



www.colourblindawareness.org

Advice for Teachers of Colour Blind Secondary School Students

Colour vision deficiency (CVD) affects 1 in 12 boys (8%) and 1 in 200 girls. There are approximately 400,000 colour blind pupils in British schools today, 95,000 of whom will have a severe condition. Colour vision testing has been largely phased out at school entry and opticians are not obliged to carry out colour vision testing as part of the NHS eye test, consequently around 40% of CVD children do not know they are colour blind on leaving school.

Teachers have not normally received any training in how to support colour blind pupils and are not likely to be aware that some children they teach have the condition. Teacher training courses do not include any teaching of the condition and therefore teachers are unaware of how to identify CVD pupils and support them in school. Most parents of CVD children are also unaware of their child's condition.

Causes

Colour blindness or CVD (colour vision deficiency) is largely a genetic disorder associated with the X chromosome, hence it affects males more than females. As a genetic disorder it does not increase or deteriorate through normal life and currently it cannot be treated. Research suggests that it is either caused by faulty light receptors at the back of the eye or perhaps connected to the nerve pathways to the brain.

Types

There are 3 main types of genetic CVD conditions which can vary from mild to severe forms; protanomaly/protanopia, deuteranomaly/deutanopia and tritanomaly/tritanopia and these terms relate to the three main colour receptors in the eye. Protanopia relates to a red deficiency, deutanopia relates to a green deficiency and tritanopia to a blue deficiency. In all deficiencies, however mild or severe, accurate perception of more than just one colour is affected.



Normal colour vision



A form of severe red/green CVD
(Deutanopia)



Tritanopia (severe loss of blue
vision)

People with red or green deficiencies will see the world in a similar way to each other because red and green are very close together on the light spectrum. Most people think red/green colour blind people confuse just red and green. This is not the case at all - red/green colour blind people have problems with colours right across the spectrum, particularly reds, greens, oranges, browns and greys, as the images above demonstrate. Blues and purples can be confused because of the red tones in purple and people with a red vision deficiency will find it difficult to distinguish dark colours and can readily confuse a deep red with black!

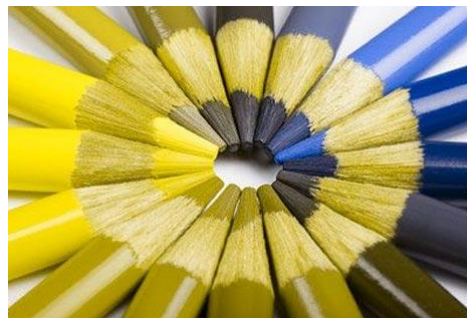
Red/green deficiencies are very common but a blue deficiency is extremely rare. Some colour blind people see no colours at all and live in a greyscale world.

Some important facts about colour blindness in education

- In the average UK co-educational (maintained sector) school classroom there will be at least one colour blind pupil, in an all-boys' school the figure will be considerably higher
- In an average box of 24 coloured pencils a person who has the most common form of colour blindness will only be able to accurately name 4 or 5 colours although they will probably be able to guess more
- In the average UK secondary co-educational school of 1,000 pupils there will be approximately 45 colour blind students (42 boys and 2 or 3 girls)
- Colour blind pupils will not usually admit their condition for fear of ridicule and learn coping techniques to hide their condition from parents, teachers and peers
- Colour blind students are not only disadvantaged psychologically but also in maths, science, ICT, art, geography, sport, food technology and in any lessons where the teaching uses colour only to make a point
- In secondary education computers and the internet are extensively used especially for web-based homework programmes and research projects. Coloured graphs and charts are frequently used by teachers. If labels are not used in addition to colour then colour blind children will miss out on information and interpret information incorrectly - they often miss vital information on the internet due to poorly designed web pages
- Unlike in Japan, in the UK there is no requirement on textbook manufacturers to ensure textbooks are printed for ease of use by colour blind pupils
- Colour blind students about to leave school are poorly advised on careers which they will subsequently find difficult or impossible to pursue, for example several areas of medicine, web design, horticulture, electronics, marketing, many divisions of the Armed Services, medical research, decorating, fashion and so on



Normal colour vision



Deuteranopia

What can teachers do to help?

In order to ensure that you are not inadvertently discriminating against an undiagnosed colour blind student in your classroom, review your classroom practices to take account of the needs of colour blind pupils by adopting as many as possible of the following suggestions.



