An tSraith Shóisearach do Mhúinteoirí

Junior CYCLE for teachers

Resource Booklet

Science

Nov – Dec Cluster

2017

Ionad Oideachais Mhúineachtáin

An Roinn Oideachais agus Scileanna | Department of Education and Skills

Notes

Contents Page

Thinking About my Professional Learning

Q1. Subject Content Knowledge

1

Thinking about subject content knowledge in the contextual strands, rate your learning needs from 1 (this is an area of high priority for my learning) to 5 (I am confident in this area or this is not a priority for me now).

(Circle as appropriate)

a)	Earth and Space	1	2	3	4	5
b)	Chemical World	1	2	3	4	5
c)	Physical World	1	2	3	4	5
d)	Biological World	1	2	3	4	5

Q2. Pedagogy and Classroom Practice

Considering your learning needs around pedagogy and classroom practice, rate how each of these could contribute to your learning (1 = hugely contribute, 5 = I don't need this right now)

a) Opportunities to see examples of student work from other teachers' classrooms

1 2 3 4 5

b) A place to access and share resources and ideas with other teachers

1 2 3 4 5

c) Hearing from other teachers with classes like mine about what worked for them

1 2 3 4 5

d) Opportunities to discuss methodologies with other teachers

1 2 3 4 5

e) A chance to learn new ways of using digital technologies in my classroom

1 2 3 4 5

Q3. Assessment

Think about your learning needs in the area of assessment. Rate the degree to which each of the following might contribute to your learning. (1 = hugely contribute, 5 = I don't need this right now)

a) An opportunity to discuss with other teachers the types of assessments they are using

1 2 3 4 5

b) The opportunity to develop and trial assessments alongside other teachers who have similar students to mine

1 2 3 4 5

c) The opportunity to see examples of students' work for CBAs

1 2 3 4 5

d) Opportunities to discuss and use the Features of Quality

1 2 3 4 5

e) Sample final assessment questions

1 2 3 4 5

Q4. Criteria Based Judgements

Considering that for CBAs, descriptors are awarded to concur with national criteria, rate to what extent the following might contribute to your subject learning (1 = contribute a lot, 5 = I don't think this would contribute a lot)

a) Knowledge of how the criteria are set

1 2 3 4 5

b) Discussing how my students' work can be compared to national criteria

1 2 3 4 5

c) Seeing examples of national criteria applied to students' work

1 2 3 4 5

d) Discussing ideas for improving student learning in our school with other teachers.

1 2 3 4 5

Units of Work – Sample X

Nature of Science

1. Students should be able to appreciate how scientists work and how scientific ideas are modified over time
2.Students should be able to recognise questions that are appropriate for scientific investigation, pose testable hypotheses, and evaluate and compare strategies for investigating hypotheses
3.Students should be able to design, plan and conduct investigations; explain how reliability, accuracy, precision, fairness, safety, ethics, and selection of suitable equipment have been considered
4.Students should be able to produce and select data (qualitatively/quantitatively), critically analyse data to identify patterns and relationships, identify anomalous observations, draw and justify conclusions
5.Students should be able to review and reflect on the skills and thinking used in carrying out investigations, and apply their learning and skills to solving problems in unfamiliar contexts
6. Students should be able to conduct research relevant to a scientific issue, evaluate different sources of information including secondary data, understanding that a source may lack detail or show bias
7. Students should be able to organise and communicate their research and investigative findings in a variety of ways fit for purpose and audience, using relevant scientific terminology and representations
8. Students should be able to evaluate media-based arguments concerning science and technology
9. Students should be able to research and present information on the contribution that scientists make to scientific discovery and invention, and its impact on society
10. Students should be able to appreciate the role of science in society; and its personal, social and global importance; and how society influences scientific research

Earth and Space

1. Students should be able to describe the relationships between various celestial objects including moons, asteroids, comets, planets, stars, solar systems, galaxies and space
2. Students should be able to explore a scientific model to illustrate the origin of the universe
3. Students should be able to interpret data to compare the Earth with other planets and moons in the solar system, with respect to properties including mass, gravity, size, and composition
4. Students should be able to develop and use a model of the Earth-sun-moon system to describe predictable phenomena observable on Earth, including seasons, lunar phases, and eclipses of the sun and moon
5. Students should be able to describe the cycling of matter, including that of carbon and water, associating it with biological and atmospheric phenomena
6. Students should be able to research different energy sources; formulate and communicate an informed view of ways that current and future energy needs on Earth can be met
7. Students should be able to illustrate how earth processes and human factors influence the Earth's climate, evaluate effects of climate change and initiatives that attempt to address those effects
8. Students should be able to examine some of the current hazards and benefits of space exploration and discuss the future role and implications of space exploration in society

Chemical World

1. Students should be able to investigate whether mass is unchanged when chemical and physical changes take place
2. Students should be able to develop and use models to describe the atomic nature of matter; demonstrate how they provide a simple way to account for the conservation of mass, changes of state, physical change, chemical change, mixtures, and their separation
3. Students should be able to describe and model the structure of the atom in terms of the nucleus, protons, neutrons and electrons; comparing mass and charge of protons, neutrons and electrons
4. Students should be able to classify substances as elements, compounds, mixtures, metals, non-metals, solids, liquids, gases and solutions
5. Students should be able to use the Periodic Table to predict the ratio of atoms in compounds of two elements
6. Students should be able to investigate the properties of different materials including solubilities, conductivity, melting points and boiling points
7. Students should be able to investigate the effect of a number of variables on the rate of chemical reactions including the production of common gases and biochemical reactions
8. Students should be able to investigate the reactions between acids and bases; use indicators and pH scale
9. Students should be able to consider chemical reactions in terms of energy, using the terms exothermic, endothermic and activation energy, and use simple energy profile diagrams to illustrate energy changes
10. Students should be able to evaluate how humans contribute to sustainability through the extraction, use, disposal, and recycling of materials

