

The EMU Book:

A Curriculum for Using an Electronic Magnifier Unit



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A curriculum for using an Electronic Magnifier Unit

The term “Electronic Magnifier Unit” incorporates a range of different equipment. Previously, devices which performed the function of electronic magnification were called Closed Circuit Televisions (CCTVs) or more recently, Video Magnifiers. We have chosen Electronic Magnifier Units as the name to describe many units, which combine camera, screen and magnification capability.

When can an EMU be an appropriate low vision aid?

- when conventional optical aids cannot provide sufficient magnification
- when the student’s vision fluctuates, requiring varying degrees of magnification of print
- when the student’s textbooks contain a variety of print sizes not accessible through enlargement or optical low vision aids
- when student has difficulty reading own or others’ handwriting
- when alterations in contrast make a significant difference to reading efficiency
- when glare is an issue and a reverse image (white print on black background) or different colour background can help this
- when use of conventional optical aids causes fatigue for prolonged reading
- when student requires significant enlargement of graphics (maybe just for mathematics) and pictures, and uses other media for reading (braille, audio, electronic)
- when other physical disabilities prevent use of conventional low vision aids

Advantages of using an EMU

Instantly enlarges text or graphics

Enlargement can be customized

Colour, brightness and contrast can be customized

Students can view at comfortable reading distance

Can relieve visual fatigue often associated with reading print which is a bit too small

Can enlarge handwriting as well as print

Can be used post-school when large print is less available

Disadvantages of using an EMU

Should be prescribed or recommended by an optometrist or orthoptist experienced in the use of low vision aids

Can be large, heavy and not very portable

Requires skill and practice to use efficiently

Requires a power source

Can require maintenance, although I’m told newer ones really only need a globe changed now and then

Can be expensive

Features of EMUs to consider before you buy

Black & white or colour

Some of the newer models offer an upgrade so you can buy black and white now and upgrade to colour later, if you find you need it

Other colour options

Some EMUs enable the user to vary the background colour, although they may not magnify a picture in full colour

Monitor size

The larger the monitor then the larger the span of magnified letters on the screen. However, if the student's vision will not allow him/her to see this span of letters, then the larger monitor is not necessary. Also, the larger the monitor, the heavier and less portable the EMU will be.

Height of monitor

Many EMUs have adjustable monitor height. Especially for smaller children, this might be critical to them being able to maintain a comfortable viewing position.

Focus options

Most new EMUs have "auto-focus", but check how much the EMU will accommodate varying thicknesses of reading materials e.g. from a single page to a thick book.

Magnification

The specifications of the machine should tell you the range of magnification available (e.g. from 2X to 40X).

Contrast

Check the ability to alter contrast

Brightness

Check the ability to alter brightness and whether this affects the contrast

Positive/negative image

Most EMUs can switch between black on white and white on black.

Tray

Most EMUs come with an X-Y tray for moving the page being viewed. Most have "brakes" to restrict the movement in one or both directions.

Size and weight of EMU

This has a significant bearing on portability.

Other features

Lines and blinds: Many EMUs have line features: the ability to block off part of the screen, place a line above and/or beneath the print being read, or screen off all but the line of print. Students with central vision loss find this feature especially helpful as it assists them to track lines of print. Some devices with computer connectivity, will allow a "split screen" feature: i.e. with part of the screen showing the EMU image and the other part the computer screen image simultaneously.

Computer connectivity: Some EMUs can be connected with a computer or utilize the computer monitor as a screen.

MyReader: Both MyReader and MyReader2 have the capacity to scan and capture a page (or pages) of text, and scroll it across the screen, a line or word at a time. They can also function the same way as other EMUs for viewing diagrams, or real objects (in "live mode").

Remote controls: some EMUs have a set of controls on the EMU (usually just below the monitor) and an additional set on a remote (usually wired). This can add flexibility to the way the EMU is used. If you don't like where the controls are, you can position your remote where-ever.

Distance capability: some EMUs are capable of viewing not just a book on your desk, but more distance things, like the black- or white-board. This might be a very important feature for school students, but in some cases, adds considerably to the cost. Distance cameras which plug into a laptop or PC can be cheaper than the stand alone units, if a student already has a computer.

Some general notes on EMU use

Monitor the posture of your EMU user and ensure seating is ergonomically suited to comfortable EMU viewing. Remember that when viewing print on an EMU the screen is vertical, unlike reading a book or page where the print is usually horizontal.

