Science Policy

Company: Star International School 24b Street Mirdif Dubai	**Effective Date :** 07.10..2018 **Revision Due Date :** 06.10.2021 **First Edition Date :** 03.10.2016 **Second Edition Date**: 10.09.2017 Third Edition Date: 10.09.2019 **Edition No:** 4

Introduction

Every child is born with a natural sense of enquiry, and through our science lessons we aim to harness and develop this to produce life-long, memorable learning. Our enquiry based approach allows children to investigate ideas and come to their own conclusions about the world around them. Once children are familiar with the skills associated with enquiry, they will be able to apply these to other curriculum areas and to their lives outside of school. Our science lessons encourage innovation and problem solving, and create resilient and methodical learners. Science encompasses many important global issues, such as technology, the environment and sustainability, and as such it is now more important than ever.

Aims

Learning in Science enables children to:

- develop investigative skills through enquiry based learning
- apply investigative skills to a range of curriculum areas
- become innovative and thoughtful learners who are able to deal with any challenge
- approach real-life problems in a positive and methodical way
- think critically about their learning
- understand that some sources of information are more reliable than others
- develop curiosity and understanding of the environment and place in the living, material and physical world
- demonstrate a secure knowledge and understanding of the big ideas and concepts of the sciences
- develop skills for learning, life and work
- see themselves as a Scientist and understand that they could have a career in Science
- develop skills in the accurate use of scientific language, formula and equations
- apply safety measures and take necessary actions to control risk and hazards
- recognise the impact the sciences make on my life, the lives of others, the environment and on society
- recognise the role of creativity and inventiveness in the development of the sciences
- develop an understanding of the Earth's resources and the need for responsible use of them
- express opinions and make decisions on social, moral, ethical, economic and environmental issues based upon sound understanding
- develop as a scientifically-literate citizen with a lifelong interest in the sciences
- establish the foundation for more advanced learning and future careers in the sciences and the technologies.

Teaching and Learning

At the start of every topic the children are encouraged to share their knowledge and their ideas about what they are going to be learning. Teachers then incorporate the outcome of this discussion into their teaching to ensure children's prior knowledge is built upon and not repeated. In lessons the children are then encouraged to devise their own investigations to answer their questions.

Every Science lesson taught at Star includes at least one type of enquiry, the five types of which are:

1. Observing over time
2. Identifying and classifying
3. Pattern seeking
4. Research (using secondary sources)
5. Fair testing

Enquiry allows the children to have ownership of their own learning, finding answers to their questions through personal experience. Over the course of a topic children's prior learning is consolidated and built upon to ensure that every child has a deep understanding of scientific principles.

Science teaching is flexible so that misconceptions can be dealt with, and classes can pursue important lines of enquiry that the children have expressed an interest in. In this way children's curiosity is harnessed and utilised.

Planning

- **The Es.**

(See Appendix 1.1 for larger image).

As with Science as a whole, enquiry is central to science planning. Every science lesson taught at Star has at least one of the five types of enquiry in it. This enquiry approach stems from Foundation Stage and the 'Knowledge and Understanding the World' strand, and is developed throughout Key Stages 1

and 2. Teachers plan for enquiry to form the basis of the lesson by using the E's. The use of the Es is evident in both science planning and science books.

Using the Es every lesson starts with an **Elicit** activity, which provides an opportunity for Assessment for Learning. The outcome of this activity informs the level of challenge each child requires within the lesson, and the focus of the lesson. The next E is the **Engage** activity, which is designed to hook children into the main learning of the lesson. If appropriate the Elicit and Engage phases can be met by the same activity. Following this, the lesson will move into the **Enquiry** stage. Enquiries are child led, allowing children to develop their ideas and understanding. During this phase the teacher pushes children's learning onwards, for example asking the children to include extra components into their circuits. This constitutes the fourth E – **Explore**. Finally, the children are required to **Explain** their understanding. Bloom's Taxonomy should be used effectively here to ensure all children are being challenged accordingly (see Appendix 1.2 for Bloom's Taxonomy resources). In books, the three main Es (Elicit, Enquire and Explain) are always evident.

In KS1 the E's take place over two 50 minute lessons, with one lesson per week. In KS2 the E's are completed every week during two 50 minute science lessons. These lessons are not taught consecutively to allow children a 'brain break'.

