

MATCHING LEARNING STYLES AND TEACHING STYLES IN BIOLOGY
TEACHING: AN ALTERNATIVE APPROACH TO MAINSTREAM SCIENCE
EDUCATION IN SINGAPORE

VANESSA NERANJANI D/O MUHUNDAN
(*B.Sc, NUS*)

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It is seemingly ironic that the first page of a thesis is normally the page that is written the last. The end of a thesis signifies the end of a journey. A journey of education, a journey of discovery and inevitably a journey with little or no sleep. Part time courses are always challenging. To be working and studying at the same time leaves one in a state of constant panic. Add pregnancy to that equation and you have one very tired woman. That was me. Juggling teaching, studying and my first pregnancy was by far the most challenging situation I have allowed myself to be in. Alas, I have come out at the end of the journey armed with a beautiful baby daughter and hopefully a Masters degree.

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And of course, my beautiful daughter, your smile lights up the room as it has my life.

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Chapter One

About School

Anonymous

He always wanted to say things. But no one understood.

*He always wanted to explain things. But no one cared. So he drew. **

And it was after that, that he drew the picture. It was a beautiful picture.

*He kept it under the pillow and would let no one see it. **

And then he had to write numbers. And they weren't anything.

They were worse than letters that could be something if you put them together.

*And the numbers were tight and square and he hated the whole thing. **

He was square inside and brown, and his hands were stiff, and he was like anyone

else.

And the thing inside him that needed saying didn't need saying anymore.

It had stopped pushing. It was crushed. Stiff.

Like everything else.

** Parts of the poem deliberately left out.*

The author of the poem was believed to have committed suicide two weeks after penning this poem down. The poem succinctly articulates the importance of recognizing learning styles and hence the theme of this thesis. The author of the poem struggles with a constricting learning experience in which his ideas and his thoughts were forgotten and disregarded. It was unacceptable to be different. It was unacceptable to not understand. The teacher taught in a specific way, in a specific

style and the author of the poem learnt in another. His creativity, his spark, his joy in learning was stamped out as soon as he stepped into the classroom.

Yet at the end of it all, because of the complete void of awareness, the cause of his suicide would be deemed as stress. He would have been labeled as a slow learner, despite his boundless creativity.

Learning is in fact a personal journey of discovery. Nobody or nothing should determine or curb the learning process except the learner. People learn in many different ways. Every individual has a unique style of processing and digesting information. This is known as their learning style. Our learning styles are as individual and unique as our characteristics.

Many students are unaware of even possessing a learning style yet alone embracing it. They have, like many other students in Singapore, never been exposed to an alternative method of teaching and hence assume their lack of understanding in a class is solely due to their lack of intelligence or concentration as enforced by their teachers and parents. This is explicitly illustrated in the above poem.

This thesis will be about assessing and determining one's learning style. It is important that we determine the need for the acknowledgement of learning styles in our education system. Focusing on learning styles and catering towards a range of alternative styles during teaching allows for an effective learning process. Science, in particular Biology has always been a difficult subject to teach because it is deemed as

a content rich subject with “a lot of memorization” (Student’s comments) In this thesis, the model proposed is implemented in a Biology classroom setting.

Rather than diagnosing students with a learning disability, there may be a possibility that that same student may thrive in an environment where an alternative style is adopted.

The attempt to adopt an alternative style will require the use of a teacher that possesses a similar teaching style to that of the student. This will provide for an almost perfect situation in which both teacher and student are in their element of learning and teaching respectively. A model is proposed and adopted in this thesis that highlights a possible method of matching teaching and learning styles in Singapore’s education system. The focus will be on the teaching of Biology in Singapore.

What are learning styles?

“Because we each have a unique and individual style of learning, thinking and communicating, its desirable that we interact differently with information. Society needs all kinds of thinkers, with each expressing different mental strengths.”

- Connerr, 2008

Learning styles as articulated by Connerr, are as individual and unique as our fingerprints. Different interpretations are forged with the same content. Learning

styles are interconnected with how our mind works and each of us has our own mind and our own way of interpreting information.

A comfort zone is assumed to be an imaginary boundary that humans have drawn between what they are accustomed to and what has never been attempted. It has created such a defining impact on our lives.

Over the years, learning has settled into a monotonous day-to-day chalk to board teaching style. How this monotony set in remains unseen. Learning styles are like our individual characteristics; people need to accept our characteristics to accept who we are and how we respond to situations and circumstances.

“Human beings can learn any subject matter successfully when the instructional methods used are matched with their individual learning preferences.”

- Research done from St John’s University in New York.

To ensure life long learning, the beginning of our educational journey needs to be one that matches our individual learning preferences. This would ensure subject matter is retained and learning is desired rather than forced.

Attitudes towards learning are determined by how one is taught in school. Therefore if the experience attained in school is negative or not completely favorable towards the individual, there is an increasingly high possibility that knowledge acquisition will end once the individual leaves school.

In the Singapore education system, learning has been assessed at each juncture of a student's life through examinations and test. This may be a valid and undoubtedly a sure fire way of determining one's learning ability and capacity. However, the process of learning is assumed as a standard for the entire cohort. Little is done to explore alternative methods that may *suit* different learning abilities.

"In the last 30 or 40 years, a number of educators have proposed that teaching would be more effective if faculty members took account of differences in students' learning styles."

- Mckeachie, 1995

Many new approaches have been introduced in an attempt to cater to individual learning abilities. However, despite the alternative methods, the class sizes of 40 (sometimes even more) leave the students feeling forgotten and often forced into accepting a style that may not be theirs.

However, there are several factors that could influence this attitude. Peers, school environment and most importantly the teachers. Of these three mentioned factors, I think teachers have the highest influential level. Their presence is the presence that is often related to the learning experience. They are the communicators of knowledge and to the students; they represent the face of learning.

Teachers may employ numerous methods of teaching that engage the students and create an unforgettable learning experience. When the learning experience is memorable, the concepts taught are often concepts that remain with the student long

after the student has graduated. There are no universal engaging methods of teaching. Not every method employed may result in a successful delivery of a concept. As discussed earlier, each of us possesses a learning style that is unique. Despite the lesson being interesting, there may not have been effective knowledge acquisition.

“Who would ever realize, without being told, that these minds experience links between simultaneous events—that the cloud formation in the sky outside the classroom window carries the same message as the teacher’s words?”

- Connerr, 2008

Again, Connerr succinctly describes the fact that a simple process like a cloud formation may transmit a message far more significant. Every object, every process holds a different message that is interpreted differently by an individual. This reflects our learning styles. We may all be exposed to similar external factors, but the way in which we interpret these factors and in the end retain them differ according to our styles.

Literature Review

Even before learning styles was coined as a reputable and credible strategy in education, we all knew that we learn and interpret information presented to us differently. Some interpret information more effectively if presented in a verbal format. Whereas others interpret information more effectively when there are pictures and graphics involved. They are able to read more into an image rather than when being told the information.

The following literature review is based on the research I have done on several articles and books. The review encompasses what this entire thesis is about. However these are views and perceptions of other learned individuals.

The review is divided into 4 main sections –

1. The need for studying learning styles.
2. The study of learning styles
3. The study of teaching styles
4. The matching of teaching and learning styles

The need for studying learning styles

The need for studying learning styles was highlighted as the need for “a comfortable learning environment” (Fuller, 2004), which will result in effective and efficient knowledge acquisition. When a student is comfortable learning and acquiring knowledge, there is undoubtedly effective learning taking place. Comfort level can be acquired by ensuring a student is in an environment that offers no threats. (Connerr, 2008)

When learning styles are recognized and accounted for, learning becomes a lifelong journey (Fuller, 2004) not one that stops after we have left school. This is because we develop a thirst of knowledge because the quest for it was fruitful and painless to begin with. This encourages a further quest and an unquenchable thirst.

When one's learning styles are not met, we tend to feel we are incompetent and stupid, when in actual fact we simply need an alternative medium of interaction.

- (Fuller, 2004)

On the other hand, when our learning styles are not met, we tend to feel that the lack of knowledge acquisition is through a fault of ours. We blame ourselves and in fact our ability to process information. This creates a premature impediment to our knowledge acquisition.

The study of learning styles

Emphasis has been placed on the study of learning styles for students. Numerous types of learning styles have been identified. One of the most outstanding portrayals of learning styles as 12 different styles (Connerr, 2008) clearly indicates the depth in which this research has been done.

One of the advocates of learning styles, Sternberg, silenced critiques to the study of learning styles when he referred to their opinions and viewpoints as “ignorant.” (Sternberg, 1990) He believes that a study of learning styles would in no way hamper the process of learning. In fact he believes that students would thrive in an environment where learning styles are acknowledged and accounted for.

The study of teaching styles

Unfortunately, less research has been done on teaching styles. There are perceptions that link teaching styles to the teacher's learning styles.

