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Evaluation of the Optoelectronics College

QUALITATIVE RESULTS APPENDIX

for

Optoelectronics College and Rank Prize Fund

February 2014

Evaluation of the Optoelectronics College

by

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of

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Qualitative Appendix

This appendix is part of the final report 'Evaluation of the Optoelectronics College' and contains the verbatim comments from open questions in the surveys. The questionnaires and all other content are to be found in the main report.

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FULL QUALITATIVE RESULTS

Q.A3: The best thing about the OEC Curriculum Project is…

Scottish Schools

Additional resources.

Quality of materials, both the apparatus and paperwork.

Access to equipment and ideas that are modern, stimulating and involve the students

Equipment and activities work and are reliable.

Good quality apparatus. Well-structured worksheets.

A stimulus to pupils' interest in practical physics.

Good training and resources.

Well thought through activities with the kit needed for delivery in the classroom supported by good quality CPD.

The full range of materials/equipment/training are brilliant. I have experienced them in Moray and Angus.

Participative practical work with modern technology.

It has allowed us to improve our own knowledge in particular areas and with the kits given to the school, allowed this to be taken further in the classroom.

Relevant, engaging, challenging.

Having access to very specific equipment that we would not normally be able to buy due to budgets.

Demonstrating the relevance of physics to modern technological systems.

Robust, well developed lesson ideas

Good quality equipment that has obviously been designed by educators

Very new and up to date kit to match CfE

Good quality components that pupils can use to generate useful data. "State of the Art" equipment covering topical issues in physics and society. Worksheets and suggestions that demonstrate relevance of optoelectronics in society

Resources produced as complete, easy to use packs

The solar buggy kits provided an appropriate level of challenge for each group

Updating the curriculum content. Making resources available to schools

with S1 up to S6 Advanced Higher

Up to date take on real world interaction. Simple to use.

Inspiring teachers and providing them with light quality experiences whcih enable them to inspire young people. Providing them with easy to use kits which make teaching easier and more inspiring.

Good quality equipment that lends itself to a variety of uses within the curriculum. Practical has always been an excellent way of enthusing pupils and developing their understanding.

Great CPD opportunity for teaching staff and great, very useful resources for schools

A great set of professional easy to use resources

An application based learning approach

Making things easy for pupils to asimilate with demos and experiments that work

Equipment and training record

The training given. Quality of the activities devised, they work well with pupils

Access to high qaulity, tested classroom resources

New, useable materials

The materials are innovative and modern. They are at an appropriate level for pupils to follow independently.

They give specialist knowledge and provide equipment that is actually useable within the classroom. It is modern and exciting and our ppils have enjoyed using it.

A chance to get access to some innovative kit which can lead to quality practical learning experiences for the pupils.

The opportunity to receive training in how to use the equipment and a chance to interract with other Physics professionals.

I have recently joined XX School. We have a colour mixing kit which is excellent.

Free kit for schools

The resources that have been provided to the school have been useful and helpful in teaching the new learning outcomes of CfE.

Some different perspectives on things you've taught; nice simple kit; experiments/kit that work; paid for by someone else - thanks!

Modern, relevant and interesting contexts.

The training and the equipment that is made available to the school.

The quality of its products

Free and high quality equipment.

Good resources

Good training

English Schools (Non-fee paying)

The workshops that accompanied the kits gave lots of good ideas and opportuniites to share ideas

New, interesting pieces of equipment

Free resources are excellent

Equipment - good quality and availbale/accessible for students to use.

Useful resources and ideas

Having up to date equipment to use for practical work and demos in class. Workshops using the kit give teachers confidence in using the equipment with their classes as well as new ideas for teaching

Kit for Planck's Constant is well thought out as is optical fibre kit.

Provide a relevance and a discovery that current methods lack

Training and resources that match

The colour mixing kit and the LCD display unit which together with teh ppt and background material added depth to the curriculum

Allowing the use of experiment equipment to be used in lessons, with ideas of how to use them

The kit which we are able to use effectively in school but didn't have to pay for

Experimental equipment specific to the courses that works well

Solar cell buggies! Really simple but lots of physics skills in one piece of kit. LCD shutter with ipod (good with sixth form)

Hands on and interactive

Collecting a useful set of equipment

Embeds technology and electronics into the physics curriculum. Equipment more encouraging

Giving everyday/real life context to what can be difficult ideas

We started with the 4 kits supplied but decided to buy another lot of 7 solar buggies to enable whole class investigations

That they are supporting physics teaching in schools with free resources

They match to the curriculum in a variety of stages

The possible application for all abilities

New equipment into school as science budget is very stretched.

Good kit, particularly the kaleidescope

Free, good kit. We haven't used it but now we have had this phone call, they offer great opportunities for kids to create their own research

Bundle of kit and training - non pressured - with non physics specialists, help them out, fantastic - sharing source . Rich way of doing it. Always nice to have kit, and a different approach. This presented a whole new route and we wouldn't have time to set up ourselves, a route which is much more engaging. The strength is in the training. The impact it has compared to other initiatives has been really good, a great bit of kit with training and little staff time in setting it up once you get back.

I feel guilty because the solar buggies have some really good applications that could be used

It was a good way of getting things into schools - otherwise schools wouldn't be doing anything at all

They are quite specialist pieces of kit that are not readily available elsewhere so they are unique - really good. It is almost like it is a specialist area and we have specialist kit made by experts

Provides more ideas for teaching Optoelectronic relatied topics at KS3

Fantastic demo for addition of coloured light, We love the solar powered cars and have in cooperated them into several lessons Optical fibres help learners understand their use in communications

The quality and breadth of the resources AND the fact that we were given a day's tuition on how to use them.