Physical World

1. Students should be able to select and use appropriate measuring instruments
2. Students should be able to identify and measure/calculate length, mass, time, temperature, area, volume, density, speed, acceleration, force, potential difference, current, resistance, electrical power
3. Students should be able to investigate patterns and relationships between physical observables
4. Students should be able to research and discuss a technological application of physics terms of scientific, societal and environmental impact
5. Students should be able to design and build simple electronic circuits
6. Students should be able to explain energy conservation and analyse processes in terms of energy changes and dissipation
7. Students should be able to design, build, and test a device that transforms energy from one form to another in order to perform a function; describe the energy changes and ways of improving efficiency
8. Students should be able to research and discuss the ethical and sustainability issues that arise from our generation and consumption of electricity

Biological World

1. Students should be able to investigate the structures of animal and plant cells and relate them to their functions
2. Students should be able to describe asexual and sexual reproduction; explore patterns in the inheritance and variation of genetically controlled characteristics
3. Students should be able to outline evolution by natural selection and how it explains the diversity of living things
4. Students should be able to describe the structure, function, and interactions of the organs of the human digestive, circulatory and respiratory systems
5. Students should be able to conduct a habitat study; research and investigate the adaptation, competition and interdependence of organisms within specific habitats and communities
6. Students should be able to evaluate how human health is affected by: inherited factors and environmental factors including nutrition; lifestyle choices; examine the role of micro-organisms in human health
7. Students should be able to describe respiration and photosynthesis as both chemical and biological processes; investigate factors that affect respiration and photosynthesis
8. Students should be able to explain how matter and energy flow through ecosystems
9. Students should be able to explain human sexual reproduction; discuss medical, ethical, and societal issues
10. Students should be able to evaluate how humans can successfully conserve ecological biodiversity and contribute to global food production; appreciate the benefits that people obtain from ecosystems

Units of Work – Sample Y

Nature of Science

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Developing a Unit of Work

3.Students should be able to design, plan and conduct investigations; explain how reliability, accuracy, precision, fairness, safety, ethics, and selection of suitable equipment have been considered

5. Students should be able to use the Periodic Table to predict the ratio of atoms in compounds of two elements

5. Students should be able to describe the cycling of matter, including that of carbon and water, associating it with biological and atmospheric phenomena

7. Students should be able to describe respiration and photosynthesis as both chemical and biological processes; investigate factors that affect respiration and photosynthesis

7. Students should be able to organise and communicate their research and investigative findings in a variety of ways fit for purpose and audience, using relevant scientific terminology and representations

7. Students should be able to investigate the effect of a number of variables on the rate of chemical reactions including the production of common gases and biochemical reactions

Making Comparative Judgements

A teacher was developing their first-year students' abilities to design and plan their own scientific investigations. Students were given the following question **– How does the temperature of water affect the solubility of a common substance?** A section of the work submitted by 3 of the students is presented below.

Instructions:

- First read the **blue** method and discuss its merits with your neighbour.
- Now read the **red** method and decide if it is better or worse.
- Then read the **green** method and again, decide if it is better or worse.

Referring to the agreed success criteria, discuss in your pairs what feedback you would give each student to help improve their learning.

Blue Sample

Method

1. We weighed out 10.5g of jelly and measured out 100mls of different temperatures of water.
2. First, we put it in 71℃ temp water and measured the time it took to dissolve.
3. Then 57℃ temp water and measured the time it took to dissolve.
4. Then 18℃ (room temperature) and measured the time it took to dissolve.
5. After this we put it in 88℃ and finally we put it in 100℃.
6. We graphed our results.

Red Sample

Method

1. Fill a 400ml beaker up to the 100ml mark with cold water.
2. Measure 100g of salt into a measuring boat using a mass balance and record the mass.
3. Using a thermometer measure and record the temperature of the water.
4. Using a spatula add small amounts of salt into the 100ml of water.
5. When no more salt can be dissolved by the water, calculate the mass of the salt remaining using the mass balance.
6. Subtract the reading from the original 100 grams to calculate the mass of salt used.
7. Fill another 400ml beaker up to the 100ml mark.
8. Heat the water until it reaches 50℃ using a hot plate, carefully remove the beaker using tongs.
9. Repeat steps 2-6.
10. Repeat this method using water at other temperatures.

Green Sample

Method

1. I measured 50g of sugar into a beaker.
2. I measured 80ml of cold water, cooled by ice, in a beaker.
3. I then measured the temperature of the water with a thermometer.
4. I then added sugar (in small amounts) into the water until the water would not dissolve anymore sugar.
5. Then I measured the mass of the sugar left and wrote my results down.
6. I repeated this with lots of different temperatures.
7. I repeated this using salt and coffee.

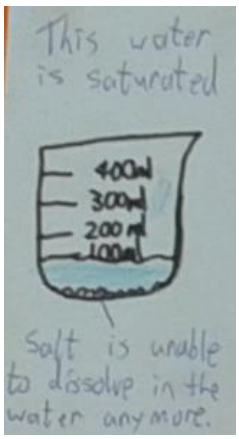
Red Sample

Method

1. Fill a 400ml beaker up to the 100ml mark with cold water.
2. Measure 100g of salt into a measuring boat using a mass balance and record the mass.
3. Using a thermometer measure and record the temperature of the water.
4. Using a spatula add small amounts of salt into the 100ml of water.
5. When no more salt can be dissolved by the water, calculate the mass of the salt remaining using the mass balance.
6. Subtract the reading from the original 100 grams to calculate the mass of salt used.
7. Fill another 400ml beaker up to the 100ml mark.
8. Heat the water until it reaches 50℃ using a hot plate, carefully remove the beaker using tongs.
9. Repeat steps 2-6.
10. Repeat this method using water at other temperatures.

Results

Temperature	Mass
18℃	26.9g
50℃	50.7g
90℃	70.2g



Conclusion

After doing this experiment I have come to the conclusion that the hotter the water the more salt it takes to saturate the water.

