Reviewing the Significance of Attention and Awareness for Developing Learner-Centric Taxonomy

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Attention and awareness are complexly interconnected and are conceived to be the two crucial cognitive components for a holistic learning experience. However, this paper claims that teaching and learning instructional materials, educational taxonomies, and evaluation strategies have not given due importance to cultivating these two cognitive components for effective learning. To substantiate its claim, this paper aims to offer a review of a range of educational taxonomies to foreground how two of the most crucial cognitive components integrally connected to critical thinking abilities are not discussed. The paper argues that a study of this kind will enable us to identify the gaps hindering the goal of achieving the concept of critical pedagogy. The paper will also offer an in-depth review of literature from the domains of cognitive science, neuroanatomical science, and language education to assert the significance of attention and awareness. The paper's originality lies in its ability to propose an eclectic learner-centric taxonomy that could be adopted for achieving the goals of critical pedagogy.

Keywords: attention, awareness, educational taxonomies, classroom instruction

INTRODUCTION

National Education Policy (2020) proposed three paradigm shifts in the Indian education system for the holistic development of learners. These shifts include a transition to a multidisciplinary holistic education model, emphasis on critical and analytical thinking, and adopting critical pedagogy for encouraging dialogical engagement between teachers and students, and students themselves. NEP 2020 proposes the conversion of classrooms into a simulated society where learners should be given adequate scope to engage in activities that will enable them to ask questions and engage in critical dialogue to understand and seek solutions for real-life problems. Asking a relevant question is conceived to be the key marker of a critical and awakened learning process. However, in a real classroom scenario, the transition from rote learning practices to an engaging learning environment is considered challenging. We are yet to convert the concepts of critical pedagogy into praxis. Multiple factors (cognitive and noncognitive), such as low attention span, low self-confidence, peer pressure, and linguistic incompetence (Bonsall, 2021) hinder the accomplishment of a critically engaging classroom.

This paper would like to discuss cognitive hindrances specifically focusing on attention and awareness. Recurrently, teachers complain about the low attention span of learners and its long-term negative academic

consequences. Although the importance of attention and awareness for developing critical thinking in learners is undeniable, this paper claims that these two cognitive processes have not received due attention from teachers and teacher educators. To substantiate the claim, the paper would like to offer a review of the existing educational taxonomies that have been used for classroom instruction, material production, and evaluation. The review will foreground that although attention and awareness are integral components of the cognitive process, these two aspects have never been the base for designing instructional strategies. The paper further argues that the existing taxonomies, such as Bloom's taxonomy, do not concord with the cognitive and neuroanatomical study of the cognitive process involved in the learning process. Hence, a review of the existing literature on Bloom and other taxonomies will enable us to discover the theoretical gaps in the learning strategies that have been proposed so far. The second half of the paper will draw on critical perspectives from cognitive science and neuroanatomical studies to assert the importance of attention and awareness in the learning process. The study, based on the review of the scientific discourses, would like to propose the revision of the discreet and hierarchical structure of the taxonomy that has been followed in education institutions globally. The paper will conclude its argument by proposing an eclectic learner-centric educational taxonomy that could be used in teaching and learning contexts to achieve the goals of critical pedagogy.

REVIEW OF THE EDUCATIONAL TAXONOMIES

Bloom's Taxonomy – History and Implications

In 1948, the idea of creating a taxonomy for assessment purposes was discussed during an informal meeting of college examiners who participated in the American Psychological Association Convention. The examiners put forth proposals to create a theoretical framework that, contrary to behaviorist theory[1], could encourage communication among examiners/teachers to exchange ideas about test materials and methods rather than creating strategies that can necessarily boost self-learning in learners. The first of three parts of the book - *Taxonomy of Educational Objectives*, namely *Handbook I: Cognitive Domain*, was released in 1956, focusing on the cognitive part along with the intention to develop intellectual skills and abilities in learners. Although the classification of the taxonomy is solely based on student behavior, the taxonomy has been designed to assist teachers in the assessment and outcome part of learning. However, learners still drag the baggage of rote learning grade after grade.

FIGURE 1
THE ORIGINAL BLOOM'S TAXONOMY (LEFT) AND THE REVISED VERSION OF BLOOM'S TAXONOMY (RIGHT)

The usage and prevalence of Bloom's taxonomy in the sphere of teachers is notable, but this taxonomy lacks cognitive underpinning regarding students' self-learning. According to Bloom's Taxonomy, skill development occurs when a learner transforms his/her lower-order thinking into higher-order thinking, where content is used as a vessel for enhancing skills. The framework was designed to ensure an equal flow of orders of thinking in a learner's learning process and acquiring knowledge.

