

# R1 Introducing electrical and electronic symbols

## Session guide

### Details of activity

You will find details of the activity on which this guide is based in the National Teaching and Learning Change Programme Engineering: Teacher and Trainer Resources: Ringbinder page 4.173.

Video clips of teachers and learners engaged in the activity.

### Aims

**Learners:** Develop knowledge and understanding of electrical and electronic components and their symbols.

**Practitioners:** Develop, evaluate and reflect on practice and explore opportunities for adaptation to enhance the teaching/training and learning experience.

## **Objectives and outcomes for learners**

### **Topic-related objectives and outcomes**

- Identify electrical components from their circuit symbols.
- Explain the function of the component.
- Relate a physical component to its circuit symbol and vice-versa.

### **Outcomes related to personal and thinking skills**

In any session, there will be opportunities for learners to develop skills outside the subject matter of the curriculum. Such skills are generic and include:

- cognitive processes such as evaluating, analysing and synthesising information
- working independently and with others
- language, literacy and numeracy
- written and verbal communication
- use of technology.

Proficiency in skills like these will enhance an individual's ability to learn in the classroom and workshop. They will also contribute to an individual's ability to succeed in the workplace. You will find references to the personal and thinking skills that are demonstrated at each stage of the session plan under the heading 'Reflecting on Learning'.

**The following personal and thinking skills are an important part of the session plan for 'Introducing electrical and electronic symbols'.**

- Working with others.
- Presentation skills.

## **Opportunities to enhance teaching and training practice**

Every session you teach offers you opportunities to increase your effectiveness as a teacher or trainer. Whether you are teaching a new or a familiar topic, developing your skills enables you to identify opportunities to try something new. Try using the card activity 'Talking teaching and learning' with colleagues to stimulate discussion about how pedagogy relates to classroom practice and to explore new ideas to refresh your own teaching/training.

You will find references to particular aspects of pedagogy at each stage of this resource under the heading 'Reflecting on Teaching'. To get the most out of these tips, discuss them with your Subject Learning Coach (SLC) and colleagues.

**The following aspects of teaching are an important part of the session plan for 'Introducing electrical and electronic symbols'.**

- Developing assessment for learning strategies and skills in whole group and small group activities.
- Effective management of small and whole group activity.
- Developing safe environments in which learners can experiment and collaborate.
- Implementing strategies for differentiated learning.

<b>Teacher/tutor/trainer plan</b>	<b>Learner activity</b>	<b>Resources</b>	<b>Reflecting on practice</b>
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<p>Introduce session aims and objectives; link to previous sessions on basic electrical theory and simple electrical circuits.</p>	<p>Learners work individually or in pairs to recall prior knowledge. Working in pairs requires them to articulate their understanding and knowledge and agree the outcome.</p>	<p>Class whiteboard or interactive whiteboard. Mini-whiteboards (MWB).</p>	<p><b>Reflecting on learning</b>  <b>Co-operative Learning</b>  By working together to explore current understanding, answering questions and supporting each other, learners develop their ability to work together and contribute to each other's learning.</p>
<p>Assess previous relevant knowledge:</p> <ul style="list-style-type: none"> <li>• ask for as many 'facts' about electrical components/items and symbols as learners can give you: record them on the board</li> <li>• pose some basic questions on electrical components/ items and ask learners to show their responses by using mini white-boards; or</li> <li>• ask learners to work in pairs and to draw and/or name as many circuit symbols as they can.</li> </ul>			<p><b>Reflecting on teaching</b>  <b>Assessment for Learning</b>  By finding out what learners already know, you can:</p> <ul style="list-style-type: none"> <li>• quickly identify misunderstandings and misconceptions</li> <li>• choose whether to deal with them at the beginning, or later in the session or feed the information into your plans for later sessions.</li> </ul>

