

Using Action Research in bicycle-maintenance classes to improve students' life-chances

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Abstract

For a period of time, I have been aware that my students aren't always conscious of the transferable skills and qualities (Meta-Skills) they are gaining while participating on Ayrshire College's Cycle Maintenance Programmes. Skills such as resilience, problem solving, working with others, listening and communication, and adaptability, are built upon, alongside the practical mechanic skills. To make students more aware of this growing skill set, I decided to carry out some Action-Research, a practical investigation into better ways of teaching, learning and sharing our knowledge with coworkers.

Using a group of 3rd year secondary school pupils, I examined and investigated what they liked about the course, what transferable skills they thought a good bicycle mechanic should have, and importantly, asked them to identify when they have used these of these skills on the course.

The research successfully showed that students can identify these key skills and when they have used them. It did highlight the lack of detail provided by students when describing examples of their use, and the need for more allocated time to discuss and reflect on this. While the research experienced some difficulties, it did give a good insight into how we can better equip students with the knowledge of their growing skill set, and how these can be transferred into future employment and educational opportunities.

Thanks and acknowledgements – In conducting this research, I was supported by a couple of critical friends in the shape of Andy Convery of Claire Collins Consultancy and Paula Christie of College Development Network. Thank you for your help, patience and positivity throughout, and also for the ad hoc counselling sessions that accompanied our meetings.

Key Words/Phrases – Action Research; Practical School Learning; Meta-Skills; Collaborative Learning

Introduction

I currently deliver a Developing the Young Workforce (DYW) Cycle Maintenance courses for Ayrshire College in secondary schools across Ayrshire. The school groups I deliver to are made up of a range of different young people, with each school having a different approach towards their selection of students. One thing that runs through all the groups in schools, is that the groups can often be made up of a high percentage of less academic students or those who are not engaging well with mainstream classes. It should be noted that there are exceptions to this.

The Young Workforce (DYW) Innovative Projects have been developed through the Ayrshire DYW Regional Group to create vocational opportunities, delivered in school, for students who may not achieve five qualifications at National 5 level.

Programmes are delivered by either school or college staff. Where the college is involved in the delivery, lecturers like myself, with significant industry vocational experience, deliver a range of vocational qualifications over the academic year as part of the school's learning pathways. This is normally timetabled for one double period per week from mid-August to the end of April.

Purpose of the research

Throughout the time delivering this course, I have been conscious that students aren't always aware of the skills and qualities that they are gaining. While they are learning the mechanical skills required to work on bicycles, they are always using and building on transferable "Meta-Skills" such as resilience, problem solving, working with others, listening and communication skills and adaptability. As a result, they are unaware of the growing Meta-skills they have, that can be transferred over to future studies and employment. According to Skills Development Scotland *"Meta-skills are innate, timeless, higher-order skills that create adaptive learners; able to succeed whatever the future brings."* SDS has suggested that in the fast paced, rapidly changing world we live in, around 65% of primary 1 students will work in jobs yet to be created. As such, there is a growing emphasis in education, to not only develop and nurture Meta-skills, but also to ensure these Meta-skills are visible and recognisable to learners.

I was hoping that through action research, we could investigate different ways of embedding this message in students' learning, and see how effective these methods are at educating students about their growing skill set.

My Research Group

The group that I decided to work with for this project were male 3rd year students from Queen Margaret Academy in Ayrshire (there are two students who were in 5th year and were supported in the school through the Supported Learning Base). The group was one of the better-behaved classes I teach, and one that is more engaged and have regular attendance.

Beginning the Action Research

To start off the Action Research, I decided to start very tentatively by asking the group a simple question,

"What do you get from coming to Cycle Maintenance?"