As the main intention of the taxonomy is to improve learners' thinking skills, the structure has been designed in an upward graphic pyramid manner with the components including - Knowledge (low cognitive

requirement), Comprehension, Application, Analysis, Synthesis, and Evaluation (high cognitive requirement). The hierarchy suggested that the process starts from a ground of knowledge to improve understanding to apply and analyze the synthesis of ideas generated and finally, evaluate the meaning of learning. Given the cognitive notion of learning by the taxonomy, the aspect of paying attention to the lecture or actively participating in the discussion is not elaborated on in the taxonomy. The components exclusively aid in developing a curriculum, creating test materials and evaluating the learners' level of understanding.

Later, in 2001, Anderson et al. revised the original taxonomy version by replacing the noun forms with verbs to emphasize the active learning components – Remember, Understand, Apply, Analyse, Evaluate and Create. The term *remember* essentially denotes the recollection of knowledge from previous encounters to understand the concept, which enables application and analysis. The order of the last two components in Bloom's was changed because, according to Anderson et al., the creation of new knowledge can only be achieved through evaluation as it appeared to be a higher-order process. This modified version could describe the learners' actions at each level. Nevertheless, the original and the revised taxonomy do not have empirical research to support the arrangement of the components mentioned above.

Why Is Bloom's Taxonomy Irrelevant Today?

Various practitioners and educationists praise Bloom's taxonomy as it has been assisting teachers in evaluating the competence of learners. Remarkably, the taxonomy is still in use in many countries, including India, for crafting learning activities, assessment designing purposes, and framing questions based on the six components. However, the relevance of the taxonomy for judiciously evaluating the various essential cognitive components of learners for initiating self-learning in the current century is yet to be studied.

Processing a piece of information and storing it in the long-term memory stack demands 'thinking' as the initial stage of learning. While Bloom and others suggested that thinking can happen at any level, recent researchers commented that thought processes "are not static: as in the flow of a river they appear and disappear as patterns of a constantly changing dynamic system." (Shadrikov et al. 2016, p. 562). At each level, thinking does not operate instantly or individually but is an interconnected thread throughout the components.

Bloom's taxonomy suggests the instructors to choose one component from the taxonomy and frame questions accordingly. According to Gracey (2021), components in the taxonomy cannot operate in isolation as each component is cognitively interlinked. As an instructor, ticking off the box for which the cognitive component has been tested will not improve the quality of logical and critical thinking in learners. The focus on the individual cognitive component is more often practiced at the expense of the learner's encounter with the concept, social skills, communication skills, and most importantly, the failure to acquire cooperative behavior. Cooperative behavior fosters and enhances the ability to sustain attention and become aware of the concept studied, which is not explained well in the taxonomy. Although the arrangement of components helps in mainstream formal education (Gershon, 2018), it has to be noted that the role played by learners in knowledge acquisition, the psychological effects experienced, the individual endurance in cognitive processing, and the reflective research approach is not explicitly explained in Bloom's taxonomy. To develop reflective learning, learners must pay attention to the epistemological aspect of learning, for which attention and awareness will play a significant role.

The mistaken notion that higher-order (creation) tasks are demanding and more significant than a few lower-order tasks causes complications in understanding the unified process in students' minds while learning. Additionally, remembering (considered a low-level learning process) placed at the bottom of the pyramid does not help in the progress of the learning process. Traces from a neurocognitive study suggest that being attentive to the information will facilitate remembrance, which helps improve the aspect of creation (Srikoon et al., 2017). While in the taxonomy, remembering and creation are placed considerably apart as the first and last components, respectively (Shelley, 2020). From the evidence found, we can assert that even before the origination of the first cognitive feature—remembering, attention serves as a medium to initiate all other cognitive components.

According to Bloom, existing knowledge shall be used as a trigger to learn new concepts. In contrast, a distinguished educator, Doug Lemov (2017) explains that activating pre-requisite knowledge (schema, which many students might not possess) cannot be achieved by simply creating a lesson plan that includes ideas and concepts from the previous grade. The proper initiation of schema requires the action of collaborative usage of components in the taxonomy. Therefore, synthesis/creation and evaluation/evaluating might be regarded as 'higher-order skills', yet knowledge/remembering (which, according to Bloom, is a 'lower-order skill') should also be considered as an essential process because without strong recalling skills, activating pre-requisite knowledge will be an arduous process for the instructors. This complication in the learning process questions the relevance of the taxonomy's hierarchical structuring. In contrast, Shelley (2020) prescribed a collaborative model of Bloom's taxonomy to enhance experiential learning. In this article, the author does not support the fact that learning should begin with existing knowledge (remember) as learning the same content from the previous grade will not produce critically intellectual individuals. Rather, to induce critical thinking skills, the component *creation* should be paid attention to, along with the involvement of attention and awareness as cognitive markers.

