

Chapter 7 Supporting beginning science teachers to teach and evaluate their lessons

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Introduction

This chapter aims to highlight some mentoring strategies when working with beginning teachers who are at different developmental stages of teaching. For example, a beginning teacher you are mentoring might be observing and practising some basic teaching skills, but not yet teaching a full lesson, or they might have started to incorporate a range of teaching strategies in lessons, but these strategies are not specifically focusing on promoting pupils' learning and so on. Therefore, you should use your judgement and knowledge about the beginning teacher to identify the best mentoring strategy to use at any one time.

The chapter starts with a brief description of the stages of development using Maynard and Furlong's (1995) model of a beginning teacher's development concerning basic teaching skills, teaching strategies and teaching styles. Next, some characteristic behaviours of an effective teacher are presented. A range of mentoring steps to support the beginning teacher's journey of becoming an effective teacher, starting from 'early idealism' then 'survival', 'recognising difficulties', 'hitting a plateau' and finally to 'moving on' stages of development are then given. The chapter closes with a discussion on how to support a beginning teacher to self-evaluate their lessons by using lesson debriefs (called post lesson discussions in Chapter 8) and pupils' feedback.

Objectives

At the end of this chapter you should be able to:

1. Recognise that it is a mentor's responsibility to identify a beginning teacher's stages of development and support them towards becoming an effective teacher;
2. Support a beginning teacher to develop the characteristic behaviours of an effective teacher;

3. Assist a beginning teacher to be able to identify and develop basic teaching skills, teaching strategies and a pupil-centred teaching style;
4. Encourage a beginning teacher to self-evaluate their lessons with the aid of lesson debriefs and pupils' feedback.

1. Stages of development as a teacher

Maynard and Furlong (1995) suggested that a beginning teacher's professional development can be mapped by focusing on five-stages namely: 'early idealism', 'survival', 'recognising difficulties', 'hitting a plateau' and 'moving on'. In the 'early idealism' stage of teacher development, a beginning teacher typically has an idealistic view of teaching and thinks that problems can be solved with goodwill. Reaching the 'survival stage' is when the reality of teaching sets in and the beginning teacher's focus is on standing in front of a class and managing a lesson. As they gain more experience, a beginning teacher starts to 'recognise difficulties' and anticipate these difficulties in the classroom and develop ways to teach a successful lesson. Beyond this, in the 'hitting a plateau' stage, a beginning teacher begins to teach a short series of lessons, but does not always link their actions to their pedagogical content knowledge (PCK). In the 'moving on' stage, a beginning teacher links their actions in the classroom to their PCK and are able to adapt their teaching strategies during a series of lessons, as appropriate. Some beginning teachers be able to utilise a pupil-centred style of teaching at the end of their initial teacher education (ITE) year, but the majority will take longer.

During Maynard and Furlong (1995) five-stages, a beginning teacher progressively develops their basic teaching skills and combines these into teaching strategies and teaching styles (Blair & Beaumont, 2020). A teaching strategy is the selection of appropriate basic teaching skills and pupil activities, such as explaining or questioning, managing classroom organisations and timings, to achieve the learning outcomes of a lesson. Over time, a beginning teacher begins to develop a range of teaching strategies that eventually leads to a pupil-centred teaching style.

Figure 7.1 depicts the relationship between basic teaching skills, teaching strategies and teaching styles. The evolving procedure of developing basic teaching skills, strategies and styles is dynamic, it develops as a beginning teacher takes greater responsibility and develops autonomy, but at the same time, it follows a linear progression in relation to the five-stages of development. (Maynard ad Furlong, 1995). These are shown on the left in Figure 7.1 and some

different learning strategies applied at each level are on the right in Figure 7.1. This chapter discusses these evolving developmental stages and provides a range of mentoring strategies that can be adopted/adapted to support a beginning teacher's development as an effective teacher.

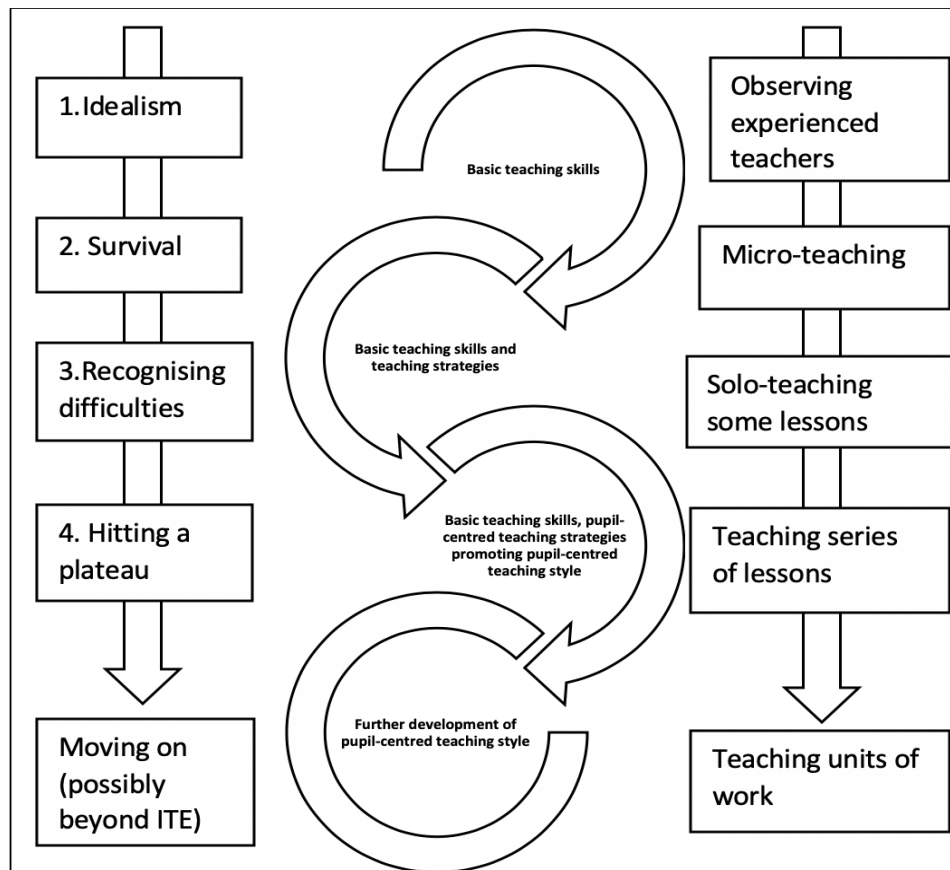


Figure 7.1 Maynard and Furlong's (1995) stages of teacher development related to a beginning teacher's increasing responsibility and autonomy.