Provides a set of resources that are more interactive allowing a usually dry topic to be livened up a bit! Being provided with training on how to use the kit rather than being expected to figure it out and work out how best to use it in lessons

Great opportunity to extend the curriculum and lots of resources

The equipment allows pupils to see light in action and to apply the principals an key concepts to real life situations. The kits provided are things that were on our wish list as a department, but were not essential, so they have provided many hours of valuable lesson material and has allowed a wide range of abilities to access difficult concepts.

Free equipment to make lessons more interesting

Well thought out pieces of kit that satisfy a demand.

Providing materials that would otherwise be just talked about in class

They have provided equipment that we can use - both in extracurricular activities and also in lessons - that we would not otherwise have. This equipment has enhanced teaching in that it aids pupils to develop a strong understanding, e.g. of the mixing of colours of light, and it also the pupils enjoy using it so their enjoyment of science is improved.

Meeting with colleagues to be introduced to and use new innovative equipment.

Receiving new resources.

Exposing teachers to new knowledge.

Giving students the chance to interact with electronics and thereby demystify them.

Free equipment which would otherwise be beyond the budget of my school.

Allowing teachers like myself to have a go of the equipment whilst on the course, and then use in lessons. Also providing new equipment which enables us to enrich pupil's learning further.

Free resources and training for schools

I only have the experience of OEC via the Extreme Physics event at XX School, consequently any views that I have are very limited. However, the initiative to place good quality equipment in schools is an excellent one. So, in my opinion the best thing about the initiative is exactly that, good equipment in a school that otherwise would not have access to it.

The practical kits and equipment received

Great kit and networking opportunities to get fresh teaching ideas

For high calibre students it is a great learning tool

English Schools (Fee paying)

Excellent resources

Free , course well presented , equipment was useful although some was beyond the curriculum. Not a big problem as I ran a few 6th form extension lessons

Some of the ideas are new and interesting. The kit we would not normally think of buying is useful. Any initiative like this is welcome.

Free hands-on training

Playing with kits first - this is really important

Use of modern apparatus/equipment to ilustrate scientific points which works and looks equivalent to material in the world outside the lab.

The kit was a good idea

The colour mixing kit it makes it so much plainer - and so much easier for the technicians to set up - saves time. It looks so nice. It's all superb - thank you very much

It gave us some new ideas. It was also nice to meet other people from other schools and see new initiatives.

The fantastic free equipment

Being shown how to use the kits and play with them first

Lovely kit which looks, and is, classy and children enjoy using it; does differentiate both practically eg how to vary energy input and in their treatment of results.

Q. A4: The OEC work can be improved by…

Scottish Schools

Expanding the range of experiments, having new apparatus for new procedures

Looking for activities within new course content that can be supported with inovative practical work.

Tying in with the new qualification e.g. National 3,4,5 and the new Higher Physics

More kits being available

Expanding the full range of experiences and equipment to more schools

Adding exemplar materials such as pupil instruction sheets which have been developed by different schools

Increasing the number of areas covered and finding more funding to help put relatively basic but robust equipment into the schools

Wider publicity in the school physics community

Being more widely publicised

Increasing the amount of equipment given to schools, and broadening the range of learning outcomes that it can apply to

Keeping in contact with the schools on new updated equipment

Identifying opportunities in the new Curriculum or Excellence courses where

A clearer photograph and circuit diagram of correctly assembled kits

Local groups to support schools

I feel it is fine, the only thing I would like is a more comprehensive list of item suppliers and costs.

Making it available to more teachers

I like the flexibility the kits supply but perhaps a look at Nat 3/4/5 and the new H / AH courses would allow specific course contents to be met. In the new courses we have an assignment that optoelectronics lends itself in terms of application and practical.

Not sure it can. They already discuss things with teachers to make sure the courses and resources are appropriate for our needs.

Incorporating more applications. E.g. fibre optics, lasers

Expanding into other topics perhaps

As a 'Fellow' of OEC and a pilot school, we received some 'early' equipment, or versions. We would like the updated equipment and final stuff we didn't receive.

Making up kits can be hard to arrange, unless part of the learning is in the building, ready made kit is easier to put into lessons.

Is there a discussion forum?

It is not always easy to get to these courses because of where they are located or time off school or weekends. This is more an issue for teachers than OEC.

Ensuring that the materials provided articulate to teaching schemes

Improving robustness of kit.

Producing more hands on activities and resources which the whole class could work with at once rather than resources which need to be teacher-led by demonstration.

Continued liaison with the IOP continuing professional development team

English Schools (Non-fee paying)

More workshops. Website explaining how to set up the equipment (this may already exist, but not aware of it).

Wider range of experimental ideas

Information about replacement parts, e.g. LEDs

LCD display is overly complicated and not worth including too small for easy whole class use

Better instructions and follow-up resources

Possible further training or feedback sessions

A state school needs 10x kits, not 5. We have classes of 32. This restricts the boards use and buggy use to clubs and enrichment days

Making it easier to get hold of extra kits (e.g. solar buggies) to make it a better experience in lessons

By extending it to KS4 & KS5

Tighter units with individual curriculum 21st C for example

Aligning more closely to schemes of work

More equipment for KS3 and KS4 which is less 'fiddly'

More ideas for kits being emailed out / following up sessions

Providing ideas on the variety of ways with which you can use these resources

Closer modelling to KS4

There was one kit which I can't remember which the technician put together but we couldn't use

Can't say as we haven't used it yet.

I don't know - it was so easy to know how to put it into our work. It is always nice - if there were some case studies real applications of the voltage etc. in real life - contextualise the learning

Having more

I remember thinking that the leaflets were not overly user friendly

Can't remember receiving the kit

More networking opportunities in the South of England - I have not been able to make it to other get togethers because of travel time.

Availability of spare parts to repair, in particular solar cars, some of which have stopped working

I suggest you look at the new KS3 & KS4 Curriculum for Science and link the use of the equipment to activities that match what will need to be covered.