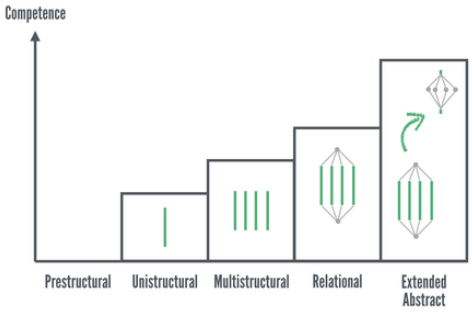
In an article titled, 'Why it is time to retire Bloom's Taxonomy?', Gracey (2021) points out that the taxonomy aimed to educate teachers on how to teach and assess the students. This article also states that thinking does not operate according to the hierarchy or linear sequences, whereas the complexity of the task regulates the learner's affective, cognitive and metacognitive functioning. Moreover, in the book *Taxonomy of Educational Objectives,* Bloom et al. (1951) clearly pointed out that "it is expected to be of general help to all **teachers**, …" (p. 1), "it was suggested that the taxonomy could be most useful to **teachers**…" (p. 4) which attests the importance laid on teachers' association with materials production and designing assessments. The instructors apply this methodology to learners for assessing their understanding of the test material produced. The questions framed by instructors can help in assessing students' level of learning but to identify whether the learner comprehended the content, it is important to allow students to critically question the concept encountered (Almeida, 2012). Learning, as a collaborative process, should help the learners with metacognition and offer learning satisfaction (Cheng et al., 2021). Therefore, experiential and inquiry-based learning provides new possibilities for gaining knowledge and produces well-rounded professionals.

Taxonomies Other Than Bloom's Taxonomy

Nearly all the available taxonomies other than Bloom's taxonomy such as The Structure of Observed Learning Outcome (SOLO), Webb's Depth of Knowledge, Understanding by Design Framework etc., are teacher-operated where the teachers undertake any method from those taxonomies and apply it to create learning and assessment activities for learners to improve the knowledge-gaining process. This section will review the taxonomies in light of cognitive learning aspects.

(i) Following the trails of Bloom, Kevin Collis and John Biggs designed a taxonomy named The Structure of Observed Learning Outcome (SOLO) (See Fig. 2) in 1982 to decode the levels of understanding while learning, i.e., Prestructural, Unistructural, Multistructural, Relational, Extended Abstract. This taxonomy explains how a learner acquires knowledge through stages from zero ideas to an abstract which can be formed into new knowledge. The idea of progressive learning can assist teachers in asking questions, but this taxonomy has not discussed the reverse action of students attempting to ask relevant questions.

FIGURE 2
THE SOLO TAXONOMY



(ii) Subsequently, in 1997, Dr Norman Webb released a taxonomy named Webb's Depth of Knowledge to identify the difficulty level in assessment materials. However, the representation of components in a linear stack model resembles Bloom's Taxonomy. The intentional attempt to visualize the depth of knowledge is not supported by empirical evidence since knowledge does not operate in a linear model (Francis, 2016).

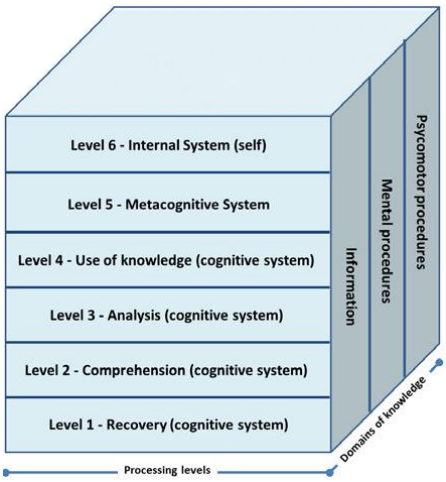
FIGURE 3
WEBB'S DOK LEVELS

(iii) Later in 1998, Grant Wiggins and Jay McTighe suggested 6 facets of understanding in their book Understanding by Design Framework to examine the component 'understanding'. This method assisted the teachers in designing curriculum and learning materials backwards where the students' outcome will be considered the first stage of knowledge transfer. Notably, this taxonomy is teacher-centric, which will not support learners in understanding the learning process from a cognitive aspect.

