical thinking strategies include strategies that sharpen the focus on the concept and strategies that help students dig deeper into the concept (10).

Critical thinking strategies that sharpen the focus are used to make careful sense of a concept and clarify it to create common ground. Strategies that can be used are to identify the direction, sorting out ideas for relevance and focusing on key points. Critical thinking strategies that assist students to realize the depth of the investigation include full-spectrum questioning, making connections and honoring multiple perspectives (10).

These critical thinking strategies can be used to find analogies and other relationships between concepts and to determine the relevance and validity of information used to solve the problem.
The critical thinking strategies teach students to find solutions or alternative ways of treating problems. Teaching strategies that help to develop critical thinking are promoting interaction among students as they learn; asking open-ended questions (Why do you think that? Is it fact or opinion? How are these concepts alike? What would happen if?) and allowing time for reflection and providing opportunities for the transfer of information to encourage the application of new information in authentic situations (38).

A metaphor for the lecturer’s role is “a guide on the side rather than a sage on the stage” (51:54).

Teaching strategies to develop holistic thinking – thinking is a skill that needs to be taught to students to help them meet the needs of current challenges in the real world (4). Thinking determines how intelligence is used (43). Lateral thinking is free of constraints and is concerned with changing preconceived notions to bring out new ideas. Techniques associated with lateral thinking are challenging existing notions, looking for alternatives and provocations, where the situation is first imagined and then plausible solutions need to be sought (43). Edward de Bono, who coined the term lateral thinking, developed a tool that encourages people to make decisions only once all points of view have been considered. This is done by analyzing the problem from different directions using unorthodox methods which would normally have been ignored (4, 19, 43).

Teaching strategies to develop emotive thinking - Problem-based learning can be used to get students practically involved in learning. Involvement will affect their attitude towards learning as it requires a personal response. Problem-based learning can be distinguished from other forms of enquiry-based learning in that the problem is presented to the students before other curriculum
inputs; making the student responsible for searching for appropriate sources of information. The learning comes from working towards the understanding of the resolution of a problem, rather than trying to memorize a rapidly changing knowledge base. This does not exclude other teaching strategies such as lectures, practical sessions and tutorials which follow once the students have been presented with the problem to assist the students to use all the information to ‘solve’ the initial problem (5; 42).

The rationale behind problem-based learning as a teaching strategy is to challenge the students with ill-structured, open-ended, real life problems that stimulate critical and creative thinking, develops problem-solving skills and stimulate self-directed learning strategies and team participation skills (5). Through problem-based learning students are empowered to conduct research, integrate theory and practice, and to develop the skills to solve a defined problem (42).

Problem-based learning can initially be scaffolded to reduce the cognitive load by guiding the students through the steps they will have to follow to solve a typical problem. This guidance fades when students gain experience in the process of problem solving (Barrett, 2010).

According to Barrett (5) these steps involve to clarify the terms and concepts used in the problem description and then to identify the phenomena that need to be explained, after which prior knowledge and common sense are used to brainstorm the phenomena concerned. The next step is to criticize the proposed explanations and to formulate learning issues in order to ‘fill the gaps’ in their current knowledge. This is followed by gathering the information required to address the problem through self-directed learning, where individuals take the responsibility for seeking relevant information to be able to share multiple perspectives in the collaborative group in order to reanalyze the problem and formulate a comprehensive answer to the problem. These
steps help the students to co-elaborate and co-construct their knowledge which in turn leads to
‘social and cognitive congruence’.

The epistemological position in problem-based learning is to not see knowledge as
something static, but rather as something that is made and remade through dialogue which is in
line with postmodern concepts of knowledge (5). Problem-based learning further promotes
multidisciplinary student-centered learning; stimulating lifelong learning (42).

“One of the best ways to prepare future employees is to teach students how to think not what
to think” (8:21).

Learning strategies

The importance of the appropriate learning strategies to process new information should not
be underestimated. The students are not always aware of which strategy to follow to learn new
concepts and should be guided in this respect. Developmental and individual characteristics that
have a bearing on how students learn under specific conditions should be taken into account (41).

Students are more likely to learn when they learn with others than when they learn alone.

There are different approaches to facilitate activities where students learn together such as:
cooperative learning, collaborative learning, peer learning, and problem-based learning. The key
to success when students are working together is that they should talk to one another, articulate
their understanding of the subject matter, ask and answer questions (31).