- Lighting is important. Bright, low, inside or natural light can affect colour recognition. The brighter the light the easier it is to recognise colour. Seat colour-blind students in good natural light and square on to the board but avoid glare
- Assign a classmate to help the student where coloured diagrams or pictures are being used
- Check worksheets for colour issues and where possible use patterns or secondary indicators e.g. labels, to differentiate rather than colour. Photocopy worksheets into black and white then re-check that the worksheet is still able to perform the task you require. However, depending upon the shade and brightness of the original colours, greyscale copies will not always solve problems, therefore also check with the student that they can access all of the information required from the worksheet
- Use strong contrast on the board and on computer screens. Do not use red and green or pastel colours to highlight different teaching points, rather underline the words you wish to emphasise
- Check computer settings, web pages and computer-based teaching aids with pupils to ensure the student can pick out all of the relevant information
- In science CVD students might not be able to read litmus paper, carry out chemical titrations, identify a material by its colour when burnt, understand coloured diagrams in biology textbooks, etc so in lessons use a buddy system and be mindful of the issues when setting practical tests. Universal indicator can cause all kinds of confusion.



Normal colour vision



Deuteranopia

- Check the student has access to fully marked-up sets of coloured pencils, paints felt tipped pens etc labelled with the name of its colour. Note some names like 'vermillion' do not give colour clues, so use other descriptions (bright red) instead
- Ensure storage boxes and so on are not labelled by colour only and use written references in addition to colour
- Look out for other students teasing colour blind pupils for incorrect use or recognition of colours and ensure self-esteem issues are dealt with immediately
- In games/PE check the student is able to identify his teammates and use blue and yellow bibs to distinguish between teams if necessary. Also check he is able to see coloured training cones against grass/Astroturf, to see the ball (e.g. red cricket balls and orange hockey balls are difficult to see against grass, particularly in poor light) and so on



- Do not use a 'traffic light' system for the student to indicate how difficult he thinks his task is, most colour blind people cannot be relied upon to know the difference between red, green and orange
- 'Audit' your classroom, including computer-based interactive white board software packages, to ensure important messages for the students are not given in 'difficult colours', especially red and green
- Consult with diagnosed colour blind students to identify where they might have problems and encourage them to let you know whenever they think problems with colour might occur
- Graphs and charts use colour to illustrate facts. Use secondary indicators such as labelling, patterns and shading rather than, or in addition to, colour



Normal colour vision



Deuteranopia

- In art organize a colour palette for the student to memorise colour placement and focus on mediums other than colour e.g. charcoal, textiles, clay
- In food technology students may not be able to cook meat properly, distinguish between ripe and unripe fruit, use colourings and decorations correctly or be very successful in food presentation
- Assignments from CVD students may appear 'boring' to read as colour will not be used to its full effect to make statements. Make sure you do not penalise a CVD student for this
- Be aware that at present textbook manufacturers do not take account of the needs of colour blind children. Most contain at least a few pages which colour blind children are unable to read. In particular atlases, geography, all science, maths and ICT textbooks will present some information which colour blind pupils are unable to access. However, Galore Park are in the process of converting all of their textbooks so that they will be suitable for the colour blind. Visit www.galorepark.co.uk for details of suitable products which are currently available.
- Make sure external examining bodies are made fully aware of the student's colour blind condition including a detailed breakdown of the questions in exam papers which the pupil will be unable to answer
- Be aware that giving a colour blind pupil extra time in exams to account for colour issues will NOT help the student because no matter how long he might look at a problem colour he will never be able to accurately identify it.



- For diagnosed CVD students ensure your SENCO and all teaching colleagues are aware of potential problems and ensure an Individual Education Plan is put in place for the student at the earliest opportunity.

If you are a colour blind teacher please note that you may not always be aware of the strategies you use to cope with your own condition which may be different to the strategies adopted by a colour blind student. Sometimes you will not be able to notice information which will be readily apparent to your colour normal peers. You may have a mild condition or a different type of condition to your colour blind pupil and so will not necessarily be able to appreciate the needs of your colour blind students as they may not match your own. If you have any doubts always seek confirmation from colour normal peers/pupils and your colour blind students before using colour to make a teaching point.

How to obtain a diagnosis and further help

- If you suspect that you have a colour blind child in your class recommend to the parents that the child be referred to an optician for a test as soon as possible. Most opticians are able to undertake free eye tests for children and the parents should make sure that they specify that the child needs to be tested for colour vision deficiency (some opticians charge for this element). You will need to have a formal diagnosis of the specific type of colour blindness so that you will be able to provide effective support for that child in the classroom.
- Refer the child to the Specialist Teaching Services/Visual Impairment team at your Local Education Authority who will be able to advise you about how to support the child's specific type of colour vision deficiency.
- Refer to the Colour Blind Awareness Organisation's website www.colourblindawareness.org for more detailed information and ensure parents and students are also aware of this resource.