FIGURE 4
UBD FRAMEWORK

(iv) Marzano & Kendall prepared a framework in response to Bloom's Taxonomy's shortcomings in 2006 during which many educationists began to criticize Bloom's Taxonomy. This taxonomy focuses more on the thinking part of the learners and on how teachers can help their learners achieve intellectual thinking. Additionally, this taxonomy was research-based and can be authenticated to a certain extent. However, this taxonomy was solely designed for the teachers to assist learners' thinking behaviour rather than imposing importance on learners' self-efficient learning process. The preliminary stages including attention and awareness as two vital components have not been extensively discussed in this taxonomy.

FIGURE 5
MARZANO & KENDALL'S *THE NEW TAXONOMY*



INTRODUCTION TO ATTENTION AND AWARENESS

Many researchers proposed that the essential component(s), i.e., the cognitive stages mentioned in the taxonomy, of any learning process must be explained to the learners before implementing the taxonomy in a classroom environment (Al-Hejin, 2004; Farley et al., 2013). The primary components, as found to be crucial by cognitive psychologists, that facilitate learning are attention and awareness (Robinson et al.,

2012; Leow, 2013). During cognitive processing, language and attention influence each other to produce an outcome that can be considered intellectual, says R.K. Mishra in the book - *Interaction Between Attention and Language Systems in Humans* (2018). In today's prompt world, learners cannot be spoon-fed with the help of components in taxonomies. Rather they have to be provided with strategies that should be practiced to activate quality learning. Therefore, this paper will introduce two significant components—Attention and Awareness which are crucial in a framework for learners to kickstart their learning process that will enhance their inquiring ability. These two components are missing in the globally accepted taxonomy, i.e., Bloom's taxonomy and other similar taxonomies. Also, Bloom's taxonomy and other taxonomies explain abstract cognitive domains that are insufficient for the learners' self-regulation, competence, and imagination (Deci & Ryan, 2012).

The role attention plays in a learner's day-to-day life determines cognitive abilities possessed by the learner, including *awareness, memory retention, consciousness, noticing and understanding.* The concept of attention has been connected with awareness, most frequently, as these two cognitive components are intrinsically interconnected and cannot operate separately (Leow, 2012). While attention is studied in more of a non-controversial manner by many researchers, the role of awareness in learning remains highly controversial in cognitive science, cognitive psychology, and Second Language Acquisition. According to the principles of classical psychology, attention has been found to function along with consciousness. Carr and Curran (1994) rightly highlight that "if you are conscious of something, then you are attending to it" (p. 219).

Furthermore, the terms *attention, awareness, noticing, and consciousness* have a variety of overlapping connections where one concept kneads over the other. To illuminate the differences and similarities between these terms, and to exemplify their purpose in learning, a few studies that have empirically investigated the phenomena will be reported in the following sections. In addition, the following sections will discuss the need for incorporating attention and awareness as essential components in a learning and skill development taxonomy.

Theories Supporting Attention and Awareness

Attention is regarded as a psychic process that helps a child be cognitively ready and prepared to take in and process information. Children's attentional development directly impacts their academic performance and is considered a beginning stage in any learning process (Almakhan & Manshuk, 2014). To understand the depth of attention in learners, there are several theoretical underpinnings of which only Schmidt's Noticing Hypothesis, Tomlin and Villa's Functional Model of Input Processing, and Posner and Petersen's Tripartite Model of Attention have directly dealt with the importance and tenets of both attention and awareness in learning.

The most widely cited definition of the initial stage of learning in SLA was scripted by Schmidt. According to him, attention "is necessary to understand virtually every aspect of second language learning…" (Schmidt, 2001, p.3), which controls awareness functioning and leads to the initiation of noticing. As Schmidt (1993) defines, noticing is "the necessary and sufficient condition for the conversion of input into intake". When noticed carefully, students receive the input without comprehending the content and necessarily focus on reproducing the input without analysis (which indicates rote learning). Rather, to make meaning out of the input, the intake process must be explained to the learners. To support the previous point, intake is usually considered as a subset of input that the learner will take in and it has been found to occur at the preliminary stage of the acquisitional process (Leow, 2012). Before the acquisitional stage, consciousness remains a pre-requisite feature within which attention and awareness underlie.

