

Open Research Online

The Open University's repository of research publications and other research outputs

Action research: systematic reflective action to improve practice

Book Section

How to cite:

Lee, Clare (2012). Action research: systematic reflective action to improve practice. In: Lee, Clare; Johnston-Wilder, Sue and Ward-Penny, Robert eds. *A Practical Guide to Teaching Mathematics in the Secondary School*. Routledge Teaching Guides. Abingdon: Routledge, pp. 113–122.

For guidance on citations see [FAQs](#).

© 2013 Clare Lee, Sue Johnston-Wilder and Robert Ward-Penny

Version: Accepted Manuscript

Link(s) to article on publisher's website:

<http://www.routledge.com/books/details/9780415508209/>

Copyright and Moral Rights for the articles on this site are retained by the individual authors and/or other copyright owners. For more information on Open Research Online's [data policy](#) on reuse of materials please consult the policies page.

oro.open.ac.uk

Chapter Twelve - Action Research – systematic reflective action to improve practice

Clare Lee

When you are teaching you may come across problems which aren't solved simply, one part of your professional role will be to try different approaches to solving them, evaluating those approaches and using the results of that evaluation to inform your practice. Systematic exploration of this kind is often termed 'action research'. Action research takes many forms, but the term always indicates cycles of systematic exploration designed to solve a problem or at least improve a situation in professional practice.

You might use action research as a tool to find effective solutions to many pedagogic issues, for example you could use action research to:

- investigate the effect of using a rich task on the pupils' learning about Pythagoras' Theorem.
- consider whether working together in friendship groups is more effective for your pupils than working in groups of your choosing
- find out the most effective way to get Year 8 bottom set to learn more mathematics.

Action research is a methodology that aims to study a social situation with a view to improving the quality of action within that situation. An important part of such research is that a professional, in this case a teacher, studies an aspect of their own practice that they find problematic and thinks of a solution that is in some way aimed at improving that part of their practice. Therefore through action research teachers become researchers in their own classrooms, and can combine curriculum development and professional development in one process. The action research process is a powerful one as it provides an opportunity for both in-depth analysis and true ownership of the outcomes. Action researchers investigate something that they see as challenging and develop a solution that fits their own context and teaching. Action research emphasises reflection on current practice and developing personal or 'living theories' (Whitehead 2008) from an analysis of that practice. The outcomes of such research are both personal and practical. However you will often come across other teachers sharing their experiences and discoveries in in-school magazines or teaching journals, for example Mathematics Teaching (ATM) or Mathematics in School (MA). In this way the ideas that are generated can be made available for other practitioners to think about incorporating in their practice.

“Action research may be defined as *‘the study of a social situation with a view to improving the quality of the action within it.’* It aims to feed on practical judgement in concrete situations, and the validity of the ‘theories’ or hypotheses it generates depends not so much on ‘scientific’ tests of truth as on their usefulness in helping people to act more intelligently and skilfully.” (Elliott, 1991) (his emphasis)

Small changes can make a big difference

Engaging in an action research project usually involves exploring a discrete and often small aspect of teaching and learning. However even at this scale, the process encourages teachers to become more reflective about their own practice and therefore it can enable some teachers to make dramatic improvements in their teaching. Since each teacher decides his or her own research focus related to some real practical concern, action research questions take the form of:

"the commonplace, fundamentally crucial questions of, 'How am I going to improve the process of education for myself and my children?'"(McNiff, 1988)

Professor Tim Brighouse (1999) talks about the impact of what he terms “butterflies” on the everyday life of the school and on the process of school improvement. He defines butterflies as “those small interventions that have a disproportionate effect on meaning and change”. The concept of the “butterfly effect” has been taken from Chaos Theory where very small changes can produce massive effects. In his book “How to improve your school” (Brighouse and Woods 1999) he provides an example of butterflies as the stirring of the air in Peking that transformed within a month into storm systems in New York.

TASK: Think of a small change that has made a big difference to you or your teaching. This could be a different way of studying that helped you learn more or a difference in the way that you approach teaching which made your lessons more successful.