[It is important to note that there is no fixed correlation between Maynard and Furlong's stages of development and the development of autonomy and responsibility by a beginning teacher]

As a mentor, your focus should be to facilitate the development and improvement of a beginning teacher's basic teaching skills and build their teaching strategies to eventually develop their own teaching style. The level of support a beginning teacher needs from their mentor varies from considerable guidance to minimal guidance, depending on their experience, responsibility and autonomy about teaching science (Shea & Greenwood, 2007). Taking this into account, the effectiveness of different mentoring approaches is not the same at all stages

of development. It also differs from a beginning teacher to beginning teacher. Therefore, it is a mentor's responsibility to identify and support different aspects of a beginning teacher's teaching practices and provide differentiated levels of assistance.

Before presenting some differentiated mentoring strategies to support the development of a beginning teacher's classroom-based teaching practices at different stages of development, the next section considers five characteristic behaviours of effective teachers. This guides further discussion on how to support the development of a beginning teacher's basic teaching skills, teaching strategies and pupil-centred teaching style, in all five stages of teachers' development.

2. Characteristic behaviours of effective teachers

There are a variety of views about what constitutes an effective teacher. However, we believe that there is probably general agreement about five characteristics of effective teachers, even if these characteristics can be viewed in different ways. These characteristics develop gradually from 'early idealism' to 'moving on' stage of development (Maynard & Furlong, 1995). This gradual development varies from one beginning teacher to another, as mentioned above. Before presenting these five characteristics of an effective teacher, Task 7.1 asks you to list your top five characteristics of an effective teacher, then compare your characteristics with the five characteristics below.

Task 7.1 Characteristic behaviours of effective teachers

There are many characteristics of an effective teacher, therefore:

Step 1. List your top five characteristics of an effective teacher

Step 2. Next, read the suggested characteristics presented in this section of the chapter

Step 3. While reading the suggested characteristics of an effective teacher link/compare/contrast them with the characteristics that you listed in Step 1.

Step 4. Finally, using some guidance from the five characteristics identified in this section, identify some mentoring strategies you can use to support a beginning teacher to develop the characteristic behaviours of an effective teacher.

The five characteristics that we believe are necessary for a beginning teacher to develop as they move from Maynard and Furlong (1995)'s idealism to moving on stages of development are calmness, clarity, consistency, care and confidence.

Calmness

Thinking back to your own experience, you might recall some of the beginning teachers you have observed, who tended to get flustered, were disorganised and probably shouted a lot, as well as blaming the class or individuals when things went wrong. You might consider that their classrooms were not calm environments that were conducive to learning! Therefore, from the period of initial idealism, you need to support a beginning teacher to understand that pupils appreciate teachers who are calm. Throughout the different stages of development, you need to encourage the beginning teacher to think carefully about ways they can develop themselves as a calm teacher by creating an atmosphere where pupils feel safe to learn. At first, probably during the early idealism and survival stages of development, you can model such calm environments with some of the classes you teach and discuss the approaches you use to promote calmness in the classrooms. The choice of classes could include lessons where the beginning teacher finds it difficult to keep the classroom environment calm. During later stages of development, when the beginning teacher is teaching some solo-lessons or a series of lessons, you could ask them to reflect and discuss their current classroom environments, focusing on ways they plan to keep calmness in their classrooms, what works and what support they need from you to make it better.

Clarity

From the time they first enter a classroom, a beginning teacher is talking to pupils individually, in groups and/or as a class. For a beginning teacher, in the early idealism stage of development, in particular, a beginning teacher needs to ensure they are enunciating clearly (such as asking clear questions, explaining complicated ideas and giving clear instructions), among other things. Therefore, starting from the early stages of development, you need to encourage the beginning teacher to think about how they will explain concepts to pupils, what questions they will be asking the pupils, what questions they expect pupils to ask them and to plan their teaching accordingly. A key part of preparing clear instructions is to carry out activities in advance and identify key points which pupils may find difficult so that the instructions are clear for pupils. For example, a simple experiment might include asking pupils to use a burning splint to heat different volumes of water in a boiling tube and to record the rise in temperature. A beginning teacher will have some idea of the temperature rises expected. However, by

carrying out the experiment in advance, they are able to think about conceptual difficulties pupils may have, such as calculating a change in temperature and why a burning splint is used to heat different volumes of water et cetera.

Consistency

One of the characteristics of teachers that can really upset pupils is when they perceive a lack of fairness in a teacher's actions. It is worth discussing this at your weekly mentoring meetings with a beginning teacher you are mentoring especially during the early stages of their development. For instance, John a Year 8 pupil calls out funny names to address other pupils in the class and is simply told by the beginning teacher "not to do it again", but when James in the same class does the same thing, he receives a punishment exercise. Share this scenario with the beginning teacher and ask them to think about how these two incidents would be perceived by John, James and by the other pupils in the class and what, as a teacher, they could do differently so that all pupils are treated consistently. You could also share some of your experiences with the beginning teacher when pupils complain about lack of fairness in a teacher's actions. You should also discuss the importance of the beginning teacher learning about the school and departmental behaviour management policies so that they can apply them fairly and consistently. In addition, you should also encourage the beginning teacher to consider an approach to a variety of likely classroom scenarios so that they are prepared in advance for fairness and consistency. For example, what will they do if a pupil needs a pencil? What happens if a glass beaker is accidentally broken? We believe that when a beginning teacher thinks through likely classroom scenarios in this way, there is less need for ad hoc teacher's actions during the lesson. Developing these thinking processes during different stages of a beginning teacher's development could reduce the potential for perceived unfairness. It is also likely to increase the beginning teacher's ability to maintain a productive learning environment while dealing consistently with classroom issues according to the school's and/or science department's behaviour management policies.

Care

Encourage a beginning teacher to do simple things that demonstrate a caring relationship with their pupils. For example, when a beginning teacher is observing experienced teachers, they

can start to learn pupils' names. Subsequently, addressing pupils by name can make a huge difference to their relationship with a class. You could also advise them to use a class map to learn pupils' names and share any techniques you use to learn pupils' names.