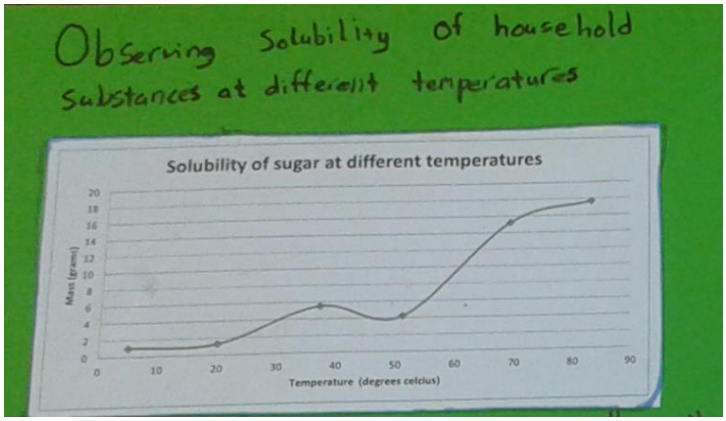
Green Sample

Method

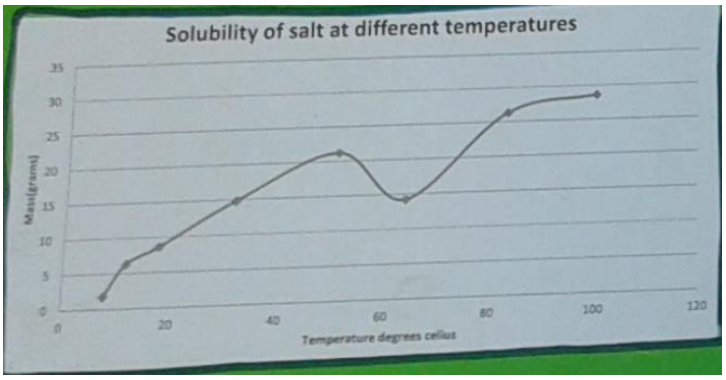
1. I measured 50g of sugar into a beaker.
2. I measured 80ml of cold water, cooled by ice, in a beaker.
3. I then measured the temperature of the water with a thermometer.
4. I then added sugar (in small amounts) into the water until the water would not dissolve anymore sugar.
5. Then I measured the mass of the sugar left and wrote my results down.
6. I repeated this with lots of different temperatures.
7. I repeated this using salt and coffee.

Results for Solutes: Sugar, Salt and Coffee

Temperature of water	Mass of sugar
5℃	**10g**
20℃	**13g**
32℃	**55g**
51℃	**42g**
69℃	**152g**
83℃	**177g**



Temperature of water	Mass of salt
8℃	**1.2g**
12℃	**6.3g**
18℃	**8.6g**
32℃	**14.8g**
51℃	**21.2g**
64℃	**14.2g**
83℃	**26.3g**
100℃	**28.6g**



In the 4th test with sugar even though the water temperture was higher than our 3rd test and the mass of sugar able to dissolve decreased but our tests showed that water at higher tempertures needs a higher mass of sugar to satuarate it. We made another error on the salt on the 6th test, as the result does not following the pattern of the curve.

Temperature of water	Mass of coffee
18℃	**0.2g**
76℃	**Couldn't see when it was saturated**

Conclusion

I have proven that my hypothesis was correct the higher the temperture of water (solvent) then the more mass (solute) is needed to saturate it. The lower the temperture of water the less mass of solute is needed to saturate. Salt and sugar both become more soluble when the temperature of the solution is increased. The solubility is different for both substances. Sugar is more soluble than salt at all temperatures.

Using Features of Quality

Features of Quality for the EEI

Sample Identifier	Notes	Provisional Descriptor

Features of Quality for the SSI

Sample Identifier	Notes	Provisional Descriptor

Features of Quality for the EEI - SLAR Meeting

Sample Identifier	Notes	Provisional Descriptor

Search Vs Research

Research – To inquire specifically, using involved and critical investigation	**Examine** – Consider an argument or concept in a way that uncovers the assumptions and relationships of the issue
Discuss – Offer a considered, balanced review that includes a range of arguments, factors or hypotheses: opinions or conclusions should be presented clearly and supported by appropriate evidence	**Evaluate (ethical judgement)** - Collect and examine evidence to make judgments and appraisals; describe how evidence supports or does not support a judgement; identify the limitations of evidence in conclusions; make judgments about ideas, solutions or methods

- Working in pairs, choose a LO from the table below
- Write a research question by reworking the search question given
- When finished, share your research questions around the table and discuss

Learning Outcome	Search question	Research Question
BW 10. Students should be able to evaluate how humans can successfully conserve ecological biodiversity and contribute to global food production; appreciate the benefits that people obtain from ecosystems	How does the Varroa mite affect the honey bee?	
E&S 8. Students should be able to examine some of the current hazards and benefits of space exploration and discuss the future role and implications of space exploration in society	What experiments have been conducted on the International Space Station in the last year?	
CW 10. Students should be able to evaluate how humans contribute to sustainability through the extraction, use, disposal, and recycling of materials	What is the process of fracking?	

Reflection Activity

Think back to those professional learning needs you identified earlier (pages 1 &2). Can you now consider **how** or **when** any needs which you identified could be addressed **in your own school.** Filling in the table below might help.

Area of Need	Identified Area of Need	How or When?
Subject Content Knowledge		
Pedagogy and Classroom Practice		
Assessment		
Criteria Based Judgements		

Map of the Website

Framework
Science Specification
Assessment Guidelines
Science Info Leaflet

Latest News
Twitter Feed
Newsletters

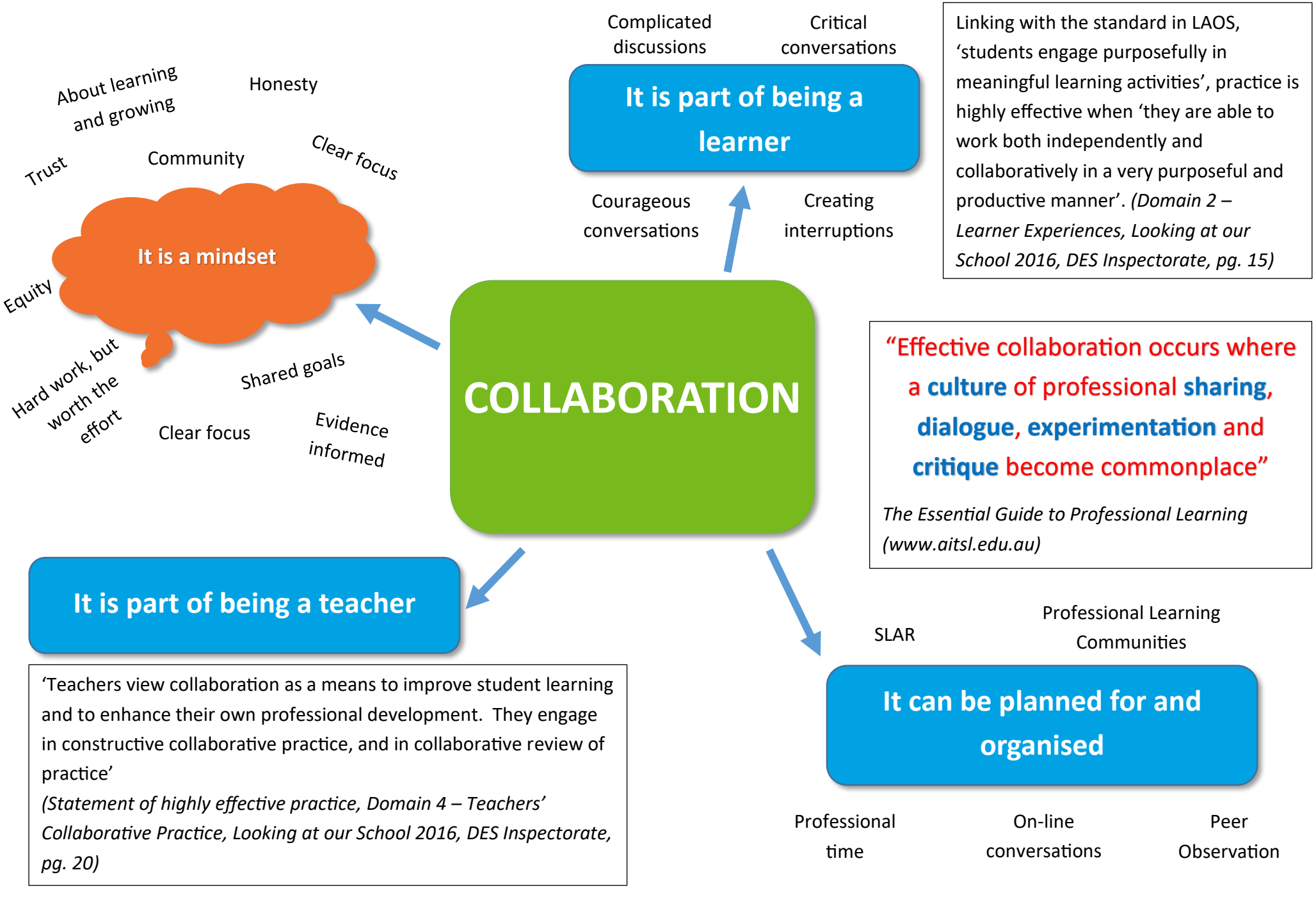
CPD Workshops / Elective workshops
Presentations
Resource booklets
Materials used during workshops

Planning First Year / Planning Next Steps / Working with Learning Outcomes / Planning Documents
Planning Resources
Resources to help your department when working with learning outcomes
Posters, plans and templates to help with planning

An Overview of Assessment for Junior Cycle / Classroom Based Assessments / Subject Learning and Assessment Review
Overview of changes in assessment for Junior Cycle Science
Formative assessment in the science classroom
Information regarding Classroom-Based Assessments
Supports for the SLAR process

Various resources including:
Posters, reading strategies, videos, links to websites
Introducing the Specification, the Nature of Science strand and inquiry based learning

Le fáil trí mheain na Gaeilge.


COLLABORATION
It is a mindset
About learning and growing
Honesty
Trust
Community
Clear focus
Equity
Hard work, but worth the effort
Shared goals
Clear focus
Evidence informed
It is part of being a learner
Complicated discussions
Critical conversations
Courageous conversations
Creating interruptions
Linking with the standard in LAOS, 'students engage purposefully in meaningful learning activities', practice is highly effective when 'they are able to work both independently and collaboratively in a very purposeful and productive manner'. (Domain 2 – Learner Experiences, Looking at our School 2016, DES Inspectorate, pg. 15)
"Effective collaboration occurs where a culture of professional sharing, dialogue, experimentation and critique become commonplace"
The Essential Guide to Professional Learning (www.aitsl.edu.au)
It is part of being a teacher
'Teachers view collaboration as a means to improve student learning and to enhance their own professional development. They engage in constructive collaborative practice, and in collaborative review of practice'
(Statement of highly effective practice, Domain 4 – Teachers' Collaborative Practice, Looking at our School 2016, DES Inspectorate, pg. 20)
It can be planned for and organised
SLAR
Professional Learning Communities
Professional time
On-line conversations
Peer Observation

It changes things:

"Educators need to see collaboration as a powerful mechanism for exploring beliefs, scrutinizing practice, and getting better, and therefore, teams benefit from considering how to improve collaboration" (*Donohoo & Velasco, 2016, pg.74)*

"Professional learning should make a difference to teacher learners **and** to the students that they teach." *(Nolan and Huber 1989)*

"To be most effective, collaborative learning should be driven by analysis of **student work** and be focused upon the development of teachers' knowledge, skills and understanding." *(Harris and Jones, 2012)*

"Professional Learning happens as a part of **the everyday work** of each teacher in each classroom" (*Fullan 2007)*

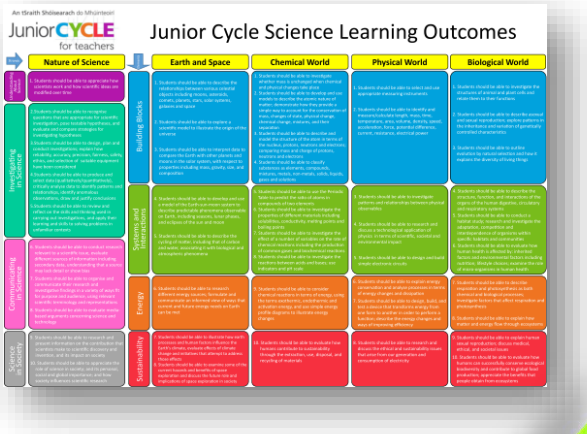
Schools that effectively collaborate "create a base of pedagogical knowledge that is distributed among teachers within a school as opposed to being held by individual teachers". (*Brook et al 2007)*

A Professional Learning Community – "An **inclusive** group of people, motivated by a shared learning vision, who **support** and **work with** each other, to **enquire into their own practice** and together learn new and better approaches that will **enhance all pupils' learning."** (*Stoll, 2006*)

Expectations – by the Teachers and Students of Ireland, for the Teachers and Students of Ireland

Teacher Developed

Teachers were an integral part of the subject development group for JC Science and the various consultation processes. They helped to shape, in a direct way, the learning outcomes of JC Science, which informed the Features of Quality for the Classroom Based Assessments (CBAs).



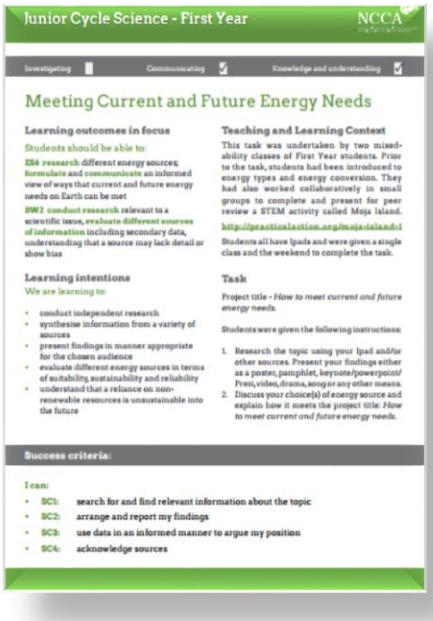
Teacher Realised

Teachers draw on their craft knowledge and professional judgement to realise expectations **every day in the classroom**. These expectations are developmental, and are part of the formative process of JC Science teaching, learning and assessment. The CBA moments are opportunities for students to celebrate their science learning journey. The moments of Subject Learning and Assessment Review meetings are opportunities for teachers to celebrate professional learning, ensure coherence of expectations, collaboratively assure our professional judgements and enhance our craft as science teachers.

Teacher Assured

To support coherence of our expectations of the students, there is a quality assured process of exemplifying the curriculum, facilitated by the NCCA. **Teachers lead this process**.

- ✓ Teachers develop examples of classroom work in Irish classrooms
- ✓ These examples are brought to the NCCA for consideration to enter a quality assurance process.
- ✓ At the quality assurance process, these examples of classroom work are presented for review by a group of independent teachers, NCCA, DES, SEC and JCT. Final examples are then published on www.curriculumonline.ie. These paint a national picture of our expectations of student learning and learner progression throughout JC Science.



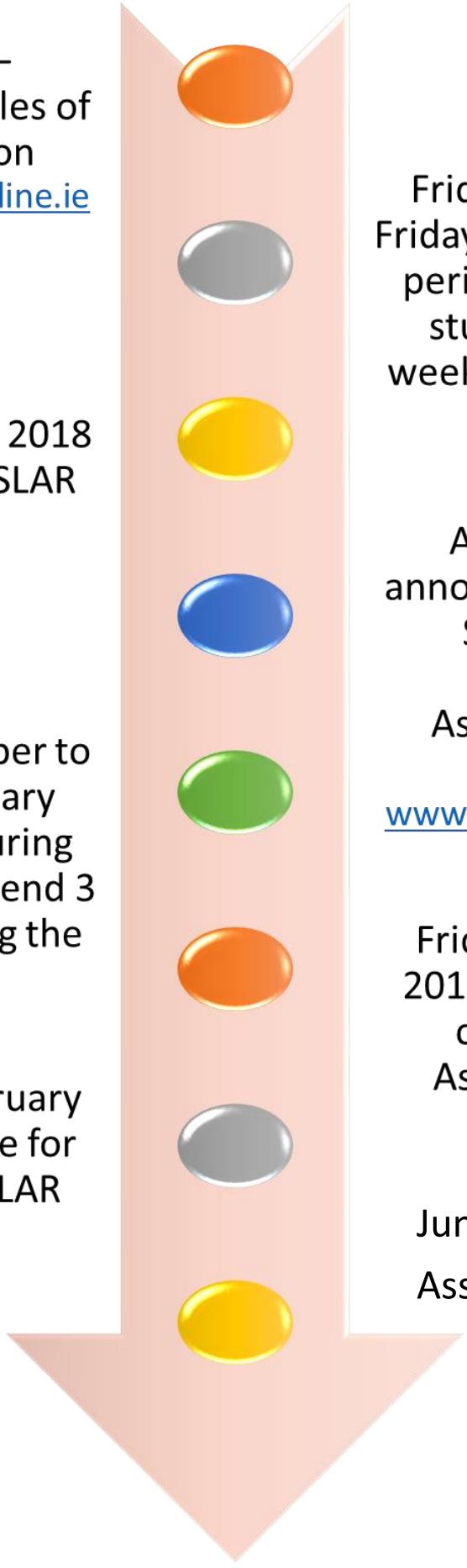
Timeline of Key Dates

Spring 2018 – annotated examples of EEIs available on www.curriculumonline.ie

Monday May 28th 2018 – latest date for SLAR meeting

Friday 7th December to Friday 25th January 2019 – period during which students spend 3 weeks completing the SSI

Thursday 7th February 2019 – latest date for completion of SLAR meeting



Friday 20th April to Friday 18th May 2018 – period during which students spend 3 weeks completing the EEI

Autumn 2018 – annotated examples of SSIs as well as examples of Assessment Tasks available on www.curriculumonline.ie

Friday 1st February 2019 – final date for completion of Assessment Task

June 2019 – Final Assessment

Frequently Asked Questions on the CBAs

NOTE: All page references are to the

Junior Cycle Science Guidelines for the Classroom-Based Assessments and Assessment Task, First Edition, 2016

1. Is there a prescribed booklet to fill in?

No, there is no prescribed booklet to fill in. Students will report their research and findings in a format of their choice as specified in the Guidelines (pg. 17 and pg. 28).

2. Where do we store CBAs?

Once the SLAR is completed, provisional descriptors have been reviewed and final descriptors awarded, the work is given back to the student and does not need to be stored.

3. Do I give students feedback on the CBAs?

Providing effective feedback is a crucial step in using the EEI and the SSI to support learning in science. Students will be informed of the descriptor they have been awarded once the SLAR meeting has taken place and its outcomes have been processed. However, effective feedback goes beyond the naming of the descriptor awarded. Feedback on the strengths of the student's work, and on areas for improvement can be used to support their future learning. Information gathered during the completion of the EEI and SSI, and from the Subject Learning and Assessment Review meeting can be used to inform planning for future teaching and learning (pg. 21 & pg. 34).

4. When do the titles come out?

There are no titles. The students choose a research question (EEI) and a scientific topic or issue (SSI) linked to one of the topic options listed in the Guidelines (pg. 15 & pg. 26).

5. Can all students do the same topic?

The Guidelines highlight that the CBAs **promote student engagement** through providing opportunity for **student choice** about the topic or issue to investigate or research. For the EEI and SSI, students are expected to choose a topic for investigation from the list provided in the Guidelines. From this, they must formulate a question to investigate and "under normal circumstances, each student / group should complete a different investigation" (pg. 12).

6. Do all students have to have a separate report?

For both CBAs, teachers should ensure that each student is individually able to produce evidence related to the Features of Quality of this assessment. For the EEI, whilst students are encouraged to work in groups they must work individually to compile the report of their investigation. The SSI is an individual research report.

7. Can students work together?

The SSI is an individual research project. Whilst students may collaborate with classmates in gathering relevant information and data, each student must individually produce evidence to meet the Features of Quality of this assessment.

For the EEI students are encouraged to work in groups and will participate in four activities (not necessarily in a linear fashion) (pg. 15 - 17):

- Questioning and predicting: individually or in groups (each student must contribute to the work of the group)
- Planning and conducting: individually or in groups (each student should work on their own to write their Investigation Plan (pg. 21) but must contribute to the collection of data)
- Processing and analysing: should be done as individuals
- Reflecting and reporting: whilst students can reflect on their investigations together, they must report as individuals

8. Does it have to be a completely new investigation?

During the EEI, students will be required, amongst other things, to gather and analyse primary data. Similarly, during the SSI, students will be required to gather and analyse secondary data. In keeping with the spirit of the Guidelines, it is envisaged that students would engage with gathering new data for these investigations. In this regard, students would be carrying out new investigations. However, these investigations could be extensions of classroom work or areas of interest to students that were part of the teaching and learning process up to the point of the CBAs.

9. When should I share the Features of Quality with my students?

During your CPD with JCT science, we discussed the need to develop students' understanding of the feaures of a good investigation, as a **developmental process**, through the use of **formative assessment practices**. This supports students' understanding of the expectations of the features of an investigation, in line with the Features of Quality in the Guidelines. The Guidelines state that "From an early stage, students should be familiar with and **understand** the Features of Quality used to judge the quality of their investigation. This is best achieved when students use success criteria for ongoing assessments throughout first, second, and third year" (pg. 13). The teacher is the person best situated to decide on the rate at which this development progresses and will be guided by their professional judgement and their students' age and stage of learning.

10. How were the Features of Quality developed?

They were developed by the NCCA in consultation with the various educational stakeholders, based on the Nature of Science learning outcomes.

11. What is the purpose of the investigation plan?

As part of planning the investigation, "Students should be given time to have hands-on experience in the laboratory to plan and refine their experimental design, decide what equipment and materials will be necessary, and assess any possible risks" (pg. 16). After this planning session, the students submit an investigation plan individually to their teachers. This should take no more than a single class period to complete. The plan details the research question, equipment and materials request and the proposed method. This information is important for the teacher to ascertain whether the proposed method is dangerous, if the method is unworkable or unmanageable for logistical reasons, or if the question does not lend itself to scientific investigation. This may prompt the teacher to suggest changes, or to provide assistance which in individual cases may be beyond reasonable support. This may inform teachers' overall consideration of the descriptor awarded when using the Features of Quality (pg. 16).

12. Why must each student submit an individual plan?

Submitting an investigation plan is good scientific practice for now and later life. By submitting an individual plan, each student takes active ownership of their investigation from the outset. The individual plans also provide the teacher with early evidence relating to the Features of Quality for each student. This may inform teachers' judgements when considering the level of achievement of their work.

13. What provisions can I make for my students with special educational needs (SEN)?

Special provisions may be put in place for a student with a specific physical or learning difficulty to remove as far as possible the impact of the disability on the student's performance in both Classroom--- Based Assessments and the Assessment Task so that he/she can demonstrate his/her level of achievement. The accommodations – for example, the use of Irish Sign Language, support provided by a Special Needs Assistant, or the support of assistive technologies – should be in line with the arrangements the school has put in place to support the student's learning throughout the school year and are not designed to compensate for a possible lack of achievement arising from a disability (pg. 9).

14. Can I consider my student's research records when awarding a descriptor to their investigation?

No, only a student's investigation report is considered when awarding a descriptor. However, the idea of students keeping records is a good scientific practice to develop. Part of this practice involves students recognising the need to transfer relevant information into their final report. It is important to remember that the CBA moment is also a formative process and therefore feedback can be given to the student from the evidence that existed in his/her research records but did not appear in his/her final report.

15. Do Features of Quality carry different weighting?

No, all Features of Quality carry equal weighting. When awarding a descriptor, remember that it is a case of 'all or nearly all' of the features that will lead you to awarding an 'on balance' descriptor.

16. For the EEI, does experimental mean "hands on" laboratory work?

Yes, it does. Students need to be given the opportunity to demonstrate evidence of learning related to the Features of Quality of the EEI, and "hands on" experimental investigation work provides this opportunity (pg. 16).

Descriptor Definitions

Deciding the level of achievement for the Classroom-Based Assessments

Teachers use the Features of Quality to decide the level of achievement in each Classroom-Based Assessment. The Features of Quality are the criteria used to assess the student work, as best fitting one of the following Descriptors:

- **Exceptional** describes a piece of work that reflects all of the Features of Quality for the Classroom-Based Assessment to a very high standard. While not necessarily perfect, the strengths of the work far outstrip its flaws, which are minor. Suggestions for improvement are easily addressable by the student.

- **Above expectations** describes a piece of work that reflects the Features of Quality for the Classroom-Based Assessment very well. The student shows a clear understanding of how to complete each area of activity of the investigation, and the work is praised for its rigour. Feedback from the teacher might point to the necessity to address some aspect of the work in need of further attention or polishing, but, on the whole the work is of a high standard.

- **In line with expectations** describes a piece of work that reflects most of the Features of Quality for the Classroom-Based Assessment well. It shows a good understanding of the task in hand and is free from significant error. Feedback might point to areas needing further attention or correction, but the work is generally competent and accurate.

- **Yet to meet expectations** describes a piece of work that falls someway short of the demands of the Classroom-Based Assessment and its associated Features of Quality. Perhaps the student has made a good attempt, but the task has not been grasped clearly or is marred by significant lapses. Feedback will draw attention to fundamental errors that need to be addressed.

Sourced from the 'Junior Cycle Science Guidelines for the Classroom-Based Assessments and Assessment Task', First Edition.

Supporting the Process

The CBA process is a part of normal classroom practice. Like normal classroom practice, students will always require some support. To facilitate developmental feedback to students during their engagement with the task, the process of completing the Classroom-Based Assessment should be viewed as part of teaching and learning, and not solely for assessment purposes. It is envisaged that teachers will guide and supervise throughout the process through 'reasonable support'.

Reasonable support may include:

- Clarifying the requirements of the task
- Using annotated examples of student work provided by NCCA to clarify the meaning and interpretation of the Features of Quality to students
- Providing instructions at strategic intervals to facilitate the timely completion of the investigation and report
- Providing supports for students with special educational needs (SEN)

It is not envisaged that this level of support involved requires teachers to edit draft reports, or to provide model text or answers to be used in the student's evidence of learning.

CBA 1 – Extended Experimental Investigation (EEI)

If a student requires more than what is deemed to be 'reasonable support', the teacher can make a note of the level of assistance provided, in the following areas:

• formulating hypotheses/predictions	where a teacher gives an investigation question or excessive guidance in forming a testable hypothesis/prediction with justification
• planning	where a teacher has to provide assistance in the design of the investigation—because, for example, the proposed method was dangerous, incomplete, or unworkable
• conducting the investigation	where a teacher has to provide assistance to ensure the safe assembly and use of equipment

CBA 2 – Science in Society Investigation (SSI)

The teacher can review their own notes to check whether a student required more than what is deemed 'reasonable support' in choosing a topic for investigation, deciding a specific research question, or finding and recording information.

Adapted from the 'Junior Cycle Science Guidelines for the Classroom-Based Assessments and Assessment Task', First Edition.

Investigation Plan for CBA1

Student name:	Date: Class:
Research Question:	
Equipment and materials request:	
Proposed method:	
Approved by:	Date:

Sourced from the 'Junior Cycle Science Guidelines for the Classroom-Based Assessments and Assessment Task', First Edition.

Sharing Samples of Work for the Subject Learning and Assessment Review Meeting

Each teacher of second-year students should submit four samples of student work for the Subject Learning and Assessment Review Meeting. Where feasible, these samples should **contain an example at each of the four descriptor levels.** The information will be used to create a running order for our upcoming Subject Learning and Assessment Review (SLAR) meeting. As we may not have time to discuss all the samples, please number the pieces 1 to 4, where 1 should indicate the sample that you would most like to discuss.

Please return this form by: _____ Date of SLAR meeting: _____

Name of Teacher: _____

Sample 1	Investigation topic: Provisional descriptor: Preference for use at SLAR: ☐ Format:
Sample 2	Investigation topic: Provisional descriptor: Preference for use at SLAR: ☐ Format:
Sample 3	Investigation topic: Provisional descriptor: Preference for use at SLAR: ☐ Format:
Sample 4	Investigation topic: Provisional descriptor: Preference for use at SLAR: ☐ Format:

Running Order of Samples for the Subject Learning and Assessment Review Meeting

Facilitator: _____

Date of SLAR Meeting: _____

Venue & Time: _____

Order	Teacher Name	Sample Collected	Provisional Award 'Exceptional'	Provisional Award 'Above Expectations'	Provisional Award 'In Line with Expectations'	Provisional Award 'Yet to Meet Expectations'

Guidelines for Carrying out a Subject Learning and Assessment Review Meeting

Subject Learning and Assessment Review meetings enable teachers to collaboratively reach consistency in their judgments of student work against common, externally set Features of Quality. Greater understanding of standards and expectations will develop over time as teachers come together in professional discussion to reflect on the quality of their own students' work, informed by the subject specification, assessment guidelines and other support material including annotated examples of students' work provided by the NCCA.

Overview

The review process is centred on **teachers discussing student work at structured** meetings. It will play an important role in helping teachers to **develop an understanding of standards and expectations** by enabling them to reflect on the evidence of students' work and to share the learning and teaching strategies supporting that work.

The **objectives** of the review process are to achieve:

- greater consistency of teachers' judgement,
- better feedback to students,
- greater alignment of judgements with expected standards,

and to assure parents and others that students are receiving appropriate recognition of their achievements in line with standards and expectations.

The time for review meetings will be provided for in the school calendar from the allocated 22 hours of professional time for each full-time teacher each year. **One teacher (facilitator) of each subject will be allocated two additional hours by school management to prepare for and coordinate each review meeting.** This role will normally be rotated among the relevant teachers.

Each meeting will:

- be subject specific
- be approximately two hours long
- take place at a time as near as possible to the completion of the Classroom-Based Assessment
- involve the review of student work related to a specific Classroom-Based Assessment

Where there is a single teacher of a subject in a school, the teacher can be facilitated to participate in a Subject Learning and Assessment Review meeting in another school. In the case of an Irish-medium school, the single teacher of a subject can participate in a Subject Learning and Assessment Review meeting in another Irish-medium school.

Facilitator's Guide

Teachers will fulfil the role of facilitator during Subject Learning and Assessment Review meetings on a rotational basis. The facilitator will model effective questioning during the discussion of the samples of student work focusing on how well students' work matches the Features of Quality. During review meetings, where it is not clearly evident which descriptor should apply, the group should look for the evidence in the student's work that matches **all or nearly all** of the Features of Quality associated with a particular descriptor. This '**best fit**' approach allows teachers at the review meeting to select the descriptor that '**on-**

balance' best matches the work being assessed. The facilitator will submit a **short report** (see pg. 27) of the review meeting to the school principal.

Teachers should not assume that the results of a group of students being assessed will follow any particular distribution plan as the student's work is being judged only against the Features of Quality rather than other students' performance.

Before the meeting

As a first step, teachers may find it helpful to review some of the relevant **NCCA annotated examples** prior to coming to decisions about their own students' work.

Once students have completed their Classroom-Based Assessment, the teacher will carry out a **provisional assessment** of the students' work based on the Features of Quality. These provisional assessments may be modified in light of the discussions that take place at the Subject Learning and Assessment Review meeting.

The teacher will make a note of the descriptor allocated to each student and any other point they may wish or find useful to refer to during and after the Subject Learning and Assessment Review meeting. This note will be for the teacher's own use.

In preparation for the Subject Learning and Assessment Review meeting, each teacher will **identify one sample of student's work for each descriptor**, where feasible, and will have these available for discussion at the meeting.

During the meeting

The facilitator leads the meeting and keeps the record of the decisions made in a template, which is used to generate the report of the meeting (see pg. 27) It is recommended that the meeting should generally follow this sequence:

- The facilitator explains that the purpose of the meeting is to support consistency of judgement about students' work and to develop a common understanding about the quality of student learning. The value of the meeting in providing feedback to students on how they might improve their work should also be highlighted.

- The facilitator asks one member of staff to introduce a sample of work they have assessed as ***Yet to Meet Expectations***.

- Following a **short introduction** by the teacher, the facilitator leads a general discussion on the extent to which the student's work matches the relevant Features of Quality. If the meeting affirms the judgement, this is noted in the meeting record by the facilitator.

- **Where there is a lack of agreement, the facilitator should refer to relevant annotated examples of student work provided by the NCCA and, if appropriate, a couple of examples of student work that other teachers in the group have assessed and awarded that descriptor to.**

- The facilitator should look to establish consensus during the discussion of examples but the emphasis should be on developing teachers' professional knowledge and skills rather than on seeking unanimous agreement over every Feature of Quality in every example.

- The emphasis in affirming judgements during the review meetings should always be on a 'best fit' approach which allows teachers to agree the descriptor that 'on-balance' is most appropriate for the work being assessed.

- While reasonable time should be allowed for discussion, the facilitator should use his/her professional judgement to decide when it would be appropriate to proceed to the next sample.

- **If possible, there should be discussion of at least two samples for each descriptor and the facilitator should ensure that each teacher has at least one of their samples discussed during the meeting.**

- **The process is repeated, in turn, with samples assessed as *In Line with Expectations*, *Above Expectations* and *Exceptional* being discussed and shared in the group. At the end of the meeting, the facilitator briefly summarises the key points from the discussion**.

- It's important that each teacher **notes the implications of the decisions** made during the meeting for the rest of the student work they have already assessed, particularly in the case of descriptors where their judgement did not align with the view of the majority of teachers at the meeting.

After the meeting

After the meeting, each teacher considers the assessment of their students' work based on the outcomes of the meeting and, where it is considered necessary, makes the **appropriate adjustments to their provisional assessments**.

Following the Subject Learning and Assessment Review meeting, the **facilitator submits their report** from the meeting focusing on the outcomes of the discussion of student work at the meeting, and submits it to the school principal.

The facilitator may also ask teachers, should they wish, to **contribute some student work to a bank of examples**:

- To support the induction of new teachers

- To support future Subject Learning and Assessment Review meetings

- To use with students and parents in demonstrating the standard of work achieved.

Adapted from www.juniorcycle.ie/Assessment/Review-Meeting

Facilitator's Report

Subject Learning and Assessment Review Meeting

Subject:	**Date/time**
Attendance	
Key decisions taken	
Points of note for future review meetings	
Any further comment?	
Facilitator Date	

Sourced from www.juniorcycle.ie/Assessment/Review-Meeting

Action Plan

How can we, in our subject department, foster a culture that supports collaboration?

Contact Information

Information and resources are available on our website: www.jct.ie

For any queries, please contact us on one of the following:

Email: info@jct.ie

Phone number: 047 74008

Follow us on Twitter @JctScience and @JCforTeachers

The Science Specification and Guidelines for Classroom-Based Assessments and Assessment Task, First Edition, are available at www.curriculumonline.ie