During a lesson children are not expected to write up the full investigation in their books**,** but instead evidence in books is related to the taught skill. The full enquiry process is evidenced through photographs. This ensures that work produced is of a high standard and that children have an in depth knowledge of investigate skills and techniques. Lessons fulfil engaging objectives that build on from prior learning, ensuring that the children understand their personal Science Learning Journey. Science has many cross-curricular links, such as Computing and Geography, which are made explicit in science planning.

- **Differentiation**

Science lessons are differentiated to ensure that all children can access and enjoy their learning, whilst creating a suitable challenge for each child. Lessons are planned to challenge all children, and higher order questioning is used to push children to think Scientifically. A range of resources are used to ensure that every child, including those with SEN or EAL, are able to fulfil the lessons objectives. Regular assessment (see below) allows teachers to support and challenge children to an appropriate level.

To differentiate the Enquiry phase, teachers are encouraged to do this not only through different investigations but also through the open-ended nature of the task. This ranges from structured enquiry to open enquiry (see appendix 1.3). When differentiating the Explain phase teachers refer to Bloom's Taxonomy to ensure all children are being challenged appropriately.

At Star teachers know that all children are capable of Critical Thinking, and children are pushed to use and develop these skills. Bloom's Taxonomy is used to inform different levels of questioning which is evident in planning, teaching and marking.

Although differentiation is planned, teachers are flexible and use the Elicit activity to guide each child's level of challenge. This means that any child who performs well in the Elicit will be moved forward in their learning.

Assessment

Differentiation goes hand in hand with regular assessment, to ensure that all children are receiving the right amount of support and challenge. Science Specific Assessments are:

- Regular Learning Ladders data input
- Termly Assertive Mentoring assessments (Years 1-6).
- Yearly GL assessments (Years 3-6).

Every Science lesson begins with formative assessment in the Elicit phase of the Es planning process. Teachers use this to inform their lesson, and the level of challenge each child requires. Teachers update Learning Ladders regularly, and both of these assessment elements are immediately reflected in planning. Summative assessment is conducted termly through the use of Assertive Mentoring assessments, which not only assess the children's knowledge of learnt objectives, but also their prior knowledge of forthcoming units. At the end of the year GL assessments are conducted which provide an international benchmark of attainment and progress.

Secondary assessment

Secondary assessment differs from Primary in that the students will receive the same forms of assessment irrespective of their ability. Both summative and formative assessments are created with levelled questions that allow students of all abilities to access on some level. Formative assessment will be done through various methods, these include; SOLO task, high frequency, low stakes testing and practical skills assessments. The SOLO tasks provide the student with two questions based on their prior learning but allow for a broad answer to try and encourage students to extend their answers to other aspects of science, however the success criteria enables marks at all levels of response. High frequency low stakes testing aims to reduce the pressure of exam questions by increasing the amount of tests students do but removing the need for students to worry about the outcome. This form of assessment happens at the end of a single topic and is only 30 minutes long, the students then mark another students test using the markscheme. This allows students to, one see other students' responses and two use the examiners criteria which further supports their understanding of expectations. Finally students are judged on their ability to successfully plan all aspects of a practical experiment, then complete the practical, collect valid and accurate results then display these in the correct way. This creates the opportunity for students to conduct their own research, handle equipment, manage data and evaluate their own work.

Summative assessment is rather more straight forward, students will receive a sixty minute test of around sixty marks every assessment point, at the end of each term. This test is synoptic and will have questions relating to all content covered up to that point, The test will be compiled using past paper questions of all levels of difficulty, starting with the easiest then increasing in difficulty usually ended in a long answer question. The test will also include questions about linked practicals, data handling and related mathematics. The summative assessment is designed to simulate the GCSE exam and will be the basis for any grading used for students.

Resources

Every KS2 Science lesson takes place in the Science Lab, unless another area (such as the splash pools or the astro turf) is more suitable. Science lessons do not happen in the children's own classroom. By teaching in the Science Lab we are showing children that everyone can access science, no matter of their background, gender or culture. Teaching in the Science Lab also means that teachers are better able to utilise the fantastic resources we have. These resources are labelled with specific objectives to

ensure ease of use. Outside of the Science Lab, every classroom has an Investigation Station, comprising of a table of STEM resources and key questions. This encourages the children to apply their enquiry skills in their classroom and allow teachers to foster these skills regularly.