Beginning from the survival stage of development, a beginning teacher needs to start building a teacher-pupil relationship. This relationship can be built by them chatting to pupils outside the classroom while they are lining up before they go into the classroom. For example, the beginning teacher might ask how their day has been so far or if they are in any afterschool clubs et cetera. These chats could also take place during break time about things that interest pupils such as sports, TV programmes, books they have read recently, the latest mobile phone/video-game et cetera. Chatting in this way can give a lot of information about what does or does not interest pupils and why, and how their interests can make its way in the science classrooms. These chats also make pupils feel that their (beginning) teacher cares about them as individuals. Therefore, you need to make the beginning teacher aware of the importance of these informal chats to help them plan lessons that reflect the pupils' interests where possible.

Confidence

Starting a teaching career can be challenging for a beginning teacher. Working with potentially dozens or hundreds of pupils is also a challenge, so it is not surprising that some beginning teachers feel that they lack confidence. At this point, the old adage, "fake it until you make it," can be useful. Therefore, if you find the beginning teacher you are mentoring working hard on planning how to teach a lesson in an interesting way but are not teaching it this way due to their lack of confidence, then encourage them to act as if they are confident, by being calm and using confident body language in front of the class. We consider that by acting being clam and using confident body language will gradually develop a beginning teacher's confidence, which could eventually result in confident teaching.

Another indicator of developing confidence is less teacher talk and more pupil talk in a lesson. A typical beginning teacher, because of lack in confidence, will give explanations or instructions by talking to the pupils themselves, thus adopting a teacher-centred approach. Therefore, to increase their confidence, you need to encourage the beginning teacher to plan how they give explanations or instructions by incorporating more questions and interactions with pupils. This has an additional benefit in that the less teacher talk there is in a classroom, the more the pupils talk about science (Figure 7.2), and so the more science they learn.

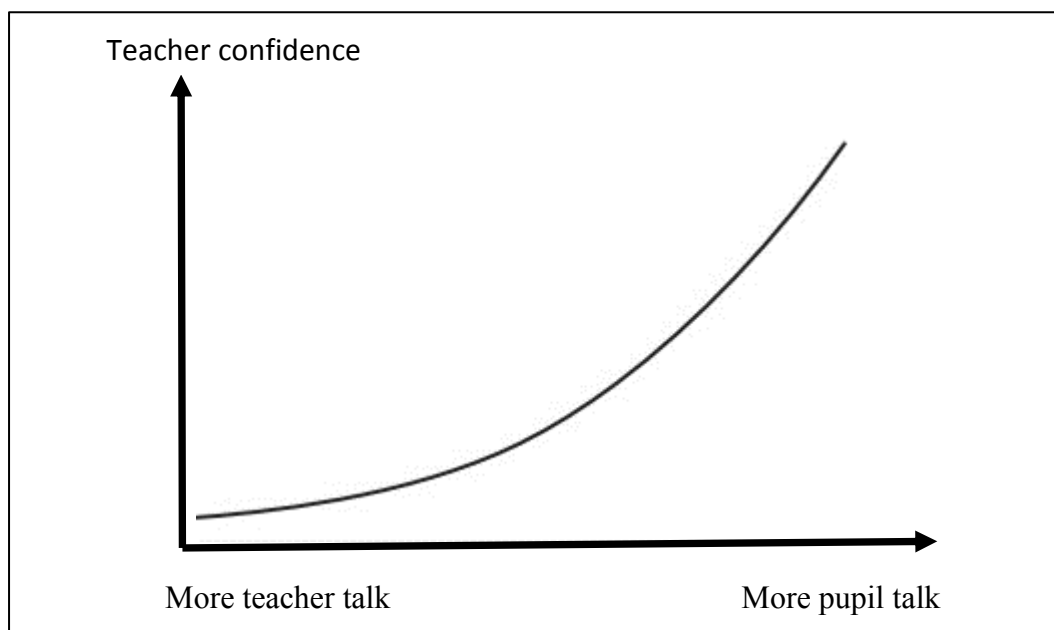


Figure 7.2 A schematic representation showing that as beginning teachers become more confident, they tend to talk less and the pupils tend to talk more.

In supporting the development of confidence in this way, share the confidence graph (Figure 7.2) with a beginning teacher you are mentoring, ideally at the survival stage, when they are teaching small number of lessons (micro-teaching, see section on survival stage below). Review the lesson plan and accompanying lesson observations with them. Later, at the stages of recognising difficulties, hitting a plateau and moving on, i.e. probably when they are teaching a whole lesson or a series of lessons, revisit the graph and discuss the beginning teacher's confidence level. You need to support a beginning teacher in mapping their confidence levels, based on less teacher talk and more pupil talk. This confidence mapping requires you to ask and discuss some questions with the beginning teacher, such as where does the beginning teacher view themselves on the confidence graph and why? How much were teacher talk and pupil talk evident in the lesson? Did teacher talk decline and pupil talk increase over a series of lessons? How can the beginning teacher increase their confidence by accommodating more pupil talk about science and less teacher talk?

After implementing some or all of these general mentoring strategies Task 7.2 asks you to allow a beginning teacher to develop their thoughts about their strengths and challenges in becoming an effective teacher. This task will also provide an opportunity for you to identify the beginning teacher's needs and your action points to support them in developing calmness, clarity, consistency, care and confidence in their teaching practices.

Task 7.2 Supporting a beginning teacher to identify strengths and areas of challenge in becoming an effective teacher

Complete the following:

- Encourage a beginning teacher to identify some teaching approaches they have observed or are already using in the classroom to be calm, clear, consistent, caring and confident
- Then ask them to identify one challenge they face in each of these five characteristic areas to implement in their classrooms
- Having identified the challenges, ask the beginning teacher to observe two or three other teachers and identify approaches the observed teachers use so that these challenges do not arise in their classes
- Encourage the beginning teacher to discuss other teaching approaches with you and then plan to implement them in their classes

The steps above can be repeated at three different intervals depending on the teaching load of the beginning teacher, such as first when they have started to plan and teach mini-sections of a lesson, such as starter activities only, then when they have begun to take on the responsibility of teaching a few lessons of one class or different classes. Third when they are taking almost a full teaching load of solo-teaching sessions in your school.