“Research supports the concept that most teachers teach the way they learn.” (Stitt-Gohdes 2001) Most teachers would teach based on the practice that best worked for them. The method, by which they learnt, provided for effective knowledge acquisition and in their opinion would provide for effective learning for their students.

The matching of teaching and learning styles

In this area of my research, I faced several critiques of similar models in which teaching styles are matched with learning styles. The main critique was the fact that there is a lack of scientific evidence supporting the benefits of matching these styles.

“We were startled to find that there is so much research published on learning styles, but that so little of the research and experimental designs that had the potential to provide decisive evidence.”

- Glenn, 2009

There are scientists that claim that this proposal of matching the two styles is redundant and useless because of the lack of research done in this aspect. (Glenn, 2009) Unfortunately, before learning styles was a proven strategy in the classroom, the learning styles predictor kit became commercialized. This “cheapened” the idea of

adopting learning styles in the classroom. It was seen as a moneymaker and therefore unreliable.

“But the important thing to remember is that what are called "learning styles" are preferences and habits of learning that have been learned, and that everyone is capable of going beyond the particular "style" preferred at the time. Regardless of their learning "styles," students can learn strategies that enable them to be effective when taught by methods that are not compatible with their preferred "style." To assume that one must teach to a particular learning style misses the fact that a given student may be best taught by one method early in learning and by another after the student has gained some competence.”

- Mckeachie, 2005

Despite the fact that matching learning and teaching styles would provide for an ideal situation in which effective and efficient learning may take place, it is important to note, as Mckeachie has successfully articulated, that opposing strategies to our learning styles may provide an equal benefit to the students. Mckeachie believes that a match may not necessarily be the key to effective learning. He believes that developing a person's learning through exposure to different and opposing strategies may result in a more competent student.

Despite the critiques on matching the two styles, the advocates of learning styles, (Sternberg, 1990) still believed that a matching would provide a learning environment that is comfortable and suitable for effective learning. There was a general consensus that the match, if further explored and studied would result in a revolutionary approach to teaching and learning.

Learning disability or misunderstood learning style?

When a student is unable to perform to a certain standard in school, or exhibits behavior that is unacceptable in a Singapore classroom setting, they are diagnosed with a learning disability. I personally hate the word disability. It makes no sense. Not being able to do something in a particular way may not necessarily leave one inadvertently hopeless in performing that same task in another way. It is imperative to understand that not being able to perform any task, physical or mental, in a way that is determined by societal standards does not make one disable. In fact a person that is able to perform above and beyond the societal standards should be proclaimed and respected not labeled as disabled.

A viscous cycle ensues. When an opposing teaching style is used for a student with a particular learning style, the student will seem bored and disinterested. This results in the teacher complaining to the student's parents about the student's limited attention span and lack of concentration. The student in turn reacts in a defensive way. He refrains from trying to behave, as he feels misunderstood and judged. Whatever little knowledge the student was attaining from the teacher is now down to zilch.

For example, a kinesthetic learner requires movement during learning. He thrives on being given the liberty to move during the learning process. However, in a regular classroom setting, this kind of behavior will render the student a label of being attention deprived and teachers would advise parents to seek professional help claiming that the student is intolerable in class and disruptive. The student ends up

feeling ashamed at being labeled and in the worst-case scenario, gives up the learning process altogether. Once again, the student is the one who loses out.

Instead of approaching the possibility of a learning disability as a initial solution, it would definitely benefit the student if his/her learning style was acknowledged first. In this way, the student does not lose out even before his/her learning journey has begun.

Chapter Two

Over the past chapter we have dwelled into the need for there to be a recognition of learning styles and the benefit of the recognition. When there is recognition of learning styles, how should they be classified?

In this chapter, there is an in depth focus on the different interpretations of learning styles. Most advocates of learning styles lean towards the traditional method of classifying the learning styles according to the three main styles, Auditory, Visual and Kinesthetic. (Armstrong, 1980)

In my opinion, everybody can be classified according to these three styles. There is a definite distinction between the way we process information and the classification according to the three general styles provides a general guideline in which we are able to follow.

However, a Visual learner may interpret information in a visual format according to pictures and graphics. Two learners who both interpret information in the similar format may have different levels of retention of knowledge and may even be meticulous in different facets of their learning. This would mean that within these three generalizations, there could be a further division of our learning styles, which would provide for a more in depth perspective into the way we learn.

In this chapter we focus on the three main learning styles as well as an in depth focus on a more detailed perspective of learning styles. (Connerr, 2008) This detailed

perspective is what the survey in this chapter is focused on. The survey is an alternative approach in determining our learning styles as opposed to the traditional questionnaire format.

The survey is based on the detailed perspective of learning styles according to Connerr 's interpretation. (2008) However the survey was created from scratch through my own experience in a restaurant. Through personal observation, I realized that people generally read the menu at a restaurant differently. It never occurred to me before this how fundamentally important a mundane seemingly irrelevant task is towards learning styles. I realized that the way in which a person reads a menu and orders his/her food depends on his/her learning style. And hence the construction of the survey ensued.

Different interpretations of learning styles

In Talkers, Watcher and Doers, (2004) three main styles are identified and described. They are the auditory learner, the visual learner and the kinesthetic learner. Many papers and books on improving learning abilities focus on these three types of styles. Individuals are generalized and classified according to these three types of styles. The three styles are briefly discussed below.

Auditory learners are learners who listen and learn. They digest information by simply listening. They are able to sit through long lectures easily and walk away from the lecture with valuable and important knowledge attained.

Visual learners are learners who learn by sight. They are able to visualize the solution to a problem. They see it in their head like a photograph and are then able to write it down. They are not able to follow verbal instruction well and works best when there is a list of things to do rather than being told what to do.

Kinesthetic learners are learners who learn when their body is active. They need movement to digest information. They learn from touching and experiencing for themselves rather than being told a theory and made to understand it. They tend to misunderstand instructions when presented orally or visually.

The table below succinctly illustrates the categorization of the three learning styles. This tabulation was adapted from. There is a concrete difference between each type of learning style, based on the learner's interpretation of experience as well as common comments the learner would make in regards to knowledge acquisition.

Learning Style	Auditory	Visual	Kinesthetic
Interpretation of experience	Identify sounds related to an experience	Have a sharp, clear picture of an experience	Develop a strong feeling towards an experience
Common comments made by the learner.	I hear you clearly, I want you to listen ... This sounds good	Do you make pictures in your head Do you have visual images in your head as you are talking and listening to me? Can you see what I am saying?	Do you feel what you are saying? Are you in touch with what I am saying?

There are individuals whose style transcends 2 different styles or even broaches a little of each, hence producing a completely different style altogether.

However, after further reading especially the book *Learning Without Tears*, (2008) there was an alternative classification of styles that addressed the comment above.

Learning styles are as individual as our characteristics. One author went as far as providing fingerprints as a benchmark by which learning styles should be compared. (Fuller, 2004) In other words, indicating that learning styles are unique to each and every person. There may not be general classifications for each and every style.

Each person possesses a combination of two or three of these styles. In *Learning Without Tears*, (2008) the classification is more detailed and allows for more than just three main styles. The classification of styles here also allowed avenue for the characteristic input of the individual. This is a very important point that most learning style scientists leave out. Our character determines the way we learn.

If we are sensitive individuals by nature, we tend to process information with our heart and not with our head. If we are straightforward individuals who are relatively no nonsense we tend to process information at face value and determine its importance immediately upon processing it. These styles are further discussed in this chapter.

Revolutionized Learning Styles

After discovering the interpretations of several different learned professionals in regards to learning styles, I discovered a particularly interesting interpretation that I

could easily identify with. The interpretations were clear and concise and yet exceptionally detailed. These interpretations are by the learned, Helyn Connerr from her book, “Learning Without Tears.” (2008)

I adapted the interpretations or profiles as she identifies them, according to my own observation and research of students and teachers in the school environment. There are altogether twelve profiles. Each of which deals with how the student best learns and acquires knowledge. In Helyn Connerr’s book, there are even tips and strategies as to what a teacher or a parent could do to best benefit the student of that learning style.

The profiles are represented by appropriately chosen nicknames and characteristics of animals, which illustrate the depth in which Helyn Connerr has dwelled in to identify the facets of these profiles. In my interpretation of the author’s profiles, I exclude the tips and strategies offered to the parents and instead focus on the environment and specific features of teaching that best suits a student of that learning style. I categorize each style into subcategories; **Characteristics, Learning Environment** and **Flaws**. This categorization provides a clearer focused perception on the learning style and how best to suit it or match it in the classroom.

1. First Profile – The Trailblazer

This profile is represented by a squirrel.