All science resources are subject to a yearly audit. The information gathered in this audit forms a spreadsheet of resources that is found on the School Network (Z-drive). The spreadsheet not only helps with enquiry planning, it also allows us to replace resources that are running low before they run out.

Secondary resources

All secondary science lessons take place in the Science lab, and where necessary incorporate scientific equipment. The Science resources have been upgraded to accommodate the requirements of the secondary curriculum which along with the chromebooks allows students gain a deeper understanding of how science works.

The science lab is also equipped with the Clevertouch board enabling staff and students the opportunity to live edit and create joint work and collaborate to learn. ANother tool used to maximise this is Google Classroom which is an ideal space to store, upload, create and share ideas, resources and support each other. On the G Drive there is also a catalogue of resources curated by members of staff that are used to inform lesson planning and teaching.

Cross-curricular Links

The topics taught in Science often cross over into other curriculum areas, these ways are listed below:

- Maths – application of number through the use of weights and measures, presenting and handling data, calculating, estimating, predicting and problem solving.
- Computing – using data loggers, iPads, cameras, computers and microscopes to research, record, present and interpret data.
- English and Arabic - Communication in a variety of contexts through promoting the skills of reading, writing, speaking and listening.
- PSHE – having the confidence to work independently when asked, and also the social skills to work collaboratively.
- Theme – topics taught in theme often go hand-in-hand with Science, for example Water, Water Everywhere.
- PE – topics taught in Science complement and consolidate PE learning, for example healthy lifestyle.
- Enquiry skills learnt in Science are applied throughout the curriculum, whenever children are problem solving and investigating. These skills are also applied outside of school to ensure children are resilient and methodical learners.

Secondary cross curricular links

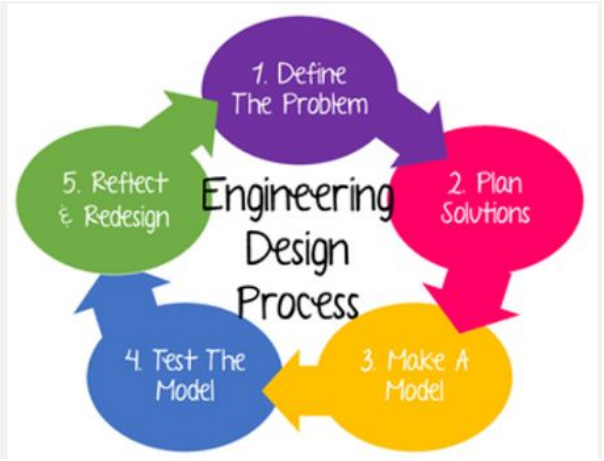
The secondary department work closely to provide cross curricular links, specifically in science, the link with maths allow students make connections and use similar terminology and skills in both subjects. This is very important for data handling and graph skills as well as using and manipulating equations. Other links such as comprehension is English further enhances the ability to understand long answer questions and provide detailed and concise answers.

- **Science and STEM**

Across the world the importance of STEM subjects is being realised, and their links are being utilised in schools to ensure lessons are meaningful. These individual subject areas have clear links within our school. In any one Science lesson there are clear opportunities for children to use technology such as iPads and data loggers; Engineering through varied tasks and objectives, asking children to apply their knowledge to testing, planning and creating products; and Maths through the use of data collection, presentation and analysis.

Every Primary classroom has an Investigation Station which is stocked with STEM challenges and resources, to ensure children have frequent opportunities to practise and enhance their enquiry skills independently.

Two days of every academic year are dedicated to our STEM days. Over these days children are tasked with completing the engineering design process in order to create a new machine (e.g. boat, rocket), to fulfil a brief.



Across the school these activities are differentiated but relate to the same purpose and context. The activities that each year group undertook during these days are displayed on the boards in the Science Lab.

During the Year 2018-19 Star International Mirdif established a link with My Discovery Lab. This company provided us with STEAM boxes to use within the school, as well as support during our STEM days. They also provided assistance in the engagement of our children in STEM activities outside of school (see next section).