3. A beginning teacher teaching lessons and mentor's support

As mentioned earlier in the chapter, your support to a beginning teacher in their development into an effective teacher changes over time as they develop. This section considers practical steps in supporting a beginning teacher's development, starting from recommending they observe and practice basic teaching skills, teaching strategies to promote pupils learning and developing a pupil-centred teaching style. These practical steps will be linked to Maynard and Furlong's (1995) stages of development and with a beginning teacher's increasing responsibility, such as from micro-teaching to teaching some solo-lessons, to teaching a series of lessons. However, as discussed above, different beginning teachers move through these developmental stages at different rates so there may be overlaps between different stages of a beginning teacher's development, and where they are in terms of their teaching timetable and responsibilities.

Early idealism stage of development

One of the most daunting experiences for many beginning teachers during the early idealism stage of development is standing in front of a class for the first time and learning to embed basic teaching skills in their day-to-day teaching. Thus, as a mentor you need to identify ways by which you can support the development of basic teaching skills by a beginning teacher in their early stages of development. Having said that we believe that, depending on the performance and individual needs of a beginning teacher, sometimes you need to strengthen and/or recap these basic teaching skills even later in their developmental journey.

There are a wide range of basic teaching skills which beginning teachers need to develop, some of which will be stronger than others for any one beginning teacher (Kyriacou, 2018). In our view, these basic teaching skills incorporate teaching practices which align with the five characteristic behaviours for becoming an effective teacher, above. Some examples of these basic teaching skills are listed in Table 7.1, along with some possible characteristic behaviours of an effective teacher. Task 7.3 asks you to read and augment Table 7.1.

Task 7.3 Characteristic behaviours of an effective teacher and basic teaching skills

Follow the steps below:

Step 1. Look at Table 7.1. Do you agree with the examples of basic teaching skills?

Step 2. What other basic teaching skills would you add to the second column of the list?

(Some characteristic behaviours and skills occur in more than one place in the table).

Table 7.1 Some examples of basic teaching skills (based on Bassett, Bowler and Newton, 2019, pp. 172–174; and Kyriacou, 2018) aligned with some characteristic behaviours of an effective teacher.

Characteristic behaviours of an effective teacher	Some basic teaching skills
Calmness	Looking and sounding like a calm teacher Managing a positive classroom environment
Clarity	Embedding clear instructions (for themselves and for the pupils) to effectively carry-out learning activities Preparing classroom organisation and management in advance

	Getting attention and providing instructions
Consistency	Awareness of what is happening in the classroom (“eyes in the back of your head”) and demonstrating fairness in their actions for all pupils Following school and departmental procedures and routines
Caring	Building positive relationships Reinforcing expectations Balanced use of praise
Confidence	Looking and sounding like a confident teacher Self-evaluation of strengths and development needs

These basic teaching skills mainly start to develop in the early stages of a beginning teacher’s development, namely during early idealism and survival stages and require some reinforcement at the beginning of the recognising difficulties stages of development.

Now, referring to Table 7.1, your experiences both as a beginning teacher yourself and as a mentor, reflect on some of the challenges that a beginning teacher you are mentoring could face while standing in front of a class for the first time. How can you support the beginning teacher to deal with these challenges? Then using your accounts gained from Task 7.3, discuss some basic (day-to-day) teaching skills with the beginning teacher to help them identify areas of strength and areas for development. Since observation is very important in this stage of a teacher’s development, in Task 7.4, you are asked to work with the beginning teacher to help them to identify some basic teaching skills that they have observed by viewing experienced teachers using certain basic skills and then to consider how they could develop such skills in their practice.

Task 7.4 Assisting a beginning teacher to develop their basic teaching skills at the early stages of development

1. When a beginning teacher you are mentoring is observing experienced teachers, ask them to fill in Table 7.2. They should note examples of basic teaching skills in column 2 and link these to one of the five characteristic behaviours of effective teachers presented in Table 7.1.
2. Next, during your weekly mentoring meetings, ask the beginning teacher to discuss the first two columns of Table 7.2. Then, support them to consider their next steps, drawn from their observations of experienced teachers and encourage them to complete column 3 of Table 7.2.

Table 7.2 Links between the characteristic behaviours of effective teachers, associated basic teaching skills and a beginning teacher’s next steps in developing these skills.

Characteristic behaviours of an effective teacher	Observed basic teaching skills	Next steps for beginning teacher

During the weekly mentoring meeting, as mentioned in Task 7.4, you may want to discuss the following points with the beginning teacher:

- The appearance of the experienced teachers – how do the teachers dress to present themselves as teachers? Smart/casual? Lab coat/no lab coat?
- Body language of the experienced teachers – open or closed. How do teachers demonstrate confidence?
- Experienced teachers' voice, tone, volume, pitch. How do the teachers manage their classes by using voice alone?
- Confidence of the experienced teachers - How do they showed confidence in the classrooms?
- What strategies were they following for pupils' entrances and exits from the classroom?
- What were the teaching instructions during transitions between activities?
- What routines for collecting and returning equipment and homework were followed?

In addition to Task 7.4, you may want to encourage the beginning teacher to read relevant units from Capel, Leask and Younie (2019), for example:

- Unit 2.3 Taking responsibility for whole lessons
- Unit 3.1 Communicating with pupils
- Unit 3.2 Motivating pupils
- Unit 3.3 Managing classroom behaviour.

You could discuss the tasks from these units with the beginning teacher to assist them to develop basic teaching skills, and also revisit and modify Table 7.1, during later stages of their development (ideally every month).

Survival stage of development

The survival stage is where you can reduce the number of some observations made by a beginning teacher of experienced teachers (as in the early idealism stage of development) and offer opportunities to the beginning teacher to conduct some micro-teaching sessions. Micro-teaching involves a beginning teacher planning (see Chapter 6) and then teaching part of a

lesson, such as a lesson starter or a short demonstration of an activity. Now read case study 7.1, where the mentor, Henry, is supporting a beginning teacher Hanniyah. Task 7.5 asks you to plan questions that you would ask the beginning teacher to support their development.

Case study 7.1 Hanniyah and Henry

Hanniyah is planning a lesson about preparing ‘different concentration of solutions’. Henry, the mentor, suggests that the pupils have probably forgotten how to measure the volume of a liquid accurately and he suggests that Hanniyah plans and teaches a lesson starter about using a measuring cylinder before he takes the lead. Hanniyah researches information about different kinds of menisci and how to measure concave menisci for clear and coloured liquids (such as water and a solution of potassium permanganate) and a convex meniscus like mercury (Denby, 2018; Helmenstine, 2019). Hanniyah also decides to remind pupils that the measuring cylinder should be on a level surface and that the pupil’s eye must be level with the meniscus for an accurate reading. Hanniyah proposes that the learning outcome for the lesson starter is that pupils will be able to use a measuring cylinder accurately to measure the volume of clear liquids. Henry agrees, but asks Hanniyah to consider how to measure the achievement of the learning outcome. Hanniyah suggests using a series of multiple-choice questions using photographs or drawings of menisci in measuring cylinders. The pupils will use show-me-boards to record their answers and then explain their thinking via verbal questioning. Hanniyah also suggests that the pupils use measuring cylinders to measure 25 ml of water to show that they can measure liquids accurately.