<p>Taking this reviewing activity one stage further, explore learners' understanding of 'meters', 'power supplies', 'transducers' and 'other components'. Lead a discussion of the examples they propose.</p>	<p>In new groups of three, learners write the four headings on a sheet of flip chart paper and add examples in each column. They discuss these amongst themselves and then in the whole group, to achieve an agreed outcome.</p>	<p>Flip chart paper.</p>	<p><b>Reflecting on teaching Assessment for learning</b> This last part of the session is yet another opportunity to assess learners' progress and to decide what the next steps should be.</p>
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<p>Organise learners into pairs or small groups. Set the scene and describe the activity. Distribute Card Set A. Tell learners that they will be asked to explain their results to the whole group. Where there are disagreements, ask successful groups to explain their reasoning to others.</p>	<p>Learners allocate each component card to one of the four columns on their flip chart paper. They discuss and agree their choices within their group, and then walk around to check each other's classifications, until they think they have found the correct solutions.</p>	<p>Card Set A (yellow, Name and Function).</p>	<p><b>Reflecting on learning</b>  <b>Effective participation</b>  Working with others helps learners to develop skills in taking turns, making their own contributions and expressing their agreement or disagreement with each others' ideas.</p>
<p>In the second part of this activity, learners relate the names of components (yellow cards) to their symbolic representation (blue cards).</p>	<p>In each group, learners take it in turns to pair a component card with the correct name and function card. They discuss the pairings.</p>	<p>Card Set B (Blue, Circuit Symbols).</p>	<p><b>Reflecting on teaching</b>  <b>Differentiation</b>  You might ask less confident learners to work initially with a small number of cards, and add more complex components and symbols when they are ready for them. The more advanced learners can work with the complete set from the start. You might choose to produce different worksheets for the more and the less confident learners.</p>
<p>Learners reach agreement within their group and then with the whole group.</p>			

**Managing groups**

Use information from the initial check to decide how you group learners for the 'name and function' activity.

<p>Facilitate a short whole-class discussion and encourage learners to establish the following key points:</p> <ul style="list-style-type: none"><li>• the importance of being able to identify electrical symbols on circuit diagrams</li><li>• the importance of identifying electrical components on actual equipment</li><li>• the health and safety aspects associated with specific components such as capacitors.</li></ul>	<p>Learners answer questions and contribute to discussions on electrical symbols, electrical components and basic electrical safety. Individually, they complete an appropriate worksheet.</p>	<p>Electrical components Worksheets – blank and part-completed Mini-whiteboards Flip chart paper and pens</p>	
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## **Assessment for Learning**

### **Before the session**

- Refer to outcomes of initial assessment of language, literacy and numeracy skills for each learner.
- Check that your session plan takes account of their levels of skill.

### **During the session**

- Use the initial discussion to identify learners who need additional learning support, as well as those capable of more complex extension activities.
- Eavesdrop on the group discussions to see if learners' understanding is accurate, and where misconceptions lie.
- Use activities such as producing and delivering presentations, completing worksheets, and so on, to assess progress and to make decisions about what you will need to do in the remainder of the session and/or in future sessions.
- Use the final part of the session to check learners' understanding and to decide what to do next.

### **After the session**

- Offer support according to learners' needs.

**Incorporate your observations into your plan for your next session.**

## **Adaptation**

Some possible ways of adapting the activity would be to:

- Provide a box of assorted components and ask learners to match components to symbols.
- Refer learners to a reference source, such as BS3939 or a similar text – this will increase their confidence in using their support material.
- Make a permanent record of the card classifications by photographing them.

## Reflections

Reflecting on what you have done is an essential part of developing your skills as a teacher or trainer. You will get the greatest benefit if you explore the questions below with a colleague or your SLC.

### About yourself

- How did the actual lesson follow your original plan?
- Which parts of the session were effective and why?
- If you ran the session again, what would you do differently?
- Did the organisation of learners into groups work? If so, why do you think this was? If it did not work, what would you do differently?
- What contributed most to learners' understanding?
- Were there sufficient resources for all learners to participate fully?
- Which methods could be developed further?
- Where else could similar methods be used?
- If you were uncomfortable using the suggested approach, talk to your SLC or someone else whose skills you respect. Maybe they could demonstrate the principles, or work alongside you in one of your sessions.

### About the learners

- Did the discussion at the beginning of the session reveal anything unexpected about learners' existing knowledge? If so, how did it affect your session?
- Did the activities stretch the more advanced learners as well as bringing on less advanced learners?
- What did you notice about learners' abilities to express themselves clearly, and use technical language accurately? How could you develop these abilities further?
- What did you do to help learners develop their abilities to learn more effectively?
- How did the learners engage with the learning?
- Did the learners offer any feedback or ideas for future delivery of the material?

## **Relationship to the workplace**

- In order to work on electronics or telecommunications equipment, learners must have a good understanding of electrical symbols, be able to read circuit diagrams and identify key components in industrial/commercial equipment.
- In the automotive industry, vehicle electrical systems are becoming more complex, so it is ever more important for learners to have a good understanding of electrical symbols and to be able to identify key components on vehicles.
- It is a requisite in the training for mechanical engineering that learners have an understanding of electrical principles. This includes electrical symbols and components.
- For learners working in the ICT industry, a good knowledge of electrical symbols and electrical components is essential.
- As industry relies more on multi-skilled technicians, it is important for mechanical engineers to clearly understand electrical symbols and to identify electrical components.