Community Involvement

Through our partnership with My Discovery Lab we held a STEM parents workshop prior to our STEM Days. This workshops asked parents to come into school to find out more about STEM, and how they could support their children with these subjects at home. It also gave parents an insight into how we teach STEM in school, and the types of children complete during our STEM Days. During this workshop

parents were also introduced to the My Discovery Lab Home Laboratory boxes. These boxes aim to make it as easy as possible for families to conduct STEM activities in the comfort of their own home.

Equal Opportunities

All children are provided with equal access to the Science curriculum. We aim to provide suitable learning opportunities regardless of gender, ethnicity or home background. Lessons are tailored to the needs of all children,

Special Needs

We provide engaging and appropriate lessons for all children, ensuring they are able to achieve to the best of their ability. Through careful use of resources and strategies we ensure that all children are able to access their learning in a meaningful way. Through regular assessment, and working closely with the Intervention Team, we identify which pupils or groups of pupils who have extra learning needs and adapt our lessons accordingly. If the child is on the Special Educational Needs register they will have an IEP with SMART targets, and these are taken into account when planning and teaching.

Lower attaining children have lessons adapted to ensure they can access their learning. Furthermore, target children attend a weekly intervention with the Science Leader. Higher attaining and gifted students are given activities designed to deepen their understanding and challenge them appropriately.

Time Allocation

In KS2 pupils have two 50 minute lessons of science per week. In KS1 children have one 50 minute lesson a week, although teachers are free to allocate a Science afternoon/morning once every two weeks in place of this. In EYFS Science is taught both discreetly and as part of continuous classroom provision.

Secondary timing

In KS3 students are given four periods of Science a week, these are made up of hour long lessons unless on a Thursday then they are reduced to 45 minutes.

Record Keeping

School science learning is evidenced in books. Across the school evidence comprises children's writing, photographs, specific pupil voice snap shots, recordings, links to videos (predominantly using QR Codes) and assessments.

Books are marked regularly by teachers and one focus group per lesson receives in-depth marking. Children respond to their 'Wishes' (see assessment policy) in a timely and appropriate manner using purple pen, and the teacher acknowledges these responses, picking up misconceptions where necessary. Marking follows the school's making policy by asking children to rectify, apply or reason their understanding. Science book scrutinies are regularly conducted by the Science Leader and SLT.

Secondary data

Data for secondary students will be collected from SOLO tasks, end of topic test (high frequency low stakes tests) and assessment point tests, this will be stored using spreadsheets in science and the assessment point tests also whole school on the central data collection sheet. Students will also receive feedback on assessments through DIRT tasks written in their books. Students will self and peer mark to improve their work lesson by lesson to give instant feedback.

Staff Development and Training

The Science Leader and SLT are responsible for ensuring that all staff feel confident and happy when delivering quality first science teaching. In order to do this, regular staff training occurs. Science staff training comprises meetings and workshops taken by the Science Leader, and INSETs led by outside agencies. On top of this, the Science Leader regularly meets with Year Leaders and individual teachers to support them throughout the year. Training ensures that staff are aware of how science is taught at Star, and that they have the tools and ideas to teach the curriculum objectives in an engaging and memorable way. All teaching staff are encouraged to contact the Science Leader if they feel they need extra training in a specific area.

Role of the Subject Leader

The Subject Leader provides professional leadership and management for science and ensures that it is managed and organised so that it meets the aims and objectives of the school. The Subject Leader monitors teaching and learning within the subject, offering ideas and supporting planning where necessary. They also provide and organise further training to ensure all staff have a good knowledge of the topics that are taught in school, as well as how to teach them. The Subject Leader is responsible for managing the resources for science and maintaining the stock ensuring it meets the needs of the curriculum. The Subject Leader liaises with the Principal and SLT, providing regular feedback on standards and monitoring. On a secondary level this role extend to the management of the practical technician who is in charge of equipment and stock. The secondary leadership will evolve with the progression of the secondary school but in the meantime secondary leadership will be responsible for planning and delivering effective and informative lessons and assessments.