This question was written on a white board at the end of one of my classes and I wrote up the responses from the students. There was a wide variety of answers given including:

"Useful"

"Nobody annoys you"

"Its hands on"

"You get to have fun"

"It's our choice to come"

"Its top class"

"You actually learn"

"You get to chill and work"

Reflections and next steps

I was intrigued with some of the responses received in this first part of the research and wanted to see if there were any other classes or projects which they attended in school that they felt the same about? I wanted to know if there were any common approaches to delivery or techniques used in teaching, that students found most enjoyable or valuable. For this next part of the research, I was also keen to find out what the students felt they were

learning while attending my classes. As such, we decided to pose two new questions to the group,

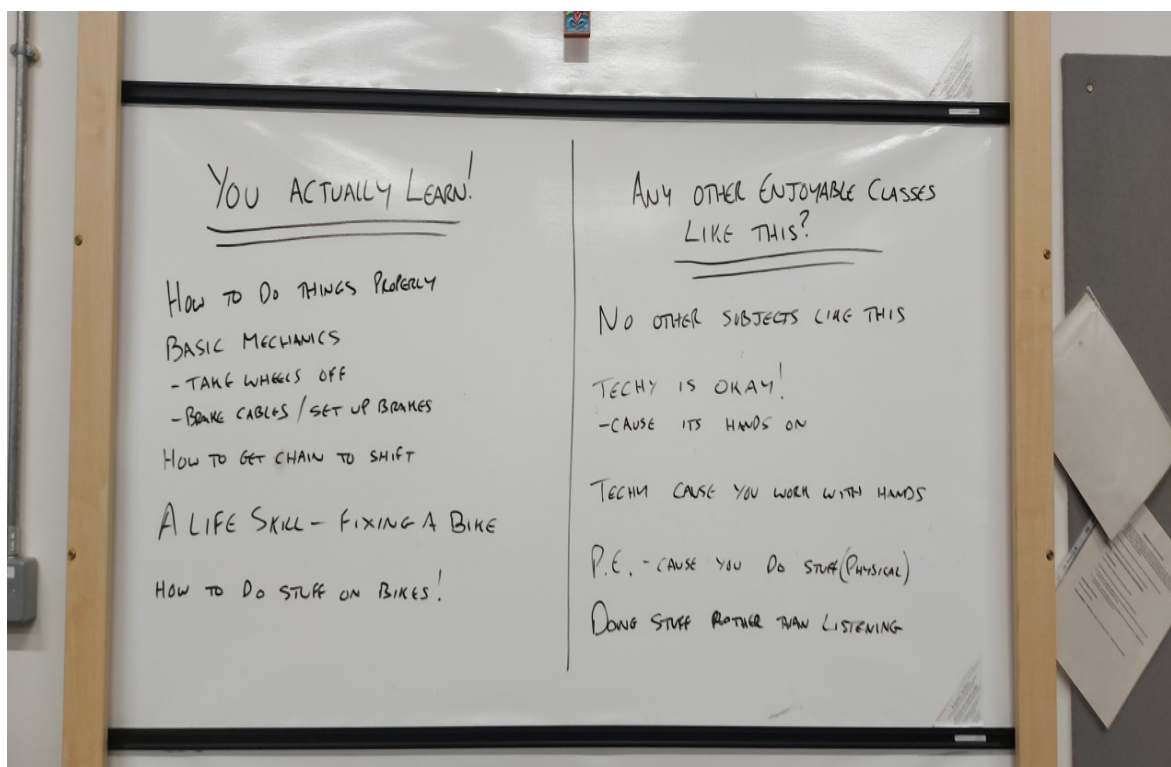
“Are there any other things you do in the school that you would describe as ‘Useful’ or classes where you feel ‘You actually learn’?”

“What do you feel that you learn from being in the Cycle Maintenance project?”

It was hoped that these two questions would allow us to delve deeper into the thinking of the students, and hopefully understand what is it that they feel they learn in my classes; what they like to learn and in which ways; and also, what are they learning but are maybe unaware of?