Meaningful learning is facilitated by articulating explanations, whether to one’s self, peers or
the lecturer. It is common belief that a central part of learning any discipline is learning the
language of the discipline. Learning a ‘new language’ requires practice by reading and speaking
that language. It is also true that articulating self-explanations improves meaningful learning and retention (31).

Specific learning strategies that students can follow are SQ4R (survey, question, read, record, recite, review) (50) which will not only help with remembering information but also improve understanding it. Acronyms (35), acrostics (12), songs and rhymes (33) can be used to remember information but also to link related concepts. Concept (36) and mind maps (30) can help with chunking and relating information (32).

Deliver

The mode of delivery refers to how the content will be presented to the students. When a module is designed it is important to use a blended approach by incorporating as many different modes of delivery as possible to accommodate different teaching and learning strategies.

Higher education institutions realized that holding onto the past learning and teaching practices is not congruent with the needs of the 21st century student (53). The increasing evidence that Internet information and communication technologies are transforming much of society, it is has an impact transforming higher education (21). Blended learning has been introduced in tertiary institutions for more than a decade and has gained importance during the last six years with the development of online learning. Terms that have been used interchangeably with blended learning are “mixed mode learning”, “hybrid instruction” and “technology–mediated learning”. The understanding of blending learning is a combination of “face-to-face instruction and technology enhanced instruction” (54). Garrison and Vaugan (20) argue that blended learning is “the thoughtful fusion of face-to-face and online learning experiences” such that the strengths of each mode are blended into an optimal learning
experience within a unified course (52). Blended learning combines the affordance of various
digital technologies such as social networking, virtual collaboration, generating of online
resources with the real life social interaction of face-to-face teaching (18).

It is imperative that to ensure that each ingredient, individually and collectively adds to
meaningful learning environment by delivering the right content to the right people at the right
time (45). This implies that blended learning requires the intentional redesign of learning
material with appropriate support structures where the emphasis is shifted from assimilating
information to constructing meaning and confirming understanding in a community of enquiry
(21).

Creating a blended learning program is an evolutionary process which needs to take into
account the capabilities of the lecturers, the infrastructure of the institution, and also the
receptiveness of the learners to new learning formats. Initially eLearning activities can be
introduced as a supplement to the current offering. This can then be developed into a blended
learning program (44).

The blended learning design can be integrated into the whole brain model for learning (16) as
illustrated in Figure 3.
Figure 3 Blended whole brain learning

Logical quadrant

Inquiry-based learning is a discovery method of learning. Learning takes place most notably in situations where students draw on their own experience and prior knowledge to discover truths that are to be learned. Inquiry-oriented learning reflects the constructivist model of learning in that it states that learning is the result of ongoing changes in our mental framework as we attempt to make meaning of our experiences. In this active mode of learning students are encouraged to make meaning by developing and restructuring knowledge schemes of concepts through exploratory conversations and lecturer intervention. Inquiry oriented learning calls students to investigations to satisfy curiosities. Curiosities are satisfied when they have constructed mental frameworks that
adequately explain their experiences. There is no authentic investigation or meaningful learning if there is no inquiring mind seeking an answer, solution, explanation, or decision. Students should be able to derive rules and theories as opposed to facts and systems. Students are encouraged to make meaning of what they are studying by individual investigation (14).

Analytical quadrant

Through critical thinking students organize their knowledge using visual representations of concepts to illustrate relationships by using tools such as concept maps to ease the information overload on the working memory. It is imperative to remember to build on what is already known and to recognize similarities between new information and what they already know by using advanced organizers such as rules, analogies or concrete instances. Deep thinking can be facilitated through elaboration using co-operative learning strategies such as peer tutoring and paired problem solving to make students observe and modify their own thinking processes (14).

Holistic quadrant

Lateral thinking is concerned with changing concepts and perceptions. Lateral thinking is about reasoning that is not immediately obvious and ideas that may not be obtainable by using only traditional step-by-step logic. Lateral thinking refers to the generation of novel solutions to problems. Many problems require a different perspective to solve them successfully. Lateral thinking applies to problem solving, breaking up the elements of a problem and recombining them in a different way. Lateral thinking is distinguished from critical thinking in that critical thinking is concerned with judging the truth value of statements and seeking errors, while lateral thinking is more concerned with the movement value of statements and ideas, creating new ideas (14).
Emotional quadrant

Problem-based learning is regarded as an effective learning strategy and an active process of personal cognitive construction. This changes the traditional view, as the students take responsibility for their own learning with the lecturer taking the role of a facilitator. The principal idea behind problem-based learning is that the starting point for learning should be a problem, a query or a puzzle that the student has to solve. Problem-based learning courses start with problems rather than with exposition of disciplinary knowledge. Students move towards the acquisition of knowledge and skills through a staged sequence of problems presented in context, together with associated learning materials and support from lecturers. True problem-based learning is not facts oriented, it is oriented towards understanding of concepts. It involves a student-centered learning experience where students are free to study in depth, unencumbered by the burdens of broad courses based on the memorization of facts (14).