Monitor lighting in the room. Avoid placement of the EMU with windows, or lighting behind it. Avoid glare coming off the EMU screen. Some users prefer working in a dimly lit room, so the brightness of the screen is enhanced.

When tracking, move the X-Y table and not your head and eyes.

Some research suggests that the best reading speeds are achieved when about 24 characters can be viewed in one span.

The optimal character size should be determined for each reader, to elicit the fastest reading speed.

Some users experience feelings of motion sickness when viewing the movement of the EMU, often when making the sweep to return to the beginning of a line. Sometimes this only happens when someone other than the viewer is controlling the movement of the image, so the sooner they control it themselves, the better. If this still happens when the student is moving the image, encourage him/her to slow down the movement, or ask student to look at the edge of the monitor when returning to the beginning of a line.

Learning to read with an EMU

Motivation

It is very important for the student to start with the right attitude to this new way of accessing print. The student might best learn the benefits of using such a magnification aide by using it to view familiar images and things in which s/he has a particular interest.

Be aware that students with poor motor skills or cognitive skills might find using an EMU difficult because they need to manipulate part of the whole image they are seeing and to realize that this is part of the whole. Lots of language and concept work might be necessary to develop the idea that we are looking at only a part of the whole picture.

Check that the student has an understanding of concepts and vocabulary such as:

- top & bottom
- up & down
- left & right
- small & large
- horizontal, vertical & diagonal
- zoom in & zoom out

- light & dark
- clear & blurred
- focus
- enlarge & reduce
- background & foreground

For this beginning motivation-enhancing period, students can view things of interest like:

- own or others' hands and fingers, including any injuries (?)
- other students' art work
- family photographs
- pictures of favourite sports stars or rock stars
- favourite pictures in books or magazines
- live bugs, worms or small animals
- school photos
- familiar and much-read books (making sure they're not too challenging)

Familiarization

Allow child some time to "play" with the controls and experiment with what they do to the image. This can be done with some fun materials such as those above.

Demonstrate how when the image is largest there is less of the page or photo on the screen.

Learn where all the controls are and what they do.

Experiment with focus (if it's not automatic), colour, brightness, contrast, line blocking, and of course, size.

Focusing

Most new machines have automatic focus, but if your student's does not, try these steps.

Discuss and demonstrate the concept of "in focus" and the idea that things in focus are much easier to recognize. Use some fun activities to try putting the image in focus and out of focus and back in focus again.

Explain that if you place a thick book under the EMU after viewing a single page, the focus will need to be altered because of the difference in height of the two objects.

Enlargement

When the EMU was prescribed, the optometrist might have recommended a size to be viewed with the EMU. If so, initially teach the child how to enlarge various sizes of print to the size s/he has been recommended on the EMU.

The optometrist's recommended print size should only be used as a guide, because preference for print size can vary greatly from the clinical assessment and over time. Using something like a learning media assessment (testing reading efficiency with sustained reading tasks) can help determine what print size is the most efficient for the individual student. In fact, some students choose not to use a particular print size for regular use, but to use the magnification control as an ongoing choice.

Start with lowest magnification and gradually enlarge image on screen until it matches the size required. Start at top left of page. Try to maintain the image on the top left of the page, even though only a portion of the page can be seen when enlarged. If the child has difficulty manipulating both the position of the image and changing the size, the teacher can do the moving while the student concentrates on the enlargement.

If no information was provided about the recommended print size with the EMU, present print in various sizes to evaluate which size best suits the student. Remember to maximize the span of letters seen at a time. If the print is too large, it will impair the reading process.

Using the X-Y table

The X-Y table moves in four directions to allow every part of a page to be viewed. It is the part of the EMU which is least familiar to students and requires some practice. It is not unusual for a new reader with an EMU to skip or reread lines of print.

Initially, the X-Y table should be controlled using both hands.

X-Y tables are engineered so that they move more easily left to right and right to left, less easily top to bottom or bottom to top or diagonally. You can restrict the student movement to just left to right or right to left with no up and down movement. Some have margin stops, so if you are reading a small column of print, the movement can be restricted to this span. To block off lines you can find it useful to use “lines” and “blinds” of text.

It helps before this stage to establish if the child is clear on concepts of left, right, up, down, back, forward, away, towards, slow, fast, etc. as these are words which will be used when describing the desired movement of the table.