Further feedback

The responses that the students gave are shown in the image below:



While this stage of the action research produced some information, such as, the students' enjoyment of more hands on or practical lessons, I was hoping that it would have led to the students thinking more about the skills and qualities they were gaining by working on the bicycles. The students really needed a fair bit of guiding to produce the answers above, and if left to produce answers on their own, would really have struggled. This experiment

summed up my initial expectations and concerns that students would find it difficult to articulate what they were gaining from participation in this project.

Challenges to my real-world research

One thing that should also be noted at this point, is the limiting factors that I faced in trying to conduct this research. For example, I had very limited time at the end of the class to try and produce this part of the research, and the class had been disrupted by a disagreement between a couple of students. While it was sorted pretty quickly, it was enough to impact the attention of the students and the effectiveness of the session. There was also a lot of noise coming from the technical class next door, mostly due to the open plan nature of the classroom set up. In addition, we are also having to use a board in another section of the workshop to record answers as there is no access to a board in the main area we use. I hoped that I could address some of these issues by adopting a different approach on our next attempt at gathering information from the students.

Planning my next Action Research activity

In our next attempt at engaging with the students, I hoped to utilise an existing resource we use to gather evidence for a unit, Personal Development Award – Practical Abilities. Within the college, we have a simple booklet that encourages students to record evidence of a project that they participate in. (See Appendix 2) As part of this booklet, students reflect on how their cycle project went, and consider areas they could personally improve on. However, I decided that this cohort really need a little bit of guidance to prompt them to start this reflective process. I felt that they needed an opportunity to expand on their answers by asking students to give real examples of these skills in action during their time on the course. I was also concerned that several of these students required help with reading and writing and this exercise might prove rather time-consuming for me, which creates extra pressures in a class that is easily distracted while in the presence of sharp objects and materials that can be broken.

The main action research - designing a reflective stimulus

After much deliberation, I decided that the best way for the students to think about the skills and qualities (Meta Skills) used by a good bicycle mechanic, was to give them a selection to choose from. I believed this might help in the development of their thinking and to spark conversation around Meta-skills (not a term the students are confident with using). I added some prompts to their Project booklet, to inspire the students to reflect more deeply on their learning, and begin to identify the additional transferable skills they had enhanced. I had suggested a wider checklist range of skills and qualities to encourage the students to highlight the ones they think are most needed by a bicycle mechanic. I created a page in the existing workbook for their Personal Development – Practical Abilities unit, and added a list of 12 potential skills and qualities, each with a short description to help with understanding (see Illustration 1, below).

The skills and qualities needed as a mechanic...

Working as a Cycle Mechanic doesn't just require practical skills like working with tools, it also requires the right qualities and skills to get the job done to the best of your ability. From the list below, which 5 skills or qualities do YOU think are MOST ESSENTIAL to a good cycle mechanic....(circle the appropriate red words)

Concentration – The ability to focus on a task and not get distracted.

Confidence – Can talk to people easily.

Problem Solving – Thinking things through logically to solve an issue.

Sense of Humour – Can take a joke and have a laugh.

Team Player – Works well with others to get tasks complete.

Outgoing – Life and sole of the party! Is normally centre of attention.

Initiative – Ability to take control and make decisions on your own.

Resilient – Ability to recover well after setbacks and keep trying.

Patient – Can deal with problems without getting annoyed.

Fast Worker – Ability to work quickly.

Tough – Can work in any conditions and has good strength.

Creative – Ability to think of new ways to do things, try other methods.

I wanted the 12 options to contain what I thought were key Meta-skills such as resilience, problem solving, concentration, initiative, etc. I also selected some less essential words and qualities that you might find in a mechanic, for example, "strength" and "fast worker". The students had to read through the list and the descriptions, before circling the 5 skills/qualities they thought were the most essential.

Prior to this task, I expected the students might struggle with the understanding of each of the options. I hoped that the accompanying descriptive text might help with this and I also spent a minute or two talking through the options. I also had reservations that the answers received would show duplication across the workbooks as students turned to each other for THE ANSWERS! (i.e. the answers that the teacher wanted.)

Conducting the action research

On the day we conducted this part of the research, we only had 7 students in attendance.