Action research cycles

Action research is always open ended. It begins with an idea that you want to develop, or a problem that you encounter that turns into a question of the form “How do I ...?” or “If I then ...?” Action research is then the developmental process of researching practice and finding potential ideas that may form answers, putting an idea into practice, investigating how well that idea answered the problem, and continually checking whether what is happening is in line with what you wish to happen. Seen in this way, action research is a form of self evaluation.

Action research is simply a form of self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own practices, their understanding of these practices, and the situations in which the practices are carried out (Carr and Kemmis 1986: 162).

For example:

If you

- use a rich task to introduce Pythagoras’ Theorem you may find on evaluation that the pupils remember how to use that theorem very well. Therefore you may decide

to use rich tasks in another learning episode and investigate whether that is as effective.

- try to improve bottom set Year 8s' learning by asking them to sit and work individually you may find on evaluation that the atmosphere in the class seems poor. You may now decide to try asking them to work in pairs of your choosing; subsequently you may look at the tasks they are working on.

At each stage of the action research cycle it is possible to act alone. However working collaboratively can enhance each phase. It is easier to ask and answer *hard* questions when working in a small group. Discussion can help establish the *full meaning* of a situation and provide motivation to look *in-depth* at the evidence. Other people can provide ideas to improve the plans. In sharing research, teachers create a "thinking culture" exploring more fully the complexities of teaching and learning.

Action Research can be summed up as systematically exploring a change in classroom practice, applying research cycles in order to know that an improvement has occurred and sharing that experience with others.