The recommended movement with the X-Y table is to start at top left, move across the line, then move back across the same line to the beginning of the line before moving down to the next line.

To begin this process, lock the table so that only left to right or right to left movements are possible and help the child establish a tracking speed with just this horizontal movement.

At first s/he can track a single line such as on the Exercises – page 1.

You can start with lines of letters, as shown in the Exercises – page 2.

Other activities which can assist students to develop skills with the X-Y table are provided in the Exercises – pages 3 to 7.

Learning to read with the EMU

After these exercises, start with single lines of text – one line per page, and gradually build up more lines as the child becomes confident.

Try one-liners like tongue twisters, short riddles, names of pop stars, names of films, etc. Try to choose material which is age-appropriate and of interest.

Build up to reading more than one line using longer riddles, jokes, song lyrics, or short passages out of favourite (known) books. Use a finger at the beginning of each line as a marker to find the next line.

Once the child is up to reading paragraphs at a time, use repeated reading exercises to increase speed. These are usually done using short, interesting, factual pieces. The child reads a passage once and is timed. S/he reads it again and is timed again, and hopefully the reading speed has increased.

Locating print on the page

Children will need plenty of practice with different books: some with one line of print, others with several, with text always in one place, with text in varying locations on the page. Some of the Dr Seuss type books have text placed very creatively on the page.

Use the lowest possible magnification first to get an overall view of page and locate where there is print or pictures, then magnify to reading print size to read. It may take some practise to increase the magnification, and at the same time, remain on the part of the page you wish to view. If the child has difficulty with this, try placing a bright or bold sticker on the part of the page you are aiming at.

Using screen blocking and line marking

Students who have difficulty remaining on one line, or have photophobia, can find blocking part of the screen useful. Find the print, or the part you want to read, and then set to the magnification required, then bring the line marker or screen blocks to the line of print desired.

Learning to write with an EMU

Writing with a EMU can be tricky because the student must watch the screen rather than their hand. Also, the working area for writing must be kept small whilst writing is enlarged on screen. Start by letting the child play or scribble while watching the screen. The paper to write on needs to stay still, so temporarily stick it to the tray and put the tray brakes on.

Then the child can try copying some simple shapes drawn first by the teacher. You might need to remind the child to watch the monitor rather than their hand.

Try drawing long lines which will necessitate moving the X-Y table.

Try doing join-the-dot type activities. These swill help establish control over where the pen should go.

When the student begins writing under the EMU, start with bold line paper. If the student usually prefers not to use bold lines, these can be phased out as s/he becomes more skilled.

It is easy to make the mistake of writing on a line where there is already some writing, if the student is not systematic, or if s/he indents some material and does not check the line before writing. Remember that the EMU narrows the field of view significantly.

It is also very tricky to do fill-the-gap type exercises using the EMU. This is an important skill because it can be useful for such tasks as filling in cheques or forms. The difficulty is in locating the position on the form to write while viewing the EMU screen. Start by doing fill-the-gap activities where there is a bright or bold marker for each gap. Depending on the child's vision, s/he may locate the marker by looking first at the original page (not the screen), placing a finger on the desired position, then locating the finger on the screen – or, this whole process may need to be done on screen.

Some EMUs have a locating light. When you locate a position on the screen, push a button for the “page locator” and this will shine a small light on the page position so that you can place your pen there.

It can be tricky to judge the actual size of one’s writing when it is being seen enlarged on the screen. Students will need to practice writing and learn to “feel” the appropriate size from the amount of movement of their hand and fingers. In the early stages, they can adjust the size by visually checking the actual writing on the page, not on the monitor.

Independent living tasks

EMUs can be used for reading and viewing:

- Newspaper
- Telephone book
- Medicine bottles
- Food labels
- Directions on food packaging
- Writing cheques
- Filling in forms
- Cleaning and cutting fingernails
- Viewing photos
- Viewing bugs and objects from nature
- Cards for board games
- Greeting cards
- Bills and correspondence
- TV guides

“Reading” diagrams with a EMU

One big advantage of using an EMU is that the enlargement is variable and, when reading a diagram, one can zoom in on detail. However, unless the viewer is systematic and develops some strategies, details of a diagram might be missed. At least when reading print there are contextual cues as to whether you’ve missed a word or skipped a line, but with a diagram, there are no such cues.