Characteristics

Squirrels are often quick and fast with their movements. Similarly, students with this learning style are often very quick on the uptake. They treasure their thirst for knowledge and make it known to everyone around them how much they know and how much they want to know. A little like an eager beaver, students with this learning style are independent and creative.

Learning Environment

These students will thrive in an environment where lessons are discussed rather than simply taught. They use their thoughts as well as the thoughts of their fellow learners to form theories. Debates and argumentative essays are assignments that he/she would love and would be able to absorb the most from. A challenging situation will spur this student on, however he/she does not thrive in an environment where there is constant teaching and very little opportunity for discussion. The ambience of the classroom that best suits these types of learners must be one that involves movement and discussion intertwined with regular teaching.

Flaws

They may appear too forthcoming in their opinions and their thoughts. The independence of thought may sometimes appear offensive to authoritative figures in their life for example their parents or teachers. He/She learns in reference to himself/herself and this may appear self-centered and somewhat self-proclaiming.

2. Second Profile – The Vault

This profile is represented by an Ox.

Characteristics

An Ox is a slow moving animal that takes its time in achieving its aim. Similarly students categorized under this learning profile tend to acquire information in a slow and steady pace. Information or knowledge that is acquired is subjected to a importance and priority test. What is retained is relevant and important according to the student's discretion. Despite retaining selected knowledge, the knowledge acquisition becomes permanently embedded in the mind of this student, hence the appropriately chosen nickname, The Vault. Aesthetic appeal plays an important role in determining which bearer of knowledge this student will relate to.

Learning Environment

The way in which a lesson or knowledge is packaged and delivered to this student needs to be aesthetically pleasing. In other words, the teacher must be appropriately dressed and the slides or the notes containing the content knowledge needs to be organized and in a proper format.

Outside disturbances tend to have little or no effect on this student. He/She will remain fixated on knowledge that he/she deems important despite the numerous disruptions to the lesson. Kinesthetic modes of teaching tend to favor the intellectual development of this student.

Flaws

Students with this learning style tend to be inflexible in their thoughts and actions. They are firm and steadfast in their belief of what is important information. This student responds almost negligibly to criticism or feedback to perform tasks in an alternative method.

3. Third Profile – The Curious

This profile is represented by a butterfly.

Characteristics

A butterfly is an animal that enjoys the gift of flying. Anywhere and anything will be explored. Students with this learning style are in one word, inquisitive. Everything is of significance to them. However if the answer is delivered in a somewhat slow manner, the interest of acquiring the knowledge is quickly lost. The more general the information attained, the better. The details of the topic or the in depth knowledge is something that this student will refrain from.

Learning Environment

This student enjoys both visual and audio stimulations of learning. Project based assignments are the assignments that this student will ace. Knowledge is acquired quickly and within one lesson. Repetition is not required and in fact considered

mundane and monotonous by this student. The newer the information and the more recent and current it is, the better.

Flaws

He/She is however unable to retain facts and information that does not seem useful to him/her. Instead information gathered is only retained for the duration in which it is in use. After which, the information is quickly forgotten. Similarly, a butterfly may visit the same flower more than once in a day without previous recollection of having visited it the first time.

4. Fourth Profile – The Sensitive

This profile is represented by a swan.

Characteristics

I relate very much to the description of this learning style. Students possessing this learning style acquire knowledge through their heart rather than their minds. They are highly strung in the emotions sector. Their outlook on life is brimmed with emotions and feelings. The importance or priority of knowledge is rewarded based on how it feels. He/She is able to read into people's feelings by simply studying their body language and the conversation they are having. There is so much connection with her/his emotional realm that there is nothing he/she goes through in life without it having some emotional connection.

Learning Environment

An artistic student, he/she learns effectively with pictures and artistic representations of the content to be acquired. It is of utmost important that the learning environment is quiet and safe for this student to thrive. Overwhelming and upsetting the balance of the assurance that a safe environment provides can result in a drastic decrease in the acquisition of knowledge.

Flaws

This student is easily distracted and can go from learning to simply stoning when her favorable learning environment is threatened. With so much emotion involved in learning, the process of learning becomes very volatile, just like human emotions. This volatility may not necessarily suit a regular school environment.

5. Fifth Profile – The Dignified

This profile is represented by a lion.

Characteristics

Ideas and knowledge must be classified as important and relevant to be acknowledged by this student. He/She is incredibly intuitive. The ability to listen to what is important and to disregard what is not is innate. He/She develops a fierce passion for what he/she acquires and believes in. The knowledge remains in his/her brain for as long as it takes to use it.

Learning Environment

This student's learning environment may be the simplest and easiest to create. There need not be appealing visuals or interesting facts. As long as the content is relevant and important, this student will have an automatic acquisition of the knowledge. Pressure is also not well received and should be absent if effective learning is to be observed.

Flaws

Instructions that do not suit his/her current agenda will be easily disregarded and no response will be given. Often the appearance that this student does not hear you or even understand you due to the lack of response is projected. This may lie unsettlingly for authoritative figures in the student's life.

6. Sixth Profile – The Analyst

This profile is represented by a monkey.

Characteristics

Curiosity is an understatement for this student. He/She has an overactive curiosity in which every aspect of knowledge needs to be scrutinized and dissected. Information is acquired as small tiny parts which is in fact part of a whole picture. Questions, incredibly detailed ones, are a norm for this student.

Learning Environment

Hands on approach are the best way for this student to acquire knowledge effectively. He/She learns by experiencing the concept and seeing it for themselves. The opportunity to observe a concept in its sub components allows this student to efficiently acquire the knowledge without difficulty.

Flaws

The constant questions may occasionally appear as an insult for a learned individual in which knowledge is attempting to be delivered. The questions may sometimes appear as an interrogation rather than a product of an inquisitive mind. This student's method of processing information requires time and patience, which sometimes may not be a liberal component especially during a classroom session.

7. Seventh Profile – The Diplomat

This profile is represented by a parrot.

Characteristics

The Diplomat is a student that subjects all information that he/she encounters through a weighing balance in his mind. There is a constant battle of pros and cons in understanding content. Alternative perceptions of knowledge are a regular mental wheel turning occurrence for this student. Creativity is an innate quality as new and unique ideas stem from simply considering different perspectives.

Learning Environment

Group work, which involves discussion, serves this student very well. He/She enjoys listening to different perceptions on the same topic. The alternative vantage points enable this student to develop his/her own theory about the content, which allows effective learning.

Verbalizing ideas facilitates a mental conclusion for this student. Wordy novels and papers appeal to this student. The presentation of content needs to be respected.

Flaws

The process of learning for this student may sometimes appear as an indecisive process. Because of the numerous advantages versus disadvantages going on in his/her mental facet, the student may require more time in effectively acquiring knowledge. This is simply because, to this student, all points of views are important and endearing.

8. Eighth Profile – The Detective

This profile is represented by a snake.

Characteristics

This student relies heavily on his/her investigative skills to discover knowledge and content. In other words, he/she learns through his/her own assumptions, theories and perceptions. The student's perceptions and assumptions are influenced greatly by knowledge from authentic and reliable sources. Even the bearer of the knowledge is scrutinized for credibility.

Learning Environment

This student will not benefit with a regular lecture style lesson. This student is a very visual person. Seeing is learning. However, learning in this sense may not necessarily mean learning the right content. Often, this student absorbs limitless information without a gauge on its importance.

Flaws

This student tends to appear serious and fails to understand boundaries of his/her perceptions. He/She may perceive something personal from an action that a person has made and will discuss it as an after thought.

9. Ninth Profile – The Pioneer

This profile is represented by a fox.

Characteristics

This student creates and extinguishes ideas and perceptions at lightning speed. He/She has a somewhat hyperactive curious mind with unlimited questions and ideas. Every action, whether mental or physical, is a development of knowledge for this student. However, as quickly as it is created, ideas vanish as they use up the necessity facet of his/her mind.

Learning Environment

This student would appreciate being teacher's pet. He/She would love moving around, handing out papers when everyone is confined to their seats. Long-term memory is non-existent in this student's mental dictionary. "Cramming" or last minute studying suits this student very well.

Flaws

What is retained is only retained if it is constantly in use. Anything that is dormant in his mind is discarded. His/Her enthusiasm is easily extinguished by disapprovals or unfounded criticism. Once his enthusiasm is gone, his quest and thirst for knowledge is quickly depleted as well.

10. Tenth Profile – The Achiever

This profile is represented by a goat.

Characteristics

This student observes things and decides things as how an adult would. His/Her manner of thinking and mode of expression is very matured. Any information that needs to be retained needs to serve a practical function. Practicality is one of the leading factors that all ideas and thoughts are subjected to. He/she develops automatic scaffolding to everything around him/her.

Structure and rules are what this student thrives on. Chaos and impromptu matters are frowned upon and not welcomed.