The Action Research Cycle

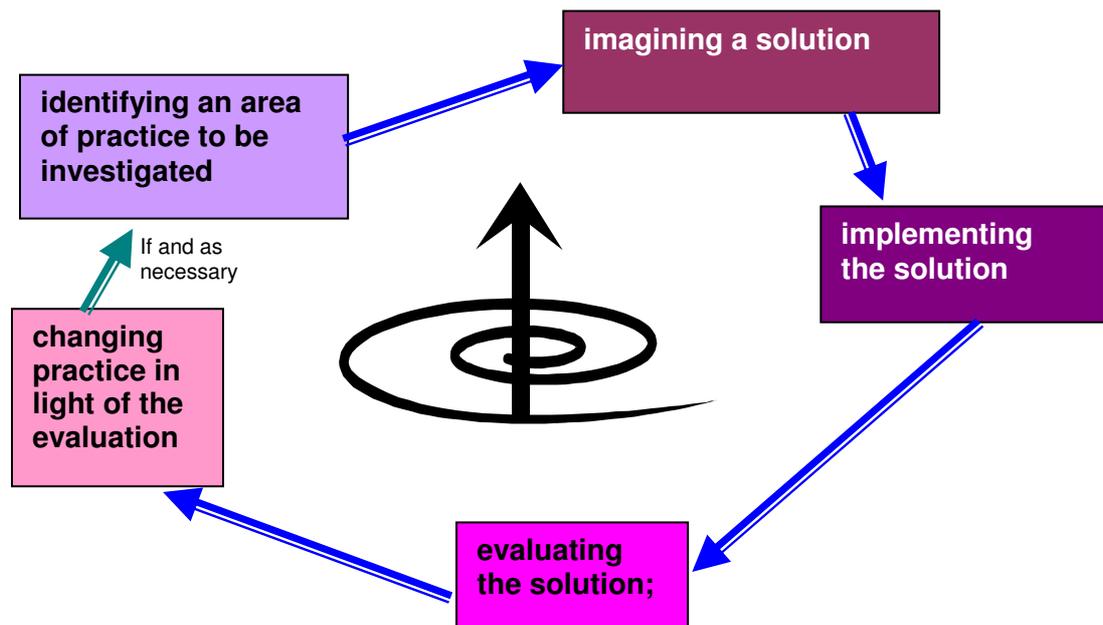


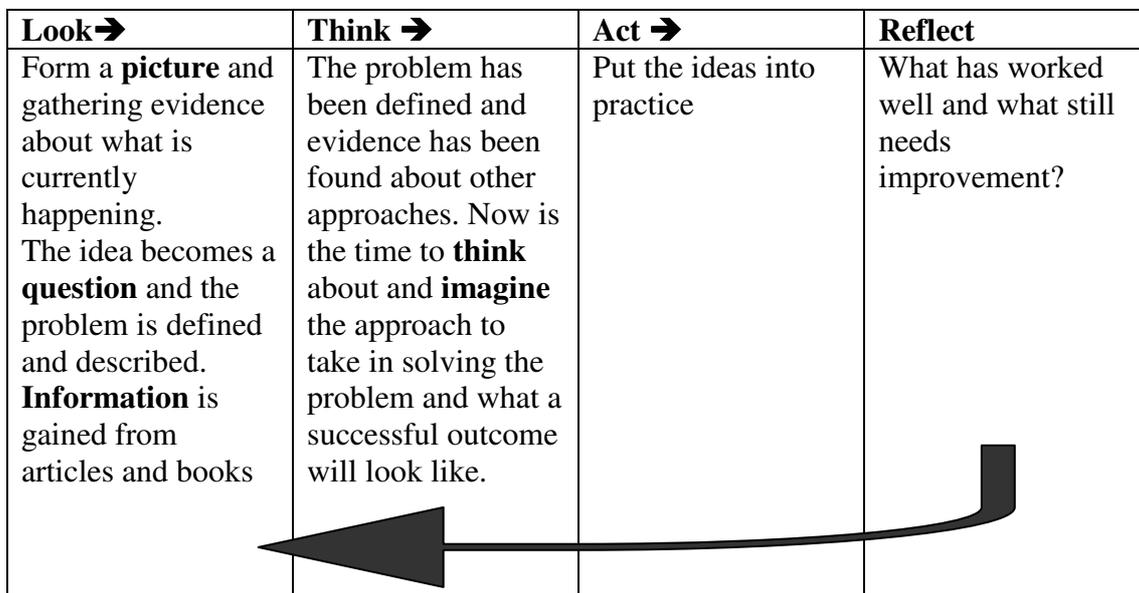
Figure 12.1 Adapted from <http://www.jeanmcniff.com/booklet1.html>

An Action Research sequence:

- *review current practice:* you could use the monitoring and evaluation of lessons and sequences of lessons that is part of your day to day practice to do this;
- *identify an aspect* that you want to investigate

- *imagine a way forward*: reading teaching journals, exploring the web and especially working with others are good ways of doing this.
- *form the problem* and imagined solution into a research question;
- *try out* the imagined solution; and
- *evaluate what happens*: seeking evidence to support what you see as happening and possibly involving others in the discussion of the outcomes of your innovation;
- *modify your practice* in the light of what you have found, and continuing working in this new way or trying another option if the innovation did not provide a complete answer;
- *monitor* the new idea;
- *review and evaluate* the modified action and so on ...

A simplified version of this sequence is given in the diagram below:



Action research (as its name suggests) requires both action and ideas more traditionally associated with research. Therefore engaging in action research not only requires you to use existing evaluations and hunches about your teaching to decide on the problem to tackle, it also asks you to read what others have said on the subject, where others have found problems and what solutions they have found. It asks you to try out some innovation in your practice but also asks that you consider why that innovation might work, look at assumptions that you or others may have previously made and thus reach a deeper understanding of the solution you seek. You will not just report that the pupils seem to enjoy the new lessons, but you will also seek evidence to back up your hunches and thereby allow you to be sure ‘what works’ and what could still be improved.

Good action research balances:

Lots of action	<i>with</i>	Lots of research
Information driven Observation Trying out something Experiential Knowing about		Knowledge driven Engaging with the research community Conceptualising and theorising Identifying assumptions About understanding practice

Designing your action research project

Identifying the focus of your study may be quite difficult when you start teaching as you will want to know about many aspects of your practice and may think that everything needs improvement! Remember that action research is about your own professional development and therefore you will want to study something that interests you.