With consciousness being an integral component that activates cognitive readiness, Schmidt (1994a) suggests four dimensions of consciousness exist in the human mind. *Intention* is perceived as the first dimension which indicates the part of the learner's intention to attend to the stimulus. The concept of intentional versus incidental learning is often associated with this dimension. The second dimension is identified as *attention,* where the learner facilitates focus and detects the stimulus. This is followed by *awareness,* the third dimension, which points out the learner's response/subjective experience of the stimulus. The final dimension of consciousness is *control*, which stages the learner's ability to process the

information, and the effort (spontaneous/requiring some mental effort) required to deliver the output. The output delivered is the by-product of the two significant elements – attention and awareness. This attests to the fact that attention and awareness play a significant role in knowledge acquisition.

According to Schmidt, attention is affiliated with awareness, and he supports the idea of learning with the support of awareness. Moreover, he suggests that awareness at the level of understanding is a higher level of learning action than the level of notice, which leads to mere intake. Awareness at the level of understanding helps in deeper learning and boosts the ability to analyze, question, and test hypotheses at different levels.

Tomlin & Villa's Functional Model of Input Processing in SLA differs prominently from Schmidt's proposition of the role of awareness in the learning process. Drawing on literature from cognitive science, Tomlin and Villa (1994) attempt to put forward a functional analysis of attention. According to Tomlin & Villa, four conceptions of attention exist in SLA. One of the first conceptions is attention can be a limited capacity system. This provides the idea of the brain being presented with multiple stimuli simultaneously and the possible implausibility of processing them all. With multiple stimuli presented at any given time, the second conception of attention leads to selecting the necessary stimuli. The third conception of attention involves controlled information processing rather than operating automatically. The reason behind this assumption is that few tasks demand higher processing effort, thereby leading to the requirement for a higher degree of attention. The idea of performing more than one task with controlled attention led researchers to identify the fourth conception of attention, which is human brain must involve in a series of coordination among multiple stimuli, and here, attention has to be organized, maintained, restarted, and redirected to perform different tasks. Thus, the functioning of attention in a learner's brain plays a significant role in becoming aware of the stimulus, taking in the stimulus, and having control over processing the information (Cicekci & Sadik, 2019).

In Tomlin & Villa's model, Posner and Petersen's (1990) postulation has been discussed where an information processing method comprises three separate yet interconnected attentional functions that actively foster input processing. The proposed hypothesis extends as (a) *alertness*, which implies the overall readiness to cope with incoming input, (b) *orientation* refers to the arrangement of stimuli from the received input, and (c) *detection*, which is considered the most important part of attention as it indicates the cognitive registration and revisiting of a required stimulus. Only when a stimulus is detected and attended to, it becomes readily available for further processing. Here, detection does not necessarily mean awareness for which Schmidt (2001) proposes the term registration—for the stimuli detected without the help of awareness. What Schmidt stresses here is that attention and awareness become vital to detect a stimulus and processing it to take in the necessary components while learning.

Awareness, by definition, refers to the personalized, subjective experience of an individual with the input or cognitive data. To understand the function of awareness in learning, it is mandatory to understand the difference between learning and knowledge. Reber (1989) highlights the definition of implicit learning and explicit learning. He describes implicit learning as the process by which knowledge is acquired unconsciously. In stark contrast, learners know what input data they process and take in during explicit learning. Learning, as a process, is distinctively different from acquiring knowledge (knowledge is regarded as a product of learning). According to Paradis (1994), two types of knowledge have been detected. One is implicit knowledge, which is gained without awareness. It is unavailable to the conscious part of the brain and can be used instantly without consciousness. The second type is explicit knowledge, attained by the learner with awareness in action and can be accessed on demand. The interaction between these concepts is believed to be impossible by some (Krashen, 1982; Truscott, 1998), yet others like Ellis (1994), Carr & Curran (1994), and Schmidt (2001) argue that interaction is possible at the stage of learning which is why the crucial part of noticing is stressed again in the following paragraph.

Schmidt's (1994b) approach to *noticing* refers to "the registration of the occurrence of a stimulus event in conscious awareness…" (p.179). The simplified formula of Schmidt's definition will be *noticing* = *awareness* which includes the anonymous version of detection prior awareness. He also distinguishes understanding from noticing, as understanding is recognizing the input, whereas noticing is looking for surface elements in the input. The above definitions of consciousness, awareness, attention, learning, and

knowledge provide a clear picture of *understanding,* as understanding represents a deeper level of awareness which is a subset of attention. Therefore, in the initial stage of learning, an integrated thread of consciousness, noticing, attention, and awareness is required to initiate learning, processing of input, and conversion of input to knowledge. The following section will contain relevant literature on attention and awareness from cognitive science to validate and apply the concepts discussed above.