Providing details of where to get spare parts. Improved lesson resources.

More opportunities like that one

Differentiated worksheets to support materials

Relating the equipment to KS3 more as we don't teach KS5 and only some of the stuff is relevant to KS4

Providing an up to-date catalogue of equipment that is a available to all schools.

Continuing to provide innovative materials including literature concerning the advances being made in this field of study

I'm not sure! Everything has been pretty good.

Providing class sets of equipment.

It would be great if examplar worksheets and also a pupil method sheet could have been provided. However, we are still greatful for the support we received in addition to the equipment.

I could not say, my experience to date has been a good one.

Getting ALL the kits to schools, especially the solar buggies, which would be useful for GCSE.

More of them (kits) rather than such high quality?

English Schools (Fee paying)

Don't know

More closely fitting with a wider variety of syllabuses (the "communications" set is not relevant to gcse or OCR-A).

Maybe links to curriculum. Also the solar cars were a bit slow and having tried to find some correlation between charge time and distance moved was not able to do so.

Keep coming up with ideas especially syllabus related ones.

Instructions with kits / on CD especially since kits took a while to come. I had taken notes but they were not complete.

Increased number of related activities

Better for higher quality solar cell cars, they did not last very long. Delay, the kits arrived several months after signing up

No

The things we have used most - colour mixing and solar buggies and dynamo - the others have come out for specific things but not embedded in curriculum as a necessity but useful adjuncts

Giving further instructions for the use of the equipment - it took a while to work out how to use some of it

Having more detailed information about the kits. It was a while before I got them (after the workshop) and could not remember all the details.

Q.A5: The most significant impact on pupil learning has been…

Scottish Schools

Improved understanding of important physics concepts - especially colour mixing kit

Increased interest in physics/science

They can find out for themselves as approved, to talk and check

Increased interest in physics

More engagement with practical physics

Hands on practical activity with modern equipment

Good investigative work with "real world" data that doesn't just give "straight line" results.

In my current school - Intro to renewable energy. The other 2 kits are brilliant. They enhance the learning of the pupils by showing how physics really works

Interest in electronics and opto as a result of using the kits instead of simply web-based research.

Pupils have had a chance to actually work with the equipment and see more relevant demonstrations of applications of principles of physics they have been learning about

Pupils making the link between the "lab kits" and the "real world" applications

Access to easy to use kit which demonstrates physics principles in a clear and simple way

Developing skills for scientific enquiry

Greater engagement in this subject area

They get to see clearly a result which would be difficult to see otherwise

Kits encourage pupils to ask questions and present opportunities for pupils to innovate with the components available.

Pupils enjoy the 'hands-on' activities

Increased interest in solar physics

Making the resources relevant to modern life

More effective demonstrations

Encouraging group work and co-operative learning.

Improved enthusiasm for the subject due to pupils making better connections to real-life situations NOTE: No amount of enthusiastic teaching and inspiration can combat the negative effect of the reduction of choice due to local implementation of CfE. Overall numbers have DECREASED due to school trying to enforce 1 science only in S3.

Developing understanding of concepts.

Access to resources they would not have had otherwise.

Improves the quality of learning by enabling clear demonstrations of vision and colour

An increased interest in solar cell technology.

Increased pupil interest and engagement

An appropriately supported and funded initiative has been very useful so pupils have hands-on experience of OEC type activities

Widespread, across the class, understanding of the topics as they were demonstrated (lots of "oh that's how it ..." comments).

We're now in a position to use hands-on equipment, rather than ICT for science lessons

Increasing interest - demonstrate practicality of solar power

Bright, up-to-date teaching resources.

Hands on experimenting with modern equipment that seems to do something instead of being theoretical.

Having good quality, appropriate equipment.

Visualisation of theory

Demonstrating modern uses of technology and making relevant links to life outside school.

Difficult to say - everything we've used the kit for we could have resourced ourselves so I don't know how to put this… I guess it is that we got the kit and went ahead with it sooner that we would have otherwise. so a better overall experience, added variety to the course….

Good at capturing interest

Pupils get more hands on certainly with the LED kits.

Improved investigative skills

As an aid to investigation

Access to kit to do practical

English Schools (Non-fee paying)

Understanding of different colours within white light. Enjoyed solar buggies investigation

Clear demonstration of white light

Solar power, very interesting for learners

Application of scientific principles

Hands on experience, a fund way of learning

Having a colour mixing kit where you can see the effect of adding colours easily - this was never possible with our original demo. All the equipment has been well thought out so the it clearly demonstrates the ideas intended to pupils.

Wwith optical fibres

Pupils are able to use real opto-electronic equipment and connect it to career options

The students enjoy and are influences by new ideas

LCD display - I don't think we had a way of illustrating them better and the colour mix worked well

The abilitiy to see science in action

Have seen how simple to operate electronic circuits can be and so grown in confidence

Being able to 'see' the ideas being taught and work them through for themselves

Active learning, relatively robust so students can explore safely

The ability to really understand a different topic by discovery

Hands-on use of some of the demonstrations

Determining Planck Constant. Use at KS5

Helping students develop understanding of relationships/variables. That white light is a mixture of RBG

Developing investigative techniques. Pupils have a better understanding of variables. Precise timings/measuring.

Enthusiasm and fun approach while learning

The visual impact of the demonstrations

The hands on approach and accessibility of otherwise difficult areas of light/illumination

Enhanced understanding of concepts such as colour mixing as equipment shows the effects so clearly.

Haven't taught the year 8s for some time

Allowing students in very physical practical way to understand, and then tinker with the variables - so easy for them. It decoupled the cells from other variables and cells.