Learning Environment

This student understands little when given a textbook or shown slides on content. What triggers the mental absorption of this young individual is the ability to experience the content of what he/she is learning. The environment of learning needs to be one that is organized and systematic. Each thought has its own place in his/her 's brain. Similarly, all aesthetic, external components should have its own place in his/her environment.

Repetition suits this student very well. The many times as the information is repeated, the better.

Flaws

The repetition aspect of this learning style may serve as a flaw as well as an advantage. There is little or no acquisition of knowledge if the content is not repeated. This requires valuable educating time. New information, if packaged in an unconventional manner appears as void information for this student. Because of the perfectionist mindset, outputs may be delayed and may not even appear if it is not perfect enough.

11. Eleventh Profile – The Innovator

This profile is represented by a penguin.

Characteristics

This student enjoys being different and alone. He/She tends to refrain from conforming principles and thoughts. Individual and unique thoughts and ideas are what are important and retained.

Learning Environment

What is taught to this student must fit a criterion of practicality and usefulness. If information delivered is not up to par with what is important, it will be forgotten or discarded.

Flaws

This student is not receptive to suggestions and feedbacks. Simply because, this student does not realize the impact of the impression he/she is reflecting. He/She appears to be unreceptive and obsessed with his/her own thoughts and ideas. But to the student, it is a normal and acceptable behavior. The impact the behavior has on an observer is a foreign concept to this student.

12. Twelfth Profile – The Intuitive

This profile is represented by a dolphin.

Characteristics

Everything is view and perceived as a whole. An all-encompassing mind that includes rather than excludes. Details are explored after the big picture is initialized in the student's mind. This student represented by a dolphin, plods through life with intuition as his/her head light. Every thought and idea is framed by instinct and intuition. Similarly a dolphin uses intuition to determine its next course of movement or action.

Learning Environment

Learning is emotional for this student. The absorption of knowledge and content is limitless. Retention of knowledge is however the opposite. It has its boundaries and limitations. A very visual individual, he/she thrives on absorption through pictorial

formats. However, any other format is rejected in terms of retention or even acquisition.

Flaws

Evidently, this student is often chided as a person with short-term memory and useless retention skills.

This student is often disregarded as being lazy and unfocused, however this to me appears to be the flaw of the system rather than the flaw of the individual. Brimming with creativity and ideas, this student is misunderstood because of her outward representation of her manner of acquiring knowledge.

Determining our learning styles: A survey

This survey is based on Connerr's interpretation (2008) of learning styles as described in the previous section. To further illustrate the characteristics of each learning style, I tabulated all twelve learning styles according to the following characteristics. The table can be found in Appendix 1.

1. Stimulation of learning

This focuses on what stimulates the individual to learn. What triggers the interest of the individual.

2. Knowledge Depth

This focuses on the depth in which the individual acquires knowledge.

3. Relevance of knowledge

How does the individual determine what knowledge to acquire.

4. Assignments

What kind of assignments suits this individual.

5. Retaining knowledge

How much knowledge is retained for this individual and what kind of knowledge is retained.

6. Organization

Is the individual obsessed with being organized or is organization a quality that is non-existent.

7. Emotional

Is the individual's learning based on how he/she emotionally feels about the knowledge.

8. Others

Any other important information about that particular learning style.

Originally learning styles surveys are done using a questionnaire or an inventory list. The questions are based on the way in which one acquires and retains knowledge. Questions are phrased in a multiple-choice format (Soloman) where options are given for the learner to choose from. The format is formal and emits a serious tone. As I attempted this questionnaire, I was particular of my answers with the mindset that the way in which I think and learn is at question. I was therefore careful in ensuring I did not appear somewhat dumb or silly with the wrong answers. There was a similar response when the questionnaire was attempted by my colleagues and selected students.

The seriousness of the mindset during the attempt does not necessarily produce an inaccurate response. However, the fear of being inadequate and the anxiety of determining one's learning style may result in the learner being brought out of their comfort zone. If one is out of one's comfort zone, there is a lack of security and this may result in an inaccuracy of answers. (Granger, 2010)

However, if a comfort zone is created, or if the context of the questions is different from a regular educational or classroom setting, the learner or the student may approach the questions with a different mindset therefore producing a more accurate and honest response.

One example is the VARK learning styles questionnaire (Fleming, 1992) where questions are asked based on different scenarios and the responses of the student are elicited. The student based their responses on the context of the different scenarios and relates it to their learning. This provides the student with an alternative scenario and setting, which encourages a more accurate response.

Background research/observations

The survey was created with the twelve learning styles (Connerr, 2008) in mind. The survey is found in Appendix 2. There were a few rules/structures that I followed when constructing this survey. The rules or structures were adapted and followed to suit the needs of the user.

I based these rules and structures on observations of my students and fellow colleagues. My best subjects were actually my family members. I realized that again, comfort zone was a key factor in ensuring an accurate response.

1. Rule One – Restaurant Context

I created the survey with questions related to a restaurant context. It would work well, if the learner or the student actually visited a restaurant and followed through with their regular behavior, after which attempting the survey.

The questions are based on the student's response to a restaurant ambience and how the student reads the menu. The environment and setting of these questions ensures a comfort zone is created. The anxiety of determining one's learning style is not in the forefront of the student's mind and instead, the student is focused on his/her actual response to the questions in a comfort setting.

This provides for a more accurate response simply because the pressure of attaining a seemingly good learning style is absent.

2. Rule Two – Simple language

The language used for the survey is simple and to the point. There is a lack of extensive articulation of the language. Instead, the simplest form of the word is used. This ensures that the survey works for both students as well as teachers.

The language used prevents or reduces the chance of a misunderstanding of the interpretation of the question. The audience, whether students or teachers will understand the questions and the language used.

*“Design survey questions that are **simple, short and clear**. Don’t use large, complicated words and ideas when smaller, simpler ones will do. Your intention is for your entire population to be able to understand and answer your questions.”*

- Gingery 2009

When the intention is to create the survey for teachers and students, there must be a language appropriate survey questions created. The same principle is adopted when the feedback form was created.

3. Rule Three – Guiding Principle

The guiding principle is simple yet very effective. The motive behind the principle is to provide an invisible guidance to the questions and the scenario that is created. The mindset and the thought process of the learner or the student are created according to the way the questions are phrased.

This ensures that the learner or the student achieves the end result with the correct thought process and mindset. The required end result is achieved without misinterpretation of the questions or the aim of the questions.

Chapter Three

This chapter focuses on the whether teaching styles are similar to learning styles.

There is some evidence to show that the way in which a teacher teaches reflects very much on the way in which the teacher has learnt. This is further explored in this chapter.

In this chapter, there will be an initial glimpse into matching teaching and learning styles. And in particular is this matching of styles is applicable to the teaching of Biology in which content is rich and knowledge is in depth.

The Singapore education system, despite being adapted from the United Kingdom's education system has been localized and is in fact unique to Singapore. The different policies and strategies that have been introduced focuses on creating advancement in education. In my opinion, this model is one that will aptly fit into the requirements of Singapore's education system.

Teaching styles: Are they similar to learning styles?

“Although individual studies support teaching to learning styles in the classroom, some educators feel there's not enough consistent evidence to justify it.”

- Talkers, Watchers and Doers.

A teacher is often described as an educator, an individual who “moulds the nation” (MOE), or even an individual who brings out the best in the students.

The way we teach, or even the way we explain things is the way we have acquired the knowledge. In other words, the way we teach is the way we have attained the knowledge and processed it.

In a way, teaching style represents the thinking process of the individual, the learning style of the person. Learning style as defined earlier, is the way in which human beings begin to concentrate on, absorb, process and retain new and difficult information. (Dunn, 1999)

The way in which an individual processes information eventually develops into the manner in which the individual delivers the information.

If a student possesses a particular learning style but is taught in a style that opposes the way the student learns, the student will appear bored and disinterested. It does not necessarily mean no learning will take place. There will be some or little acquisition of knowledge. The process of attaining this knowledge will take longer and it will be a difficult process for the student.

However, if the teaching style matches the learning style of the student, the learning process becomes more efficient and more effective.

This matching of styles seems straightforward and sensible. However, critics (Glenn, 2009) have expressed opposing views in the area of lack of research as well as some other issues that will be further discussed in this chapter.

Some critics have indicated that the matching of styles in the classroom may lead to a monotonous classroom in which all students respond in an almost similar manner. (Brown, 2003) Despite the fact that there is efficient and effective attainment of knowledge, the monotony of the lesson may result in a lapse of attention for the students. Simple, irrelevant things will begin to distract them and draw their attention away from the intended course of learning.

Matching Styles: Will it work with the teaching of Biology?

“Most of the attempts to match students with teachers have proved to have relatively little effect upon learning. It is plausible that, at least initially, trying to fit teaching to a student's learning style may be helpful.”