LITERATURE FROM COGNITIVE SCIENCE

Attention in Its Form

Before elaborating on the studies undertaken to examine attention in learning, it is imperative to revisit research that discusses attention's functioning. Attention has been noted as one of the main characteristics in learners to achieve academic success and transform input into knowledge. Being attentive to any type of input enhances cognitive, social, and developmental skills during the childhood phase of learners. Cicekci & Sadik (2019) highlight that attention is required to analyse a problem and create intellectual ideas based on the input. Several levels of research are being conducted to explicitly denote the role of attention in language development. Most of the research is executed with participants ranging from beginners to intermediate to advanced levels of Second Language Acquisition (SLA). The results of these studies indicate the role of attention in learning is crucial and provides strong support to educate teachers as well as learners about the importance of disintegrated attention during the learning process.

While the notion of attention being a limited capacity system was supported by many, Sperling (1960) experimented to validate this hypothesis. For this experiment, he gave five participants a sheet with nine letters arranged in three rows with 50 milliseconds per session. The recall action of the participants was noted in an average recollection of 4-5 letters. When the participants were asked to recollect a particular (upper, medium, or lower) row, they could recall the letters correctly. This suggested that attention is only limited to orientation and not detection. This means that detection can happen unconsciously, whereas attention can only be oriented to a limited section of the stimuli (one row). According to the late selection model by Best (1992), selection happens after the input has been detected and this experiment confirms the statement.

Neuroanatomical evidence supports Posner and Peterson's postulation where an experiment involving monitoring electrical activity and blood flow in the brain somewhat supported the description. Even though alertness, orientation and detection were found to be functioning separately, they were, anatomically, found to be associated with each other (Posner & Petersen, 1990; Posner & Rothbart, 1992). This proves that attention alerts the brain to orient the stimuli and detect the input to select the necessary data. The repetitious loop of the components mentioned above initiates learning (process), understanding (consuming information), and storing (knowledge and skills). Having discussed a few empirical research on the functioning of attention, it would be considerate to list significant studies highlighting the relationship between attention and the learning process.

Attention and the Learning Process

In a general classroom of learners, given that the learning environment is positive with minimal distractions, learning cannot happen if the students fail to regulate their attention to activities or shift to an out-of-focus stimulus (Uluğ, 1991). Previous experiments conducted to investigate the functioning of attention in learning required participants to focus on one stimulus and ignore the other. This method typically uses dichotic listening tasks, where the participant is made to wear headphones with one audio in one ear and different audio in the other. One such experiment conducted by Moray (1959) resulted in participants not remembering any of the suppressed stimuli but could repeat the prose passage played in one ear while listening to it (also known as *shadowing*). A similar experiment was undertaken by Norman (1969), resulting in poor recollection of *unattended* words.

With a slight variation in the experimental model, Allport et al. (1972) invited 6 participants to shadow a passage under any of the three conditions: (1) listening to words in one ear and passage in the other, (2) words in the display, and (3) pictures in the display. Recognition and recall of the unattended words were

poor to difficult in all three conditions, and this rules out the fact that divided attention is considered as a problematic phenomenon. An experimental design crafted by Nissen and Bullemer (1987), Serial Reaction Time (SRT), has been widely cited as evidence that attention is mandatory for learning to happen. Subsequent studies adopted this design as their methodology to appropriate attentional conditions leans towards a successful learning process.

Surprisingly, a study conducted by Curran and Keele (1993) showed evidence for learning without attention. The result suggested that non-attentional learning was possible, and the type of knowledge acquired was procedural knowledge (stored in short-term memory) rather than gaining declarative knowledge (long-term memory), which can be located later in the memory. A study by Kellogg (1980) shall be explored to elaborate on procedural knowledge. The result of this study suggested that attention was not primarily needed to store data in long-term memory. In other words, without attention, knowledge cannot be stored in long-term memory and only can be located in the short-term memory vault. According to Schmidt (1995), the experiments conducted so far show learning without attention but in a way where less attention leads to less learning. However, Cohen et al (1990) found that simple task structures could be learned without the help of attention.

Can it be concluded that learning without attention is possible? Cognitively, no. Curran and Keele (1993) themselves admitted that

> when we refer to one form of learning as non-attentional, we do not wish to imply that no attention whatsoever is used on the primary task. Undoubtedly, subjects must in some sense attend to a visual stimulus to make a response. (p.190)

In many cases, it is an *awareness* that seems to be missing rather than attention. Attention is the basis of learning, and learning without attention is theoretically impossible (Truscott, 1998).