In the discussion, they also decide that Hanniyah will line the pupils up outside the laboratory and then bring them in to begin the lesson starter. This will allow Hanniyah to establish herself as the teacher by using existing classroom routines and practising using her teacher’s voice.

Task 7.5 Survival stage: Micro-teaching and mentoring support

Complete the following steps:

Step 1. Thinking about Table 7.1 and case study 7.1, list questions that you could ask a beginning teacher, to support them to incorporate the basic teaching skills indicated below:

- Maintaining health and safety in the classroom
- Managing relationships and reinforcing expectations
- Gaining attention and providing instructions
- Maintaining classroom organisation and management
- Self-evaluating the strengths and weaknesses of their teaching
- Incorporating effective technology integration.

Step 2. Next, observe the beginning teacher's micro-teaching part of the lesson (you could use the lesson observation template from Chapter 8 to record your observations)

Step 3. If required, add further questions (during or after the observation) to the list of questions that you listed in Step 1

Step 4. After the lesson, ask the beginning teacher to reflect on their micro-teaching session by asking them to answer and discuss the list of questions obtained from Steps 1 and 3.

Step 5. Finally, support the beginning teacher to plan next steps based on their reflections on the micro-teaching sessions.

Some sample reflective questions supporting Steps 4 and 5 of Task 7.5 could be (in this list 'I' refers to the beginning teacher):

- How will I pay attention to health and safety?
- What classroom routines will I follow for consistency?
- What instructions will I give the pupils? How I can make the instructions clearer? Should I repeat the instructions (or not)?
- What classroom management strategies will I adopt to engage all the pupils? How will I:
 - Spot and deal with low-level disruption effectively
 - Use praise and encouragement
 - Deal with wrong answers positively
 - Deal with unexpected events?
- How will I use my voice and body language to reinforce instructions?
- During group work, how frequently will I move from one group to another?
- Will I spend more or less time with particular group of pupils and why?

- How will I stick to the timings in the lesson plan or adapt appropriately?
- What are typical types of things, which I should say at different points in a lesson?
- What are some of the teacher scripts I will use? such as:
 - Pens and pencils on the desk; bags under the desk and hang up your jackets
 - Start the activity
 - Stop
 - Eyes on the board
 - Pens down.

Recognising difficulties stage of development

After the survival stage, teachers usually start recognising numerous difficulties associated with their development as a teacher. By now, teachers are responsible for a whole lesson for the first time; a milestone for any beginning teacher. Therefore, it is important to provide a beginning teacher you are mentoring with the support needed to overcome any perceived difficulties. During this stage of development, you need to encourage a beginning teacher to consider everything discussed in developmental stages one (idealism) and two (survival) for a whole lesson. Supporting the beginning teacher in this stage of development mainly requires you to encourage them to revisit some basic teaching skills and start considering a few teaching strategies that can promote pupils' learning. Some approaches to meet these mentoring requirements are presented below:

1.Revisiting basic teaching skills

In terms of lesson preparation and planning, the beginning teacher will plan an interesting and engaging lesson. However, at the start of the recognising difficulties stage, a beginning teacher may fail to recognise some basic skills, such as does the equipment need to be ordered from the technicians in advance? How do I encourage positive behaviour? How will I implement the school's behaviour management plan? What are foreseeable problems in the lesson, and how will I deal with them? Are there other basic teaching skills that I need to consider?

We believe that at the start of this developmental stage, you need to suggest to the beginning teacher that they keep revisiting and updating Table 7.1 to apply basic teaching skills consistently in their teaching practice, until these practices become part of their teaching

routine. Next you should observe at least one of their initial solo-taught lessons with a focus on the implementation of basic teaching skills. Task 7.6 asks you to do this.

Task 7.6 Recognising difficulties stage and mentoring support

Complete the following steps to guide a beginning teacher to develop some basic teaching skills:

1. Observe a beginning teacher's lesson, focusing on a particular basic teaching skill or a combination of skills – see Table 7.1. Make sure you agree the main focus of the observation with the beginning teacher beforehand
2. In the post lesson meeting listen to the beginning teachers' reflections on the lesson and give them your feedback gained from the lesson observation, encouraging the beginning teacher to reflect on the feedback provided
3. Use a copy of Table 7.2 to record some of your observations and further actions required
4. Next, following from the feedback and discussions, offer your support to the beginning teacher to strengthen their existing basic teaching skills or to initiate teaching skills that are essential but not yet a priority for them.

2. Teaching strategies

In addition to reinforcing some basic teaching skills, a beginning teacher needs to develop their teaching strategies. To this end, we recommend that you ask the beginning teacher to read Mosston's continuum of teaching styles article (Mosston & Ashworth, 2002) (see further resources). However, it is important to note that what Mosston and Ashworth term teaching styles are usually referred to as teaching strategies, so we are using the term teaching strategies and not teaching styles when referring to Mosston's continuum.

During this developmental stage, a good starting point is to discuss some teaching strategies with the beginning teacher. One reason for this is that, at this stage, some beginning teachers feel that they must plan to control everything that happens in the classroom, resulting in a teacher-centred approach to learning (such as Mosston and Ashworth's (2002) 'command' and 'practice' strategies). Asking a beginning teacher to read Mosston and Ashworth's continuum supports them to consider moving to a more pupil-centred approach to learning. For example, rather than the beginning teacher giving instructions to pupils (exhibiting a directions giving teaching strategy) for an activity, they could use questioning to develop the details of the activity with the class and have the pupils agree on how they would carry out the activity (exhibiting a collaborative problem-solving teaching strategy). In addition, you could discuss

these different teaching strategies with the beginning teacher. You could model some for them in your practice and discuss the suitability of these teaching strategies for the lessons you have taught. Next, you can help the beginning teacher to suggest, recognise, choose and justify their choice of incorporating some specific teaching strategies, which they think are appropriate for two to three lessons that they are about to teach. This exercise should help the beginning teacher to understand that not all lessons should be teacher-led, nor can they be completely pupil-led: instead, it depends on the learning outcomes, safety issues and pupil needs. Some example teaching strategies are presented in the next part of this section (Hitting a plateau).