Imagine the change

Your action research project is not about just identifying a problem - it is also about trying out ideas that may help to solve that problem. Once you have settled on what you want to change in your teaching you will have to start thinking about or imagining how that change could be brought about. This will almost certainly involve you in discussions with other people but also in reading books about possible solutions or searching the web for ideas. You should spend some time on imagining solutions and making plans for implementation as this can save you from making mistakes or running up against unforeseen problems. However if all teachers were able to implement innovations without any unforeseen problems there would be no need for action research.

You may want to investigate something straightforward such as:

“What happens if I tell one class not to put their hands up to answer a question and I choose who answers the questions?” This is simple because it is one action with one class; however after the first try out it may become more complex. How do I choose who answers? How do I devise questions that are worth thinking about and discussing the way that ‘no hands up’ encourages? Thus the cycles of action research begin.

Or you may want to start with a more complex innovation, such as:

Working in a way that encourages a class to develop more complex thinking skills which requires detailed planning before you start; what complex thinking skills do you want the class to develop? What ideas already exist to introduce these skills? How do I encourage the learning of mathematics alongside these thinking skills? What aspect of the curriculum will lend itself to working in this way? All of these questions can be thought about in the planning stage but the action research will provide more compelling answers.

Ask the question

It is usually a good idea to devise a question that your action research project can answer. This way you will know at the end of the first cycle if you have completely answered the question or whether there is more research to be done to provide an answer. Therefore best question is the one that will lead you to look at your practice deeply and engage in cycles of continuous learning from your everyday practice.

Questions can be stated in an “if/then” format:

For example

If I [insert the action to be taken], how will it affect [describe one or more possible consequences of the action]?

If I use a ‘no hands up to answer a question’ rule, how will it affect the number of students actively engaged in answering questions?

If I focus on complex thinking skills how will it affect the students ability to answer harder examination questions?

The question should be clear about both what the researcher intends to do and what the possible outcomes might be.

Decide what success will look like

It is important at this time to think about what you expect to happen. This has similarities to setting out success criteria in lessons. Identify at the start of the process what you hope to achieve by implementing your ideas, then you will know if and when you have been successful.

TASK: think about an aspect of your practice that you have found problematic and make a brief search in this volume for solutions to that problem. Form the problem and potential solution into a research question.

Now imagine what a successful answer to that problem might? be. What could you do that you do not currently do? What difference would this solution make to the pupils?

Collect the evidence

Since it is your research project the only person you really have to convince of the efficacy of your innovation is yourself, although reporting on your project at a department meeting may be useful. However it can be difficult to convince even yourself about how well an innovation worked, so you will need to decide on what data to collect and how to do this. Video can be useful as it is possible to watch the recording several times and begin to understand such things as how your actions affected the pupils and vice versa. However there can be drawbacks; not all pupils will consent to being videoed and you must get at least the permission of the head teacher before you video, even if you do not intend to show the video to anyone else. If you do intend to show it to, for example, your fellow students, you will need written permission from parents.

Interviews with pupils can be useful, but time consuming. You may need to ask pupils to be interviewed during their breaks as taking lesson time could disadvantage those pupils that you interview. Interviewing is also a skill that needs to be practiced. If you audio-record the interviews you may find that you do most of the talking. Plan for this by preparing the questions you will ask and interview pupils in twos or threes so that the atmosphere is more like a conversation.

Most other forms of data can be collected in the general course of your teaching provided you plan first, for example, homework or other written work in class. You may decide to use a test at the start of the project (pre-test) and one at the end (post-test) although all test data must be treated with caution. For example if the tests are different are you sure they are of comparable difficulty, and if the same test is used, are you sure any improvement is directly attributable to the innovation?

Reflect on your data

Once you have tried out your innovation and collected evidence about how well your actions addressed the specific problem, the next stage is to reflect on the evidence that you have. Again reflection must be systematic; it can be easy to say it was all wonderful because the pupils enjoyed themselves, but then the question is did they learn any mathematics? However as a beginning teacher, it is more likely that you will be hypercritical, perhaps beginning by saying that the pupils were too noisy when they were excited by working in a different way. Neither way is the best.