The Functioning of Awareness in the Learning Process

Many researchers observed the dissociation between learning and awareness in cognitive psychology (Curran & Keele, 1993; Nissen & Bullemer, 1987; Reber, 1967, 1993). Yet, several scholars have argued that learning without awareness seems low to impossible (Dulany et al., 1984; Robinson, 1997a, 1997b; Schmidt, 1995). The role of awareness in learning was wronged in many studies. However, Schmidt (1995) points out that "there was a solid relationship between awareness and learning in these experiments" (p. 21).

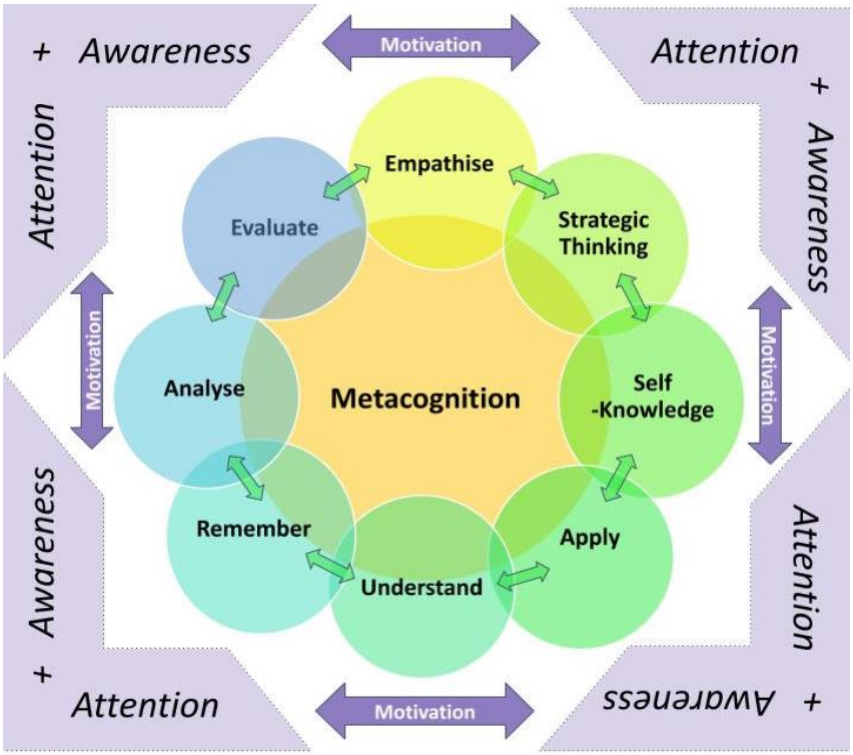
Awareness was tested in detail in Curran and Keele's 1993 study. Results suggested that participants who were informed (made aware of) about the task performed better than those who were slightly aware and performed better than the less aware group. This study attested that awareness plays a facilitative and prompting role in learning. A more interesting experimental design by Leow (1997) provided further evidence for the importance of awareness in learning. Three groups were identified at the end of the study, according to Allport's (1998) criteria for awareness, which are: (1) unaware (without awareness), (2) low aware (without the ability to describe the task), and (3) high aware (including awareness and cognitive change post-task). At the end (post-test) of the experiment, the high-aware group performed well than the low-aware and unaware groups.

Similar results were attained in a sequential study by Leow (2000). In this experiment design, the post-test was administered after three weeks, where the evidence of awareness was noted. Results suggested that participants displayed awareness of what they were exposed to and performed better than those classified as less aware. Learning without awareness might seem possible, but it is believed to have limited effects and only stores the data in short-term memory (Schmidt, 2001). By definition, awareness is a state of mind which demonstrates a particular learner experience through which the degree of learning can be measured (Leow, 2001). Therefore, along with the maintenance of attention, awareness should be accompanied as an initial stage in learning to streamline a learner's mind.

CONCLUSION

The gaps identified in the study emphasize the requirement for creating an educational taxonomy that could respond to the cognitive requirements of the learners. Hence, this paper would like to conclude its argument by proposing a learner-centric taxonomy grounded in the theoretical explanation of the information processing mechanism given by the researchers from cognitive science, neuroanatomical science, and SLA:

FIGURE 6
LEARNER-CENTRIC ECLECTIC TAXONOMY



In the above-proposed taxonomy, attention and awareness are demonstrated as overarching phenomena influencing various cognitive aspects required to process and internalize information. The double arrow used in the taxonomy indicates the information processing mechanism explained by the researchers from the education and cognitive science domain. The authors of this paper argue that information processing is not a unilateral phenomenon, rather, it is a complex two-way process that an individual has to visit and revisit multiple times to accomplish the task. Hence each cognitive component is demonstrated in a complexly enmeshed position with double arrows. Metacognition is at the centre of the cognitive process because attentive and aware learning experiences should trigger the metacognitive element required to question, filter, process, and store the information required to produce a desired outcome.