Hard to say how it impacts: The buggies work well with a short video clip - it is good for kinaesthetic learners

The pupils enjoyed using them - I am sure if it was useful. The teacher that used them has left, so they are no longer being used. You have made me feel guilty so I am going to dig them out and start using them

Engagement and they aren't used to having access to this type of kit, the fact they are entrusted with this specialist kit makes them feel great and they engage more. They think they have A level kit

The ability to discuss a concept then trial it with the Solar cells in action kit

Seeing science in action, clear understanding of coloured light

It has helped them understand colour. The solar cell buggies have been very popular as an investigation tool. The 'wind up' light is excellent for quickly demonstrating the difference in energy demand of the two bulbs. We have Flexible Fridays at our school which means you have a whole year group for the day. The kit has been used in many ways with a wide range of ages and abilities and the feedback has been very positive as they really enjoy hands on. Basically we would never have considered purchasing such equipment purely because we do not have the funds.

Using the equipment

The equipment of highest value to us has been the equipment targeted at A level as we have only started providing A level physics recently and so only have a very small budget for equipment. It was great to get some free resources e.g. the measuring the voltage required to light various colours of LED.

Unfortunatelly I have only attended one of the free sessions offered but the session on light and colours was fab - we have used our resources and purchased more to help students understanding. Students find lessons more exciting and learn a lot more.

Increase in pupils ability to write extended answers about light and waves due to practicals and demonstrations using the kit.

Students are able to use the kits and observe results that are reliable, repeatable and easy to obtain.

Hands on always improves our learners experiences and understanding and this is certainly the case here

In their understanding of how colours of light mix - it was difficult before to "prove" to them that green, blue and red light mix to make white as our resources did not readily show it. However the equipment we have has definitely improved the teaching of this topic.

Ability to use solar buggies and improved demo of coloured light resources.

The chance to be hands on; practical instead of theoretical.

Pupils have had the opportunity to use equipment which they may not have had the chance to use otherwise.

Standard of the kit and the increase in access to practical tasks

Having equipment that is intuitive to use and reliable means that pupils quickly get to use it for its intended purpose and teachers can deploy it confident that the equipment will not limit the learning.

The visual impact on some lessons, rather than images/videos/etc

No evidence to say if they are going on to choose science - the biggest impact is that we are a girls' school - girls are free to choose and do it without boys

English Schools (Fee paying)

Good use of apparatus by children

Greater independence in investigations (solar buggies)

6th form - ran a short course on opto electronics , this extended and enriched their curriculum. Keystage 3 - had extra equipment that pupils enjoyed using.

Enjoyment

Being able to SEE the results

Enthusiasm to learn from their involvement - most welcome feedback was from a Y9 who suddenly linked the order of the electromagnetic spectrum to the voltage require to "switch on"

Fun - playing with the kit

I think because they are so visual and so clear, they can see what is going on and it improves understanding

Difficult to say - whether one piece of kit has an impact - it depends on the teacher or the context it's set it. But it has been useful

I don't think a significant impact was made, however the equipment provided was a good addition to what we already teach and enhanced lessons taught

Practical experimenting with sturdy (and slightly unusual) equipment

Q. B5: Would you say that the use of the Solar Cell kit is embedded in your course(s)?

Scottish Schools

Used for an investigation in S1 for all classes

Still getting to grips with curriculum change

Kits are used when teaching renewable energy resources

We are still developing S3 but intend to embed

This kit has been used as a "challenge" lesson with particular groups and also with PTs on a themed day.

Was embedded for S4 investigation (Standard Grade) - use now in CfE is sporadic... teacher dependant.

Have been factored in to a unit on "energy" with S1 now

Embedding new equipment takes time to do properly. Courses are still developing. This new equipment encourages active learning.

Provides excellent opportunities for pupils to collaborate and learn how to problem solve. Very topical and of the moment, so gives practical illustration. Trying to find time to develop uses.

I was developing a new unit for CfE at the time, so used the kits for the final pupil activity

Used as an investigation practical for S1 and S4. Also used by young engineers club for S1-

Within energy transformation and renewable energy sources

This kit has been used with selected small classes mostly of lower ability.

We use them as part of a unit on renewables ; Used to develop fair testing and other practical skills.

Kit seemed very appropriate. We would like to use it more and have attempt to embed it. The robustness of the kit has been questioned.

It could be, but the kit is borrowed from another school

Simple kit. Kids like the solar powered cars. It is something a bit more unusual than the usual things they get to play with.

When I received the solar cells kits the department had a new Science technician who lacked confidence to put the kits together. Then, the storage arrangements for the department's equipment were changed. The support staff are just beginning to create an inventory and decide where to store all the equipment. Hopefully they will then be stored in an accessible place and I can get them included in the course.

Robustness of equipment an issue over time.

When teaching renewable energy or even just identifying the energy changes which take place in a given object the solar cell kit has been useful.

We doubled what we'd been given, to get class sets of 10; i.e. 2 pupils per solar buggy.

It is part of our S1 energy course - renewable energies, an investigation with choice of variable.

It follows on from similar investigation with wind turbines.

Used as an extension task with S1/2 Science along with being used in the S2 Science Elective.

They are an option in the National 4/5 course for an investigation write up.

The kit was also used during a P7/S1 science induction day in June 2013.

Although we have had this kit it has not been written into our courses. It may be used in a future rewrite of the courses.

Simple to incorporate in the curriculum for excellence

English Schools

Used in Y13 Applied course for inverse square rule

We use it for taster days when school children visit us (we are an FE College)

Needs to be written into schemes of work, these are in the process of being changed

An option at various points - especially renewable energy

Number of items

Year 10 Entry level group use them as part of their units

As mentioned before, 5 buggies is insufficient for 32 pupils

It is in the SoW (scheme of work), but with only a few buggies they're not always used.

