Guidance for Love Food Love Science mentors

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About Love Food Love Science

IFST members supporting food science teaching

We created Love Food Love Science to support the teaching of food science and technology at secondary school level in the UK. As members of the Institute of Food Science and Technology, we can play a pivotal role in upholding the quality of food science teaching and enticing the next generation to think about the exciting and rewarding food science careers available in our economically significant and vibrant sector.

Teaching resources

Through the Love Food Love Science website, teachers can access resources designed for them by real food scientists. Resources range from simple explanations of key food science concepts, experiments and practicals, detailed explorations of some food science concepts, and a directory of other credible food science resources – we don't need to reinvent the wheel. Resources might be used by teachers to develop their own knowledge before tackling a particular topic in the classroom or used in class with students as a teaching aid. Equally, as the website is open access, students and their parents may want to use our resources to support their learning or just for fun!

IFST mentors

Alongside teaching resources, we are offering teachers the opportunity to access IFST mentors. This is our opportunity to improve the quality of teaching of food science in the classroom by helping teachers who might be rusty or struggling with new topics or giving real-world examples and credence to an aspect of the curriculum sometimes side-lined as 'cookery'.

Teachers can make a request for support from a particular IFST mentor using the mentor listing on the Love Food Love Science website. IFST Team handles requests from teachers and liaises with mentors to ensure we are not bombarded or spammed; profiles in the mentor directory do not contain contact details.

Developed with teachers

We developed Love Food Love Science in collaboration with teachers (through our friends at the Food Teachers Centre and individual teachers); we have engaged and consulted with our sector stakeholders; and we ran a pilot of the IFST-teacher mentoring in 2016, all of which has helped us shape Love Food Love Science.

Love Food Love Science is free to use. It is managed by IFST as a charitable educational activity. We see volunteering to support Love Food Love Science, by becoming a mentor or helping create teaching resources, as our way of developing the food sector in the UK and safeguarding the public by ensuring a strong food science and technology profession for years to come.

Love Food Love Science was re-launched (replacing an out-of-date website) in April 2017.

Why we are supporting secondary school teachers?

At an education policy forum in 2015, IFST with its partners identified the introduction of the new GCSE option in Food Preparation and Nutrition for secondary school students in England from 2017, which has a greater emphasis on science than many 'home economy'

teachers may have been used to, and the abolition of the Food Technology A' Level, as a risk/opportunity to the food science profession and the food sector generally. We see supporting secondary school teachers to deliver credible and exciting food science in the classroom within the new GCSE syllabus and injecting food science into the 'hard science' curricula as key ways to help bridge the educational gap.

Aims

- To help teachers improve their understanding of food science and bring the subject to life using real-world examples.
- To show how the scientific method works in practice – for example, variables, control, testing, measurement, sensory evaluation.
- To support teachers by giving them access to a food science mentor/critical friend.
- To inspire and excite teachers and young people about food science and technology.

Benefits

- Engage and show teachers and young people how the tasks that they are set at GCSE match real life circumstances and opens up careers options, improving the take-up of post-16 and degree routes into the food sector.
- Raise the profile of food teaching in schools as head-teachers, parents and governors come to see greater value in the subject to the local economy, community and in terms of careers prospects.
- Provide a route for food science professionals to become more closely involved in the education and exam process, offering feedback to exam boards and advice on relevant syllabus content for the future.

Food Preparation and Nutrition GCSE

Teaching of the new GCSE Food Preparation and Nutrition began in September 2016. The syllabus covers nutrition, food provenance, food choices, cooking and food preparation, including the scientific principles underlying the cooking and preparation of food, food safety, and practical skills. It is assessed in three parts: 50% written exam, 35% practical test and 15% food investigation, where students have 8-10 hours to complete an investigation into the working characteristics, function and chemical properties of ingredients and produce a written report.

The first examinations will be in the academic year 2017-18, with the written exam May/June 2018, practical test (anytime November 2017- May 2018), and the food investigation (anytime September 2017-May 2018). Many schools will hold 'mock' or practice examinations, starting summer term 2017 (at the end of the first year of the course), but continuing year-on-year.