At this stage of development - or at a later stage - you could then support a beginning teacher to teach lessons using a pupil-centred approach to learning (linked to Mosston and Ashworth's continuum). You then need to observe the beginning teacher's lessons and provide feedback focusing on teaching strategies that promote (or not) pupil-centred teaching approaches to learning science.

Hitting a plateau stage of development

Another major milestone in a beginning teacher's development is moving from teaching one lesson at a time to planning and teaching a short series of three or four lessons within a unit of work for the same class of pupils (such as Year 9 pupils) included in the science curriculum, such as 'cell biology' (a description of this unit of work can be seen Appendix 10.1). At this stage the beginning teacher is beginning to know the class and can see how each lesson fits into the overarching unit of work. Teaching several consecutive lessons allows them to make their lessons more pupil-centred. They can build on their developing knowledge of teaching to make the most of their basic teaching skills (as part of their day-to-day teaching routine), incorporating observed and/or practised teaching strategies with an aim of promoting pupils' learning. Therefore, reaching this stage of development, a beginning teacher should spend more time considering the learning aspects of a unit of work, including how to help pupils to learn more effectively, taking account of the differentiated learning needs of individuals (see Chapter 6, pp xx). All these learning-oriented practices potentially require the beginning teacher to use a broader range of teaching strategies in their teaching.

One of the challenges mentors face supporting a beginning teacher is to use a wide range of teaching strategies is that a beginning teacher starts to rely too much on a few teaching strategies which work for them they become reluctant to try new/different strategies. So, how

can you encourage the beginning teacher you are mentoring to try a range of teaching strategies? A starting point could be to ask them to identify a variety of research-based teaching strategies (Muijs & Reynolds, 2018) and to include these strategies across a series of lessons they are about to teach. At this point, you need to encourage the beginning teacher to consider which teaching strategy is most pedagogically appropriate for each lesson (or a part of a lesson) and the pupils they are teaching. Through this encouragement, a beginning teacher will strengthen their PCK (see PCK in Chapter 10) and develop their pupil-centred teaching style in a research-informed way. Particularly at this stage of development, your focus should be to encourage the beginning teacher to use a variety of pupil-centred teaching strategies which could enable pupils to achieve the intended learning outcome(s) over a series of lessons (see Chapters 6 on planning learning outcomes, ppxx). A variety of assessment for learning strategies can be helpful here. Chapter 12, section 4 (ppxx) presents some strategies to support the beginning teacher to develop ‘formative use of rich questioning’, ‘comment-only marking’, ‘self- and peer-assessment’ and ‘formative use of summative tests’ et cetera, promoting the learning of science for all pupils. Next, some useful and varied teaching strategies for you to ask a beginning teacher you mentor to use are suggested. You can adopt/adapt as appropriate. In addition, there are many more a beginning can try.

1. Use of questioning

Show-me-boards, for example, is a tool to allow all pupils to answer questions. They can be useful at any stage of a lesson. You can advise a beginning teacher to layout a mini-whiteboard, a marker pen and a duster for every pupil before the lesson starts. You can then suggest ways to use these whiteboards so that all the pupils are engaged and show their answers at once and there is no copying. For example, the beginning teacher asks a closed question (such ‘what is the atomic number of the element chlorine’) and then uses a countdown, “three, two, one, show me”. Another use is to ask groups of pupils to construct a joint answer to an open question (such as ‘what are the advantages and disadvantages of using chlorine in a swimming pool’).

You must encourage the beginning teacher not only to check pupils’ right and wrong answers but also to see what pupils think and how they reach those answers. This can be achieved by encouraging them to provide opportunities to the pupils to give a wide range of responses. Moreover, it is useful to discuss ways of using pupils’ responses and misconceptions as a body of evidence to plan and teach their future lessons. In addition, Chapter 6 (pxx) suggests some teaching strategies to plan open-ended questions and Chapter 11 (pxx) presents ways to cope up with unexpected questions and answers that arise in the teaching of science.

2. Incorporating group work

A beginning teacher needs to recognise that the aim of teaching is to promote pupils' learning and that learning is a social activity. Hence, using teaching strategies which require pupils to work in pairs or groups, can strengthen pupils learning. You could ask a beginning teacher you are mentoring to choose groups for the pupils by matching pupils' strengths and weaknesses so that all pupils benefit from the group work. The beginning teacher should also realise that putting pupils into groups with different strengths could help pupils (with a range of learning needs) to develop their science skills and understanding. Next, ask the beginning teacher to select an appropriate group work strategy such as paired discussion in a think-pair-share activity, groups of pupils working together during experimental work in a discussion group or completing a longer-term project et cetera. Once the beginning teacher has selected an appropriate strategy, you can ask them to reflect on why they think this particular group work-based activity is appropriate to boost pupils' learning. During this reflection, you can discuss how different group work strategies can be adapted, or differentiated, to cater for the needs of different pupils. In addition, you can allow the beginning teacher to allocate group roles to pupils and discuss the benefits of changing these roles regularly to develop pupils' science skills and understanding. Chapter 16 (ppxx) suggests some mentoring suggestions on selecting group roles and responsibilities for the pupils.

3. Use of texts

Science textbooks provide textual and visual content for most of the science curriculum and can be supplemented with additional books or internet resources. In addition to using a science textbook, you may suggest that a beginning teacher uses a range of other text-related materials (for example newspaper items from 'New Scientist', science mnemonics and word-pictures from TES website and abstracts/articles from student friendly magazines such as 'BBC Science Focus' et cetera) mainly because pupils find scientific text (from the textbook) challenging to read (SERP, 2020). Some examples activities related to scientific texts are given below:

- You could model some of your lessons where you extend the use of written texts to promote pupils' learning of a scientific concept. For example, ask pupils to read a particular section of a book, such as the process of 'fractional distillation' to distil different fractions from crude oil. Then, from their reading of the text and diagrams develop a flow chart, mind map or SWOT (Strengths, Weaknesses, Opportunities or Threats) analysis chart to present their understanding of distillation