It does not fit into the syllabus so has been used as an enrichment practical/extension and for building practical skills

A practical investigation built in to the GCSE course

Doesn't fit naturally so dependent on individual teachers

Used to illustrate scientific method as well as conservation/transformation of energy

Part of Year 8 work on light and investigative approaches (HSW)

I have used it extensively in coursework for AS and A2 physics students. I have not used it at KS3 because students don't know how capacitors work.

1. Not enough for a whole class to use in a lesson. 2. Time is always an issue.

Would need more buggies to do this

Y9 & Y10 - generally very well embedded. It works well with the syllabus - it's good. Very good for average to weak students - and the brighter ones want to unpack it a bit more. We don't have to spend with them to modify the kit, play around with the circuitry etc.

Years 7 and 9 in energy and sometimes with 6th formers - yes it is embedded - prior to that nothing as nice, but we would try to use - some demonstration - there is a lot more to do with them than we have done. One thing that helped - GCSE ISA - one of them involved solar cells so useful to have the kit. Would help if we had more - so in an A level group is better

Not used it a huge amount - when we have been doing changes between different types of energy - yes it is embedded

The content is but perhaps the activity is not since the teacher has left

Science club not so much in lessons – yrs 6/7/8

Mainly with Y9 and 10 and for extra demos - it's quite good! We have an energy circus that we run with Y9 and it is well used there. We do have a project week and one group looked at the buggies and what they can do - they got a lot out of it. Embedded with sixth form.

A KS3 lesson has been written using the solar cells as part of the school's curriculum, we link it in with the use of solar cells in under developed countries for example solar powered wells

Not completely but it is starting to be as more (new) staff are becoming confident with using it. I have had to encourage staff to use the equipment as there is a feeling it is 'too nice' and a fear it might get broken! Knowing how we can purchase replacements/ how to repair the kit could be useful.

The buggies have not lasted terribly well with the rough and tumble of the classroom. Our students haven't intentionally damaged them, but they have been dropped etc a few times. Some buggies are noticably better than others.

Used by individual staff when wanted

We only have 5 of the buggies/lamps and have not purchased any more. This is not enough to use with a class bigger than 15 pupils so has only been used with low level smaller classes

Obvious link with energy and electricity so it was spot on for Year 7 energy and Year 9 when preparing for GCSE/BTEC

We are currently in the process of re-writing our KS3 course - so we have not embedded the use of the kit into each of the years as we are still in the process of re-writing them. When we get to the relevant scheme we will embed it then, rather than re-writing a scheme twice.

I used initially with my year 9 class and have encouraged others to do so, only problem is that with one of the cars not working. You're going to have pupils working in very large and not necessarily the most productive sized groups..But they're a great bit of kit which really excited the pupils. Emphasis in lesson was on HSW skills but linked with real world large scale solar car projects.

Used to teach alternative energy resources and as ISA introduction.

As is always the case a set of 5 is hard to use with a class of 30. The kit tends to be extension/ one off lessons.

As we only received the equipment towards the end of the last school year, we have not had much chance to utilise them yet as most teachers are teaching chemistry and biology at the moment. The kits have been written into the SOW and will be used later on in the year.

Fits in well with the topic areas covered at KS3 and in year 10 of AQA GCSE

Q. B8: Please complete the following paragraph: Learning/teaching experiences using the Solar Cell kit could be improved if…

Scottish Schools

Buggy and lamps were more robust

Greater range of capacitors, size of solar cells

We could directly measure power generated by PV in some way

The light sources had been more reliable - bulbs often didn't work/needed replacing. Problems of GS23/PAT testing with lamps - perhaps LED lamps could be used.

Faster buggy

Capacitors and motors had higher ratings so that pupils could enjoy higher speeds.

Buggies are fairly fragile and although they have lasteed well and can be fixed, it is frustrating if a problem arises when using them with a class.

Provided with a range of cpacitors / solar cell sizes? Nice kit, thank you. The school already teaches PV in S1 so not a huge impact on numbers. Certainly improved PV lessons though

Larger kit

The kit was more robust

They were found to be a bit fragile and would be better if they were more robust

They were slightly less fiddly to put together

Buggies were more robust - version 2 has been developed but we have v1 (see earlier comment) which was not so hardy.

If they moved faster than just a crawl. Do not seem to move far - motor selection perhaps?

Light sensitive cells would work in less than strong sunlight - possibly the latest cells do this. But it is a useful resource where pupils can do practical work.

English Schools

You could remove ambient light!

We had a larger version

Don't know

There were more available

We had the time to spend longer on some topics

These were a good addition to the classroom and we bought more

Enough for full class use (1 per pair of pupils)

More buggies, also they are unpredictable which is a shame if you use charge time v distance travelled for calibration lesson

More kits, components didn't overheat quickly

They were reliable! Discouraging for students to take repeats with little reliability

We had more (Inf fact we did buy more from Mindsets as we found them to be very worthwhile)

The buggies were smaller

Active learning, relatively robust so students can explore safely

The kit wasn't so fragile and could be used with students younger than KS5

Would be nice if cars went faster , also difficult to get any data using kit as the length of charging seems to have little relation to distance moved

By making them more reliable. So far, one or two are already not working.

Rather selfishly, more equipment is needed for whole class use. However, it has been used by the science club to good effect.

It's less scary for non physics specialists - works really well with their confidence. It would be nice to have more of them - be able to top them up - we have 6 and it's not enough for the class. We would like to buy them in if we could buy them in, we have budget. The only other thing is that they are vulnerable to heat damage from the light..that's the only issue we have

The thing that would allow us to embed it more - would be having more of them in GCSE l - so at the moment they are used as exhibits. Might need 15

No I can't think of any

No

I take 3 or 4 sessions of an hour each - structured - 1 hour of playing; then we get them to plot graph - investigation so they change the charge time/change height or lamp and easure the distance. Then we get them to interpret the graph to the point it is not plotting - to develop investigation skills, In the curriculum it is content and content and we don't have the time such a shame because it is such a brilliant investigation. If they are bright enough they do triple science so science isn't an option, it is compulsory

Nearly half our students do separate science , This is up to date kit so it’s fine

The solar cells were modular and could be easily reconfigured to changing the object they are powering.