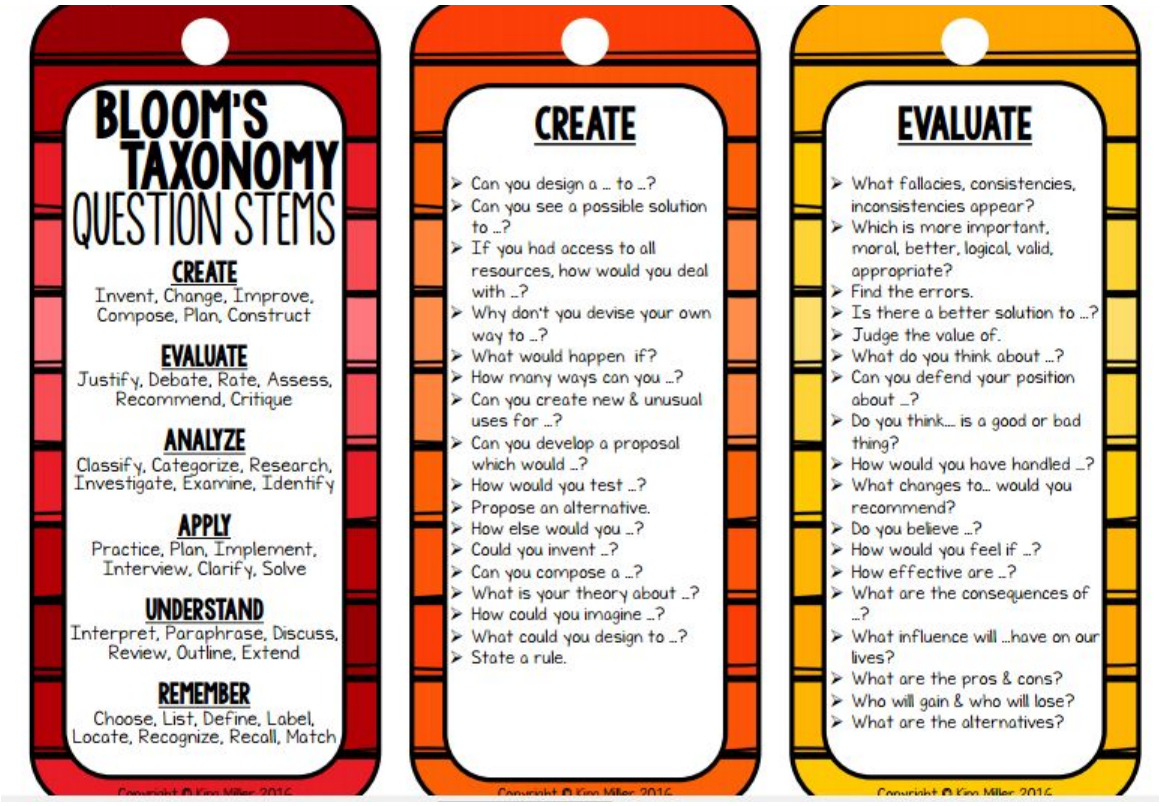
Monitoring and Evaluation

This policy is subject to formal review every year, and as part of the on-going school self-evaluation process. Its success in relation to the School's Development Plan will be evaluated as part of the annual science audit and at regular team meetings. The Subject Leader and SLT monitor the delivery of the Curriculum through: scrutiny of plans and books, work-sampling, lesson observations, Learning Ladders, INSETs and informal meetings with each year group.