Food science investigation: non-examination assessment (NEA)

Our pilot concentrated primarily on the food investigation element of the GCSE as we felt this is where our expertise would have most impact and where we know that teachers need most help. We continue to think this aspect of the GCSE is where most teachers who want mentoring support will want to concentrate. Students have 8-10 hours to complete a choice of two or three tasks and produce a 1,500-2,000 word report (written and with photographic evidence). This focuses on investigating the working characteristics, function and chemical properties of ingredients.

How the food investigation task is assessed:

- Research and plan (approx. 5 marks)
  - Research sources
  - Create a plan – variables, test more than one
  - Predict an outcome
  - Use specialist food science vocabulary
- Investigate (approx. 15 marks)
  - Investigate the working characteristics, function and chemical properties of ingredients through practical experimentation, and then use the findings to achieve a particular results
  - Review and make improvements to the investigation by amending ingredients, process, cooking method
  - Knowledge and understanding of the working characteristics and properties of ingredients
  - Record investigation, modification and adjustments
  - Wide range of tests – sensory preference, participant feedback
  - Photographic evidence, stages of investigation, documented
  - Results well-presented, logical and different formats
- Analyse and evaluate (approx. 10 marks)
  - Analyse the data and results collected, draw conclusions based on scientific knowledge
  - Justify findings, clear reasons for success or failure of investigations
  - Evaluate the hypothesis and confirm/review prediction
  - Demonstrate understanding depth of task
  - Well-structured, clearly expressed
  - Use specialist terminology accurately.

The major content of this task that is examined is:

- Why food is cooked
- How heat is transferred – conduction, convection, radiation
- Carbohydrates – gelatinisation, dextrinization, caramelisation
- Fats and oils – shortening, aeration, plasticity, emulsification
- Protein – denaturation (physical, heat and acid), foam formation, coagulation,, gluten formation,
- Fruit/veg – enzymic browning, oxidisation
- Raising agents - chemical, physical, biological
- Positive use of micro-organisms, fermentation.

We have taken this GCSE core content as the starting point of Love Food Love Science, although we feel free to work with teachers around the entire syllabus and, in fact, throughout secondary school science curricula.

What do we gain by becoming mentors?

Apart from the 'feel good factor' and giving something back to our school communities, as members of IFST we know that the support we provide to teachers is based on solid understandings of the scientific method and genuine knowledge about the food sector and the opportunities for exciting and rewarding careers in it. We see mentoring and supporting Love Food Love Science as our chance to uphold and strengthen capacity in food science for the future.

On a personal level, we acknowledge that mentoring and contributing to Love Food Love Science, perhaps simply by thinking about what we do every day in a new light – through the eyes of teachers and their students – is both challenging and rewarding, bringing its own rewards in terms of personal growth and professional development.

Professional recognition

As only IFST members are able to volunteer as Love Food Love Science mentors, we ensure as best we can that the food science expertise brought to the classroom is robust and evidence-based. As Love Food Love Science mentors we act as ambassadors for the Institute and for the food sector in general. Our mentoring sessions may be among the few encounters teachers and, if they are involved, students will have had with a non-medical or education 'profession', and it is important that IFST's role in setting, promoting and advancing professional standards and ethics of those working in the field is clearly communicated. We view our interactions with teachers and their students as an opportunity to underline the importance of people working within their scope of knowledge and skill and, in the case of food science and technology, this is recognised through membership and/or registration with IFST.

Through our interactions we inform teachers about IFST and our aims, to:-

- develop and share knowledge about food science and technology
- act as the voice of the food science and technology
- promote professional development and standards and ethics
- encourage people to take up careers in food science and technology.

What does becoming a mentor involve?

Depending on the support a teacher needs and the level of interest from their students, mentoring can vary from a single interaction, perhaps only an exchange of emails or a call, through to regular contact over a number of weeks, perhaps a weekly Skype session. Of course, we need to fit mentoring around our own schedules.

In our pilot (Autumn 2016) we found that teachers and students particularly value face-to-face assistance when preparing for and conducting the food investigation task of the new GCSE so, on occasion, we might offer to spend a few hours in the classroom under the supervision of the teacher to help teachers and students with a specific topic or task, or to give some real-world context to the work they are doing. Actual time commitment varies with each teacher-mentor relationship and it is down to us to find the balance that works for both parties.

What every new mentor needs to know before starting

Safeguarding

As mentors we understand concerns about 'safeguarding' and must not at any point interact directly or indirectly with students without the express consent and continuous supervision of their teacher, and this includes 'virtual' interactions such as email, social media, apps, webchat, and telephone. If we are invited into schools, it is for the teacher and school to explain local 'safeguarding' protocols and make arrangements for our visits.

Introductions

IFST Team will screen all requests for mentoring support. This ensures only genuine requests from teachers in need will be passed on to us. IFST Team will normally forward on a genuine request for support by email to the relevant mentor. As mentors we aim to reply to IFST Team within two working days to acknowledge and confirm if we are free to deal with the mentoring request and, if so, when we expect to have time to deal with it. If we are not free to help, IFST Team will endeavour to find another mentor to assist.

Mentoring requests come in a standard format, which includes the teacher's name, the name of the school, location, topic or support required, and the teacher's contact details. It is for us as mentors to establish the link with the teacher.

Setting expectations

In the pilot, we found it helpful to set expectations at the start about the level of support required and on offer, and how this might be delivered and over what period.

Getting started

Schools tend to be a little bit more flexible about how they can use time in the Summer term. We expect the majority of requests for mentoring support will come in before the end of June and beginning of July.

Initial contact with the teacher may be by email, a telephone call or a meeting at the school.

Here is a useful checklist of things to discuss:

- Identify what support is needed and what could be offered, eg. when is the teacher free to speak on the phone, or what are the dates and times of lessons you need to plan around? (Some schools work on a two-week timetable).
- How much time do you have to offer?
- What support can you easily/comfortably provide?
- What resources does the school have access to, eg. multimedia projector, video and website content, ingredients, equipment, etc.?
- If you are going to be helping in the classroom, is it possible to have a preparatory visit to plan your activity?
- Ask the teacher to outline the procedures for visiting the school, for example they may require photo ID (as part of the school's safeguarding policy), for you to book parking and sign in at the reception.
- Confirm the teacher has completed necessary risk assessments and that insurance policies are in place for your visit.

Working with teachers

Planning

Things to think about when planning with your teacher(s):-

- Lessons take place in a food classroom, equipped with a domestic or catering style kitchen area – not a science lab, although some science equipment may be available.
- Be clear about what will be achieved within the time available.
- Think about what the teacher and their students will find most helpful and what can you contribute?
- If you are going into a classroom, check the 'level' of the presentation required and the expectations. Usually it is best to:
  - keep verbal communications and instructions to young people short and clear.
  - use more visuals and examples.
  - build on limited knowledge and scientific vocabulary.
  - explain any technical words you are using.
  - use questions to check students' knowledge, eg. am I right in thinking that you all know what xxxx means? Can anyone explain what I mean by xxxx?
  - where possible link your real-world experiences of food science to what you are doing with the teacher and their students.

Be guided by the teacher about the abilities of their students. We found it helpful to look at the students' classwork and their current textbooks to get an idea of what they are working on and calibrate our approach. We also found worksheets and PowerPoint presentations pitched at the average 14-16 year old students, such as Food a Fact of Life Website, useful.

'Remember the age & ability of the pupils.' (a teacher from the 2016 pilot)

http://foodafactoflife.org.uk/Sheet.aspx?siteId=19&sectionId=83&contentId=306

Mentoring - working with teachers and their students

Teachers and, if they request support in the classroom, their students will welcome support across many aspects of the GCSE. They will welcome advice and feedback on the investigations skills that are used in the food sector (research, setting up investigations, analysis and evaluation, as well as report presentation).

Love Food Love Science does not propose a single approach to mentoring as there are myriad ways of supporting teachers and classes: we can be flexible according to the amount of time they and we can devote to the support, and some resources are not available to all. On occasion support will mean visiting a school but, more often, it will be delivered using modern technologies (Skype, email, voice and video conferencing). The mechanism of support should be agreed with the teacher.

'Keep things simple - you don't realise how much knowledge you have.
Students are generally receptive to new ideas and curious to learn.
Keep activities short.' (a mentor from the 2016 pilot)

Some approaches that you can use are:

- Supporting the teacher with information, resources (video/photos) and ideas.
- Working with the teacher on an inspirational start to the task for the class, to create interest and develop their knowledge about the ingredients they are going to work with.
- Working with the teacher on an aspect of the functional properties of ingredients.
- Finding a case study from your work in the sector that demonstrates key concepts or report presentation skills that the teacher or you can deliver in a short presentation to students.

- Help the teacher to understand how to demonstrate key concepts by co-designing an experiment.
- Explaining the relevance of the investigation or task to the sector, and why food science is important.
- Hosting a visit to your site to witness food investigations first hand in the real-world.
- Answering questions by email, Skype or conference call during specific points of the investigation.
- Listening to the students present their findings (by video-log, in the classroom or by video conference) and offering constructive advice.
- Providing teachers and, where relevant, their students with feedback and how they might improve for the future.

Example food-related exercises for the classroom

Practice food science investigations

Many schools run 'mock' and practice exams in the Summer term in readiness for the final examinations. This is our opportunity to help teachers work with students during the practice food investigation task as, clearly, external support for the formal examined food investigation will not be permitted.

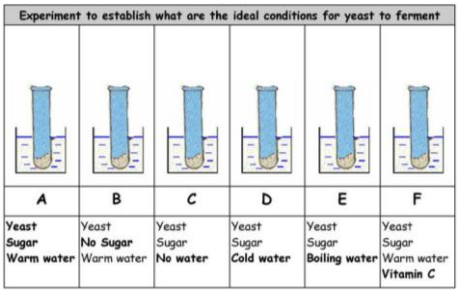
During this food investigation task, students have 8-10 hours to complete a choice of two or three tasks and produce a 1,500-2,000 word report (written and with photographic evidence). [See *Food science investigation: non-examined assessment*, p.3]

Example tasks

Here are some examples of the tasks that students may be set to complete in the 8-10 hour examination. The tests change each year and are carried out under regulated conditions. Students can have help in practice tasks but not for the actual examination. They choose one task.

AQA Board

1. Investigate what type of flour is best for bread making.
2. Investigate the use of raising agents in baked products.
3. Investigate the ingredients used to thicken sauces and soups.



Educas Board

1. Shortcrust pastry should be crisp to the bite and crumbly in the mouth. It can be prepared using a range of different ingredients. Investigate the working characteristics and the functional and chemical properties where appropriate of the different ingredients needed to achieve a perfect shortcrust pastry.
2. There are a number of ways to thicken a sauce. Investigate the working characteristics and the functional and chemical properties where appropriate of the different methods used to thicken a sauce.

OCR Board

1. Eggs are a very versatile food. Explore and scientifically investigate the changes that occur when eggs are used as a setting agent. Explain scientifically what happens.
2. Bread is a staple food product. Explore and scientifically investigate the changes that occur when flour is used as the main ingredient in bread. Explain scientifically what happens.

Lesson tasks

Here are some examples of tasks that teachers will use during their teaching to develop students understanding throughout the course. These are used to develop their knowledge of the working characteristics of the ingredients as well as students investigation skills.

Practice task 1: enzymic browning

- Which fruits and vegetables turn brown?
- Can enzymic browning be slowed down or stopped?
- Does the way in which fruits and vegetables are cut affect their enzymic browning?
- How does the texture of fruits and vegetables change when cooked?

Practice task 2: dairy

- Demonstrate and explain how an emulsion is formed when making butter.

- Explain the changes that take place in milk when it is heated.
- Make yoghurt and explain the food science behind it.
- Make cheese and explain the food science behind it.
- Why is UHT milk slightly less white? Compare the flavour of UHT milk with fresh milk and discuss.