If you set out your criteria for success carefully at the start of your project then they will guide your reflection. How far did you achieve your criteria? Did everyone in the class learn the same thing? Did some learn better than others? Did the normally taciturn girl answer some questions? Did the activities encourage a thinking atmosphere?

A useful reflection tool can be to think about the innovation from different points of view. What was the effect on the girl who usually takes everything in her stride, was she able to challenge herself? What about the boy who makes a lot of mistakes, was he able to correct himself? What about the pupils who usually do very little because they say that they are 'stuck' - were they able to get on more purposely?

Remember to include your own point of view and that of any other adults in the room so that the conclusions you reach about the efficacy of the innovation include everyone. It can also be very useful to involve other people in the reflection process. Their view on the data will be less intimate and therefore they can give you another valid view and ideas come out in conversation with others that just do not occur to you when you view the data by yourself. The others that you involve could be a friend, another teacher or perhaps your mentor or head of department. It is the different perspective that is so valuable not necessarily the level of experience.

TASK: Think about the question that you devised in the previous task and the success criteria you decided on.

Now consider what data you could collect to enable you to know how successful your solution will be.

Think about how best to reflect on this data. Whose viewpoint will be vital to take into account? What will tell you most about the success of the change in practice?

Do your answers to the last bullet point make you want to change your success criteria or the data you set out in the questions above? They often do which indicates why the whole action research process needs to be thought through before you start.

Decide on where next

The last part of each cycle of action research is to decide what you have learned by completing the process and to consider what to do next. It may be that the next step is to continue with the same idea, enabling both your pupils and yourself to become more used to acting in a certain way and for your innovation to become embedded in your practice. Alternatively it may be that the ideas need tweaking and that a further cycle of the research process is needed to establish whether the tweaks are the right ones.

It is very unlikely that you will have completely solved the particular problem that you were seeking a solution to in the first cycle of research and most action research projects require two or three cycles to provide the answers that are sought. Hence it is worth planning for more than one cycle when you begin.

NOW TRY THIS: Use the ideas in this chapter to solve a problem that you have encountered in teaching. Make sure the issue is important to you and use the ideas about systematic inquiry to come up with an approach that works for you.

Action research and Professional Development

Action research can be an important part of your professional development because of its potential to tackle and find solutions for issues that are personal to you. The whole process is about becoming a better teacher and enabling your pupils to learn mathematics more effectively and hence it is particularly powerful professional development. If you engage in an action research project, not only will you find a solution to a problem but you will also understand why it is the best solution of many, and you will be able to articulate the reasoning behind acting in that way. Therefore you will be in a position to share your experiences with others and possibly help them to modify your solution to fit their context.

As has been indicated throughout this chapter many of the most successful action research projects are completed by groups of teachers. If you work in a group of two or three you can plan together and come up with compelling solutions. You can also help one another collect data and reflect on that data. It is so much easier to see the effective practice when looking at someone else's lesson than when considering your own.

Some mathematics departments have begun to use their 'in-school training days' to work together to plan an action research project in order to implement an innovation in the curriculum or in pedagogy. The sense of purposeful systematic effort engendered by the action research process will result in the best way of implementing the innovation for the department and will help the department feel a sense of working

together for the good of the department and the pupils in their care. This is professional development in action.

Summary:

In this chapter you have been introduced to the concept of action research as a means of solving problems that you will encounter in your teaching career. The discussion included the following:

- what is action research methodology;
- defining your idea as a research question;
- the action research cycle;
- designing a project and putting the ideas of action research into practice;
- the part that action research can play in professional development.

Further Reading

McNiff, J. Action research for professional development. - Concise advice for new action researchers, available from <http://www.jeanmeniff.com/ar-booklet.asp>

Hopkins, D. *A Teacher's Guide to Classroom Research*, Maidenhead: Open University Press.