The task produced the following results and responses from the class:

Skill or Quality	Number of Votes
Concentration	6
Confidence	2
Problem Solving	7
Sense of Humour	0
Team Player	5
Outgoing	0
Initiative	2
Resilience	3
Patience	5
Fast Worker	1
Tough	2
Creative	2

I was pleasantly surprised by the results I got back with the top responses being some of the key Meta-skills I hoped they would feel they were developing. I was surprised and pleased that there was no duplication across the workbooks which show that students were completing the task using their own thoughts and ideas.

While the task appears to have been relatively successful, it should also be noted that the situation and environment surrounding the completion of the task wasn't ideal. We had just had word of the delivery of a load of bikes for future repair and had quickly needed to

completely strip out a storage container prior to them arriving. This impacted the time I had to complete this part of the research and it felt as if we were doing the task but not really spending enough time on it. It felt like something I just needed to have completed. There was also a lot of background noise in the class due to it being a shared space and this class was competing for desk space.

Moving forward, I decided that I would ask the students to reflect on the practical project they were currently involved in. As part of this, I asked the students to describe three occasions they had used any of the five skills/qualities they identified as being essential for a good bicycle mechanic. While having these two tasks embedded into the Practical Abilities booklet makes sense in terms of cutting down additional paperwork tasks, it does have its draw backs. One thing I was aware of, was that progress in terms of the research, was now very much tied to the progress of the practical project. I was therefore unable to do any more until the students' projects were complete.

An additional pressure was the need to get students through all of the required assessments for their main qualification, resulting in a frantic time period at the very end of my time with the students. I was hoping that we can extend our time with this group into May/June, when we normally finish up delivery at the end of April, because 4th years take study leave and other students switch into their next year's timetable around this time.

Final stage

With work coming to an end with this group I concluded the research with the completion of the amended booklet I had designed. I had designed the additional part of this booklet to attempt to encourage students to reflect on their learning; identify key Meta-skills they had used; and importantly, articulate real life usage of these sought after skills.

On completing the booklet, students were asked to think back to the 5 key skills or qualities they selected earlier as essential to a good bike mechanic. They were then asked to identify a time during their course, when they feel they used up to three of these key skills or qualities, and how they were practically used (appendix 2, p8).

Once again, I was a little sceptical about the quality of the answers I would receive or even if they would write anything at all. It was the last session with the young people and they had been a bit excitable due to us completing an enterprise venture in which we repaired and serviced bikes for school staff, raising money for consumables for the project for next year. With this in mind, below are the answers I received from the student's booklets for each chosen skill/quality.

Confidence

"You need to talk to people what is bad with the bike."

Concentration

"I kept concentration when cleaning gear and chain with the chainwasher."

"Have to be focussing when fixing bikes."

"Focus – tuning the suspension and tuning the brakes."

Problem Solving

"I carried out a M-check."

"I carried out a safety check to see what problems there is. I then fixed the problems."

"you need to find out what is wrong with the bike"

"I found out how badly the gear cable needed replaced, so I replaced them correctly with no knowledge on how to put the gear cable on."

"used problem solving to fix gear cables."

"Putting the brakes into the right position."

Team Player

"You need to work with people which can make it easier.", "If you work with people it will be easy to work."

"I helped others out with fixing their bikes."

Initiative

"I needed to take control when working your self."

"When I had to change brake cable."

Patience

"When I sanded down a bike frame and it took long to do."

"I needed patience to fix the brake and brake pads."

"waiting for the rear swing arm." (note – part was away for painting)

Resilience

"setting the gears takes resilience."

Non-Meta-skill based answers

Fast worker

"The fast you get the bike done the happier the customer."