- Mckeachie, 1995

In a perfect world, teaching and learning environment would be a creative, stress-free ambience where ideas flow freely and limitations are extinct. Biology teachers, myself included, strive to establish the fact that understanding of the content comes before the memorization. However due to the fact that Biology is such a content rich subject, students often move straight into memorization, which in the end results in zero retainment of knowledge.

“When students cannot learn the way we teach them, we should learn to teach them in the way that they can learn.”

- Fuller, 2004

It is important to realize that we as teachers should be somewhat versatile in the way we teach. What Fuller is implying in the comment above, is that students should be provided with a suitable ambience and environment for learning and this can be done if the teaching style suits the learning style of the student.

“A method appropriate for most students may be ineffective for other students who could learn more easily with a different approach. Methods of teaching (e.g., graphic or verbal), ways of representing information, personality characteristics of teachers all affect learning and affect different learners differently.”

- Mckeachie, 2005

Mckeachie clearly illustrates in the above comment that there are numerous extrinsic factors that influence the learner. As mentioned earlier, the most influential aspect would be the teacher and the way he/she teaches.

The success of using learning styles is hindered by the traditionalists who cling on to the old habits of teaching. They consider the revolution a “pedagogical high-tension” which is instituted by “freaks of gifted education.”

I have experienced this old mindset first hand from an adjunct teacher in my school recently. We were using this new innovation in my school known as the Interactive Whiteboard. The software enables the student to view images in 3D and allows the student to participate in the lesson by using a touch screen. This is especially useful for Biology teaching in which diagrams and images are essential parts of learning.

Upon observing the lesson, the senior teacher remarked that no new skills are going into the playing around of images with a “pen”. The stylus used was considered a “pen.” No surprisingly, she insists that the students would learn more if they were given more assessment questions and were tested every lesson. Her comments at the end of the lesson were that the students failed to learn anything during the lesson and in fact misbehaved and were wildly out of control. In her defense, the students were noisy and excited at the possibility of a lesson without the constant droning of their teacher’s voice. Not to mention the sight of the computer. With a class of 40 students, it did get somewhat out of hand. However, after each student had a chance to experience the software at play, their interest inclined towards the knowledge and the content of what was shown. The entire class session took a lot longer than a regular lesson. The process is inevitably a long one but the rewards are well worth it.

There is no doubt that assessment based knowledge is still one of the best and one of the most valuable tools a teacher could possess. However, introducing the students to the Interactive Whiteboard was a means of triggering their attention and developing an interest for learning rather than ensuring acquisition of content. By employing the use of foreign tools during learning, a passion for learning is created. Knowledge delivery becomes secondary.

What is often misunderstood by the traditionalists is that students are distracted rather than intrigued by these external media. There needs to be a more long-term approach in maintaining the interest in learning. This is the approach we need to adopt rather

than ensuring marks are attained. In this way, the student graduates with not only a knowledge rich head but also a thirst and passion for wanting to learn more.

Encouraging this thirst for knowledge, allows a student to discover more than just what the syllabus indicates. There is an out of boundary creativity that is sparked which in fact is often extinguished during a normal teacher centered lesson.

Making this thirst for knowledge permanent requires a delicate nurturing of passion rather than a content rich overload.

Nurturing passion requires the student to develop a want not a need for learning. The methods need to elicit an interest rather than desperation to score. The passion is intrinsic. Just like the learning style. It comes from within. If the style is catered to or is adhered to in the way the teacher teaches, the student will develop interest rather than desperation.

As mentioned earlier, a student processes information in a particular format that is unique to the student. If the method in which the student is taught compliments the mode of procession in his information centre, the student effectively acquires this knowledge with the expectation of a further delivery of more information.

Thus an interest is created.

On the flipside, if the method fails to complement the student's style, there is a more difficult mode of processing information that is incompatible with the student's method of processing. The student takes a longer time in acquiring this knowledge

and concludes that the content is too difficult. The thirst for more knowledge is immediately stamped out as the basic knowledge becomes difficult to digest.

An analogy that may suit this scenario is the compatibility of an Apple computer and a regular computer using Windows. When a document is incompatible with an Apple computer, the user is forced to change the format or convert it in order for it to be viewed on the Apple computer. This process is sometimes difficult and time consuming. The user may conclude that an Apple computer is difficult to use and gives up in ever trying to use one at all.

However, if the document is compatible and easily viewed, the user finds it easy to use the Apple computer and discovers that there are certain features and functions that exceed the limitations of other computers. The user will then continue to use the Apple computer with a desire to continuously try and develop documents from the computer.

This is very much similar to the matching of teaching and learning styles. When the way in which a student processes information is matched by the mode of delivery of the teacher, the student effectively and efficiently digests the knowledge and content delivered. The student will in actual fact develop a thirst for new knowledge rather than be satisfied with what was already given.

This results in a nurturing of a passion for learning.

Exploring Realities: Singapore's Education System

I am entrenched in this system as a government schoolteacher and I am familiar with the rules and regulations of the Ministry of Education in Singapore.

Disadvantages

One of the main features of the Singapore's education system that immediately works in opposition to the model proposed is the class sizes. Because of the severe lack of teachers in the system, it is close to impossible to ensure a teacher student ratio of 1:20. Not only will the model fail to work, even normal knowledge acquisition becomes difficult and painful, as there is very little one to one contact between teacher and student.

In a class of 20 or less, the teacher student ratio is at an all time low and one to one interaction is not only possible but difficult to avoid. When the class is small, the teacher is easily able to detect and discover the learning styles of the students. In this way, the teacher is able to match her teaching style according to the way in which the student learns.

The introduction of the model aims to alter the direction of teaching and learning into processes that are fun, engaging and most importantly comfortable for both parties. Teachers have very often, spoken through my own perspective, lost their direction and their purpose when classes are difficult and unmanageable. The drive in ensuring

knowledge is delivered with an element of interest cultivated in acquiring the knowledge is long gone.

Advantages

“MOE will also study how it can build on recent enhancements to better customise secondary education, in terms of curriculum offerings and approaches to students with different learning styles and needs.”

- (Eng, 2009)

The ministry is definitely trying to move towards an education system that caters for all types of learners and hence catering towards different learning styles. There is indeed recognition of learning styles and the need to account for the different learning styles is identified. However there is no system in place in which learning strategies are adopted solely for the benefit of a learning style.

“In Singapore, there are many important initiatives launched by the Ministry of Education to reform the nation’s educational system. For example, ‘Thinking Schools, Learning Nation’; ‘Innovation and Enterprise’; ‘Teach Less Learn More’; and ‘Engage Learners’ are the government’s visions for developing a productive and resilient nation to face the challenges in the knowledge-based economy.”

- (Kim, 2006)

There is no lack of strategies or innovations launched by the Ministry each year. Once again, there is a call for more innovative approaches towards teaching. In fact the

Teach Less, Learn More campaign was one that particularly struck me as a very realistic strategy that could be implemented at the ground level. Using the matching styles model, the strategy of teaching less and learning more is encouraged and emphasized.

Chapter Four

This chapter encompasses the crux of the thesis. The model is explained in this chapter. The method in which I chose to introduce this model is by describing it and then spelling out the aim and the method. The method is divided into different phases. The phases clearly indicate the steps I took in achieving the implementation of this model.

The next part of the chapter identifies a key strategy that could be adopted for a particular learning style. It was almost impossible to identify strategies for all the different learning styles. As one of the teachers involved in the implementation of the model, I used this strategy for the group of students that were matched according to my own teaching style.

Introducing “The Matching Style Model in Biology teaching.”

Description

The Matching Style Model involves analyzing and determining the learning and teaching styles of the students and teachers respectively. By determining the learning and teaching styles, a conducive environment for effective teaching and learning can be created. Once the styles are determined, the styles can be matched accordingly. It is important to note that there may not be one teaching style to suit every learning style. However there is a range of learning styles that may suit a particular teaching style.

The model addresses this possible compatibility of styles and the effectiveness it serves in the aspect of teaching and learning.

Aim

The aim of the model is to create a comfortable environment where students feel at ease to express their opinions. As mentioned earlier, the comfort and security of the teaching environment plays a pivotal role in determining effective learning. The environment is secondary to the primary role the teacher plays in the mode he/she adopts in delivery of information. Teaching styles vary depending on the teacher's cultural and educational background. Teaching style is also greatly influenced by the teachers' learning style. The assumption made is that by matching the styles of the teachers and the students, a conducive learning environment is created which will result in effective learning.

Method

The Matching Style Model is one that involves several rounds of preliminary research and groundwork before it can be implemented.

The model would also involve an incorporation of the lesson study model in which lessons conducted by the teacher is peer observed. The reason for an incorporation of this model is to introduce a feedback aspect into the model. Qualitative analysis will

be done based on the student's perception of the model. A qualitative research is done using the model and is explained in the next chapter.