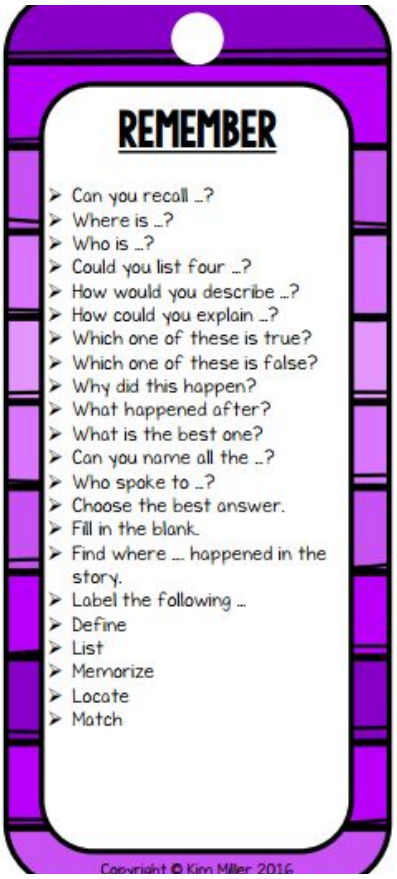
Appendix

1.1

1.2


BLOOM'S TAXONOMY QUESTION STEMS
CREATE
Invent, Change, Improve, Compose, Plan, Construct
EVALUATE
Justify, Debate, Rate, Assess, Recommend, Critique
ANALYZE
Classify, Categorize, Research, Investigate, Examine, Identify
APPLY
Practice, Plan, Implement, Interview, Clarify, Solve
UNDERSTAND
Interpret, Paraphrase, Discuss, Review, Outline, Extend
REMEMBER
Choose, List, Define, Label, Locate, Recognize, Recall, Match
CREATE
Can you design a ... to ...?
Can you see a possible solution to ...?
If you had access to all resources, how would you deal with ...?
Why don't you devise your own way to ...?
What would happen if?
How many ways can you ...?
Can you create new & unusual uses for ...?
Can you develop a proposal which would ...?
How would you test ...?
Propose an alternative.
How else would you ...?
Could you invent ...?
Can you compose a ...?
What is your theory about ...?
How could you imagine ...?
What could you design to ...?
State a rule.
EVALUATE
What fallacies, consistencies, inconsistencies appear?
Which is more important, moral, better, logical, valid, appropriate?
Find the errors.
Is there a better solution to ...?
Judge the value of.
What do you think about ...?
Can you defend your position about ...?
Do you think... is a good or bad thing?
How would you have handled ...?
What changes to... would you recommend?
Do you believe ...?
How would you feel if ...?
How effective are ...?
What are the consequences of ...?
What influence will ...have on our lives?
What are the pros & cons?
Who will gain & who will lose?
What are the alternatives?


ANALYZE
What is the function of ...?
What's fact? Opinion?
What assumptions can you make about ...?
What statement is relevant to ...?
What motive is there?
What conclusions?
What does the author believe? Assume?
State the point of view of...
What's the relationship between ...?
What's the main idea? Theme?
What literary form is used?
What persuasive technique is used?
Which events could not have happened?
If ... happened, how would the ending be different?
How is ... similar to ...?
What are other possible outcomes?
What was the turning point?
What are some of the problems of ...?
APPLY
Predict what would happen if ...?
Choose the best statements that apply.
What would result from ...?
Tell what would happen if ...?
Tell how, when, where, why.
Identify the results of ...
Write in your own words ...
How would you explain ...?
What do you think could happen next?
Who do you think ...?
Clarify why ...?
Illustrate the ...
Draw a story map.
Explain why the character acted ...?
Group by characteristics such as ...
What questions would you ask of ...?
From the information given, can you develop a set of instructions about ...?
Write a brief outline ...
Do you know another instance where ...?
UNDERSTAND
What is the main idea?
Which are the facts?
State in your own words.
Is this the same as ...?
Give an example.
Select the best definition.
Condense this paragraph..
What would happen if ...?
Explain why ...
How would you summarize ...?
What expectations are there?
Read/show in the graph (table).
What are they saying?
This represents ...
What seems to be the reason for...?
Is it valid that ...?
What seems likely?
Which statements supports ...?
Outline ...
What might happen next?
Can you clarify ...?
Can you illustrate ...?