Some unexpected findings

For comparison, and a little by accident, I had an opportunity to compare the results from this target group with a different set of young people who had no previous input from me on transferable skills (Meta-skills). I had unintentionally lifted the wrong booklets on the way in to teach a separate college group of students, and found that I had brought the ones amended for this research group. I decided to go ahead and ask these students to fill in the research amended booklet to compare whether the answers received would have been different in any way. These students are older (15-23yrs old) and were participating in a course within the college that has an input from me in the shape of a Cycle Maintenance Programme. They would have been filling in the standard booklet anyway as part of their programme and unit, and they were unaware that additional sections were added. The results from this group were as follows.

Skill or Quality	Number of Votes
Concentration	2
Confidence	1
Problem Solving	1
Sense of Humour	
Team Player	1

Outgoing	
Initiative	
Resilience	2
Patience	1
Fast Worker	1
Tough	
Creative	1

When these two students were asked to give real life examples of using these chosen skills or qualities during the course, the students gave the following responses:

Concentration

“When putting in new bearings and it was very fiddly to work on inside the cranks.”

Problem Solving

“When fixing the gears, adjusting the brakes and other components on the bikes.”

Team Player

“When we fixing teachers bike with other people in groups.”

Patience

“When working on bike to make sure not mess up on bike, to not redo it,”

Confidence

“When trusting myself to keep stuff right and working on chain and crank.”

Non Meta-skills responses:

Fast Worker

“Worked quickly when doing tyres, inner tubes and brake cables.”

Learning from my action research

Reflecting on the research and the process we went through, it is apparent that students were able to identify essential skills and qualities needed to work as a bicycle mechanic, and importantly, give examples of using these Meta-skills. What should be noted however, is that students required additional clarification and guidance from me to get a better

understanding of the terms used, and they often needed help with the reading and recording of answers. While students did give examples of times when they used these important Meta-skills, the answers were often a little vague and lacking in the degree of detail that might be required if they were asked to give an example of these during interview. I personally feel that asking students to write their responses was partly the issue here, especially with the students' limited literacy. Other factors limiting the data collected from the school group was the environment and the tight time frame. This is in no way a reflection on the school, who were very supportive, but is a reflection on the nature of action research being conducted in real classrooms.

When looking at the results found from the two older college students, the answers were a little more detailed. This may be due to the age difference, academic ability, technical knowledge, or a multitude of other factors. It should be noted that they had a very small group, a quiet area to write, and more time to spend on their booklet and answers. I had hoped that by encouraging the students to recognise, articulate and record their development, they would be better prepared to speak about them during future interviews and job opportunities. I feel that I showed that students can identify key meta-skills and highlight when they use these skills, however, I feel that their ability to fully articulate these skills still needs further encouragement. This might be achieved with more allocated time to spend with students on this subject throughout the year, and a more suitable environment to collect the data and information. I also feel strongly that any future work in this area needs to be embedded into existing work, assessments or topics that are currently being taught. This would help students to relate their abstract meta-skills to recognisable practices from their everyday experience, rather than meta-skills being an academic bolt-on that can seem divorced from their everyday experience.

Finally, for any future research, I feel that more time needs to be spent introducing these Meta-skills with students. While the first instinct may be to place this responsibility with teaching staff, there is an opportunity for college departments such as Student Services, or even national organisations such as Skills Development Scotland to play a greater role in inspiring students' awareness of this concept. Either way, I feel it needs to be clear to students how they are developing these important future skills, and, this should be

reinforced periodically throughout the year. By introducing a regular system of “Recognise, Articulate and Record” throughout a course of study, students might be better equipped at identifying the skills they are using, and importantly, be able to take greater ownership of their progress and articulate their personal skills development more confidently and with greater detail as they move towards contributing fully to the society of tomorrow.

References

https://www.skillsdevelopmentscotland.co.uk/media/48265/1451_skills-toolkit-phase-1-_guidance-paper_v4-002-final.pdf

[Future skills: action plan - gov.scot \(www.gov.scot\)](http://www.gov.scot)

Appendix 1



Ayrshire College Action Research Project- Cycle Maintenance





Step Forward is the **CDN Research and Enhancement Centre's** action research programme. Its purpose is to enhance practice across our colleges and develop the action research skills of college staff.