The process is summarized in the section below. The model will be explained according to the following subcategories –

1. *The Initiation Phase.* This step is to determine learning styles of students and teaching styles of the teachers. This is a small step but it is a laborious and long process.
2. *The Implementation Phase.* How the model would be implemented in the classroom using the teaching of Biology as the focus.
3. *The Reflection and Feedback Phase.* This is the component that imitates the lesson study model. There is an aspect of peer review where external teachers are invited into the classroom to study the effect of the teaching style on the students.
4. *Revise Phase.* Another component adopted from the lesson study model, this part involves the revision of the model according to the feedback provided.

Specific Biology teaching method adopted

In an effort to ensure that the teachers' styles were exhibited during the planning of the lesson, I suggested a skeleton for the lesson outline and the teachers themselves made the appropriate adjustments based on what they felt would suit the students.

The suggestions made were divided according to the way the students were divided.

One suggestion is illustrated below in detail.

The topic that was used was, Photosynthesis.

Introduction

For the kinesthetic class, the constructivist approach was adopted. The lesson outline is as follows.

About the strategy

The constructivist approach to me is learning a concept not by understanding an explanation but by experiencing the concept. It is by arguing a concept and developing theories and opinions about a particular concept with nothing but preconceived notions and perceptions. This can be a somewhat dangerous situation to place a learner in. I realized that the main aim of the constructivist framework is to allow students to develop their own ideas and theories on a concept without the teacher's explanation. I was greatly inspired by the possibility of giving this liberation and freedom to my students.

I used an experimental set up as a method of allowing the students to develop their own ideas and opinions about the concept of photosynthesis

Objective

By allowing the students to first develop theories about the experiments, it allows them to follow a suitable framework and train of thought. The liberation and freedom of developing their own ideas was new and exciting to the students and this allowed them to further discover their own perceptions.

Through peer discussion and critique, they were able to develop even further their theories and ideas. There was a significant lack of fear in making a mistake or in making a wrong judgment. The reason for this may be because the teacher, who is the normal judge and mistake corrector, took a back seat to the whole proceedings. The teacher facilitated and guided rather than taught. In this way, the students' ideas and opinions are not curbed in any way and also not altered based on the experience or opinions of the teacher.

What I discovered from my students was that, through this lesson, the concepts were retained willingly. Usually, I notice that students "force-feed" themselves the concepts and force their own understanding of the concept by taking it "*as it is*". With this lesson, they did the complete opposite of that. They questioned the concept and they understood not because they memorized the concept but because they experienced the concept. This made a significant difference in their understanding.

The other factor that struck me was the significant role the teacher plays in this constructivist approach. Any teacher has an innate willingness to explain to a student a concept as soon as confusion is detected. I had to make an enormous effort in being

patient despite the apparent confusion that ensued during the initial parts of the class. Slowly I realized that the students are capable of developing their own ideas and even if the ideas were wrong, through peer discussion, they were able to work it out and weigh out the possibility of the error. The teacher plays an important role in doing nothing. As a student, the immediate reaction to not understanding is to ask the teacher. Again this was not allowed and the students were forced to fend for themselves.

This was not just a lesson for the students but a valuable lesson for me.

Chapter 5

This chapter focuses on the implementation of the model as an action research project. The project is described in detail as an action research project.

Action Research Project - Introduction

Armed with a descriptive and detailed theoretical model, the only area left to conquer was the action and research area. This would test the practicality of the model, which would send home the reality of implementation. I was determined to implement this model in a regular classroom setting and identify for myself, the logistical constraint or even worse the constraint of the model failing in theory.

Creating a strategy, in this case a model in pedagogical Biology teaching is based on theoretical knowledge of learning styles as well as in depth knowledge of regular teaching practices in schools. However, the model in practice, despite the massive amount of research and ideas that were intertwined will throw the model into an infancy stage of development in the area of research.

The most logical and systematic method of investigative implementation is through developing an action research project.

And so my journey of a **Qualitative Study on the Matching Styles Model** began.

An action research project can be a quantitative or a qualitative study. A quantitative study also known as a causal study, would involve an implementation of a strategy followed by a detailed statistical analysis on the impact the strategy would have on a quantitative assessment of the students. A qualitative study would similarly involve the implementation of a strategy, however the mode of analysis would be in terms of the perceptions of the students and teachers, which can be attained using questionnaires or interviews.

An action research project requires the following processes in place. The following is a guideline to the flow of an action research project. An action research project involves 5 basic areas. Each area is accompanied with a general description, which is distinguished in italics.

The details of the action research project *based* on the matching styles model are then described in the following section.

Guidelines

1. Problem definition
 - a. Research question
 - b. Research purpose
 - c. Rationale of the study

This facet of the project involves defining the problem at hand. Some of the questions I asked myself when forming this part of the project are as follows –

- *What was the initial obstacle encountered that led to the development of the matching styles model?*
- *What was the purpose of creating this model?*
- *What did I intend to achieve through the implementation of the model?*

2. Literature Review

This aspect of the action research project involves the review of other similar models. There were no similar models to the one implemented, therefore the focus of the literature review was more on learning and teaching styles in general.

3. Methodology

- a. Subjects of the study
- b. Timeline of the study
- c. Data collection

This part of the action research project involves the description of the details of the project. The focus is on the subjects, the timeline and the method of data collection. The data collection for this project was done through questionnaires, which were administered after a series of classes in which the model was implemented. The questionnaire is described and analyzed in the following section.

4. Data analysis and interpretation

- a. Analysis
- b. Interpretation

c. Follow up action

The results will be derived from the answers provided from the questionnaires.

The questionnaires are phrased to provide an insight into the perception of the students and teachers with respect to the implementation of the model.

5. Reflection

a. Strengths of the study

b. Improvements

This part dwells on the insights of the researcher in relation to the outcomes of the action research project. Improvements will be explored and the possibility of the action research project becoming a generalisable action will also be explored.

Problem Definition

The problem faced is that even though students are interested in the subject matter, they are unable to understand the concept taught. Some appreciate the laboratory lessons, while others treasure the lessons conducted in class with just the whiteboard and the teacher. There are other students who are more inclined towards a power point lesson being the lesson he/she gains the most from.

There is inadvertently a group of students with differentiated methods of processing information. Each student is different in terms of his or her learning styles or mode of knowledge acquisition. The normal method of teaching is ignoring this diverse group of individual styles.

Research Question

How does introducing the Matching Style Model improve the interest and attention of the students during Biology lesson?

The research question is phrased in a manner that would elicit response in terms of perception of the students and the teachers. There is also no numerative, quantitative data that could or should be used in the analysis of this question.

Research Purpose

The purpose of the research is to determine if the introduction of this model worked towards the benefit of this research. By conducting a qualitative research, the success of the implementation is not judged on the students' grades but instead on the perceptions of the students and teachers.

The ambience of the class and the level of participation determine the success of the implementation.

Rationale

The rationale behind the matching style model is to create a class environment in which students are comfortable learning. There is an intricate balance that needs to be achieved between students and teachers. By ensuring both parties are in their comfort zones, effective teaching and learning can take place.

Methodology

Subjects

This is the technical aspect of the whole project. The subjects chosen are the Secondary Four Biology students in my current school.

The system in my school is that the Secondary Four students are banded according to their grades and receive suitable individual attention from the teachers. Therefore we may have up to 3 teachers assigned to a graduating class. It is a department strategy to provide one on one attention to the graduating students hence ensuring their success in the national examinations. I am confident of my department's strategy and it has proven to be a success in the past.

However, after going through the system for the last 3 years, it occurred to me that despite the individual attention, some students still fall through the cracks. They appear to understand and attempt to provide assurance for the teachers that the lessons and their effort were not futile, but their assessment grades tell a different story. These students, I believe are not being taught in a manner in which the content is absorbed at 100% efficiency. In other words, their learning styles are not recognized. As emphasized in the previous chapters, the recognition of learning styles may not provide for undeniable knowledge acquisition, in fact the matching of learning and teaching styles will only ensure that there is an effective transmission of knowledge to the students.

Timeline

Teaching is an ongoing process and the effect of teaching is never immediately noticeable. However, judgment can be made through the acquisition of knowledge. An effective transmission of knowledge would be evidence of successful teaching. However, the main purpose of implementing this model was to identify the perceptions of the students and teachers rather than the effectiveness of learning through assessment. Singapore's education system has been driven by the success of assessment learning and the fun of knowledge acquisition has taken a subtle back seat.

Questionnaires

These are the specific questions asked during the qualitative study. A questionnaire was created with a series of questions that were designed to measure the specific perception of the implementation of the model. The questionnaire was administered through an online portal. This was to ensure there was minimal contact between the subjects and the researcher. A cover letter was included, found in Annex 2, which clearly defines the intention of the questionnaire and the purpose of the implementation of the model. The subjects are given a choice to participate in the survey and their confidentiality is strictly adhered to.