If possible, view the whole diagram first without magnification, to get an overall view. If this is not visually possible, view first at the lowest manageable magnification.

Then magnify the top left corner of the diagram first and systematically track around the whole picture. The viewer can stop and zoom in on labels or detail as the diagram is scanned.

Methods might be different for graphs or pictures, or when the student is answering specific questions from the graphic information.

Try to provide students with experience of different types of graphics. It can be useful to go through a student’s textbook (Maths or Science) and give them prior experience viewing the graphics before they are required to use them in class.

Try doing simple jigsaw puzzles, dot-to-dots, viewing graphs, maps, pictures and photos using the EMU.

Increasing reading speeds

Once the student is competent with their equipment, some work can be done to increase his/her reading speed. Continue to monitor fatigue, as this might increase along with reading speed.

Typical reading rates for mature readers – Oral & silent reading rates (in words per minute)

Year level reading rates	Minimum oral reading rates	Typical silent reading rates
1	60	less than 81
2	70	82-108
3	90	109-130
4	120	131-147
5	120	148-161
6	150	162-174
7	150	175-185
8		186-197
9		198-209
10		210-224
11		225-240
12		241-255

(Foundations of Low Vision pp259)

Reading rates for people with low vision (in words per minute)

Ocular Media

Central Field	Clear	Cloudy
Intact	131	95
Loss	39	29

(Foundations of Low Vision pp284)

Teachers often believe that low reading rates are a natural outcome of having low vision and hence do not attempt to provide training to improve skills. Suggesting that the low vision student does every second question or reads fewer books because of time limits, whilst often practical, perpetuates the low vision student's poor skills and stamina and disadvantage in exposure to reading. Good readers become so through reading! Good EMU readers become good EMU readers by reading with their EMUs!

Strategies for increasing reading fluency and speed

Here are some ideas for increasing reading speeds generally. These can be applied to students using an EMU.

Because an EMU will reduce a student's field of view, practice can be done, at least initially, using short phrases, which do not require tracking across a line of print. There are some examples in the exercise pages 8, 9 and 10 or you can make up your own based on the interests of your student.

Also try these strategies.

Repeated readings:

- use short, interesting stories (3-5 min.)
- read and time
- re-read and re-time
- make student aware of rate increase
- repeat several times

Paired reading

- choose classmate with similar reading level but faster rate
- have VI student read a passage on own (silently will do)
- let classmate read passage aloud while VI student follows text
- then two read together
- VI student will try to match speed of classmate

Choral reading:

- select easy reading material for a small group of children including VI student
- read aloud together
- since no-one is “on stage” this is a comfortable way for slower students to try to match speed of faster readers

Echo reading:

- similar to choral reading, but teacher and student read together
- direct student to disregard meaning and concentrate on smooth eye movements
- teacher gradually increases rate of reading as passages are repeated

Give the student a purpose for their reading. For example, ask him/her to answer a question from the text. With a specific purpose to his/her reading, the student is less likely to focus on using the EMU and more likely to focus on the reading task.

Fatigue

Vision impaired students should be taught to recognise the signs of both visual and postural fatigue. Offer the student strategies to deal with them. For example:

- take short breaks
- close eyes
- look into distance
- change task - listen to audio book for a while
- shift physical position of arms, neck, back, shoulders, etc.

The student may also try relaxation techniques. “Imagine a knot behind your eyes, close eyes and imagine the knot gradually untying, think of a peaceful place...”

Assessment and monitoring of EMU skills

Checklist of EMU user skills

General functions:

- Operates power on/off switch
- Able to focus
- Able to select appropriate magnification (maximizing span of print)
- Able to adjust brightness
- Able to adjust contrast
- Able to adjust colour options
- Able to adjust polarity (black on white vs. white on black)
- Able to adjust machine for comfortable viewing position
- Able to set locks on X-Y table
- Able to adjust lighting

Student’s EMU use specifications:

- Optimum print size when using EMU
- Optimum viewing distance when reading with EMU
- Optimum letter span
- Preferred monitor set up: contrast, brightness, polarity, background colour

Reading functions:

- Able to locate print on page
- Able to locate beginning of text on page
- Able to smoothly track line of print
- Able to return to beginning of next line of print
- Able to sustain reading for ... minutes, before fatigue
- Able to maintain a reading speed of ... words per minute

Writing functions:

- Able to locate pen/pencil on page while viewing monitor
- Able to write on lined paper
- Able to write without lines
- Able to maintain appropriate writing size
- Able to read own writing
- Able to fill in forms or fill-the-gap exercises
- Able to underline words or phrases in texts
- Able to write notes onto text
- Able to erase writing with accuracy

Graphic viewing functions:

- Able to locate graphics on page
- Able to locate top right hand corner of graphics
- Able to track systematically around graphic
- Able to zoom in on detail while maintaining position
- Able to interpret graphics

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AND

Thank you to staff of Humanware for lending us three EMUs to play with, and for being very positive and encouraging in helping with the development of this booklet.