Enhancing learning together is our guiding principle.

Working together, as a sector, as a system, is at the heart of the programme and we will be supporting projects that bring together teams, colleges and partners right across Scotland and beyond.

Step Forward will develop key themes from CDN's research to transform ideas into actions that will allow college staff to develop their practice and enhance the impact of their courses and services.

What is Action Research?

Action research involves practitioners investigating their own practice (that's the 'research') and then using what they find out to make improvements (that's the 'action'). Engaging in action research will help participants to improve their practice, and sharing what they discover will help their colleagues develop approaches they can use to help their learners too.

At the core of Step Forward is the desire to develop rigorous, transferable action research approaches that inspire practitioners in the sector as well as delivering exemplar projects that will support the practical application of CDN research and provide new opportunities for learners.

Appendix 2

DYW Cycle Maintenance

Personal Development: Practical Abilities (SCQF level 4)

Unit Code: H18W 44



Unit Log Book

Student:

School:

What you need to do to complete this unit...

1. Participants must select a relevant project that they can work towards by the end of the year.
2. Participants must identify what your strengths and weaknesses are in relation to completing this project.
3. With the help of the tutor, participants need to identify targets/activities to develop the practical skills required and work on the project they selected.

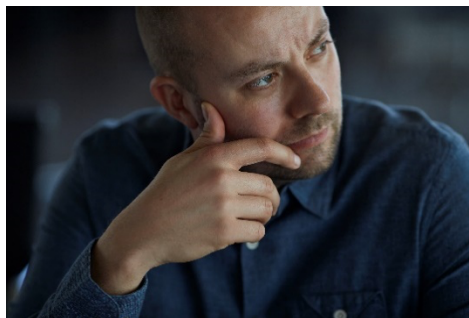
4. Finally, participants must reflect on the project and the process they went through, including how they could improve their skills.

The Project

As part of this unit, participants must select a project that they can work towards. In doing so, participants will develop their Practical Abilities.

Working with your lecturer, you should identify a project that is suitable to achieve the aims of the unit.

To complete this Practical Abilities unit, I have decided to ...



The skills and qualities needed as a mechanic...



Working as a Cycle Mechanic doesn't just require practical skills like working with tools, it also requires the right qualities and skills to get the job done to the best of your ability. From the list below, which 5 skills or qualities do YOU think are MOST ESSENTIAL to a good cycle mechanic....(circle the appropriate red words)

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Tough – Can work in any conditions and has good strength.

Creative – Ability to think of new ways to do things, try other methods.

Identifying your own strengths and limitations

A strength is something that you can do well. A limitation is something that you cannot do or would like to improve (an area for development).

Think about what practical abilities are needed for your project(s). Put ticks in the boxes in the table to rate your strength or limitation in these practical abilities on a scale of 1 to 5.

Practical abilities	Strength ——— Limitation					Assessor comment (Agree/disagree)
	1	2	3	4	5	
Gathering and organising information						
Communicating effectively						
Creating an item						
Providing a service						

Targets

Based on the identification of your strengths and limitations, you should set targets for the development of your practical abilities within your project(s).

Target 1:

Target 2:

Assessor signature _____ Date: _____

Carrying out your activities

Name _____ Date _____

Project(s) _____

Activities	Completed (✓)

Assessor signature _____ Date _____

How the project went!

Review

Name _____

Date _____

Project(s)

Progress made towards targets
Areas for further development of practical abilities

Assessor signature _____ **Date** _____

The skills and qualities I have gained...

Thinking back to your project, can you give an example of a time when you used any of the skills or qualities that you previously selected as ESSENTIAL to a good bike mechanic?
(Remember the words in red on page 4!)

1) Type of skill/quality: _____

Describe how you used this skill or quality. What did you do.....?

2) Type of skill/quality: _____

Describe how you used this skill or quality. What did you do.....?

3) Type of skill/quality: _____

Describe how you used this skill or quality. What did you do.....?