The questions are targeted for both teachers and students. The questions are directed to collect data based on the General Question. The following guidelines were adhered to allow for accuracy of answers.

Guidelines

1. Be aware of your audience. There are two different questionnaires. One for the teachers and one for the students. The teachers' perception of the lesson and the lesson preparation is completely different from the students' perception of the delivery of the lesson.
2. The questions asked, adopted simple language with minimal usage of confusing terminology or jargon.
3. There are no double negative terms used in the questions. In other words, the questions were phrased in a positive tone and format.
4. Each question is based on one concept at one time.
5. The questions are not leading in the type of answers expected. Instead, the questions are left open ended and open to interpretation.
6. There is no guideline as to how many questions would produce a valid questionnaire. However, I feel that it is more important that the specific questions encompass the intention of the research question.

Questionnaire for the Students

Question 1

Did you have fun learning during the lesson?

Having fun during learning will develop into knowledge acquisition. When a person is allowed to have fun, there is a comfort level achieved which enables effective knowledge acquisition.

Question 2

How did you feel about the introduction of the model?

This question is eliciting the perception of the subjects on the general introduction of the model. The question is left open ended and no inference of tone of interpretation is provided.

Question 3

What specific methods used was suitable for you?

This question is to confirm the matching of the styles was suitable and appropriate. By indicating the methods they preferred or liked, they are in confirming that the style the teacher adopted was suitable for their understanding.

Question 4

How helpful is the model towards your learning?

This question was administered to determine the benefit of the model towards the learning of the students.

Question 5

How would you describe the atmosphere in the class? Was it conducive or was there minimal participation?

This is another clear indication of the level of comfort achieved with the model. The stem of matching the styles rides on the comfort of the students and the teachers. If there is comfort, there is an undeterred exchange of knowledge and ideas which in turn results in effective knowledge acquisition.

Question 6

Did the implementation of the model aid in your understanding of the content taught?

If the content taught has been understood, it indicates knowledge acquisition. However, the way that the question is phrased solely attributes the understanding of the content to the implementation of the model.

Question 7

What would you like to see different in the introduction of the model?

This question would help in the development of the action research processes and implementation of the model for future usage.

Question 8

What was the single best thing that came out of the introduction of the model?

This question compels the student to reflect on the lesson and identify a particular aspect that he/she feels has benefited him/her in one way or another. The reflection of the lesson will also conjure other positive or negative aspects of the implementation of the model that would be useful to the researcher.

Questionnaire for the teachers

There is also a question on the planning of the lesson, as this would determine the level of preparation the teacher would need to have to teach this class.

Question 1

Was it difficult to decide on the tasks/activities to perform during the class?

If there is a matching of the styles, the teachers would consider the task or activities conducted during the lesson easy to derive and implement.

Question 2

How did you feel about the implementation of the model?

This question elicits the perception of the teacher to the implementation of the model.

Question 3

Was it fun to teach the class after the implementation of the model?

Once again, if there is an element of fun involved in the teaching, it indicates that the teacher is confident and comfortable with the class. A rapport would develop for a fun lesson to be conducted.

Question 4

Was it easy to teach the students?

If the styles of the teacher and the students were matched accurately, the teacher would have little or no problem in delivering a lesson to students with like minds and styles.

Question 5

How would you describe the ambience of the class? Was it conducive or was there minimal participation?

The ambience would determine the comfort level of the students and the teachers. If there is an active discussion, it indicates that the students and teachers are appropriately matched in terms of styles. They are comfortable with the pace of the lesson and feel no pressure, negative or positive, in contributing their ideas and opinions.

Question 6

How would you grade the acquisition of knowledge of the students based on the students' body language and responses?

Teachers are able to judge the body language of the students. The teachers observe a different perception of the lesson. One in which it would be easy to identify the understanding of the students.

Question 7

Would you like to see the division of the classes in a similar way again?

This would be helpful in the development of the action research processes for future usage of the model from the teacher's perspective.

Question 8

What was the single best thing that came out of the introduction of the model?

This question compels the teachers to reflect on the lesson and identify a particular aspect that the teacher feels has allowed a substantial amount of understanding. The reflection of the lesson will also conjure other positive or negative aspects of the implementation of the model that would be useful to the researcher.

Analysis

Class Ambience

The responses indicated that there was a reasonable amount of participation involved during the lesson. Students commented how participation was usually a rare occurrence in the normal class setting.

Knowledge Acquisition

The responses indicated that there was definitely knowledge acquired. The knowledge acquired was in some cases linked directly to the strategy or the method of teaching used.

Methods used

Students were able to specifically identify methods that appealed to their interest and attention. Reasons cited for the specific methods identified ranged from the method being interesting to the fact that it delivered the knowledge in a concise clear manner.

Future implementations

Students felt that the way of dividing the class and the methods adopted for the teaching were suitable and helpful.

Disadvantage of the model

Some students indicated that the logistics of dividing the class was a “waste of time.” They felt that it was not worth the effort and the class should remain as it was before the implementation of the model. There were comments that the students were not used to the teacher’s style of teaching and preferred the previous mode of teaching.

Interpretation

Class Ambience

Despite the apparent insecurity of what to expect with the division of the classes, the students eventually warmed up to the fact that the class was catered to their learning style. There was a sense of comfort that both the teachers and the students found difficult to articulate. It was however, a positive more interactive change to the regular ambience experienced in the regular class setting.

The comfort level that was attained due to the matching of the styles of the teaching and the learning brought about a comfort zone for both the teachers and the students. This comfort level led to the students and the teachers experiencing learning and teaching in a different perspective. There was an easy flow of thoughts and ideas between teacher and student through discussions and questions.

The students described this comfort level as the ability to “say what we want” because they knew they would not be judged or reprimanded for saying the wrong things.

As mentioned by Barbara Prashnig, the comfort level achieved would eventually result in effective learning.

Knowledge Acquisition

Their knowledge acquisition was not measured through specific tests or scores but there were questions in the questionnaire that dwelled on content acquisition. The response was generally positive with a few students still claiming that the topic fazes them. The majority of the response indicates that there were specific methods, or in some classrooms, strategies, that were adopted that seemed to be etched in their mind as the link between the content.

The fact that the content is linked with a strategy, point towards the fact that the strategy had an enormous impact on the student's learning. As mentioned by Mckeachie, the matching of teaching and learning styles may not result in complete knowledge acquisition but in effective learning. This means that the student learns with a greater efficiency and a longer retainment.

Methods used

The students identified specific methods according to the different classes they were in. When the methods were identified, a second round of analysis was made in comparing the methods identified with the students' learning style. Majority of the

students found the methods that were directly related to their learning style as methods that appealed to them.

This indicated that the matching of the learning styles to the teaching styles resulted in a positive acquisition of knowledge. The students were able to identify with the strategies that were catered to their own individual learning styles.

Majority of the students felt that the methods were the “single best thing” from the model that enabled them to understand the concept. This reiterates the fact that the students identified with the matching of the styles.

Future implementations

Students gave positive comments about continuing this model. The most important reflection that indicated a successful implementation of the model was the fact that the students were eager to know more about the topic taught. This shows that “information enthusiasm” was created. There is a willingness to continue knowledge acquisition. Learning is an enjoyed process, when comfort is created during the learning process. The fact that there is a willingness to continue the discovery of knowledge, indicates that learning was enjoyed and this in turn reflects that there was a comfort zone created for the students through the recognition of their learning styles.

Disadvantage of the model

The logistics of dividing the class was an aspect of the model that could not be avoided. There could have been a greater efficiency in the division but unfortunately there was only one teacher coordinating a large number of students.

There was also inertia to change. This could signify 2 things. One is that the activities used during the lesson may not have necessarily appealed to the particular students' learning style. This may be due to the fact that the students' learning style was not significantly catered during the division of the classes. Several similar styles were grouped together under the teaching style of one teacher.

The other reason could be due to the fact that the students' learning style is one that is resistant to change and alternatives. There are learning styles in which the students prefer a constant and consistent environment for effective learning.

Reflection on Model

Reflections on Feedback from Teachers and Students

There was a general positive tone throughout the feedback from the teachers and the students. The classroom ambience played a fundamental role in ensuring the comfort of both the teachers and the students during the course of the lesson. Because of the level of comfort, there was a substantial amount of knowledge acquired.