Practice task 3: cereals, flour, gluten and starch

- Investigate the best flour for bread making (suggest gluten ball experiment or making small batches of rolls using different flours and then conduct sensory testing)
- Conduct an experiment to show the gelatinisation of a range of starches. What happens when these starches are frozen and then defrosted?
- Conduct an experiment to find out the effect of other ingredients on the thickness of starch
- What happens when you apply dry heat to starch?

Practice task 4: eggs, meat and fish

- Make a batch of meringues and explain the changes that take place within the egg white protein.
- Show how the setting of egg protein can be affected when making baked egg custard.
- Show and explain how egg white foaming is affected when other ingredients are added.
- Investigate the changes that take place in meat (or fish) during cooking.
- Conduct an experiment to show the best way to tenderise meat by breaking down the connective tissue

Practice task 5: butter, oils, margarine

- Demonstrate the creaming properties of fats when making a sponge cake using the creaming method. Which fat produces the best results? Explain why.
- Show the shortening properties of fats when making a shortcrust pastry. Which fat produces the best results? Explain why.
- Make butter to show the emulsification process. Explain what is happening during this process.
- Conduct an experiment to show which ingredients will help to stabilise mayonnaise and prevent the mix from separating.

Case studies

There are many different ways you can work in a school as a mentor.

Case study 1: exploring flour

Richard has worked for four years in food ingredient research, where he has investigated the dietary fibre content of flour. He has been linked to Camborne Academy to support food teacher Claire and her students. Claire sought some support from an Institute of Food Science and Technology (IFST) mentor. Claire has not had any experience of working in the food industry and wanted some expert advice to support the investigation: "Investigate what type of flour is best for bread making".

After an initial meeting set up by email, Richard agreed that he would feel comfortable in explaining his day to day job of conducting investigations using pictures in a PowerPoint presentation to Claire's students. (Richard may be able to at a later date arrange a visit to his research laboratory). He would stress his use of a control to measure against.

Claire felt that the presentation set the food investigation into a real context and would motivate her students to complete the task. Claire showed Richard the students' folders and loaned him the GCSE textbook to help him pitch his presentation at the correct level.

Richard joined the GCSE class for a one-hour lesson. He gave his short presentation and demonstrated the gluten ball experiment with flour. Whilst he was making the gluten ball, Richard explained what was happening scientifically. Richard explained where the flour was produced and what processes it had been through. He emphasized that cake and pastry manufacturers would need different amounts of gluten in their flour compared to bread producers to produce the most cost effective 'perfect' product.

Richard compared the size of the gluten ball to the original dough ball. He explained about the stretchiness of the dough ball and how it could be measured. A student videoed the demonstration so it could be watched again.

Richard and Claire then organised for the students in pairs to conduct a gluten content investigation with different flours. The class's results were recorded on the white board. The white board was photographed by Claire for analysis during the next lesson. The class hypothesised about which flour they thought would be perfect for bread making.

In the next lesson, the class analysed the results with Claire and then sent a copy of their presentation by email to Richard for comments.

From this experience students; understood the relevance of doing food investigations, understood the need to make a hypothesis, how important it is to measure and record the observations and findings accurately, and the need to analyse the data to select the correct ingredient for the task in hand.

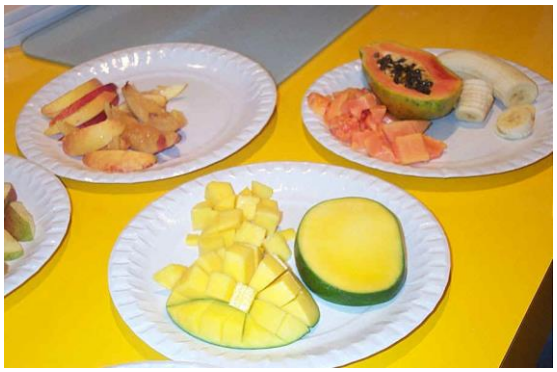
These links were given to Richard to help him to prepare the demonstration.