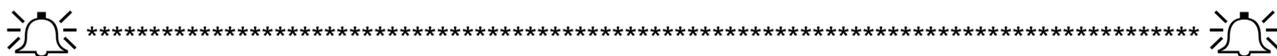
Thank you also to Rod Clement, illustrator of 'Edward the Emu', for permission to use an illustration from his book on the front cover of this curriculum.

Edward the Emu

By Sheena Knowles and Rod Clement

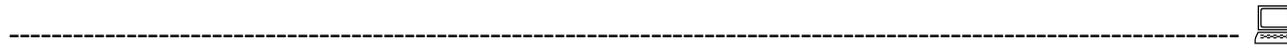
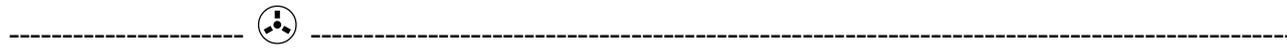
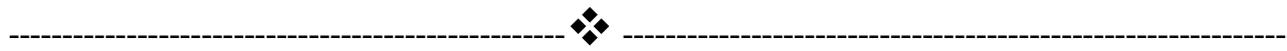
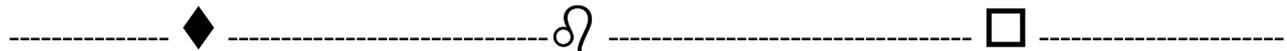
HarperCollins

Australia, 1990





How many pictures?



Exercises – page 4 (27 pictures)

Read the alphabet

a.....b.....
.....c.....d.....
e.....f.....
.....g.....
.....h.....i.....
j.....k.....
.....l.....
.....m.....
.....n.o.....p.....
q.....r.....
.....s.....
.....t.....u.....v.....
.....w.....x.....
y.....z

Read the alphabet, again

a.....b.....
.....c.....d.....
e.....f.....
.....g.....i.....
j.....k.....
.....l.....
.....m.....n.o.....p.....
q.....r.....
.....s.....u.....v.....
.....w.....x.....
y.....z.....

Read the story

.....The sun
was bright and
..... John wanted to
..... be early
..... to the
..... football finals.
He woke
up in plenty
..... of time to
..... pack
..... his lunch and
dress in his
..... team colours
but he just
..... couldn't find his ..
..... scarf
..... anywhere. He
..... wondered if
..... his Mum might
..... have washed
it but it wasn't
..... in the
..... wash basket. He
..... looked in his ...
..... school bag

Short Column Reading Exercise

the yellow ball	to the school	can live
has run away	will walk	it was
he was	on the chair	with us
up there	so long	has made
your mother	the new doll	the black bird
a big horse	could make	by the house
to the house	he would do	if you can
he would try	when you come	can run
the old man	to the barn	from the tree
went away	was made	they are

Short Column Reading Exercise

Harry Potter Phrases (1)

send an owl	he led them along	cars don't fly
keeper of the keys	tap your wand	rubbing their ribs
pat his beak	wings flapped open	Ron and Harry
long hair and beard	back to school	at Snape's class
at the roots	wash their hands	dash of leech juice
in a mean smile	potion needs to stew	up the stairs
to the tower	the Great Hall	a long list
a good time	gulp of potion	the cold wind
not even Ron	roll up the map	out in front
Harry sped up	the dark side	upside-down

Short Column Reading Exercise

Harry Potter Phrases (2)

two feet away	took out his wand	watch this spell
the dark mark	staff room door	the class came in
get a clear shot	his long robes	holding his wand
take its legs off	to get their bags	the Fat Lady
win the cup	saw the Snitch	all cats chase rats
the bell rang	put up his hand	a look in his eye
out of his room	side of the pitch	seen the Grim
the end of term	cold damp earth	top of his head
run for it	his scar hurt	the house cup