The teachers, even during personal sharing, felt that there was a significant decrease in the amount of pressure placed on them. There is an expectation for a teacher to achieve a lesson that fulfils the criteria of achieving a multimedia lesson coupled with strategies that encourages the MOE policy of *Teach Less, Learn More*. There are even school-based values that need to be instilled and followed through in the lesson. This places a certain amount of pressure on the teachers to achieve a “well rounded” lesson. By encouraging the teacher to remain in his/her own comfort zone and teach according to what makes them feel comfortable, lifts the pressure and the focus remains on ensuring there is knowledge acquisition. With that focus, the teachers are able to look at strategies that appeal to their own teaching style and strategies that they are comfortable with. Since the students have been grouped according to similar styles with their teachers, these strategies will undoubtedly prove to be successful strategies with the students.

The students enjoyed the lessons and overall there was a positive feedback. Generally the model worked to the advantage of the students and the teachers. Both parties benefited from the matching of styles. There was a clear comfort zone created for both the teachers and the students. There was effective knowledge acquisition and more importantly, the classroom ambience was conducive to the learning of all the students.

Generalisibility

This model is applicable in most schools. The stream of the students or the standard of the school has little or no bearings on the implementation of this model. What matters is that the students and teachers willingly participate.

Setbacks

There were a few major setbacks during the course of implementing the model. Some of the students and a few teachers interpreted the survey wrongly and hence we grouped according to a wrong style. After realizing the misinterpretation, I attempted to explain the survey in detail and bring them through it one step at a time. However, this defeats the purpose of the survey altogether. The survey is meant for an individual to reflect and ponder without external guidance or influence. Therefore if I was to step in and explain the mechanics of the model, I would be considered as an external influence and the result would be redundant.

The other setback experienced was that the students were bias towards certain teachers. The biasness was positively driven. The students were too used to the style of a particular teacher and hence found it difficult to adapt to another teacher despite the matching style. At this juncture, it is important to note that styles occasionally attempt to adapt. For example, a student from a different learning style can adapt his/her learning style to the teacher's style to ensure effective learning. This happens only if the teaching and learning style are relatively similar.

The logistics of the implementation of this model was a logistical nightmare. The administration of the test and the grouping of the teachers to match the student's learning styles is a long drawn process that requires meticulous planning and managing. This may not be a welcome process in a school where time is always of the essence.

Improvements

Majority of the students seem to belong to certain learning styles. This can be seen by the bar chart found in Appendix 4. Therefore for future usage, some of the learning styles should be removed. Only the more popular ones like those stated in the table should be kept.

Because of the fact that most students belonged to a particular learning style, the distribution of classes appeared slightly skewed. There were a large number of students in a particular class. When dividing the students, I attempted to look thoroughly at their answers to the questions, and try to group them into further smaller groups.

Another area of improvement would be the questionnaire. The students and teachers could relate to the questions, however I think more could have been done to make the survey more localized to the Singaporean context. This would help in the student's understanding of the questions and the expected answers.

The last challenge I faced was the fact that the students' tend to be bias towards teachers they like. Therefore despite the fact that the students' were grouped according to a comfort style of teaching and learning, they appeared keener in being in their 'favorite' teacher's class. This biasness could have been erased by the appearance of new teachers who were perhaps not previously in the school. This would have provided for a more accurate range of feedback.

(15,682 words)

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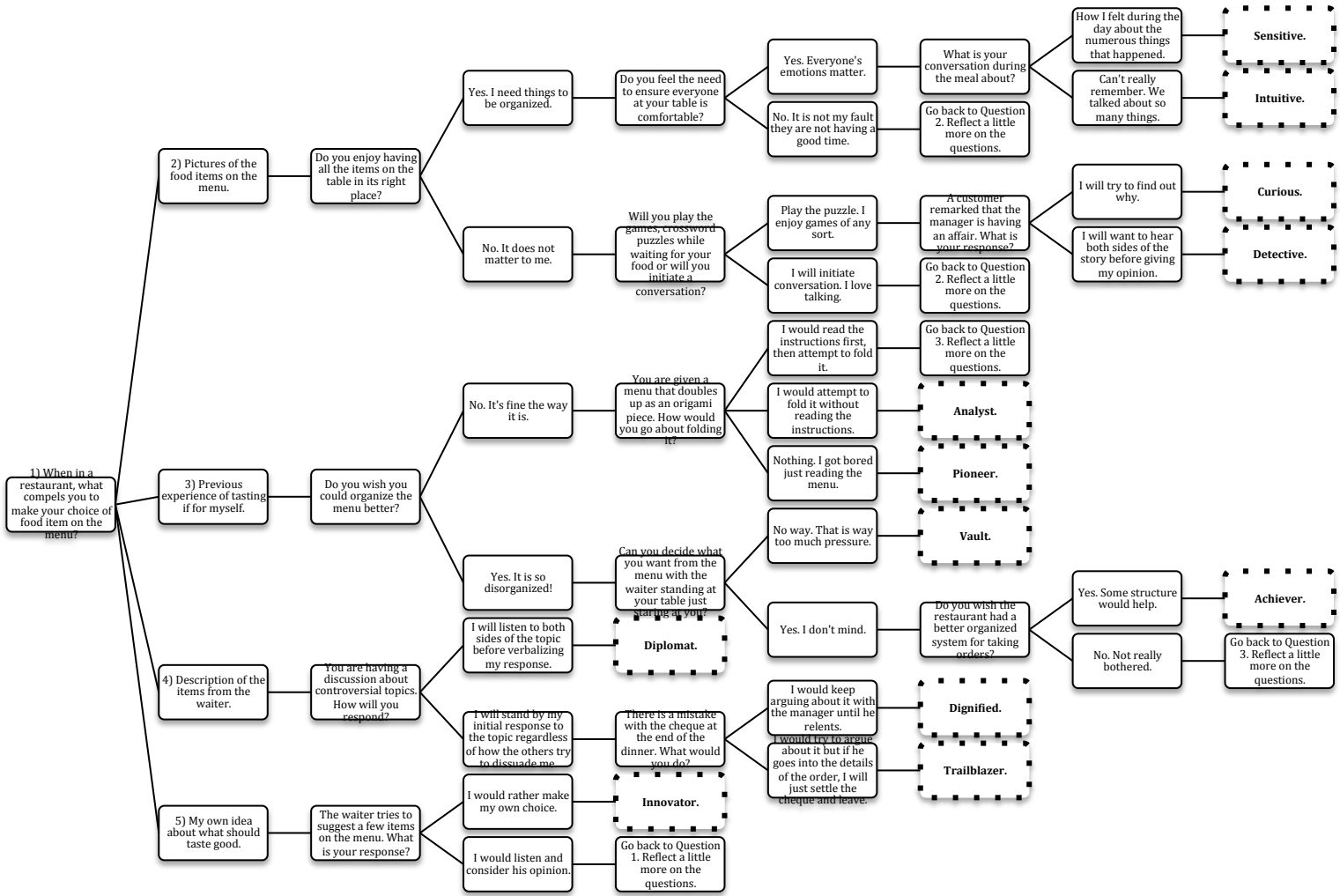
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Appendix One

Style	Stimulation of learning	Knowledge depth	Relevance of knowledge	Assignments	Retaining knowledge	Organization	Emotional	Others
<i>Trailblazer</i>	Audio/ Discussion	General	NA	Group work	NA	Yes	No	Independent and creative
<i>Vault</i>	Kinesthetic	Detailed if interested	NA	Long term growth projects	Yes	Yes	No	No pressure
<i>Curious</i>	Visual and Audio	General	Based on curiosity	Group work	No	No	No	Loves games
<i>Sensitive</i>	Visual	General	Based on emotions	Projects based on emotions	Yes	Yes	Yes	Always heart over head
<i>Dignified</i>	Audio	Details if it is important	Important	Creative project	Yes	No	No	Strong mental integrity
<i>Analyst</i>	Kinesthetic	Detailed	Everything	Investigative	NA	No	No	Long time for knowledge processing
<i>Diplomat</i>	Audio	General	Based on discussions	Group work	NA	No	No	Committed to fairness
<i>Detective</i>	Visual	General	Everything	Investigative	NA	No	Perceptions	Non communicative
<i>Pioneer</i>	Mixed with actions	General	Everything	NA	No	No	No	Easily bored
<i>Achiever</i>	Kinesthetic	NA	Practical	Organized	Only practical	Very	No	Rules and Structure
<i>Innovator</i>	Mental	Details only if there is passion	Practical	Diligently done if interested	Only important	No	No	Inventive
<i>Intuitive</i>	Visual	General first then details	Determined by instinct	Visual	Limited according to relevance	No	Yes	Easily distracted

Appendix Two



Appendix 3

<i>Trailblazer</i>	9
<i>Vault</i>	2
<i>Curious</i>	1
<i>Sensitive</i>	1
<i>Dignified</i>	5
<i>Analyst</i>	3
<i>Diplomat</i>	4
<i>Detective</i>	14
<i>Pioneer</i>	2
<i>Achiever</i>	3
<i>Innovator</i>	72
<i>Intuitive</i>	38