The cars were more robust

Further lesson plans/ideas could be produced.

Ppt resources for different ideas on how to use them were provide

Perhaps more ideas concerning their use? How are other schools using them? Cross fertilisation of information?

We had more kits to go around

More kits were supplied

The capacitors used stored a bit more energy - this would allow a little more ease with the use in investigations

We had more of them.

If more cars in exchange for lamps - schools have them already but being able to let pupils work in smaller groups and get more hands on action. NB - said not at all for pupils taking sci option as all pupils take triple science for GCSE.

We had more kits to give more hands on experience.

We had a full 'class set'.

Q. C5: Would you say that the use of the Colour Vision and Displays kit is embedded in your course(s)?

Scottish Schools

Current staff would be keen to use [the kits] but would need training or instructions that weren't passed on

Colour vision kit used by all staff in 'light and waves' unit of S2 course.

New Nat. 5 course does not include colour mixing

Huge demands on teaching time at present, everything in flux with new courses

Still getting to grips with curriculum change

This kit has been used by the Higher and Advanced pupils

The colour mixing wheels have been embedded into S2 courses and other parts of the kit used in S3 and S6.

Colour mixing kit is superb

Many of the concepts in this kit we have found a bit difficult for younger pupils

The equipment is of good quality and educational value

Use the displays part with S6 Adv Higher, but currently rehashing |S3 course, so may find a slot for colour vision there.

Within light topic to demonstrate colour mixing

This kit is easy to use and used by all chemistry and biology teachers. I also received the polarisation LCD kit which is outstanding and used with S6 amd some S2 classes

Just starting to explore use of kit at moment.

We are writing the new cfe courses and it will be included

Excellent - kids love it and retain the information

Complements an existing demo, but shows more variation in intensity and makes points more clearly.

Used in light topic in CfE level 3 (part S1, part S2). Has been used in the last few years of S Grade also.

Used for part of S2 course for Light and Sound

Equipment is easy to use quick to set up and demonstrates the clour mixing beautifully in a variety of ways. You clearly get the secondary colours with no ambiguity about the colour being created. Pupils usually remember this as it is a very good experiment.

The colour mixing materials were provided once our school had finished delivering the 'Telecommunications' unit of Standard Grade for the last time. Intermediate 2 does not include colour mixing as an outcome, and neither does National 5 Physics. The colour mixing materials were not available when the S1 course was planned.

it works!

When you read the CfE learning outcome which relates to light, it is more about refraction than about colour mixing.

I have just used the kit as nice source of light for senior experiments

Used to great effect with colour mixing, the large LED kit, first edition received at SSERC, is absolutlely brilliant.

The Fifex colour mixing kit is embedded in our CfE Sight and Sound S2 science course

Not as a course; but the equipment is used for colour mixing teaching and learning.

Easy under curriculum for excellence

English Schools

Much easier to use than our old colour wheel

Used for demonstrations of colour mixing

Colour is outside our GCSE syllabus so we teach it in year 7. Kit is helpful.

Is now for colour wheels and LED energy

Not embedded yet, still moving towards it

Higher level year 9 and Entry levlel Years 10& 11 enjoy using this kit

Excellent except our kit came without a microphone and I think the SV affecting the transparency woudl be fun to show

I always use it where possible, other members of staff forget we have it.

Colour mixer used at all available times !

It's a KS3 topic and we don't (yet) have any KS3 students

We are changing exam boards and re-writing SoL also updating our inventries to make sure all relevant practical apparatus is used as fully as we can.

A great piece of kit for showing colour mixing

Would be nice to have a class set

We use it every year with all students, we have embedded it in the scheme of work we follow for the topic of light at KS3.

Some reluctance with some of the kit.

Exciting demos which add to what I would already teach

The kits are really great - as there wasn't much we could do with light.

Lovely bit of kit that we are glad we have got, not as useful as buggies. I don't know if we can use it in other ways because it is one off demonstration from our point of view….could use in a science club

Certainly is embedded

Lovely bit of kit that we are glad we have got, not as useful as buggies. I don't know if we can use it in other ways because it is one off demonstration from our point of view….could use in a science club

It will be soon if not already - we need to advertise….some of it is a bit complicated - fibre optics a bit complicated. 3 LEDS that you can mix colour with is very good, colour disc is very good. Very nicely made.

Colour wheel didn't work - this is brilliant - use it in class and in Open evenings. It is embedded for me

Colour mixing kit is fantastic - we use it when we do colour, we use it in intro demos and then students investigate for themselves

Lessons have been written as part of the curriculum using the kit

A very good way to demonstrate colour mixing. The students found it fascinating. It even ended up being used in the main photo on the front of the school brochure.

Used by individual staff

At KS3 these kits play important role in teaching students about properties of light, how light disperses and how colour filters work.

The colour mixing wheel and demo has been used while teaching light

Although it has been added to the resources list available for this topic it is one which has yet to be re-written as we are rewriting our entire KS3 course. Therefore whilst it will be fully written in, it has not been yet.

The kits are really great - as we didn't do much with light.

Written into SOW

We've used it for special science weeks and are in the process of developing an optics area for our NT visitors.

Very direct application for teaching light to KS3 pupils.

Included in the scheme of work and used for every group to complete that topic

Q.C8: Please complete the following paragraph: Learning/teaching experiences using the Colour Vision and Displays kit could be improved if…

Scottish Schools

Access to more filters

There were more small group practical work opportunities for pupils as in both SC and IC kits

We had more of the kits, but this would be very expensive!