To keep in pace the changes that come with blended learning educators need to reconceptualize assessment of learning. Assessment is the measurement of a student’s achievement and progress in the learning process in relation to desirable outcomes (22). Two major forms of assessment exist being summative and formative assessment. Summative assessment (assessment of learning) is used for certification purposes to indicate that desired goals of learning have been met for a specific module. Summative assessment has been associated with surface learning as it tends to assess declarative knowledge and basic application with little or no evidence of personal reflection and deep understanding (46). These limitations have necessitated the integration of formative assessment (assessment for learning) to monitor ongoing learning and assess understanding with the purpose of aligning instruction to the specific needs of students. Thus, formative assessment is an iterative process to establish what,
how much and how well students are learning in relation to the expected goals and outcomes. It requires tailored feedback to scaffold learning (22).

Authentic formative assessment activities motivate students to engage in decision making and problem solving and encourages metacognitive thinking and self-learning which promotes engagement and transfer of knowledge to new situations as students are actively engaged in the assessment process. Involving students in peer assessments students not only benefit from receiving feedback, but also learns how to give feedback to others (39). Formative assessment relates to multidimensional approaches to provide opportunities for alternative approaches leading to different sources of evidence. This is enhanced by prompt feedback. If the formative assessment is online the possibilities of feedback is enhanced, and could include leading questions and hints, encouraging reflection which has a beneficial impact on learning, motivation and engagement of students who regularly engage with online assessments (55). Tailored feedback can promote self-regulated learning and encourage reflection to develop understanding. Formative assessment can be used to identify strengths and weaknesses in order to take remedial action until the desired level of knowledge is reached (9). Ongoing authentic assessment helps to facilitate and sustain multifaceted interactivity with content and learning tools and self-reflectivity as proposed for a blended learning environment (22).

According to Porter, Graham, Bodily and Sandberg (37) the advantage of improved student interest and learning provided during blended learning over traditional teaching outweighs the barriers of heavy workload on staff and lack of financial support from management. Blended learning provides various benefits over using any single learning delivery medium alone (45). Blended learning helps to balance the lack of flexibility if face-to-face classroom activities with the flexibility of online activities; while still allowing for interaction with peers and facilitators
It is however important to note that simply turning classroom courses into blended formats do not necessarily provided students with improved learning experiences; careful analysis of the preference of the learners regarding communication (asynchronous and synchronous), their abilities and expectations, the context and availability of technology need to be taken into consideration (48; 13).

**EVALUATION OF THE PROCESS**

When a course is implemented it is not the end of the process. During the evaluation phase the instructional designer measures if the goals for the module were achieved. The following questions can be asked to measure this:

- Did the students like the module? This can be done by asking the students to complete a short survey upon completion of the module.
- How well did the students achieve the objectives at the end of the module? A pre-test and a post-test can be used to measure this achievement.
- Were there any behavioral changes as a result of the module? This is more difficult to measure and might take longer periods of time. A follow-up assessment might be necessary.

Evaluation is also concerned with gathering information during all the stages of the development of the intervention. This formative evaluation focuses on evaluating whether all the steps unfold according to plan, uncovering any obstacles and planning adjustments and corrections. Feedback gathered during formative evaluation is used to fine-tune the implementation of the module in future.
CONCLUDING REMARKS

Facilitating learning in the 21st century is a challenge. The requirements to satisfy the needs of current students necessitates the change to a blended approach making use of all the possible media, while keeping in mind that “…the media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries cause change in nutrition ….. only the content of the vehicle can influence achievement.” (Richard Clark, Review of Educational Research Journal, 1993).

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AUTHOR CONTRIBUTIONS

Author contributions: S.E. conception and design of research; S.E. prepared figures; S.E. drafted manuscript; S.E. edited and revised manuscript; S.E. approved final version of manuscript.

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