We propose an inter-connected system of learning that includes the following cognitive components: Understand, Remember, Analyse, Evaluate, Empathise, Strategic thinking, Self-knowledge, and Apply. The arrangement of these components is in a cyclical formation. However, the components function in an imbricate manner. The cognitive components introduced in the taxonomy are to be read clockwise. The component 'understand' is regarded as one of the essential cognitive components that take the action of learning forward (Bloom et al., 1956; Marzano & Kendall, 2006). The inclusion of the component 'remember' can be validated by understanding Bloom's taxonomy as well as Webb's DoK taxonomy,

where the importance of remembering and recalling has been given much focus. It is argued that throughout the learning process, understanding and remembering the concept and sustained attention and awareness produce quality output from learners.

These two cognitive components are entangled with the cognitive exercise of analyzing and evaluating. According to UbD's 6 facets of knowledge, the analysis component (which is represented using the term—have perspective) is an essential aspect of learning to evaluate the opinions about the concept. At this level, the learners can break down concepts and integrate and differentiate ideas. Bloom's taxonomy defines evaluation as the ability to justify and critique different points of view. However, to analyze and evaluate, the learner should be able to empathise with the concept and the opinions raised by other people. Empathise, in UbD's 6 Facets of Understanding, indicates the learning process's emotional component. It also includes being aware of other people's emotional quotient in the learning environment. The taxonomy also emphasizes strategic thinking. This component is drawn from Webb's DoK taxonomy. Strategic thinking is directly proportional to critical thinking skills and is also known to produce constructive ideas. Strategic thinking is complexly entangled with the notion of evaluation. Strategic thinking takes us a step ahead by enabling us to rationalize and evaluate the relevance of the concepts the learners are working with.

We draw on the concept of self-knowledge from UbD's 6 Facets of Understanding (1998) to further develop the taxonomy to emphasize holistic learning. Self-knowledge demonstrates learners' awareness of their prejudices, biases, and perceptions that influence their decision-making process. After attaining self-knowledge, the taxonomy emphasizes the practice of application (apply) to understand whether the learners have the critical thinking ability to solve the problem. According to Webb's DoK levels, the learners are given a set of questions and are made to answer the same. In contrast, this taxonomy suggests that learners must question their self-knowledge by applying their perspectives in real-life situations. In this way, the cyclical learning process continues with the component 'understand' until knowledge is acquired.

This section will demonstrate the complete functioning of the eclectic taxonomy. When a learning process begins, the cognitive feature—attention is triggered and maintained, followed by the act of being aware. Right after the activation of these two components, the components function in an interlinked way. For example, the depth of learning increases when a learner understands the concept and remembers it by analyzing and evaluating the concept. Analysis can be further divided into three parts: unidirectional (thinking about a concept in a single notion), multidirectional (elaborating the analysis into multiple interpretations), and extended abstract (where the learner will be able to have a broad idea about the concept) which are regarded as the steps involved while analyzing a concept, as suggested in the SOLO taxonomy. At the next stage, learners will be sensitized about their feelings about the content they are targeting. This is the empathetic stage, connected with the cognitive exercise of strategic thinking. Through strategic thinking, the learner can build self-knowledge, apply the concept to real-time life scenarios, and gain a positive learning experience.

The novelty of this eclectic taxonomy lies in its multidirectional usage. In a contemporary 21st-century classroom, learners' cognitive level of understanding cannot be tested solely through examinations. Through experiential learning, learners can critically analyze a problem and reflect on their learnings by implementing them in real-life situations. Therefore, the flexibility of the taxonomy will aid the learners in experimenting with their learning process. Through the proposed learner-centric taxonomy, we seek to meaningfully integrate the cognitive approach with learning and the internalization of information into a classroom environment. Constructive discussions about this taxonomy would render more experiments and improvements. We conclude that attention and awareness must be regarded as valuable constructs—with which intellectual, critically active individuals can evolve.

ENDNOTE

1. Behaviorist theory supports the natural affinity present in the child to learn. It claims that the acquisition of learning in children is facilitated by the acquisition of behavior (in this case, self-control and sustaining attention span).

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