More than one of the rotating colour mixers would be useful to allow group/stations work.

No comment, All very positive

Adapted for more hands on work by pupils rather than demonstrations?

Someone could trawl through all the new learning opportunities and flag up possible areas for use

More suggested uses for the apparatus were available.

Not sure, this is already great

I think it’s very good any way!

No issues

It's just a shame this kit is so expensive. It's fantastic and we'd have more if we could afford it.

English Schools

We had a microphone. Thought instructions were clear

Kids relate to it better as it is more modern equipment than we had

The colour wheel was bigger

There was more of it

Access to more kits / borrow the.

Class sets were available

It includes a set of appropriate filter glasses. As it happened we had to buy the filter glasses and match the colours on the power point to the colours of the filters because there were some differences in the primary colours between powerpoint and glasses.

Simple instruction for students

I haven't taught year 8 for some time now so can't say

Offhand I can't think of anything

They work very well….we used to use overhead projectors. Not really any ideas on how it could be improved….really well designed, really well built, NEED MORE QUANTITY. If I were starting again I would do a few things a bit more simply - and more available 10 to school rather than 4

I got it out with the science club again and they were enthralled - I enhanced by using colour filters. I think as a piece of kit it is fab

It's fantastic

We love it as it is!

Can't really think of anything for this.

We had more of it.

Q. D5: Would you say that the use of the Illumination and Communication kit is embedded in your course(s)?

SCOTLAND

LED kits used by S5 & 6 pupils for experiment to measure Planck's Constant

Still getting to grips with curriculum change

This kit is used by all S2 pupils but also lends itself to use with more senior pupils, especially Higher

This kit was used to give opportunities for investigation at S.G and now looking to use in N4/N5 courses.

Again, was embedded in SG course but not (yet) in Nat 5. Is embedded in BGE, S1 topic on light.

Found it useful in providing a range of activities that can be used to support Outcome 1 of the new Nat 4/5 course.

We are trying to find the appropriate point in S2 to delvier this

Very good for investigations all the way up to Higher level - can be accessed in difficult ways as appropriate to level. An area for further development, time permitting.

Used to show TIR and light (LED). Modules used to show 'h' at higher level.

I have made extensive use of the kit but it is not used by all teachers. Perhaps with new Added Value units in CfE it might be used more.

Supports existing curricular area with useful equipment.

Have not yet made up all the kits

Trickiest set of all to use. Specialists have used it, not everyone in Science faculty.

The LED kits used in both teaching of light as well as in the electricity/electronics topics to show the switch on voltages. Pupils use their mobile phone cameras to 'see' the IR LED.

ENGLAND

Only for Yr 12/13 Applied group

It is used with Y12 physics to discuss communications as well as using the different LEDs to measure Planck's Constant by finding turn-on voltage of different wavelength LEs.

Training for teachers within school is needed as the kit is complex

Year 8 and Years 10 11 Entry level use the kits

Can be used for Planck's Constant in year 12 and GCSE communication

Communication NOT used - more electronics (DT)? Illumination (LED boards) used as standard practical for AS

It's used as an experiment with the lower 6th to demonstrate the quantum nature of light by finding the strike of voltage and each LED - they go on to find the Planck constant

LED stuff is quite fiddly, used by 6th form

Yes, we use at a specific part of the course and consolidate theory

Not obvious how to embed

Didn't really fit the SoL we had - we used for enrichment activities

Some not appropriate at KS3 and difficult to use without an adult with each group.

Used it with A level students once a year in Y12 when we do optical fibres. Use it usually as a demo when time they get to use it. IF I had more, we would get them to use it

Not used the fibre optic kit - not enough for a whole class to do it, and just a bit technical..too much basic syllabus to get through - LED, halogen Y11

Really impressed - use a lot with A level groups as well. Embedded at KS 5 and 4

Year 9 upwards and has been used with sixth form - buggies we have used with energy stores in the capacity. Fibre optics - Dynamo is very useful - very good demonstration of lamps; fibre optics are a bit fiddly for the fingers. Quite good for demos

We use it at KS4 with learners studying communications

This kit has been used least of all purely because of staff movement. We have had a large change and reduction in staff and technicians and are only just building up numbers. A Design and Technology teacher is currently teaching science and is looking at this kit and how it can be used with KS4.

Used by individual staff

We are still re-writing our KS3 scheme. We have yet to consider how to fully embed this kit in our scheme as we are yet to rewrite the topics which it will feature in.

Least helpful kit since less sturdy and least easy to use

Parts too small for young students

Q. D8: Please complete the following paragraph: Learning/ teaching experiences using the Illumination & Communication kit could be improved if...

Scottish Schools

Not sure if it could be improved. Very good kit and activities.

A "double set" of equipment had been issued to asllow smaller groups/individual investigative work.

Whether this (and other kits) enhances teacher confidenc eis dependent on the core subject of the teacher

There was a supporting video explaining the real life applications of the principles being demonstrated

In my opinion it works fine as is

There was a greater range of LEDs and if they had a narrower wave length range. Similarly with circles former, both would extend the range of the independent variable

A longer fibre to demonstrate communication over distance and a sound to light converter.

Again sources and suppliers of the components so match replacements can be easily sourced.

Not sure

My experience with these kits is very limited - other teachers now retired have used them with success

No issues.

Kits were made up. we need to get around to doing this for what we have been given. One demo is not enough.

English Schools

It was less fiddly

There were ready to use student worksheets

This was the most disappointing kit in terms of reliability and use - hence not used

We had enough sets, we have 26 pupils so 5 are insufficient

Easier way of powering than with battery packs? Perhaps a ready-made slot-in connection for LEDs

We had a few more! Have also used these with Yr11 students to investigate optical fibres

We could further embed it in our schemes of work for KS3

LED devices used to replace traditional ray boxes (that are clumsy & difficult to set up).