REMEMBER
Can you recall ...?
Where is ...?
Who is ...?
Could you list four ...?
How would you describe ...?
How could you explain ...?
Which one of these is true?
Which one of these is false?
Why did this happen?
What happened after?
What is the best one?
Can you name all the ...?
Who spoke to ...?
Choose the best answer.
Fill in the blank.
Find where ... happened in the story.
Label the following ...
Define
List
Memorize
Locate
Match
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APPLYING
BLOOM'S TAXONOMY
CREATE
Organize information in a new and different way.
EVALUATE
Examine sources and make judgements based on criteria and standards.
ANALYZE
Utilize lower-level thinking skills to identify key elements.
APPLY
Use a procedure or steps in a given situation to solve a problem.
UNDERSTAND
Construct meaning and build connections.
REMEMBER
Retrieve information from long-term memory.
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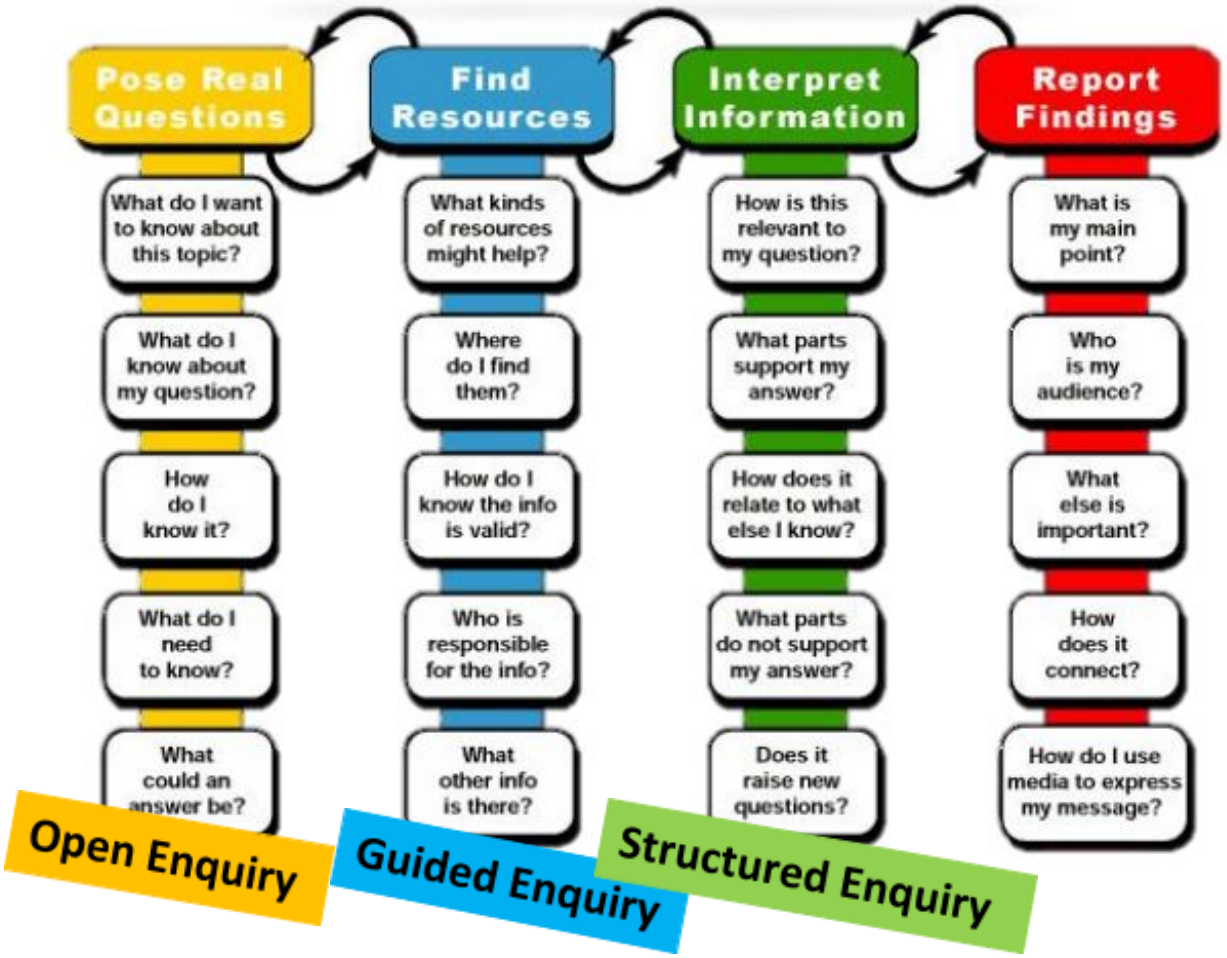
1.3


Pose Real Questions
What do I want to know about this topic?
What do I know about my question?
How do I know it?
What do I need to know?
What could an answer be?
Find Resources
What kinds of resources might help?
Where do I find them?
How do I know the info is valid?
Who is responsible for the info?
What other info is there?
Interpret Information
How is this relevant to my question?
What parts support my answer?
How does it relate to what else I know?
What parts do not support my answer?
Does it raise new questions?
Report Findings
What is my main point?
Who is my audience?
What else is important?
How does it connect?
How do I use media to express my message?
Open Enquiry
Guided Enquiry
Structured Enquiry