- A useful strategy for reading scientific texts is to introduce pupils to the Greek and Latin roots of many scientific words, such as ‘photosynthesis’, and the prefixes and suffixes used across the sciences (Feez & Quinn, 2017). For example, photosynthesis comes from the Greek word photos (light) and synthesis (making) and so means making with light – in this case making glucose from carbon dioxide and water in the presence of light. The word ‘oxidation’ can be broken down into “oxi” or related to oxygen and “dation” which refers to a process. So, at an elementary level, oxidation is the process of that occurs when an element reacts with oxygen or more correctly the process of losing electrons
- You could also suggest using numbers as alphabetical codes to support learning scientific vocabulary. For example, which scientific process contains 15, 24, 9, 4, 1, 20, 9, 15 and 14? where the first letter ‘o’ is the 15th letter in the English alphabet (the answer is ‘oxidation’). Alternatively, the letters of which chemical process add up to 111? or name the process where electrons are given away during a chemical reaction-hint – the code of the process adds up to 111
- You could also advise the beginning teacher to incorporate newspaper articles and science magazines to stimulate critical dialogues in the classroom (McClune & Jarman, 2012). One way to do this is to use a discussion board, i.e. using the classroom whiteboard/smartboard to list evidence for and against pupil’s ideas about a particular newspaper article, scientific discovery or scientific myth. Consider using mentoring approaches detailed in Chapter 15, which suggest some teaching strategies to use historical, contemporary and science fiction-based stories to stimulate pupils’ critical thinking, raise awareness of societal issues, learning scientific vocabulary and awareness of misconceptions.

Task 7.7 asks you to reflect on your mentoring practices to support a beginning teacher who has moved on from teaching a single lesson to a series of lessons.

Task 7.7 Hitting a plateau - mentoring support

Answer the following questions to reflect on ways you can support a beginning teacher to teach a series of lessons:

1. How does your mentoring role change as a beginning teacher begins to plan a sequence of lessons?
2. How will you encourage the beginning teacher to reflect on a lesson and then use this reflection to inform the next lesson(s) in a sequence without starting to plan again from scratch?
3. How will you support the beginning teacher to use different teaching strategies by focusing on pupils' learning over the sequence of lessons rather than one lesson at a time?
4. Almost inevitably, in a sequence of lessons, some things will not go as well as expected or some teaching strategies may not work. So, what will you do to support the beginning teacher to come out of their comfort zone of using a particular teaching strategy and/or a teaching strategy that they believe works well and avoiding those that seems challenging? i.e. if a particular strategy did not work on one lesson, it does not mean that it will never work. So, how will you support the beginning teacher to manage these aspects of learning to teach over days and weeks?

Moving on

This stage of development offers much more autonomy to a beginning teacher, as by now they should be independently teaching a series of lessons for a complete unit(s) of work using effective basic teaching skills and a wide variety of teaching strategies to promote pupils learning. Therefore, as a mentor, you need to facilitate a beginning teacher to develop their teaching style by supporting them to develop a pupil-centred style of teaching. You can facilitate this by asking the beginning teacher to reflect on the actions they take to make their basic teaching skills and teaching strategies pupil-centred, and how these skills and strategies aligns with pupil-centred teaching style.

Most beginning teachers probably reach this stage after they have completed their ITE programme. However, we recommend you start supporting the beginning teacher to reflect on how basic teaching skills and teaching strategies align with pupil-centred teaching style while they are still in the ITE programme, as it will support them to achieve an effective pupil-centred teaching style before taking a full responsibility of teaching as a newly qualified teacher (NQT).

4. Evaluation of a beginning teacher's progress

A beginning science teacher's ability to self-evaluate their own teaching practice develops over time, aided by mentor/experienced teacher feedback. In addition, part of the beginning teacher's self-evaluation requires feedback from pupils which they evaluate to improve the quality of teaching and learning. In this section of the chapter, we present some mentoring strategies that you can use to encourage a beginning teacher to evaluate their teaching effectively.

Self-evaluations of lesson debrief

A beginning teacher is regularly observed by you and/or by other experienced teachers to offer feedback during lesson debriefs, to strengthen their teaching practice. At the same time, it is necessary for the beginning teacher to self-evaluate their teaching practices, to enable them to develop their future practice. Therefore, you need to support a beginning teacher you are mentoring to self-evaluate their lessons, at all stages of development, such as after teaching: a micro-teaching lesson (probably during the survival stage of development), an individual lesson (probably during recognising difficulties stage of development), a series of lessons (probably during hitting a plateau stage of development) and teaching complete units of work (probably during moving on stage of development).

A discussion on self-evaluations based on a part/whole lesson debrief or a combination of lesson debriefs is ideally conducted every week in weekly mentoring meetings (ppxx describes the difference between lesson debrief and weekly mentoring meetings). One of the skills that you need to support the beginning teacher to develop is to think of aspects of the lesson, which went well (or not). This can be reinforced by initiating a discussion on lesson debriefs to talk about three things the beginning teacher did well and how these three things can be strengthened further and then talk about three things which did not go well and how they can develop this aspect. This evaluation process can be supported by using the WRAP (Wonder, Reinforce, Adjust, Plan) feedback framework (see Chapter 8, ppxx). In addition, you could suggest to the beginning teacher that they map their self-evaluations over time. Task 7.8 asks you to encourage a beginning teacher you are mentoring to self-evaluate their development along with some discussions with you progressively.

Task 7.8 Self-evaluation and mentor-mentee discussion

To support mentor-mentee discussions based on self-evaluations:

1. First share Appendix 7.1 with the beginning teacher and discuss the scope of the terms basic teaching skills, teaching strategies and pupil-centred teaching style. Some examples of basic teaching skills and teaching strategies are provided in the Appendix 7.1
2. Next, under Week 1 part of the basic teaching skills and/or teaching strategies, ask the beginning teacher to identify and evaluate some specific basic teaching skills and/or teaching strategies, they practised during the week. They could mark these as (i) one of their best, (ii) one of their worst and (iii) a new basic teaching skill and/or strategy that they will be planning to develop in the following week.