The only thing - I could do with more sets of the kit - the kit works quite well. I think I can buy them? Not sure

I think really highly of it - useful for the application and understanding

Make it less fiddly

Replacement parts were available

Parts were easier for students to manipulate

Q. E8: Please complete the following paragraph: Learning/teaching experiences using the Human Vision kit could be improved if…

English Schools Only

You could use old glasses/spectacles to show how vision is altered

The monitor was easily linked to the LED camera. The only method of using the camera was directly through the projector, not ideal

Would be nice to have class set of some of the equipment

We would find this kit very useful

Q. F2: Do you have any additional comments to make about the resources?

Scottish Schools

Training/instruction have not been passed on by the person requesting the kit

Found it hard to access website

Having good starter activities and especially I IC, good pupil activity sheets make the OEC materials very easy to use.

A very successful initiative from my point of view. It would be good to see it developed further if funds / time allow.

The resources have been very useful and have allowed teachers who were not at the courses to use the kits with confidence.

An excellent all round package. Well designed and supported.

Will definitely re-visit the website. Hve been distracted by all the changes to courses and will be looking to use the OEC kits more widely when I get time to develop resources.

Keep forgetting about the website for resources, but will try to go on soon.

Impressed with quality of communication kits and light mixing.

No

I haven't used them much, so my comments are second-hand from other teachers. Overall impressions are favourable

Useful and appropriate. Good to have other people's ideas as input to lessons.

Partially completed - it’s been ages since I got the stuff. It’s embedded within all other stuff in my cupboards hence I don’t know what pieces came from where

I think they are very good resources, but unfortunately they were delivered at a time of significant change in the Scottish curriculum. Teachers have been familiarising themselves with the new courses. The materials would have been perfect to deliver Standard Grade and some of Intermediate 2 (the optoelectronics materials) but do not immediately articulate with my interpretation of the Curriculum for Excellence outcomes. I do hope to use them in the future when I re-write my courses

I have completed what i can from the few times i have used the apparatus. I have recently joined this school.

I appreciate having this kit. I know that we have really benefited from the solar buggy kit and ideas. We haven't yet made progress with the other kit. This is no one's fault but mine. I don't need anything apart from TIME.

Keep doing your fantastic work, this is really good kit. I was glad to be on the SSERC course when I received the Colour Vision equipment, it was first run and has both inner and outer LEDs for colour mixing. The LED kits are brilliant and are used across s1/2/3 and I will be looking to extend this into the S2 Science Elective.

They are of good quality. However information should be supplied as to where parts are sourced. It took me a while to track down a worm gear (MUTR) for a solar buggy, as things get lost, broken and removed and these suppliers need to be added to the PECOS system.

English Schools

A great initiative. Our curriculum is quite specific as we are an FE college, but we will try to integrate the rest of the kits into the teaching.

I have used the booklets and I like their ability to develop independent learning

Brilliant! More please!

First class, was able to use the website to remind myself of stuff covered in the training and was then confident to use it.

Good overall resources, used mostly by Y12-13

I went to a training session with Helen Pollard in Lincolnshire. I was impressed by what we covered in the day and I was really glad to pass this onto colleagues and other Heads of Science in the family of schools. Helen did an inset session.

Thank you for offering these resources.

Some website materials were password protected. I think you should liaise with a local school to see what equipment they have and how it can be improved. This would produce a more targeted result.

Have got the kits - solar car - haven't used them. Now we have had this phone call, they offer great opps for kids to create their own research - and they can see the minimum impact of solar panels. I would do an open ended practical. Will use it with Y10 as they are looking at alternative energy and may be useful for ISAs….learn the variables from them - e.g. variables that have an impact on velocity

Downloaded something off the website - used a video of Australian using solar cars

CPD. There hasn't been enough time to repeat the CPD to other staff. Time aspect. We are overwhelmed with resources to use.

Enjoyed the session - useful activities and impressive kit

It was great to get free kit from a free CPD!!

I looked at the website but we have our own stuff.

CPD is always good. At the CPD I remember thinking WOW this is great and this is going to be really useful -to my regret I used the paper resources - I made a booklet and then did a CPD session and gave them out

Useful to find out about the kit and to meet others - can't remember how much we used with the CD……you use the stuff and then develop your own ideas from them as you use i

The resources need to be more clearly signposted. The website was briefly mentioned in my training but an email with a link or similar would have been really helpful if sent out shortly after the course. There was also quite a long delay between attending the training and getting the equipment so my memories of how to use each bit of kit were really rusty by the time it eventually arrived!

Please see previous comment.

It would be good if there could be CPD sessions ran with the whole department, with teaching ideas for all year groups as this focusses on higher age groups... We only had one teacher have a one hour session to learn about the whole kit, then kindly got a volunteer to help go through it again but it is not enough (we feel)

Really enjoyed the training session, and think in that format (seeing the items being used and discussing uses) means most likely to use in the classroom. I used the equipment where opportunities arose in the curriculum of pupils I taught/ got it in there. The solar panel cars made a great series of lessons with a year 9 class planning investigations. Just a shame one

of them didn't work. Be nice to have more cars in exchange for the lamps (most schools have loads already) so that groups could be smaller.

Just wish we could use it more but we are limited by the number of volunteers on at a time. However buggies need plenty of room and also power supplies for the lamps - we have neither so they have been used by Mrs H Pollard (SEP, Ogden Trust) for workshops in schools around the E Midlands

Was not aware of website support

Unfortunately we have not really had opportunity to use the kits in school. The kits arrived after a long period of time had elapsed from staff attendance at workshop and so impetus was lost there. We hope to integrate use of kits into our new schemes next year.

We fully intend to use the equipment, particularly within the Physics SOW and also with our Science Club