A video talking about the gluten levels in cake and bread flour. [Accessed 27th May 2016} https://www.youtube.com/watch?v=zDEcvSc2UKA

A step-by-step guide to making and recording the findings from gluten balls. [Accessed 27th May 2016.] https://www.exploratorium.edu/cooking/bread/activity-gluten.html

Case study 2: enzymic browning

Jennifer is a food technologist in a product development kitchen. She works on the development of fresh fruit snack products and has investigated how to reduce enzymic browning.



Thomas, a food teacher in an all-boys Academy is less confident in food science concepts as he was a chef prior to becoming a food teacher. He is seeking support for practice investigation 'Can enzymic browning be slowed down or stopped?'

After a telephone conversation, Jennifer arranged for Thomas to meet her at her product development kitchen. At this initial meeting Thomas quickly understood what food investigative work was as she showed him around her day-to-day work. He took notes and photos to use in his class.

They held a second meeting over the phone and used this to confirm the plan Thomas' lesson and approach. Jennifer had a looming deadline so she was not able to spare much time before the class but, with few emails and a phone call, Thomas was soon confident about how to pitch the concepts and a demonstration.

Together they worked out how to set up a fair test and identified the list of equipment Thomas would need. They designed an experiment with a Granny Smiths apple to see how strong a lemon juice solution needed to be to ensure that the apples did not discolour. During the demonstration Thomas explained what was happening scientifically when the apples were changing colour, he also explained why the lemon juice was helping to prevent the discoloration occurring. Drawing on what he had seen when he visited Jennifer, Thomas demonstrated to his class how important labelling was, and how to work in a logical manner. He spoke of the importance to have just one variable to make it possible to state what had been most or least effective.

Thomas organised his students to complete the same investigation using a different apple and different solutions, i.e. salt solution, sugar solution, water and no solution. Each small group of three students were given a different strength of lemon juice already prepared. The results were recorded by the students in their groups. They were given a template to write up the experiment and time to produce a chart to record the changes in the apples over time. Students were asked to write about their observations and to take photographs to support their written work. Each group then was asked to write their conclusions and then there was a discussion with the whole class led by Thomas about which strength of lemon juice and which apples would be used in the fruit snack.

During a follow-up lesson students designed their own experiments with fruits and solutions. Thomas stayed in contact with Jennifer every other week by video-conference/'FaceTime' until the end of term as the topics developed and the class moved on.

Jennifer and Thomas found web links related to enzymic browning to prepare for the classroom demonstration.

http://www.decodingdelicious.com/why-apples-turn-brown/ [Accessed 27th May 2016)

https://prezi.com/26smrcrqwpr8/enzymatic-browning-experiment/ [Accessed 27th May 2016] a Prezi presentation with pictures to illustrate the experiment.

Giving feedback

At the start, end, and periodically throughout(if the mentoring relationship lasts more than four weeks), IFST Team will collect feedback from us and teachers about how the mentoring is going. IFST Team will use this to improve the mentoring guidance and training.

On an annual basis, IFST Team will bring those of us involved in Love Food Love Science as mentors or contributors together with teachers in person or 'virtually' to share learning and best practice.

IFST Team will monitor use of the Love Food Love Science website and track the number of and feedback from mentoring sessions to ensure Love Food Love Science remains on track to deliver a valuable service to teachers and their students.

Developing school-food science sector linkages

You may want to continue your work with the school – after the first interactions; other opportunities may develop, such as supporting careers talks and open evenings.

Getting extra support and advice

GCSE content and OFQUAL regulations

https://www.gov.uk/government/publications/gcse-food-preparation-and-nutrition

https://www.gov.uk/government/publications/gcse-9-to-1-subject-level-guidance-for-food-preparation-and-nutrition

General Mentoring Support

http://franchisegrowthpartners.com/mentoring Top 10 Qualities of a Good Mentor.

http://www.versa.uk.com/apprenticeship/mentor_handbook.pdf A detailed manual to support good mentoring.

Food Science support

http://www.ifst.org/lovefoodlovescience

Useful contacts

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