[To keep these evaluations concise, you could advise the beginning teacher to limit their evaluations to 100 words for each of the chosen basic teaching skill and/or teaching strategy, or use bullet points to make their notes brief]

3. Next, encourage the beginning teacher to continue evaluating their lessons in a similar way for the next three weeks
4. Finally, you can arrange a meeting with the beginning teacher so that they can share with you the evaluations they have gathered over the four weeks. During this meeting you need to keep refocusing the beginning teacher's evaluations on basic teaching skills and teaching strategies and discuss how their effective use of some basic teaching skills and different teaching strategies can develop a pupil-centred teaching style. Encourage the beginning teacher to record these in the pupil-centred teaching style section of Appendix 7.1
5. You can repeat this cycle after every month or whenever you and/or the beginning teacher feel the need to reinforce some basic teaching skills and **teaching strategies** to strengthen pupil-centred teaching style.

Self-evaluations of pupils' feedback

Pupils' feedback on teaching strategies can be very useful, especially when a beginning teacher has started to teach a series of lessons. During this time, a beginning teacher has used a number of teaching strategies, so pupils have enough experience to provide feedback about the beginning teacher. This feedback can be formative for the beginning teacher in order to enable

them to adjust their teaching strategies appropriately. The pupil feedback could be obtained via discussion or anonymously via sticky-notes or a class representative. Some statements, along with feedback options, are given in brackets are given below. A beginning teacher could consider using these in order to gather pupils' feedback ('I' refers to pupils below):

- If I don't understand something, the teacher explains it to me
(Never/sometimes/often/always)
- I understood today's lesson (Not at all/a little/a bit/a lot)
- Today's lesson was interesting (Not at all/a little/a bit/a lot)
- I can choose who I want to work with (Never/sometimes/often/always)
- The teacher helps me self-evaluate my learning (Never/sometimes/often/always)
- I can suggest a science topic which interests me (Never/sometimes/often/always)
- I like science (Not at all/a little/a bit/a lot)

These statements and feedback options can be extended by asking pupils to write the reasons for their choice of option given in brackets. For example, if the pupil chose 'a little bit' for the statement 'today's lesson was interesting' the beginning teacher can provide an opportunity to the pupil to write why they think it that way and so on.

To gather pupils' feedback, you need to support the beginning teacher to use different tools to gather evidence of pupils' learning progression. In doing this, you can support them by modelling the use of some effective tools that you use to gather pupils' feedback. For example, asking pupils to: evaluate the lesson using traffic lights (red - I do not understand; amber - I understand some of the lesson; green – I understand the lesson), make a personal learning portfolio, design a concept map based on what they have learned (or not), use smartphones as polling devices to monitor pupils' engagement using apps such as 'Google Forms', 'Socrative', 'Kahoot' et cetera. After modelling from your own practice, you can ask the beginning teacher to practice using a few of these tools in their teaching. Task 7.9 asks you to support a beginning teacher to reflect on the use of selected tools to gather pupils' feedback.

Task 7.9 Supporting a beginning teacher to self-evaluate their practice based on pupils' feedback

Undertake the following actions to support a beginning teacher to self-evaluate their teaching practices:

1. Ask the beginning teacher to select a tool that they have used (or a tool they have observed someone else (like you) using) to evaluate pupil's feedback as a way to self-evaluate their teaching practices
2. Encourage the beginning teacher to identify three merits and three limitations of using a particular tool. How can they use this tool more effectively?
3. Next, involve the beginning teacher in a discussion to evaluate:
 - the impact of pupils' feedback on their planning and teaching
 - the need for modifications of some teaching strategies.

Summary and key points

This chapter has identified the following points:

- Different stages of teacher development require different mentoring approaches and it is your responsibility to modify your mentoring strategies according to a beginning teacher's developmental needs
- Your support to a beginning teacher to establish some characteristic features of becoming an effective teacher is vital at all the stages of development
- To develop as an effective teacher, you need to guide a beginning teacher to incorporate basic teaching skills, different teaching strategies and a pupil-centred teaching style
- A beginning teacher needs your support to effectively self-evaluate their lessons by focusing on their reflections to promote pupils' progress
- It is your responsibility to guide a beginning teacher to strengthen their teaching by self-evaluating their teaching practices. This includes the aggregation of evidence from lesson debriefs provided by you and/or experienced staff members, and pupils' feedback.

Further resources

Kind, V. and Taber, K. (2005) *Teaching School Subjects 11 – 19: Science*. Abingdon: Routledge.

This book is a wide-ranging introduction to beginning to teach science in secondary schools. It suggests and supports beginning teachers to plan teaching (part II) and evaluating (part III), and it offers support in many areas of learning to teach. In particular, Chapter 8 Acting to Teach Science offers useful suggestions about developing a beginning teacher's confidence in teaching science for pupils aged 11-19.

Mosston, M. and Ashworth, S. (2002) *Teaching Physical Education*. 5th edn. San Francisco, CA: Pearson.

Mosston's continuum - or spectrum - of teaching styles offers a useful conceptualisation of the amount of teacher or pupil input appropriate for different classroom activities. Although the continuum was derived in the context of physical education, it can be applied to any teaching subject including science. Mosston's teaching styles are referred to as teaching strategies in this chapter (see section on 'Teaching strategies' pxx).

Appendix 7.1 Self-evaluation and mentor-mentee discussion template

<p>1. Basic teaching skills</p> <p>(For example: building relationships, clarity of teacher talk, classroom awareness et cetera)</p>
<p>Week 1</p> <ul style="list-style-type: none">• Your best • Your worst • Planning a new basic teaching skill to develop in the following weeks
<p>Week 2</p> <ul style="list-style-type: none">• Your best • Your worst • Planning a new basic teaching skill to develop in the following weeks
<p>Week 3</p> <ul style="list-style-type: none">• Your best • Your worst • Planning a new basic teaching skill to develop in the following weeks
<p>Week 4</p>

- Your best

- Your worst

- Planning a new basic teaching skill to develop in the following weeks

2. Teaching strategies

(For example: using questioning, incorporating group work, a combination of some teaching strategies et cetera)

Week 1

- Your best

- Your worst

- Planning a new teaching strategy to develop in the following weeks

Week 2

- Your best

- Your worst

- Planning a new teaching strategy to develop in the following weeks

Week 3

- Your best

- Your worst

- Planning a new teaching strategy to develop in the following weeks

Week 4

- Your best

- Your worst

- Planning a new teaching strategy to develop in the following weeks

3. Pupil-centred teaching style

[This section will act as a consolidation section based on the last four-weeks of evaluations. Discussing this section with the beginning teacher will potentially bring together the basic teaching skills and teaching strategies practised during one-month, aiming towards developing pupil-centred teaching style.]

Mentor-mentee discussion points on the development of pupil-centred teaching style over a period of four weeks: