Self-Discipline Through Social-Responsibility

Testing a relational, reflexive data-information equivalent to the 'consequence system' in secondary school education: ABC Classes

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Introduction

Background to PhD

Teachers face a complex psycho-social dynamic in every lesson. Teachers must continuously assess when student behaviour is 'low-level disruption' versus genuine social learning. School discipline policies are well-defined and lend themselves to quick implementation; by contrast, 'soft-skills' to foster positive relationships and motivate students are naturally ill-defined and harder to learn.

Like many teachers, I developed tacit skills on how to engage and motivate teenagers, but I found that there was a systemic tendency towards emphasising discipline. Because of my background in mathematics and social anthropology, I developed meta-cognitive and social learning techniques which made manageable the pliable nature of such soft skills and the contingent nature of their social adoption by students. I formulated a simple technique called ABC Classes[1]. The intention for conducting this PhD was to determine how useful ABC Classes may be for secondary school teachers and students, and research the academic basis for it as a systemic educational solution to inhibit 'low level disruption'.

In my initial exploration during first year, I have found the systemic tendency towards discipline in schools is reinforced by a fundamental misapplication of methods in social science, resulting in an equivalent systemic tendency to enforcement of disciplines as knowledge-accretion rather than development of psycho-social sensitivity, succinctly defined as the 'invisible subject' (Roth 2018). After the rejection of an initial dual-system approach to resolve the quintessentially wicked problem, I present this Confirmation Report which focusses exclusively on ABC Classes (in the object-system of education), supported by a complementary document which focusses on Reflexive Reading (in the subject-system of academia).

[1] The name of the intervention is 'ABC Classes', the evaluations given as 'A', 'B' or 'C' Class, and the ontological social state as ABC State and A-state, B-state, and C-state.

Relevant Author Biography

I was originally accepted to study pure mathematics at Oxford, but because at 18 I harboured the desire to mathematise social dynamics, I decided to study the broadest academic perspective of our social context: Social Anthropology. I decided to embark on a career in education to understand why I had done so well in school while my peers had not, treating it as a kind of immersed, auto-ethnographic fieldwork.

The Mathematics PGCE at Brunel University led by Mark Humble was entirely focussed on engaging students with activity based, project-led, child-centred learning, exclusively situated within group work. These rich learning activities required greater self-determination, self-discipline, and inter-student mediation, especially those involving the social complexity of group work. However, many teachers in my PGCE cohort lacked the confidence to implement them. I developed ABC Classes so as to make the well-being of teachers self-evident: I could not provide interesting activities, puzzles and games, project-work and group-work, if the students did not exhibit the degree of self-organisation required such that I, the teacher, could also enjoy the experience with them. ABC Classes helped students in normal state schools achieve significant results, eg a mid-set class of 14 year-old students covered 25 weeks curriculum in 5 weeks using accelerated learning techniques (up to three topics a day), and their results meant 21 moved up a set and 3 moved up two sets.

Although ABC Classes provided the flexibility for a new social contract for students and teachers within the class, full-time teachers were not afforded the same level of social flexibility: their position and role was fixed by salaried position. I left education to explore the institutional forms which appeared to inhibit the self-organising techniques which the students appeared capable of performing. Sqale [https://sqale.co] is the concurrent result of this exploration: an alternative economic where the fundamental of money is treated as a vector not a scalar. When I returned to education two years ago, I found it much in the same place. If anything, the profession was circling back to an emphasis on discipline, eg ‘Zero Tolerance’. No equivalent to ABC Classes has emerged. I therefore decided to approach the problem from a different angle. I did not have formal language to explain what ABC classes were, nor had a formal model of what the processes involved were. I decided to pursue a PhD to reveal the underlying processes involved, to research what other attempts have been made (either in practice or theoretically), and to explore the potential of testing ABC Classes in schools.

Coronavirus Impact

After receiving initial positive responses from schools interested in testing the system in their school, Coronavirus in March 2020 led to school Lockdown. As a result, my initial Confirmation Report (Pinto 2020) lacked confirmation of school compliance, and further school Lock Down January 2021 has meant a further delay in securing research acceptance in schools. This Confirmation Report therefore represents the research proposal to be conducted when the opportunity arises.

State of Problem

Discipline remains an issue in UK secondary school education: in a report by the Office for Standards in Education, 'Below the Radar', 'pupils are potentially losing up to an hour of learning each day… because of disruption in classrooms' (OFSTED 2014, p.4).

There are four primary strategies of countering (or inhibiting) the problem: engagement, discipline, soft-skills, and social learning. Firstly, providing engaging lessons is prioritised by teacher training and headteachers (eg Jackson 2011; Deans for Impact 2016; Rogers 2002; Carter 2015). Secondly, following the punitive consequence procedure of a school's discipline policy is essential for creating a school's 'culture' (Bennet 2017; Mayer & Butterworth 1995; Gottfredson et al 2005; Skiba et al 1997). Thirdly, the cultivation of teacher 'soft-skills' to foster a positive student-teacher relationship (Jennings & Greenberg 2009) which is evidenced in the literature as reducing bullying (Creemers & Kyriakides 2008), building positive classroom environments (Hill 2019), increasing academic output (Kindermann 2016). Such soft-skills help soften the hierarchy and humanise education (Hill 2019; Christis 2005; Miller et al. 2016), which at its broadest includes demonstration of virtues and character strengths (Shortt et al 2018; Al Taher 2019; Peterson & Seligman 2004) and pedagogical ideals of authentic relationships of learning (Bakhtin 1991; Schon 1983; Reinertsen 2012). And fourthly, because of the importance of relationships in fostering a pleasant learning environment (Howe 2010), the direct teaching of social skills to students primarily as a preventative measure (Lane et al 2012).

All schools define 'expectations' or a code of conduct often simplified in a motto, school mission, or keywords, which constitute an explicit rendition of soft-skills and social learning. The primary means of communication is through understanding of the words, which is inherently problematic given the linguistic skill and limited social experience of children. Behaviour-influencing systems with proven success include the Good Behaviour Game (Keenan et al. 2000), Positive Futures (Crabbe & Woodhouse 2006), Aspire (Welch 1982), Positive Behaviour Support (Carr et al. 2002). However, such programmes focus on individual development and require significant resources in terms of specialists or teacher training. A recent movement in education is to instil Social and Emotional Learning (SEL) in every lesson (Smith et al. 2007; Durlak et al. 2011), though direct teaching of SEL skills has been shown to be ineffective with adolescents (Yeager 2017).

The problem can be brought to clear relief by contrasting the pairs of strategies as between roles and qualities, between learning-facilitator and disciplinarian (first pair above) with soft-skills and social learning (second pair above). That is, between the well-intended tenet of providing engaging classes combined with the simple, linear, punitive procedure; contrasted against the complex, non-linear understanding and practice of social relationships. However, the literature indicates the tension between the first two which describe the detrimental effect of discipline on motivation (Payne 2015; Baird et al. 2010; Shortt et al 2018). The problem is further compounded by arguments that institutional employment of 'soft-skills' and SEL techniques may be interpreted as creating 'an illusion of freedom of choice and negotiability' (Matusov & Sullivan 2019, p.14) and constitute another form of 'structural violence' (Graeber 2015) where 'motivation' and 'manipulation' merge (Osterkamp 2002). Be that as it may, the inherent challenge of researching relationships amongst teenagers is well recognised (eg Howe 2010),

though there is sufficient evidence to indicate a strong influence of peer relations on behaviour, motivation and academic outcome (Howe 2010).

Put simply, there is no systemic equivalent to the consequence procedure of escalating sanctions; there is no provision for a common language of relationality (beyond the school's often verbally complex code of conduct relative to student age and verbal competence), and as a result no simple mechanism for self-organisation or social cohesion. As a consequence, low-level disruption tends to be evaluated as a failure of discipline policy (or un-engaging classes), either by the teacher themselves or support staff, rather than a failure of relationships.

Aims & Objectives & Impact

This PhD takes the position that low-level disruption partially results from a failure in relationships. The aim to explore what form of data and information structure may usefully inform students and teachers regarding their degree of relationality or social cohesion or 'dissipative control' (Doll 2012 [2000]). Complexity and wicked systems (Andersson 2014), self-organisation and multi-agent modelling (Reynolds 1987) inform a method designed to meta-cognitively correlate student behaviour with collective social cohesion as attributed by the nominal data of 'A', 'B' or 'C' Class. To avoid reducing social complexity to an abstract and disembodied model, the ABC Classes data relates to internal, tacit or intangible knowledge within participants (Buckland 1991, p116), 'warm data' (Bateson 2015), relating the internal state maintained tacitly by participants resulting from perceived social state[2]; that is, self-discipline through social-responsibility.

The objectives of the PhD are: 1) reveal the lack of a relational equivalent to the 'consequence system' in secondary schools; 2) drill into current educational literature on discipline and behaviour, meta-cognition and self-regulation, social and emotional learning and show the non-linear nature of relationship formation (and the misapplication of a linear consequence system to resolve it) and the lack of a useful social 'measure' or data-information mapping; 3) expand focus to multi-disciplinary perspectives in order to highlight the pervasive problem of reflexivity which supports human self-organisation; 4) show the practical limitations of three meta-theories (Critical Realism, Third Order Cybernetics, and Systemic Inquiry) which accurately address the relational-reflexive problem; 5) review complexity and self-organising systems to support and improve ABC Classes intervention and its A-B-C as a relational-reflexive data-information mapping; 6) reframe the psycho-social dynamics in a classroom as a form of immersed or self-contained Action Research, in order to propose ABC Classes as a supporting data-tool; 7) propose a research design which tests the effect of intervention on student behaviour using before and after data collection of student behaviour, teacher's evaluation of student performance (Attitude-for-Learning, AfL, and qualitative feedback), and scholarly attainment; and finally 8) correlate the longitudinal outcome of ABC Classes with qualitative feedback to ascertain the degree of 'transformational praxis' undergone: does the teacher feel less like a disciplinarian and more like a learning-facilitator?

There are three potential impacts of the research: scientific evidence of nominal data measurements for dense multi-reflexive environments; theoretically establishing a relational

[2] The ABC State is the designation for the ontological state of the class. As water as three different states: solid ice, liquid water, and gaseous steam or vapour.

basis for social science; and institutionally reducing the practice-theory gap in education. Firstly, the ABC Classes research data will indicate whether the technique may be usefully employed in schools as a minimal self-organising tool, or whether it requires additional support and specialist training. Secondly, three meta-theoretical frameworks are supported by the meta-method which relies on verification and thereby implies a relational basis for social science. And thirdly, should ABC Classes be adopted in school practice, it is hoped that classes which achieve sustainable A-State will show an increased adoption of learning technologies by the students themselves and thereby lead to improved relations between education and university in exploring further research, thus reducing the practice-theory gap in education.

Research Questions

The Research Questions align to the objectives above, which may be summarised as: 1) can the linearity of a consequence system resolve relational disorders?; 2) is there a data-information structure which can capture relationality?; and 3) does the data-information structure of ABC Classes provide enough information for participants to improve their relationality and social cohesion?

Structure of Report

The Literature Review details institutional accounts of low-level disruption and the four main strategies to counter it. After reviewing a wide range of constructs and theoretical frameworks, a conspicuous absence of an information system of student relationality is concluded. Using the theoretical tools of Critical Realism, the absence is defined and the method of ABC is examined. The method is conformal with Doll's 'dissipated control' (Doll 2012), contrasts with model approaches (eg self-regulated learning of Zimmerman 1990, 1995; Bandura 1977) and costly training programmes. Due to the robust information-systems nature of the ABC Classes method, a quasi-experimental method is chosen, delineated and rationale presented in Methodology. Expected analysis will be based on before and after institutional data (behaviour record, Attitude-for-Learning), longitudinal ABC Classes and qualitative feedback. Finally, an ethical argument is presented together with state of ethics application, detailed timescale with update on training and development, before concluding remarks, unique contribution to knowledge and potential follow-on research.

COVID Disruption

The COVID pandemic disrupted engagement with schools. Although four schools and one academy chain indicated interest in pursuing research before Lockdown began in March 2020, it has been deemed unfeasible to move forwards with this research project until normal teaching conditions have been resumed. Thus, this research proposal lacks the confirmation of concrete details, which once confirmed will be included as an addendum to this document.

Literature Review

The complex nature of the phenomenon of social dynamics between children within the primarily adult construct of school, sits within the politico-economic context of which universities are also part. The following structure of the Literature Review takes us through institutional description, educational review, and theoretical frameworks in order to propose an information system approach to measure social cohesion. This structure informs the construction of ABC Classes, a novel educational intervention designed to improve self-discipline through social responsibility, from its history of origination in the field, its comparison to theoretical constructs, the meta-theoretical frameworks which support it, and the self-organised principles which underlie its construction.

We begin with a grounded description of low-level disruption from institutional accounts to estimate the immediate organisational context (objective 1). We then refine our focus to include theoretical constructs in academic literature which cover discipline, meta-cognition and self-regulation, social and emotional learning (objective 2). Because education has been considered multi-disciplinary or even post-disciplinary (Bridges 2006), we expand our focus in three stages so that we may finally arrive at an information systems approach to relationality. First, a summary of literature research indicating a terrain of knowledge fragmentation across multiple disciplines, resulting in the pedagogical contribution of Doll (2012) as it pertains to self-organisation (objective 3). Second, the adoption of Critical Realism (Bhaskar 2000, 2008a, 2008b, 2005) from a range of meta-theoretical frameworks because of its powerful techniques to draw out absence and agency within social ontology (objective 4). Third, by drawing on complexity, self-organising systems and multi-agent modelling (specifically Reynolds' 'boids' (1987)), help situate ABC Classes and classroom dynamics within the DIKW ladder of information systems (objective 5).

Objective 1 -- Institutional Context: What is low-level disruption?

Discipline remains an issue in UK secondary school education: in a report by the Office for Standards in Education, 'Below the Radar', 'pupils are potentially losing up to an hour of learning each day… because of disruption in classrooms' (OFSTED 2014, p.4). Of the 5,500 teachers who answered the Big Question 2019, the three most common types of low-level disruption were chatting (91%), not following instructions (82%) and reluctance to start work (80%) (Nasuwt 2019, p.6). Low-level disruption has a detrimental effect on student learning (Swinson 2010), impoverishes student-teacher relationships (Dursley & Betts 2015), and contributes to professional erosion (DoE 2017; Stefaniak et al 2019; Osher et al 2010). The issue is compounded because of the variability of teacher's perception and attitude to low-level disruption: "A third of teachers 'accepted' it as part of teaching, whereas nearly half said they did not." (OFSTED 2014, p.13). This variability of evaluation indicates the source of the problem: the inherent relationality involved in evaluating social behaviour. We shall examine this in the next section; in this section we shall examine standard ways that teachers are equipped to deal with the problem of disruption.

There are four primary means of countering (or inhibiting) the problem: providing students with engaging lessons, following the punitive consequence procedure of a school's discipline policy, the cultivation of teacher 'soft-skill' to foster a positive student-teacher relationship, and the

direct teaching of social skills to students to prevent problems from arising. The first, student engagement, is a tenet of teacher training (Jackson, 2011; Deans for Impact, 2016; Rogers 2002; Carter 2015). The second is based on a precisely articulated escalation of sanctions defined in Discipline Policy, namely verbal and written warning, official warning, removal from class, removal from school. The second and third are not so easily defined or well studied, however, because of their internal psychologically embedded and socially complex nature.

The institutional form of Discipline Policies provide proactive rules ('expectations') and reactive procedures ('consequences') (Mayer & Butterworth 1995; Gottfredson et al 2005; Skiba et al 1997) by which teachers are authorised to execute reasonable sanctions as dictated by government (Education and Inspections Act 2006, Section 91). A school's culture (Bennet 2017) ranges from 'Zero Tolerance' to more pastoral-leaning implementations of the consequence procedure, however some teachers are wary that disciplining may inhibit positive intentional contributions (Payne 2015 p.499) resulting in unmotivated students (Baird et al. 2010, p.155). Others argue that 'the majority of BMPs [Behaviour Management Policy] are unlikely to succeed in their stated aims' (Shortt et al. 2018, p.175) because of their underlying consequential moral philosophy; which is to say that many students do not respond positively to threat of sanctions. Short et al. go on to propose the philosophy of Virtue Ethics, where teachers appeal to character traits like resilience or determination, which finds support in Positive Psychology and the adoption of embodied virtues as character strengths (Al Taher 2019; Peterson & Seligman 2004).

Teachers' rendition of 'school expectations' merge into soft-skills, emotional intelligence and social skills (Jennings & Greenberg 2009), and development of such social skills are seen to help soften the hierarchy (Hill 2019; Christis 2005) and humanise education (Miller et al. 2016). The formation of a warm relationship between teacher and students is a recurring theme in educational literature with regards to reducing bullying (Creemers & Kyriakides 2008), building positive classroom environments (Hill 2019), increasing academic output (Kindermann 2016). Phenomenologically, the authentic relationship of trust is based on an 'internally persuasive discourse' (Bakhtin 1991) or 'reflexive contract' (Schon 1983) which authenticates the teacher-learner relationship through the presence and performance of the person and not their institutional role of 'teacher' (Reinertsen 2012). Regarding the soft-skills of students, considerable efforts in instituting the Social and Emotional Learning (SEL) agenda have been made (Smith et al. 2007), and although Durlak's meta-analysis reported a general positive effect of SEL (Durlak et al. 2011), direct teaching of SEL skills has been shown to be ineffective with adolescents (Yeager 2017).

Behaviour-influencing systems with proven success include the Good Behaviour Game (Keenan et al. 2000), Positive Futures (Crabbe & Woodhouse 2006), Aspire (Welch 1982), Positive Behaviour Support (Carr et al. 2002). Meta-analyses indicate that programmes for behaviour improvement, self-regulation or social and emotional learning focus on individual development and require significant resources in terms of specialists or teacher training (Moore et al. 2019; Muijs & Bokhove 2020; Wigelsworth et al. 2019). Lean, innovative techniques such as 'learning contracts' (Knowles 1986) or 'relationship charter' (Goddard quoted in Bennett 2017, p43) may be co-written and co-signed with students to provide more than a discipline policy. However, as an institutional tool they may be interpreted as creating 'an illusion of freedom of choice and negotiability' (Matusov & Sullivan 2019, p.14) and constitute another form of 'structural violence' (Graeber 2015) where 'motivation' and 'manipulation' merge (Osterkamp 2002).

Summary of Problem in Institutional Practice

The problem can be brought to clear relief by contrasting the simple, linear, consequence procedure (or the well-intended tenet of providing engaging classes) against the complex, non-linear understanding and practice of social relationships. As a result, low-level disruption tends to be evaluated as failure of discipline policy (or un-engaging classes) either by the teacher themselves or support staff, rather than a failure of relationships.

Put plainly, *there is no systemic relational equivalent to the consequence procedure of escalating sanctions*; there is no provision for a common language or measure of relationality, and as a result no simple mechanism for self-organisation or social cohesion.

In this way, we hope to have achieved Objective 1: to reveal the lack of a relational equivalent to the 'consequence system' in secondary schools.

ABC Classes: Origin in Teaching Practice

As a young teacher, I was aware of the systemic reliance on the consequence system for the role of teacher. I saw myself as a learning facilitator, rather than a classroom manager. I developed techniques which minimised the use of the consequence procedure. I learned that what quickened the mind of the students most was a meta-cognitive state on their own learning, on their listening to one another, and collectively achieving objectives which were rare or impossible; for example achieving 25 weeks in 5, with 21 students going up a set and 3 moving up two sets. What I needed was an equally robust system to the consequence system, which quickly explained the rules to a new class of students. The following minimal system emerged which appeared to be sufficient with new students:

- An 'A Class' is where everyone has their self-discipline.
- A 'B Class' is where someone loses their self-discipline (eg not paying attention, not working, dropping litter), but when someone points it out they correct it (ie pay attention, do work, pick up litter).
- A 'C Class' is when someone loses their self-discipline, it is pointed out, and they continue. Then the teacher is empower (by government) to enforce sanctions.

There is supporting teacher material in appendix III, but it is important to note that achieving an 'A Class' was inherently a learning experience for us all. No matter the experience or skills I had gathered over the years, the state of a class depended on the active participation of the actual students in the class whatever their awareness and skill levels. ABC Classes was not something I used *on* the class, as if the students were an object. The tool merely reflected our collective behaviour. It was a method by which students could understand our collective relationality, why I behaved as I did as a teacher, the activities I could introduce. ABC Classes was a relational equivalent to the consequence system; C classes occurred when I needed to use the consequence system, contrasted with A classes where the consequence system was not operational and I fulfilled my role as a learning-facilitator.

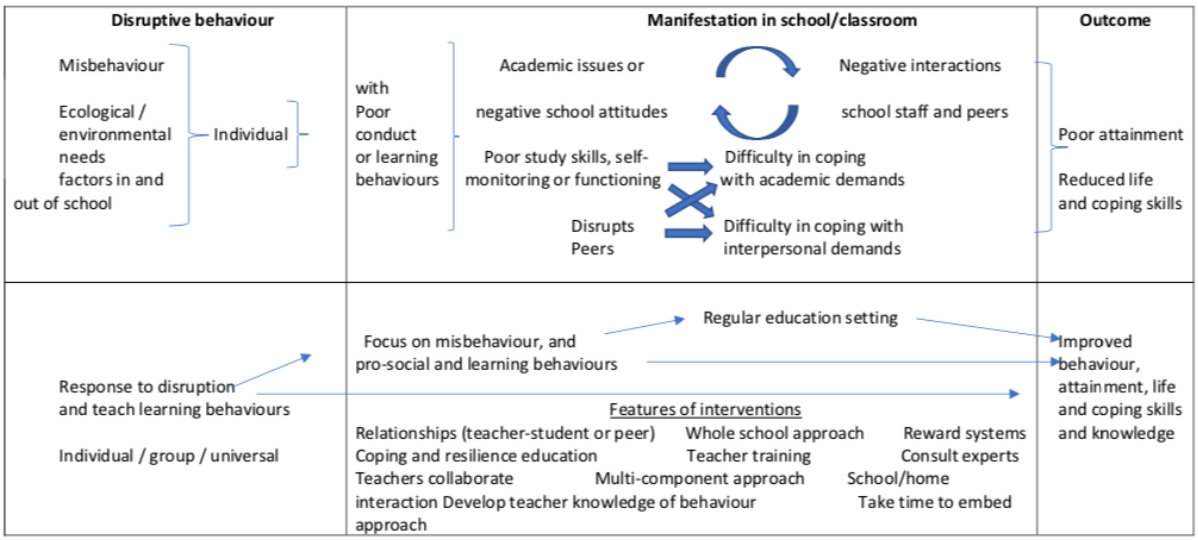
Objective 2 -- Academic Literature in Education (Objective 2)

Having gained an overview of the institutional context and the lack of a simple relational procedure (to correspond with the ubiquitous consequence system), and shared the origination of ABC Classes, what follows is a drilling down into the current educational literature regarding discipline, meta-cognition and self-regulation, and social and emotional learning. We shall emerge with a more precise appreciation of the contrast between linear and non-linear processes which will inform our information-system approach. Concretely, our aim is to discover what attempts have been made towards defining a minimal procedure to improve relationality; what minimal data-information mapping may 'capture' (or better 'reflect') the relationality of a class[3]?

Discipline and its Linear Consequence System Logic

> 'We start from the perspective that school staff need to respond to disruptive behaviour and that this is linked to factors in and out of school. Pupil's misbehaviour is seen as a manifestation of unresolved needs. The teacher will become aware of the pupil's poor conduct or learning behaviours, which can be exacerbated when the pupil perceives the reaction from school staff and peers as negative, *leading to a vicious circle of academic issues and negative attitudes to school*. Poor learning behaviours will manifest as ineffective study skills, self-monitoring or functioning and conduct problems which all can lead to difficulty coping with academic and or emotional demands, resulting in pupil underachievement. In this model longer term outcomes for children on this pathway will be lower achievement and reduced skills and knowledge to meet challenges through their life course.' (Moore et al. 2019, p91, my italics)

The same authors compile a logic model for pupil behaviour, based on a review of 54 studies conducted over 40 years, more than half of which based in the US (Moore et al. 2019, p92):



[3] A more exhaustive search of relevant material shall be conducted in the body of the PhD; showing the absence of something is challenging, a point addressed by Bhaskar and which we shall address in section 4.

The model differentiates the compounding negative feedback loops or 'vicious circle' (top half of graphic) from the linear intervention to improve behaviour (bottom half of graphic). The diagram is a little misleading because the linear intervention (a generalised intention behind all interventions) is separated from a cloud of 'features of intervention' (which the report exhaustively evidences). The obvious question we must ask is, what prevents these 'features of intervention' from collapsing into the 'vicious circle' of standard practice? The problem is well known: 'Behaviour policies that are intended to improve learning environments can become conduits for criticism of pupils' behaviour' (Payne 2015 p499). Moore et al conclude that 'relatively straightforward approaches to behaviour management in the classroom have shown very large effect sizes' (Moore et al 2019, p99) and add that 'it would be useful to see if these effects can be replicated' (ibid., p99), while admitting that research has not 'distinguished what are the key feature of effective teacher-pupil relationships and praise' (ibid. p99). After decades of research[4], what prevents such robust evidence being replicated? Why have relationships, especially relationships between adolescents, been so resistant to research? To approach these questions in parts 3 and 4, we must first drill into what is meant by 'straightforward behaviour management' and reveal the inherent linear logic of the consequence procedure, before contrasting it with the inherently non-linear logic of relationship building.

Every school is accountable for ensuring discipline, and it is the responsibility of the teacher to perform the functions of their job description and professional qualification (Q10, Q30 and Q31 in TDA 2008). The consistent application of techniques to keep attention and deal with disruption quickly and effectively is known as the teacher's 'classroom management'. The Discipline Policy might be considered a field handbook, defining the 'what' that needs to be done, a behavioural focus to prevent disruption with the overriding purpose to educate. From national guidelines and reports to bespoke school policies, repetition, consistency and social norms is emphasised (Muijs 2020, p32; Swinson 2010); special whole school provision for individual treatment is the exception (Halliday 2018). Consistency is seen to be key across all staff, building staff cohesion to provide a common front so that students have the same experience in every classroom (Shellady & Sealander 2003, Bennett 2017). A disorderly class is therefore the responsibility of the teacher.

Students themselves accept this responsibility: "Students themselves are clear that staff will deal with bad behaviour" (OFTED 2014, p25) and "The same students were observed behaving impeccably in other lessons with different teachers. Students echoed these observations by indicating that their behaviour varied according to the teacher." (OFSTED 2014, p23). The fault appears to be the teachers who fail to implement the policy correctly. The *behaviour* of the students is related to the *control* by the teacher. The locus of control is centred on the teacher, on their ability to control the class. And the main tool by which discipline is maintained is through the discipline policy and the implementation of the consequence procedure.

What exactly is the 'consequence procedure'? The consequence procedure is a sequence of clearly defined sanctions delineated in Discipline Policy. Reasonable sanctions are defined

[4] Others reports may be called upon, eg Bruhn et al., 2015; Daly-Smith et al., 2018; Evans et al., 2003; Flower et al., 2014; Korpershoek et al., 2016; Law et al., 2012; Losinski et al., 2014; Machalicek et al., 2007; Maggin et al., 2011; Maggin et al., 2012; McKenna et al., 2016; Moore et al., 2018; Whear et al., 2013; Wilson & Lipsey, 2007.

through section 91 Education and Inspections Act 2006. A popular procedure in schools is the 'C1-4' sequence: C1 is a formal warning, C2 final warning which is recorded on the student's behaviour record, C3 reported with often a sanction such a detention, C4 reported, sanction and removal from the room during lesson. Refusal to comply will escalate sanctions to internal exclusion, where the student is placed at an isolation booth, and school exclusion temporarily or permanently. There may be supplemental departmental or pastoral report cards which require signing by teachers to monitor behaviour for a period of time such as a week. All formal sanctions are captured on the student's educational record.

Although the consequence procedure is linear, we may discern the 'consequence system' as the influence it has on the teacher's 'classroom management' practice, the coordinated implementation by the supporting network of staff and the senior management team, the supporting infrastructure of government and conceptual pedagogy, and the social psychology of how children themselves understand 'school'. The linear consequence procedure explains the 'straightforward' character of behaviour management techniques which is conformal to the supporting management structure of staff[5].

The consequence procedure supports an implicit moral logic, that of consequential morality (MacIntyre 1984): if students behave, then they will achieve. This behaviour-achievement causality has been considered a systemic flaw because 1) once school ends and grades are achieved, is good behaviour no longer needed? 2) disaffected students should behave well so that other students may learn, and 3) many well-behaved students do not achieve good grades (Shortt et al. 2018). In addition, the linearity within the school system may be seen to be defective: once students have been through the consequence sequence and they are not excluded, they are circulated back into the mainstream classes and the preventative effect of sanctions no longer holds sway (Hazell 2019).

Implementation of the consequence procedure lends itself towards impersonal implementation. Whereas the teacher's execution of expectations merges into soft-skills, emotional intelligence and social skills (Jennings & Greenberg 2009), the teacher's role is impersonal in the execution of consequences: it is treated as a conversation between the school's culture and the individual (Bennett 2017, p41). There is an institutional response to student behaviour mitigated through the role of 'teacher' which is clearly specified in policy and organisationally executed through well-rehearsed procedures. Its most extreme form is known as 'Zero-tolerance'. There is slight supportive evidence for a zero-tolerance approach (Krowka et al. 2017) though it currently lacks robust evidence of its efficacy (Moore et al. 2019, p33), while the American Psychological Association reports it damages relationships and impacts academic outcomes negatively (Dr Sue Roffey quoted in House of Commons Education Committee 2011, p44). Restorative practices may go some way to mitigate against the damage to relationships (Amstutz & Mullet 2005), nevertheless we may appreciate that the tension is ever-present in the teacher-student relationship between the impersonal implementation of the linear consequence system and, as we shall see later, the personal feedback of relationships and social learning which we shall see is often represented in the literature as a circle.

[5] This linearity in management is reminiscent of 'chain of command', a direction of analysis we may explore further in the PhD proper.

Is there an alternative to this linearity of procedure and underpinning consequential morality? The alternative is an appeal to 'character'[6]. Virtue Ethics roots students behaviour in virtues: eg 'virtues of coherence of thought, respect for evidence, and an attitude of principled critique will' (MacIntyre 1984, p176). Because of the challenge of describing virtues, Positive Education proponents focus on the consequences of virtues: character strengths (Al Taher, 2019; Peterson & Seligman, 2004). Rooting behaviour in character traits shifts the onus from the following of rules (deonotological morality) or the speculative behaviour-achievement causality (consequential morality) to the demonstration of character traits (effect of operational virtue ethics) (Short et al. 2018). This invites a similar shift from the teacher's role as punitive sanction administrator (deontological actuator) or expectation deliverer (consequential moralist), to a person demonstrating these character traits themselves. Recent meta-analysis shows character education associated with higher achievement, and expressions of love, integrity, compassion and self-discipline (Jeynes 2019), and although improvements have been found in character-related behaviour and reduction of suspension after implementation of character education programmes, the relationship remains inconclusive and there is little impact on student achievement (Skaggs 2006). Robust studies are singularly missing in systemic reviews (eg Moore et al 2019). The Jubilee Centre produced the most extensive study of character education to date (2015) but it has been roundly criticised as providing a construct in 'character' which is unclear, redundant, old fashioned, essentially religious, paternalistic, anti-democratic, anti–intellectual, conservative, individualistic, and relative (Lee & Kisby 2020). The formulation of a character-based education proposes a different student-teacher relationship only when a wide range of virtues are presented (even if they can be agreed upon) otherwise it may simply reinforce those selective virtues which support the consequence system, such as Citizenship, Fairness, Leadership categorised as Justice by Peterson & Seligman (2004).

We have focussed on the linear structure of the consequence procedure because it has *universal* application in secondary schools. Nevertheless, we acknowledge that educationalists embrace a wide range of classroom management techniques, and so we may be tempted in exploring what other programmes have been studied or applied in schools. There are many excellent resources which describe suitable techniques and guidance for teacher, eg Resilient Classrooms (Doll 2004), Tribes (Gibbs 2001), Building Classroom Communities (Levine 2009), Building Community in Schools (Sergiovanni 1999), Facilitating Interpersonal Relationships in the Classroom (Salmon 2002). The many excellent resources and supporting evidence of social learning (which we shall explore topic) which may be utilised by teachers to improve relationality. However, it is essential that we acknowledge that all classroom management techniques operate *within the ecology of the consequence system*. The consequence procedure is pervasive in the practice, organisational structure, and experience of participants, and as such constitutes a complex 'system'. All behaviour programmes attempt to work within this system, *or they are rejected*. The converse is also true: the impersonal implementation of the linear consequent procedure is seen as dehumanising in de-schooling literature (eg Illich 2019 [1971]; Hart 2001); however, rejecting the consequence system, because of its enmeshed nature, unfortunately rejects the personal and social elements. There appears to be no middle ground. Schools are a 'consequence system'. We shall see that a non-linear alternative is possible, through the ABC Classes framework, however it can not be implemented by teachers as *all* interventions are. It is based on a relational fundamental (not individual virtue). This implies an

[6] This appears to be reductive of the linearity to a single point.

alternative method of research, a meta-method, and we shall examine meta-theories to support this in Part 4.

From reviews of interventions intended to improve school behaviour, (Bruhn et al. 2015; Flower et al. 2014; Korpershoek et al. 2016; Law et al. 2012; Machalicek et al. 2007; Maggin et al. 2011; McKenna et al. 2016; Moore et al. 2018; Whear et al. 2013; Wilson & Lipsey 2007), no procedure focuses on a measure of social cohesion. Most programmes target individuals who are diagnosed as problematic, and universal programmes also focus on delivery of content to the individual, just as the implementation of the consequence system targets the individual. There are few reviews which contain robust studies on discipline in secondary schools. In a review commissioned by the Education Endowment Foundation (Moore et al 2019) aiming to collate robust research studies on the effectiveness of classroom-based approaches to behaviour, of the 56 studies which were screened, deemed eligible and included from 4,826 identified (ibid p38), only three were situated in secondary school (ibid p40), a fact which 'surprised' the authors (ibid p100). Examining the results and applying our own criteria is further restrictive; ABC Classes is not based on extrinsic rewards, there is zero teacher training. Most programmes required teacher training, and the three programs which were implemented by teacher were reward systems: class dojo (ibid p45), 3 GBG (ibid p45), Class-Wide Function-Related Intervention Teams (CW-FIT) (Wills 2018). Only two programmes had no reward and five which had no reward but the child was rewarded. Only one operated with no reward, aimed to improve relationships directly and did not require teacher training, Cappella et al (2012), however it focused on elementary schools and involved consultation with an expert, a clinical psychologist. Two programmes were listed as having 'no reward but was child rewarded' (Moore et al. 2019, p119): a teacher training study (Piworar et al 2013), and a targetted behaviour programme for primary schools (Sorlie & Ogden 2007)[7].

Our research question asks whether it is possible to generate a data-information structure which captures relationality. Based on systematic and meta-analysis of the literature on *discipline*, the locus of control is exclusively centred on the teacher, not the relationality of the student body. As a result, the factors which constitute the deep structure of education appear to persist (Tye 1998; Payne 2008), and 'teachers are cast as Sisyphus straining against the eternal rock of student disruption' (Slee 1997, p.7).

Meta-cognition & Self-Regulation: Parallel Logic

We shall now review self-discipline, where the locus of control[8] is centered on the individual, in this case the student. We shall explore definitions and models of how individuals control their thinking, feelings and behaviour.

Definitions are especially problematic in the study of metacognition and self-regulation (Dinsmore et al 2008; Martin & McLellan 2007) such that 'the measurement of metacognition

[7] The PhD proper will isolate programmes which exclude extrinsic rewards, the intervention is delivered directly to the students, and there is minimal teacher training; additionally, discovering programmes (regardless of study status) which focus on collective discipline techniques and intrinsic rewards may reveal attempts to measure social cohesion.

[8] The term 'locus of control' (Rotter 1966) has fallen out of popularity and has been replaced with agent 'self-efficacy', however we shall be returning to its original definition when we explore mathematical models of social engagement.

and SRL [Self-Regulated Learning] is complex, and no optimal method exists' (Muijs et al. 2020). For want of a better method[9] we shall adopt the definition derived from the meta-analysis by Muijs et al, that metacognition is a subset of self-regulation (Muijs et al. 2020); that is, self-regulated learning involves the self-control of behaviour, motivation[10], and cognition, ie metacognition. Cognition refers to the actual learning activity or task, such as facing a problem in mathematics or evaluating a text; metacognition is the ability to choose different methods to solve the problem, or shift interpretations.

We can make use of a refined distinction proposed by Schraw et al. (2006) between *knowledge of* cognition and *regulation of* cognition. *Knowledge of* cognition includes knowing about oneself, intellectual procedures and their appropriacy. *Regulation of* cognition is the concurrent processual monitoring of how cognition is progressing, planning for the future and evaluating past outcomes. In the previous paragraph I used the term, 'for want of a better method' purposefully. Consider the etymological root of mathematics, the study of patterns, not necessarily number; that theory derives from theoria, the original observers sent to watch and not participate in the ancient Olympic games; and that science is a method which constitutes a formalised metacognitive framework of procedures. These processes tend to collapse metacognition into factual *knowledge of* cognition, rather than maintain the processual *regulation of* cognition. The conflation of meta-regressive: Schraw's distinction between *knowledge of* and *regulation of* cognition, demonstrates the former[11].

Panadero (2017) summarises and compares four important models of cognition, motivation, emotion and social learning: the socio-cognitive perspective with its triangulated relations of self, behaviour and environment[12] (Zimmerman 1990) and iterative cycles of metacognition and motivation (Zimmerman & Campillo 2003; Zimmerman & Moylan 2009); Goal Roadmaps with its emphasis on goal motivation and emotional regulation (Boekaerts 1991, 2011); a metacognitive perspective relating to goal-driven motivation (Winne & Hadwin 2008, 1998); the theoretical work and evidence on motivation (Pintrich 1990, 1993). Two more recent models focus on metacognition (Efklides 2011) and collaborative learning (Jarvela & Hadwin 2013). The potential of an amalgamated meta-model development exists (eg Sitzmann & Ely 2011), nevertheless an acknowledged weakness is summarily noted 'in sum, all of the models include [social] context as a significant variable in SRL. Nevertheless… not much research has been conducted… in exploring how significantly other contexts or the task context affect SRL' (Panadero 2017, p.21).

There is significant empirical evidence for the importance of self-control across national, school and lab experiments (Moffitt et al 2011; Duckworth 2011; Duckworth & Seligman 2005; de Ridder et al 2012). Progress has been made in cataloguing and comparing feedback models of self-regulation, upward and downward causation across supervenience levels, pathologies and dysfunctions, and goal setting (Karoly 1993). Causal patterns are emerging from empirical studies which support a temporal dimension. For example a study with 2,670 students in Hong-

[9] See Reflexive Reading (Pinto 2020; Pinto 2019).
[10] Motivation is taken to be emotional, so self-regulation of emotion may be called 'meta-emotion' (Norman and Furnes (2014).
[11] This is the purpose of Reflexive Reading: to implement the metacognitive state in the concurrent, actual hermeneutic practice of the academic reader (Pinto 2020; Pinto 2019).
[12] Zimmerman's and Bandura's tripartite model of self, behaviour and environment is a more complex modelling of Rotter's binary internal or external locus-of-control (Rotter 1996).

Kong shows positive feedback between intrinsic goals, achievement and meta-cognitive learning strategies (Cai et al 2019). Such iterative experiences are common to learning theories because of their 'cyclic' temporal form and positive purpose, e.g. Kolb's Experiential Learning (Kolb & Kolb 2009), Riel's Action Learning (Riel 2010-2019), and awareness of the participants in their own learning is acknowledged. Techniques to improve metacognition using Bloom's taxonomy have resulted in higher cognitive skills, goal orientation and self-development (Apaydin & Hossary 2017).

Self-discipline phases into both into meta-cognition and into the social dimension. The cognitive neuroscience underlying the developmental state of being able to acknowledge mental state in self and others (known as theory of mind) has been related to the teaching and learning of self-control (Sodian & Frith 2008). Self-regulation is not only metacognitive knowledge and skill but a function of self-efficacy: the ability to transform beliefs into behaviour; while pathology of metacognitive processes such as self-doubt, false beliefs, negative self-monitoring operate in social, motivational, behavioural domains simultaneously (Zimmerman 1995). Discussing perception (sharing our thoughts in a social context, explicit metacognition) enhances sensitivity and collaborative decision-making, overcomes lack of direct access to sub-cognitive (implicit metacognitive) processes (Frith 2012). Inter-subjectivity has been found to central to the development of metacognition from an early age (Brinck & Liljenfors 2013). There is considerable contention between using measures which are retrospective or real-time, though real-time assessment appears more predictive and accurate (Muijs 2020 p20; Veenman et al 2006; Dent & Koenka 2016). The high social dimensionality recognised in the literature of self-control extend into the research process itself: because of the rapidly changing learning environment, reflective practices of metacognition and self-regulated learning are recommended while researching learning and teaching (Schechter 2017).

What is clear from the literature is that the processual aspect of learning is core to many models of self-regulation and meta-cognition. The learning cycle of self-regulation refers to a feedback loop of awareness and behaviour in the individual typified by a three phase cycle (eg Zimmerman's forethought, performance and reflection which is conformal to Shaw's regulation of cognition), or four phase cycle (eg Kolb's Experiential Learning). The cycle is common for metacognition and self-regulation, and as we shall see social learning.

Social and Emotional Learning: Non-linear Logic

Education Endowment Foundation takes the following definition of Social and Emotional Learning:

> "The process through which children and adults acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions" (http://casel.org)

The philosophical assumption here is that the agency is in the individual, in their knowledge, attitude and skills, their understanding and empathy, and their ability to form relationships and make decisions. This centres on the individual and implies the standard approach of psychology to the black box which teachers and researchers can not effect directly. However the literature of Social and Emotional Learning indicates a shift in emphasis to the individual's *experience*. The

social (external phenomenon) is intimately related to the emotional (internal experience). That is, studying social learning externally (etic), or appreciating social learning internally (emic).

Social and Emotional Learning aims to be preventative: by practicing good social skills (Humphrey 2013), negative behaviours do not arise in later life (Catalano et al. 2004). Consequently, much of the focus is on early years education where prescriptive lessons are directly taught which can concentrate on specific competencies through roleplay (eg Wigelsworth et al 2019, p29, pp43-44). The earlier good social practices can be instilled, the better for the individual and social effects later in life.

There are several key studies providing critical perspectives on SEL in secondary schools (Smith et al. 2007; Barry & Dowling 2015; Clarke et al. 2015), interventions for adolescent mental health (Das et al. 2016; Dray et al. 2017), and youth development programmes (Catalano et al. 2004). Meta-analysis reports a general positive effect of SEL (Durlak et al. 2011), that it can be taught effectively, though direct teaching of SEL skills has been shown to be ineffective with adolescents (Yeager 2017). There are challenges to show the long-term effects of SEL (Belfield et al., 2015), and problems with real-world implementation: how to distinguish the effect of an intervention when people naturally are learning socially and emotional, the fitting of an intervention to a specific context, and suboptimal deployment (Durlak & DuPre, 2008). Because there are many ways of delivering SEL, this heterogeneity compromises meta-analytic techniques which are premised on comparing 'like with like' (Wigglesworth et al 2019, p38).

The delivery of social and emotional lessons relies on a theory of individual agency. An alternative to this emphasis on the individual may be found by exploring the evolution of Bandura's work on social cognition. Initially, Bandura formulated a model of social cognition based on the interaction of three factors: personal, behaviour and environment (Bandura 1986; 1977). Bandura defined three modes of agency: direct personal agency, proxy agency, collective agency through socially coordinated and interdependent effort. Bandura reorientated his theory from an agentic perspective as consciousness, humanness, and control over one's life, to where people are producers *and products* of social systems and agency operates within a broad network of sociocultural influences (Bandura 2001). Bandura's social learning theory thereby provides a bridge between cognitive and behaviourist theories, where people learn through observation, imitation and modelling (David 2015). Bluntly put, whatever the packaged lessons of Social and Emotional Learning, the young person is shaped by their environment both at home and at school. Which is to say, young people learn to become 'students' continuously in their engagements with peers and teachers, and are influenced by the culture of the school. The behaviour exhibited as 'low-level disruption', is in fact, a learned behaviour; it may be seen as the *result* of the school culture.

In terms of relational dynamics in a class, Howe describes the predominance of the 'performative mode' of engagement in the classroom, where students either interact directly with the teacher or observe another student interact with the teacher (Howe 2010). Whether based on an authentic relationship of trust through an 'internally persuasive discourse' (Bakhtin 1991) or on their institutional role of 'teacher' (Reinertsen 2012), the student-teacher relationship remains dominant. Regardless of the evidence supporting collaborative learning (Johnson & Johnson 1999; Slavin et al. 2007; Le et al 2018; Martin & Dowson 2009; Mercer 2019, 2013), students appear locked in 'performative mode' rather than 'cooperative mode' (Howe 2010).

Student-to-student collaborative learning effects motivation, social cohesion, cognitive development, and cognitive elaboration, where group goal-orientation and individual accountability are shown to produce the strongest motivational result (Slavin 1980; Slavin et al. 2007). Further evidence shows peer-to-peer interaction jumped from 4% to over 75% due to cooperative learning intervention (Shachar & Sharan 1994). Equitable, elaborative dialogue is linked to positive attitudes to education, not only in formal, presentational oratory skills but the give and take of informal group work (Mercer 2019). Dialogue format contains more meta-talk than essay format, and the social structure of tasks has shown to influence learning: problem orientation encourages coalescing argumentation, oppositional grouping encourages teamwork and greater metacognition (Kuhn 2015). Careful coding of video analysis can derive detailed insight into collaborative activity. For example, 231 groups of three students showed a positive correlation between metacognition regulation and explanatory talk, not significant correlation with cumulative talk, and negative correlation with disputational talk; symmetry and reciprocation was similar but had positive correlation for cumulative talk (Grau 2018). This supports Mercer's theoretical framework (Mercer 2013) that explanatory talk is also a metacognitively regulating collective activity[13]. The evidence of their improvement in knowledge acquisition remains equivocal, but the need of collaborative skills in adult life is undeniable (Kuhn 2015). Howe admits that research in the social dynamics (and in particular adolescent peer relations) is challenging to find, and conduct (Howe 2010), and teaching collaborative skills is notably challenging (eg Le et al 2018). However, the sociocultural perspective of child development (Vygotsky 1978) of shared meta-communicative awareness and coordinated perspectives for effective communication (Barron 2003) brings into question the need to teach collaboration skills directly.

ABC Classes: Social Learning as Metacognition

In light of the literature review, ABC Classes appears to be a unique mix of metacognition, social learning, and a way of framing the consequence system.

The challenge of disentangling shared constructs across different models is acknowledged as complex (Panadero 2017, p.22); and that the application of such models to practice needs to be 'further considered' (ibid., p.24). This is true not only of academic research, but the students experience as they metacognise on their social condition, their sense of identity, how they learn and so on. The definition of ABC Classes in terms of self-discipline (see p8) avoids the misapplication of self-discipline to an individual state. ABC Classes is a means of categorising the state of this social condition, which is supported, enabled, enacted, actioned by all participants. Which is to say, an A-state class means that individuals must be performing self-regulation, and a degree of meta-cognition will be exercised by the teacher and students when consciously referring to it.

Let us explore this in more detail[14]. We have observed that the exploration of metacognition tends towards knowledge of cognition and expertise, rather than the processual regulation of cognition (Schraw et al. 2006). Is there a relationship between the regulation of cognition (processual cognition) and regulation of behaviour (processual behaviour)? In schools, as we

[13] We shall return to this with Roth's micro-analysis of conversational fragments (Roth 2020).
[14] A reader in the Reflexive Reading positionality may be able to appreciate the temporal quality of the following text.

have shown, it tends to be the linear consequence system, the regulation of behaviour by the teacher. And schools also tend to emphasise the accretion of knowledge, despite the many fine studies showing the efficacy of metacognitive thinking tools. If we factor in the third area of our interest, social and emotional learning, we can see that a similar pattern appears to be present: that social and emotional learning is delivered as lessons, as packets of knowledge. Teachers and educators address the processes of social and emotional learning as knowledge. As educators, we wish young people to self-regulate their behaviour (self-discipline), their emotions (emotional learning), their emotions within the theatre of activity that is a class (social and emotional learning), and their cognitive processes (metacognition). However, we address this as content: their behaviour, their feelings, their social context, their thinking. The problem appears to be that *knowledge of* behaviour, feeling and social context, is treated similarly to knowledge about planets, geography, and so on. It is information as knowledge[15].

We are interested in the *regulation of* behaviour, regulation of feeling, regulation of social context, regulation of thinking. The processual activity. The correspondence is between self-discipline and meta-cognition, within the framework of internal emotional states and external social states. The emphasise, as always, is on the individual, hence the movement towards mindfulness and mental health, and helping individual students by providing them with skills and techniques. However, ABC Classes resolves the problem by linking self-discipline and metacognition to the social state of the class within which the student operates, within which they experience their emotional state. That is, it is a self-contained system.

The A and B States do not rely on any external authority, there is no consequence procedure. There is no additional knowledge. It is purely regulation of behaviour (worthwhile and engaging activities), not knowledge of behaviour. It is regulation of emotion (activation of motivation), not knowledge of emotion. It is regulation of thinking (doing the maths), not knowledge of thinking (facts). It is regulation of social context (determining it), not knowledge of social context. It is information as action.

In this way, we hope to have achieved Objective 2: drill into current educational literature on discipline and behaviour, meta-cognition and self-regulation, social and emotional learning and show the linearity of the consequence system of standard discipline practices, contrasted with the cyclic, or non-linear, nature of relationship formation (and the misapplication of a linear consequence system to resolve it) and the lack of a social ‘measure’ or data-information mapping.

[15] Cf ‘information as knowledge’ versus ‘information as action’ (Banathy 1996b).We shall return to this in Section 5.

Objective 3 -- Broader Academic Context: Knowledge Fragmentation & the Problem of Reflexivity

Having explored the institutional context and the lack of a minimal relational procedure, and drilled into the detail of educational literature and the lack of a minimal data-information structure, we shall now expand our focus to embrace wider academic context. More generally then, how do different disciplines approach the psycho-social dynamics of relationality in classrooms? An initial exploration is summarised and the most promising material regarding a mathematical treatment of self-organisation is highlighted in Doll's 'dissipative control' (Doll 2012). This is preceded with a discussion on how the literature search was conducted as an 'ant-walk', and concludes that academia struggles with the bio-psycho-social ontic 'mess' (Ackoff 1979a, 1979b, 1981) that constitutes social phenomena, and that this indicates a fundamental flaw in social science: namely, its inability to make reflexivity 'well-behaved'.

Meta: The Ant-Walk Literary Review

The Literature Research was guided by my own experience as a secondary school teacher. Having reviewed the advice from several 'how-to' books on conducting literature reviews, including the specifications by the Information School, I attempted to identify terms to scope my search. Unfortunately, this quickly became a futile exercise because of the multiplicity of nomenclature relative to any specialism, or 'jargon' if observed from external departments. I was acutely aware of the lack of machine-learning tools to aid literature search, with those available still requiring an inordinate amount of searching effort[16]. My initial Literature Review became an 'ant-walk' through multiple disciplines guided by my experience as a teacher. I judged material which focused on the same specific area I had been interested in as a practicing teacher: the complex relationality between students and a minimal data tool to help students self-organise.

The ant walk (which produced a 36,000 word review) ranged across multiple disciplines: education (experiential learning, cooperative learning, quality of talk, character education, interpersonal relationships, rubrics, collaborative learning environments, learning styles, critical thinking, growth mindset, student journey, multi-level organisational influence, researcher-practitioner pedagogy, pedagogical violence and teacher dependency, positive education, reforming schools, classroom management, teacher efficacy, interventions, classroom dynamics, peer assessment, mixed groupings, belonging, community, peer-group relations, student-teacher relations), psychology (motivation, perception, time-perception, attention, awareness, mindfulness, mindwandering, positive psychology, embodied cognition, self-determination, self-efficacy, social learning, social cognition, social and emotional learning, social development, sociograms, self-control, motivation, metacognition, trust), organisational theory (affordance, teamworking, alienation, linguistic complexity, macrocognition, non-linear organisational change, cognitive integration, chaos theory in organisational change, pragmatism, organisational learning, communities of practice), sociology (social structure, social system, social autopoiesis, habitus, purposive collective action, metaphors of social complexity, constructivist, constructionist, structure-agency), philosophy (critical realism, post-modernism, moral theory, epistemic models, explanation and understanding, science as system, discourse theory),

[16] A fellow IS PhD student and I explored the potential of creating a machine-learning program to cross-index bibliographies using Nvivo.

complexity (systems theory, self-organising systems, herding, flocking simulations, emergence, consensus, first, second, third order cybernetics), reflexivity (definitions, metacognition, self-reference, collective reflexivity, subjectivity), information systems (DIKW, knowledge sharing and context, information-based design of social systems, mathematics as sign, search techniques), and research (methods, interventions, coding, ecological systems, prevention science, socio-psychological interventions, research design, design-based research, design experiments, collaborative action research, dual lens, false research, cross-disciplinary, interdisciplinary, search techniques, imperialism legacy, ethics in praxeology, motivation, reading and eye-tracking, involving students as research participants, operational research). And this was only after establishing institutional context (discipline, retention, low-level disruption, expectations-consequences, preventative, whole school implementation, government reports, inspectorate reports, discipline policies, interschool interactions, academy federations, pre-service training, pedagogy), which has been summarised in the first section.

The most prominent work which stood out was Doll's description of 'dissipated control' (Doll 2012, p222), seeded in Dewey, which resides not unilaterally with the teacher nor with the students but instead, 'resides in the nature of the situations' themselves (Dewey 1966 [1916], p39). Dewey's analogy of the teacher as steersperson, cybernetes, who guides the ship that is the class of students through the waters of knowledge. To stabilise the self-directed learning of a student, Dewey notes the tempering function of the history of relationships between learners and teachers. Doll reinterprets this point: 'A combinatory dynamic is at work here. The teacher does steer but does so by tapping into the creative energy [currently] existent in the classroom' (Doll 2012, p225). The movement of authority moves from an external source, the authority invested in the teacher by the supporting institution of education and government, into an internal source: 'control… emerges from interactions within these situational parameters' (Doll 1993, p167). The system becomes essentially self-organised: 'Control is dissipated into the group, community, network, system, and indeed frames itself' (Doll 2012, p226).

Such wise authority provided by the teacher has been alternatively described as 'internally persuasive discourse' (Bakhtin 1991; Morson 2004): a positive learning ambience is formed through the teacher mediating the relationship of the student with the subject matter: not only through the appreciation of the internal relational validity of knowledge (that algebra works), but also in the public dialogue of engagement (the warm relationship engaged in pursuit of knowledge). The result is that teachers 'provide the epistemological, pedagogical, organizational, and safety leadership. However, this leadership has a temporary but systemic character' (Matusov & Sullivan 2019, p20). The relationship is continuously reformed. The ideal relationship can be described as:

> 'In a reflective contract between teacher and student, the student does not agree to accept the teacher's authority, but to suspend disbelief in that authority. The student agrees to join the teacher in inquiry, in trying to understand what the student is experiencing, and to make that understanding accessible to both the student and the teacher. The teacher, on her part, agrees to help the student understand the meaning of the advice given and the rationale for it; to make herself readily confrontable by the student; and to reflect with the student on the tacit understandings each have.' (Schon 1983, p296).

Doll's excellent application of mathematical processes to social dynamics of students in classes matched my own experience. But his description falls short. Creating such a mutual engagement

is challenging if the teacher is simultaneously delivering executive sanctions and is seen to be policing members of the class. ABC Classes provides a frame other than the rules institutionalised as 'expectations' and enforced through a consequence procedure by an adult representative. The ABC Classes provides a logic which formalises the 'dissipated control' of AB State class. The students are responsible for maintaining their collective state such that authentic authority may emerge and be sustained. 'The switch is to a mode where teaching becomes ancillary to learning, with learning dominant, due to the [collective of] individual's self-organizational abilities' (Doll 1993, p101).

Despite this limitation, it is important to emphasise the clear delineation which Doll brings regarding the improved relationality in a class, the role of the teacher, and the quality of learning. Doll's observations lay the foundations for the information system approach we take in Section 5. Although the 'generalist' ant-walk is insufficient for PhD specialism, the overview did bring to relief a pattern of problems, or rather the limits of standard scientific procedures which demarcated an 'absence' in social science: that relationality is inherently subjectively constructed.

Complicatedness of Social Constructs, Practical Messes by Invisible Subjects, and The Problem of Reflexivity

The academic landscape is fragmented. 'Philosophy was… unable to put a stop to the growing fragmentation' (Cassirer 2000, pp34-35). Two million articles are published a year by more than 7.8 million researchers (according to Unesco [2013] 2020). Disciplines cultivate a 'community of arguers' who share language and systematic enquiry (Bridges 2006), however academia has undergone a process of hyper-specialisation (Francois 2006); at the time of writing (2020), Scopus lists 38,060 journals in total, more than the 30,000 journals reported by STM 2018 (Johnson et al 2018): 1,537 in Education Psychology and Education, 1,351 Education, 209 Organisational Behaviour, etc. To help educational practitioners assimilate this quantity of research, numerous attempts have been made for continued professional development (eg Haslam & Shaw 2019), with specific guidance for starting teachers to take up an evidence-informed practice (Rose & Eriksson-Lee 2017; Lyon et al 2019; Brown 1992). This provision betrays the existence of the practice-theory divide: how the rich practice of teaching is all-consuming which contrasts with the 'thin description' of learning theory and teacher training advice (O'Leary et al 2014; McGarr 2017).

The problem of educational research, and social science in general, may be described as the 'invisible subject' (Roth 2018): how the actual lived-in experience of students is represented, objectified, transcribed into text and 'the researcher no longer lives with human beings but thinks about them by taking the transcription as the object of inquiry' (Roth 2020, p320). The explication and externalisation of knowledge is a necessarily multiplicative act (Bateson 1979, p64, p67) given that much of social dynamics (whether in classrooms or academia) goes unnoticed; 'We recognise one another as community participants initially in a pre-reflective way through our enrolment in existing communities and their collective practices premised on unnoticed attitudes and expectations' (Pratten 2017, p1427). Subsequent reification of relations through nominalisation ('expectations', 'discipline', 'intelligence') or substantivisation ('students learn') or 'textual coding' (Saldaña 2015) derive a 'cognitive complexity' (Warfield 2004) and 'complex polysemy' (Harbour & Gauthier 2017) which 'create artificial problem-

situations' (Shotter 2016, p52). Addressing teaching practitioners, to paraphrase Ackoff, '[teachers] do not solve problems; they manage messes' (Ackoff 1979a, p100; Ackoff 1981).

Underlying both, the messy complexity of students interacting in class and the problematic complicatedness of academics interacting through literature, is reflexivity: 'Acknowledgement of one's own participation in unitary Being-as-event, and this fact cannot be adequately expressed in theoretical terms, but can only be described and participately experienced' (Bakhtin 1993, p40). Shotter (2016), Roth (2018), Lennox & Jurdi-Hage (2016) delineate the 'invisible subject' clearly enough, but the medium of standard academic writing and reading ensure the subject remains invisible. This line of thinking evolved into Reflexive Reading in the original Confirmation Report (Pinto 2020), and the attempt to invite the 'invisible subject' into the process of research has been extracted and forms a separate document (Pinto 2021). We shall examine three meta-theories which attempt to make reflexivity 'well-behaved[17]' in Section 4.

In this way, we hope to have achieved Objective 3: expand our focus to multi-disciplinary perspectives in order to highlight the pervasive problem of reflexivity which supports human self-organisation.

[17] Understood in its mathematical sense, that is 'elegant'.

Objective 4 -- Three Meta-Theories for Understanding Social Ontology and Embodied Agency, and their Limitations

The challenge of this PhD is to situate itself in a dense inter-disciplinary field, given that education itself has been described as post-disciplinary (Bridges 2006). Most approaches are psychological, psy-disciplines (Foucault via Lanas & Brunila 2019), much less sociological (Slee 2014; Armstrong 2019). We shall examine Systemic Inquiry because of the sensitivity it brings to human systems in order to help understand the psychology of the ABC Classes psycho-social structure. A relational system can not be as simple as a system based on external behaviour (ie the punitive consequence procedure) because the internal state within people is inaccessible, however third-order cybernetics provides a framework to understand a classroom as a multi-reflexive environment. Finally, our way through the psycho-social conundrum leads us beyond a postmodern positionality (eg Lanas & Brunila's discourse) to Critical Realism (Bhaskar 2000) to help us describe the social ontology of a classroom.

Psycho-social & Systemic Inquiry

The problem of 'thin descriptions' has been traced to fundamental practices in social science (Geertz 1973), exemplarily identified by Roth as the 'invisible subject': how the actual lived-in experience of participants in research are represented, objectified, transcribed into text and 'the researcher no longer lives with human beings but thinks about them by taking the transcription as the object of inquiry' (Roth 2018, p320). It is as a result of this that 'we academics… create artificial problem-situations, by ignoring all pre-existing internal relations. We can then make things even worse by then turning to trying to solve these artificial problems, when in fact, no such problems existed prior to our abstract, aboutness-talk as what we thought were the properties of the elements constituting the initial 'problematic' situation we faced' (Shotter 2016, p52).

Rather than apply our fixed, finalised, selections and exclusions (an after-the-fact analysis, a 'thin' objectivity), we operate on the before-the-fact experience in formation, within certain field of comparison (thicker, possibility objectivity) (Shotter 2016, p28). Shotter takes a radically different position to standard scientific practices: 'While we can come to an understanding of a dead form in terms of objective, explanatory theories representing the sequence of events supported to have caused it, a quite different form of engaged, responsive undertanding becomes available to us with a living form' (ibid. p67). Spatial things appear bounded, temporal 'things' are unbounded, incomplete, unfinished. In order to appreciate the internal state of students, to appreciate the constructs we have reviewed as 'motivation' or 'self-regulation', Shotter talks of 'coordinated anticipated outcomes' (ibid. p31). Subjects are not objects of our attention, but rather fellow subjects, and we are "starting our inquiry 'from within the midst' of our lives, participative or withness thinking" (ibid. p37). Shotter urges us to towards a 'practical consciousness' into our 'discursive consciousness', our 'personal beings and bio-social becomings' (ibid. p60).

Shotter's description aptly describe my experience of engagement with students in classes. I *lived* Shotter's call to action: 'rather than problem-solving, our task is that of achieving a resolution, of bringing a particular determination to an otherwise, particular indeterminate situation, without losing its particularity. To do that, we need to 'open' ourselves to being

spontaneously 'moved' by it, to 'entering into' a living, dialogically-structured relationship with it. And this is what is needed, if we are ever to come to get a grasp of what actually it is to be a human being, to being a human person, to be a human bio-social becoming (Ingold & Palsson 2013)' (Shotter 2016, p55). The shift of natural practical consciousness mode of operating to a discursive consciousness is necessarily a deliberate act, to be conscious of our spontaneous behaviour. Shotter is referring to an attentional position, a function of awareness, before-the-fact. Shotter requires readers to transpose their spatial positioning (the 'barrier' to entry because 'it lies behind us') to temporal; there is no 'barrier', no 'problem', since time is unidirectional; the method is different; it is not 'object orientation', but to temporally regress, to become aware of object of thought. To shift from responding state (after-the-fact words and replying) to co-responding state (before-the-fact wording and intention). This is the *experience* of an A State class.

Shotter's 'imaginative hermeneutic exploration' (Shotter 2016, p52) refers to the quiet pace of therapy, not a classroom of students. However, the fluid philosophy which Shotter invokes in his writing demonstrates what he describes as 'joint action' (Shotter 1980, 2005), a phenomenologically indivisible experiential moment. This 'joint action' is conformal with 'correspondence' according to Roth's Organic Theory of synchronic dialogue: 'the simultaneous eventual phases [which] involves the joint living work of at least two persons' (Roth 2020, p13). Both perspectives and descriptions involve a sensitivity to the social condition, though one evolved from within and the other from without. Shotter's observations arose from spoken therapeutic practice: "It is not so much how 'I' can use language in itself that matters, as the way in which I must take 'you' into account in my use of it" (Shotter 1989, p141). Roth's theory is based on micro-analysis of transactions within conversational fragments lasting mere seconds: 'From the organic (transaction) perspective, each (temporally unfolding) phrase-in-the-making of an exchange… constitutes something like a fluid mini-event in the flow of life' and 'speaking for the other, who is attending to and receiving from the speaker are simultaneous events intersecting with each other in the living sound-word' (Roth 2020, pp12-13):

Being 'in synch' in this way manifests more than cognitive engagement. It is conformal with 'emotional matching' (Goleman 2006, p33):

> 'Whenever two people converse we can see this emotional minuet being played out in the dance of flashing eyebrows, rapid hand gestures, fleeting facial expressions, swiftly adjusted word pacing, shifts of gaze, and the like. Such synchrony lets us mesh and connect and, if we do so well, feel a positive emotional resonance with the other person' (Goleman 2007, p33).

Rather than present a philosophical position[18], the ABC Classes *contains* the phenomenological experience of being in a class, and offers a way to stabilise the reflexive condition through verification of our social dimension. The evidence of the class social dynamics implies a degree of internal self-regulation. Because of the greater flexibility of social interaction between students and teacher in a B or A state class, the behaviours alter. Interruption, for example, may welcomed because a student has a genuine question, remarkable insight, or an amusing observation, but contributed in such a way that attention is returned to the flow of the class. The sensitivity to 'coordinated anticipated outcomes' (Shotter 2016, p31) and the other descriptions

[18] This has been presented in Reflexive Reading (Pinto 2021).

emerge from A state classes. The sensitivity reached is collectively attained. It is not through the expertise of a therapist, but a willingness of adults to be drawn into the faster engagement with younger minds, who operate in a before-the-fact way; while at the same time, being respected by young people for providing them with engaging and demanding activities in order to achieve high standards of intellectual performance. 'A Classes' exemplify a high trust between participants, perhaps not as intense as a therapeutic relationship, but none-the-less a safe place for people to share their ideas, their vulnerabilities as they show their learning, their mistakes, their reach together. This is the environment that vocational teachers are called to, and can engender, given the right conditions. ABC Classes provides the basic framework which *may* enable it[19].

Third Order Cybernetic Instance

The history of cybernetics has been extensively covered (Umpleby 2005a, 2005b, 2015; Scott 2004) with bibliometrics (Umpleby et al. 2016; Kokol 2018). Cybernetics was originally defined as communication systems for machines and animals (Wiener [1948] 1961), essentially feedback system regulated by a 'governor' or 'gubernete' or 'cybernetes' (ancient greek for steersman). Early cyberneticists heralded this as the new fundamental in science during the 60's and 70's but lack of funding never realised their early enthusiasm. It underwent a revival with 'second order' cybernetics led primarily by von Foerster (1995 [1979]): by shifting from observed systems to observing systems, von Foerster included the observer as well as the observed, thereby increasing the dimensionality of science. Applications mushroomed into family therapy, psycho-therapy, while first order cybernetics continued into cyberspace and computer systems. Umpleby termed 'third order cybernetics' as the transition from a cognitive to a social system by addressing the Russian theoreticians efforts in developing purposeful, self-developing systems (Umpleby et al 2019; Lepskiy 2015): including reflexivity theory which derives better understanding and management of social systems (Umpleby 1994). Hence, third order cybernetics may be considered to be mutually observing systems, with no preference on the observer (Mancilla 2013): first as allopoietic machines, second as autopoietic machines, third as language as a cognitive machine creating a common domain of interaction between living systems.

The tool of ABC Classes operates in a dense reflexive environment which is self-organising[20], self-developing[21], self-generating[22]. Third order cybernetics frames the environment as the location within which agents operate; their collective operation being the environment. The immediate collective environment of a classroom are the students and teacher: rather than considering the students to be an 'audience' (first order) or 'observers' of the teacher's skills, knowledge or agency, the students are actively involved and engage one another (Murray 2006). Listening is an active skill, not just the focus on what is said. The density of reflexivity is

[19] There is no claim that ABC Classes provides this environment; it is a structure within which participants may create a conducive learning environment. The exact process of how, we shall explore in section 5.
[20] Compare to the self-organising model of emergent flocking by Reynolds (1987) which we shall look at later, or autopoiesis as self-production in biology (Maturana & Varela 1980).
[21] Lepskiy's various descriptions: 'self-developing reflexive-active environments' (2018), self-evolving poly-subjectival environments (2015), self-developing and self-supporting network.
[22] Generative mechanisms in the real domain of social ontology; 'social structure is a necessary condition for, and medium of, intentional agency, which is in turn a necessary condition for the reproduction or transformation of social forms' (Bhaskar [1993] 2008b, p153)

dependent on students and teachers sharing the same attention, a mutual passage through the knowledge. AB State is where unintentional behaviour which is disturbing is self-corrected when pointed out. The teacher, of course, is a good model and instigator of pointing out what is needed for a healthy learning environment, but the task of ensuring a healthy learning environment is a responsibility of everyone. An A state is when there is no behaviour disturbing the learning environment.

Third order cybernetics is a useful meta-theoretical frame for describing a classroom as a multi-reflexive environment, but there are a lack of tools to operate, study, behave, improve within this third-order cybernetic framework. ABC Classes is less of a theory and more of a method. It is an *instance* of third-order cybernetics.

Critical Realism and the Problem of Methods

Over thirty years, Bhaskar developed a philosophical meta-theory which spans the major paradigms of the 20th century, hard science positivism and postmodern interpretivism. He described his work as 'transcendental dialectical critical realism' (Bhaskar 2000), a bold attempt to reconcile differences and enable progress beyond the constraints of science (falsification, deduction, hypothesis, control experiments) and the postmodern extremes of reflexive and contextual relativism (semiotics, positionality, polysemy, self-referentiality). Bhaskar's Transformative Model of Social Activity relies on the 'dialectics of structure and agency', a co-emergence of social and individual: 'social structure is a necessary condition for, and medium of, intentional agency, which is in turn a necessary condition for the reproduction or transformation of social forms' (Bhaskar [1993] 2008b, p153).

The 'high level' of standard Critical Realism philosophical discussion may explain its lack of widespread application (Lennox & Jurdi-Hage 2016), given that it has been recognised as providing the 'underlabour' for social science (Lopez & Potter 2001; Lawson 1997; Bhaskar 2000). To apply the theory to our interest, students in a classroom, we must address methodology. Our first step is to establish how ABC Classes *as a method* conforms to the meta-theory of critical realism, and to do so we cross-reference a number of critical realist works with 'Introduction to the special issue: applied Critical Realism in the social sciences' (Price & Martin 2018). The introduction highlights seven characteristics of Critical Realism which correlates with Bhaskar's critical realist 'toolkit' for the social scientist: be a realist (ontology), a scientist (using retroduction), make use of the TMSA (transformational model of social activity to resolve structure-agency), commit to interdisciplinarity, employ hermeneutics, and reflect on scale and totality (Bhaskar in Bhaskar, Danermark, and Price 2017, pp42–3); to which Price & Martin have added, be a moralist (Price & Martin 2018, p93, p95).

First, a commitment to ontology acknowledges an existentially intransitive reality (Bhaskar, Danermark, and Price 2017, p42), so we can write confidently about transcendental, transfactual social objects such as Bourdieu's social capital (eg Hu 2018). There are students in school, and they are operating within the social structure of school as well as within the network of relationships, possessing internal emotive and cognitive states. Whatever our epistemic descriptions, they exist. We also acknowledge that there is a reality of universities, PhD's, Information Schools and other departments and disciplines.

Second, retroduction is defined as ‘a distinctive form of inference … which posits that events are explained through identifying and hypothesising causal powers and mechanisms that can produce them’ (Hu 2018, pp118–139). Retroduction refers to a method of inference enabled through a model of ontology which Bhaskar has put forward: actuality is the emergence of existence from underlying real ‘causal powers’. Retroduction is where causal powers are inferred from actual. Retroduction differentiates Critical Realism from deduction and induction modes of inference used in positivist, empirical realism (Fleetwood 2013). The relationship of mathematics to simple causal relations (counting to objects, calculus to motion, etc) is effective for a relatively small set of correspondences and underpins the success of the hard sciences (Lawson 1997) which leads to Hume’s ‘epistemic fallacy’, the mistaking of our explanation for reality. The creation of the term ‘retroduction’ is a bid to open up a range of causality which does not conform to such simple causal relations. Critical Realism is an explanatory tool: the measure of a theory of ‘causal powers’ is in how powerful it is, how much it explains. Judgemental rationality allows ‘researchers to evaluate and compare the explanatory power of different theoretical explanations and, finally, to select theories which most accurately represent the ‘domain of real’ given our existing knowledge’ Hu (pp118–139).

The consequence procedure is conformal to a deductive process, and its iterative application (in a C-state class) is inductive. A significant part of a teacher’s practice is to apply retroduction when engaging students, to source the potential causal powers involved in the resulting behaviour which has happened. That is, attempting to talk to students regarding their behaviour, in order to help students access their motivation to change their thinking or behaviour.

Third, the critical realist approach to structure and agency is that it is bi-directional or mutually emergent; the ‘dialectics of structure and agency’ are a co-emergence of social and individual: ‘social structure is a necessary condition for, and medium of, intentional agency, which is in turn a necessary condition for the reproduction or transformation of social forms’ (Bhaskar [1993] 2008b, p153). Porpora (1998, 2007) categorises four theories of social structure: stochastic stable patterns of aggregate behaviour of free-choice individuals (inductive, popular in economics); mechanistic determination through social structures (deductive, eg Marx); reproduction of the structure through individual agency (feedback loop centering on individual, eg Giddens’ structuration (1979)); and tensed system of relations between people in structured positions (feedback loop centering on social). This last takes the form of Bhaskar’s transformational model of social activity (Bhaskar 2008b, p154-160), ‘intentional embodied causally efficacious agency’ (Bhaskar [1993] 2008b, p277), or Archer’s morphogenesis through inner conversations and subsequent action (Archer 2003). Over time we may acknowledge as ‘personality’ or at another level, ‘class’, or according to ‘expectations’ or ‘roles’, but they are always tendencies rather than logical necessities; ‘tendencies’ is a probabilistic notion inherited from a critical theory perspective (Renault 2016, p75). Critical Realism aims to move beyond anthropism (humancenteredness and the Cartesian epistemic fallacy), and beyond adult-centrism (Alderson 2016, p.12).

In a classroom, there is a meeting between adults and children; between institutional structure and familial relations. The theories proposed are all in fluid form, in formation; the young person is accepting the formal role of being a ‘student’, just as they are in becoming an ‘adult’, and indeed just as they are in becoming a ‘citizen’ or a prospective ‘employee’ and so on. Thus, the tensed state of relations describes this ontological state. The ABC classes classifies the social state of the class according to different modalities of the structure-agency relationship. C state

has a greater tendency towards institutional structure, whereas A state has a greater tendency for the exercise of agency.

Fourth, critical realists are committed to the application of interdisciplinarity, based on a laminated, scalar ontology. Acknowledging both structure and agency commits the researcher to at least two disciplinary constructs: one to understand structures and one to understand agents, 'a laminated system consisting in a conjunctive multiplicity of levels of laminations of reality' (Bhaskar, Danermark, & Price 2017, p53). The critical realist explanation of ontological emergence as real causal powers actualise at different organisational levels justifies disciplinary autonomy, since social is emergent from but not reducible to individual interactions. In this way, critical realism and interactivism converge (Pratten 2013). Bhaskar generated a model for the individual as it actualises, the four-planar social being (Bhaskar 2016, p83): striated human (within which we may apply various categorical distinctions in as much as they are useful to explain, eg cognitive and emotive, or metacognitive and social learning), human-material interactions (how the students and teacher interacts with physical objects), human-to-human interactions (the complex psycho-social dynamics between people, again we can use different theoretical models for this ontological laminate level), and social structure (what we have described as institutional structures).

The etymological root of 'discipline' reveals the origins of the problem historically. From Latin disciplina ("instruction given, teaching, knowledge") and discipulus ("pupil"), from discere ("to learn"), from Proto-Indo-European *dek- ("[cause to] accept"). The ancient root is in the learning and teaching of knowledge, as well as the target of it being the student. The Old French descepline in 12th and 13th centuries meant punishment for the sake of correction, and in Old English peodiscipe meant creating the order necessary for instruction. From 14th century a programme of regulations and a branch of education, from late 15th century orderly conduct resulting from military training, and from late 16th century the laws and practices of church conduct. That is, since the middle-ages, the modern root took on punitive features in education, military and religious spheres.

For the young person, the notion of 'disciplines' is introduced institutionally in secondary school, when students attend different subjects, mathematics, english, science, art and so on. Interdisciplinarity is the *natural state* of a young person; the separation into different subjects is a specialisation. C-state classes reinforce distinction of disciplines through discipline. A-state classes exemplify young people who are demonstrating the discipline required to study a subject, engage other people, and so on, and potentially improve the relational transference of knowledge and skills between subjects.

Fifth, the laminate is described as a matrix or template, and it relates to the adoption in academia of theoretical 'lens', which is used like glasses or the lens in the eye, to help focus on particular elements within a field of vision, proximal or distal, in order to get a perspective or multiple perspectives within the field of vision, the object of attention; also 'lensing' which is an inadvertent or mechanical effect. 'In template analysis, too many pre-defined codes can prevent researchers from considering data that challenges original assumptions, while too few codes may result in the lack of a clear direction when researchers are overwhelmed by rich data' (Hu 2018). Adopting a framework (including critical realism itself) may be too strongly prescriptive or insufficiently influential.

Again, students and teachers are involved in evaluating the state of the class, through whatever lenses they have at their disposal. The interpretive lens of participants (both teachers and students) may appear on the outset to favour the lens of the teacher, as an institutional role. This is certainly so for C-state classes, with the 'hard lens' of the consequence procedure and what constitutes misbehaviour. However, the definition of 'self-discipline' is given in relation to the state of the class. The 'A', 'B', 'C' evaluation is part of the laminate in formation. That is to say, it may be better to consider a shift in metaphor from 'lens' to 'mirror'. The ABC Classes intervention is reflective of the participants, and the evaluation is based on their participation. The evaluation of 'A', 'B' or 'C' is less an *external* evaluation of a social state, like using a telescope with its lens to focus on a distant celestial object, and more like an *internal* evaluation of the social state, which is maleable to change because of the influence of others.

Sixth, critical realism employs hermeneutically based methodologies, described as an engagement or adoption or interaction with interpretivist and emergent methodologies (such as grounded theory or qualitative interviews). Critical Realism achieves meta-theoretical union of empirical positivism, hermeneutical interpretivism and linguistic postmodernism; hermeneutics provides an 'inside' or 'interior' to social life (Bhaskar 2016, p57). Compare with Smith's 'thick notion of persons' (Smith 2011, p317) which interfaces with social structure: embodied practices within physical context with shared history and cultural categories, in a dynamic of social norms and sanctions (Smith 2011). A literature review that looks at other researchers' views (see Isaksen, 2018) may involve questionnaires and interviews that consider what the research participants think; literature review as an immanent critique.

As we have indicated, the evaluation of ABC Class is hermeneutic, evaluated from the 'inside' of the class by the participants, and is immanent in nature since the class is monitored continuously by multiple people and evaluated collectively every lesson.

Seventh, reflexivity is seen as the unity of theory and practice, a commitment, an action of intention or will or decision on the part of the researcher. Reflexivity is defined as the resolution of theory-practice inconsistencies, a means of evaluating and critiquing assumptions and current understanding by providing multiplicity of possible actualisations rather than merely accept what is (Simmonds & Gazley 2018, pp140–159). Reflexivity is intimately linked to hermeneutics: 'It is totality too that closes the hermeneutical and epistemological circles and explains why texts or reality respectively, insofar as they appear as such, are always bound to appear at least potentially intelligible to us' (Bhaskar [1993] 2008b, p255).

We have addressed the issue of reflexivity which is implicit within the ABC evaluation, and the constitution of the actual state of the class.

Moral realism is described as an application, the active moral nature of the researcher to act with integrity towards a purpose which is ethically sound. Moral weight avoids postmodern relativism and positive reductionism and instrumentalism; judgemental rationality within the values of the participating agents and their epistemic models of causal powers derives intransitive, realist ethical positions. Researchers must be ethical: 'judgemental rationality in cognition depends not only upon the recognition of ontological realism and epistemic relativity, but upon meta-epistemic reflexivity and ethical (moral, social and political) responsibility on the part of the cognitive agents concerned' (Bhaskar [1986] 2009, p17). The researcher is not merely engaged with the condition of what is, which is an actualisation of potentials; by acknowledging an actual

outcome one can consider or imagine others: ‘that what is, is only one possible world and that, moreover, always presupposes the possibility of other worlds’ (Bhaskar 2010, p23). Thus the potential for ‘what could be’, or with a moral invective, ‘what ought to be’ (Simmonds & Gazley 2018, pp140–159).

It is of course unrealistic to suggest that students have the capacity to verbalise the sophistication of moral philosophy involved. This is also true for the teacher, and perhaps the researcher. Bhaskar developed a simple categorisation of power: power2 as ‘power over’ or oppressive coercive power, and power1 as ‘power to and power with’ or the flourishing of each person that depends on the flourishing of all in freedom and justice (Alderson 2016, p12). Both may be positive (Haugaard 2012, p34), in that a well run C class[23] is characteristic of tops sets: the dominance of the teacher is for the benefit of the students. The ‘cognitive agents’ are involved in the determination of the state of the class. As such, participants are inherently in a meta-epistemic reflexive state with an ethical responsibility. The default status of a class is a C-state, a standard school class where the teacher enforces authority when required; and it is entirely understandable that young people may question this form of power, mobilised for their benefit. On the other hand, there is no external impetus to achieve an A-state, and the teacher as a cognitive agent is not capable of determining it alone: there is no ‘ought’ enforceable by the teacher to achieve an A-state, or indeed any participant. The A-state is inherently relational. And furthermore, an A-state may only arise through a predominance of power1 relations, felt as a moral compunction to assist others in achieving a collective result.

Through this description, we may propose that ABC Classes is a ‘meta-method’ to complement the meta-theory that is Critical Realism. The actual psycho-social events in any classroom: its potential powers and liabilities (M), absence and negative (E), relational totality (L), and agency (D) are active within the responsive state of a classroom of young people. Furthermore, the meta-method conforms to the Transformative Model of Social Activity: ‘social structure is a necessary condition for, and medium of, intentional agency, which is in turn a necessary condition for the reproduction or transformation of social forms’ (Bhaskar [1993] 2008b, p.153). Specifically, the collective state of A or B or C of a classroom of students and teacher, determines the role of the teacher; the students thereby effect transformational praxis of the adult who is a ‘teacher’. To be clear, it is not transformation of the institutional role, but rather invites the adult to engage as a learning-facilitator, rather than a disciplinarian. Developing sensitivity to these processes not as ready-made ‘constructs’, but through the actual metacognitive experiencing of the formation of meaning (within multiple minds) as the social construct of the classroom dynamics is concurrently formed. Hence, meta-method, not meta-methodology.

In this way, we hope to have achieved Objective 4: show the practical limitations of three meta-theories (Critical Realism, Third Order Cybernetics, and Systemic Inquiry) which accurately address the relational-reflexive problem.

[23] I can see efficient C-state classes being designated as ‘C+’ if the ABC Classes intervention has long term adoption.

Objective 5 -- Information System Approach to Psycho-Social Dynamics

The aim of the PhD is to explain low-level disruption as a failure in relationships, and by taking an information systems approach, test a data-tool in school, ABC Classes, which provides students and teachers with a mechanism to meta-cognitively correlate their behaviour (their own sense of 'self-discipline') with collective social cohesion. Through this document, we have adopted the terminology of ABC Classes to refer to the intervention, ABC State to the ontological state of social dynamics, and 'ABC' Class to the attributed of the nominal data 'A', 'B' or 'C'. We have gone some way to providing evidence of the lack of relational equivalent to the consequence system of mainstream secondary school education (section 1), indicated the inadequacy of the linear consequence system in dealing with non-linear social relationality (section 2), implicated the gap in the literature regarding a measure of relationality in current observations of self-organisational approaches within education (section 3), and established a strong meta-theoretical basis for ABC Classes as a meta-method (section 4), in order to justify a novel Information System approach to classifying psycho-social dynamics as 'A', 'B' or 'C' Class.

To remind us:

- An 'A Class' is where everyone has their self-discipline.
- A 'B Class' is where someone loses their self-discipline (eg not paying attention, not working, dropping litter), but when someone points it out they correct it (ie pay attention, do work, pick up litter).
- A 'C Class' is when someone loses their self-discipline, it is pointed out, and they continue. Then the teacher is empower (by government) to enforce sanctions.

ABC Classes is a data-information structure which operates across metacognitive and social learning domains, implicitly aimed at improving tacit metacognitive and social learning skills. First, we will first show that ABC Classes derives 'warm data' (Bateson 2015) or information-as-action over information-as-knowledge (Banathy 1996). Second, we will show how ABC Classes frames both the linearity of the consequence procedure together with principles of non-linearity and self-organisation which conform to Doll's 'dissipative control' (Doll 2012). Third, using the underlabour of Critical Realism (Bhaskar 2000, 2008, 1993, 2005, 2010), we show how to shift from dyadic relationships to the social ontology of collective relationality which contains 'intentional embodied causally efficacious agency' (Bhaskar [1993] 2008b, p277), enabling the transformational praxis of teacher from disciplinarian (C State) to learning-facilitator (A State).

Causation in DIKW and Socially Determined Knowledge

This PhD proposes that there is an inadequate application of number to social engagement. ABC Classes is nominal data, but it represents an initial step in establishing individual-relationality. We shall review standard information system tenets, and how ABC Classes as a meta-method operates as an information system element within classroom dynamics.

> ‘Most of the time spent in school is devoted to the transmission of information and ways of obtaining it. Less time is devoted to the transmission of knowledge and ways of obtaining it (analytic thinking). Virtually no time is spent in transmitting understanding or ways of obtaining it (synthetic thinking). Furthermore, the distinction between data, information, and so on up to wisdom are seldom made in the educational process, leaving students unaware of their ignorance. They not only don’t know, they don’t know what they don’t know’ (Ackoff 1999)

The data or knowledge pyramid, DIKW, is canon to information science: at the bottom world which is reduced and abstracted to Data, which in turn is processed, organised and made meaningful as Information, which in turn is analysed and interpreted as Knowledge, the judicial use of which is termed Wisdom (Kitchin 2014). Data may be considered neutral or inert (Perez-Montoro 2010), from a realist’s position, a material to be operated upon which enables science to build an objective representation of the world (Desrosieres 1998). However, manipulating the epistemological units that are data is not politically neutral (Poovey 1998). Data is a constructed artefact with implicit bi-directionality, ‘data… need to be understood as framed and framing’ (Gitelman & Jackson 2013, p.2), possessing a political dimensionality (Foucault 1981); data embodies the cognitive process of its creators (Bowker and Star 1999), and data operates on its creators (Ribes and Jackson 2013; Star and Ruhleder 1996). The structure of data requires communities of practice to utilise and thus reproduce cognitive processes and the social relations which enable them (Ruppert 2012). The laws, standards, protocols may enable interoperability or constrain innovation (Lautiault 2012, Star and Ruhleder 1996), and social infrastructures sustain ‘sociotechnical geometries of power’ (Graham and Marvin 2001, p11). The world is not just reflected in data, it is changed by them; ‘the work of producing, preserving, and sharing data reshapes the organizational, technological, and cultural worlds around them’ (Ribes and Jackson 2013: 147). In a child-educational context, we must be especially careful in how we design our research method. It is ethically questionable to provide tools which are adult-orientated and adult-consumed (Valentine 2011); this adult-centricism perpetuates what critical realists call coercive ‘power2’ which inhibits personal and political freedom and excludes children from a political framework (Alderson 2016, p12). The infrastructure of educational data, National Curriculum and national exams, learning platform which collate absences, grades, teacher estimates of ‘attitude-for-learning’ (AfL), behaviour, and inspector grading and school performance tables, clearly are not neutral.

Put simply, data is not neutral, it has implicate political valency. However, ABC Classes is reflective to the participants. The data derived (‘A’, ‘B’ or ‘C’) correlates to a social state which is determined by the collective, which no individual has full awareness of. The ABC Classes intervention is a constructed artefact, literally embodying not just the cognitive but the emotive processes of its creators. It also operates on its creators, due to the subsequent alteration to the behaviour of the teacher. The generation of the data (‘A’, ‘B’ or ‘C’) requires negotiation by students amongst themselves, or with the teacher, implicitly and explicitly impelling a community to form and achieve an A-state, or to withstand the institutional roles of a C-state. ‘ABC’ Class *is* a form of educational data. However, it is reflexively defined. As a form of DIKW, how may we understand its defining characteristics?

Data is not neutral or static, but contains real powers and liabilities. DIKW is active, for example from ‘socially productive activities’ (Nicolini 2012) or ‘flows of information’ (Wenger 1998) within ‘communities of practice’ (Cae & Wenger 1991). Bateson’s ‘information is a difference

that makes a difference' (1972), Konorski's 'Information cannot be separated from its utilisation' (Konorski 1962), simplified to 'information-as-action' (Banathy 1996), all refer to embodied, subjective experience whether that is a biological amoeba (Scott 2004) or a reading conscious mind that is noticing (Case and Given 2016) within a layered context (Foster 2004, p229). The constructivist interpretation attributes no information to the environment, the difference is in the perceiver (von Foerster 2003). This is very different than 'information-as-knowledge', an artefact which is transmitted, signals, words, numbers, a form of 'weak knowledge' (Fricke 2009). By including embodied action, we expand the notion of a purely cognitive agency, and generate a 'rich' or 'thick' description involving emotive and social dimensions (Shotter 2016, p28; Geertz 1973; Smith 2011): 'a thick [complex] notion of persons is essential for rightly understanding what social structures are and why and how they come to exist and change' (Smith 2011, p317). This is especially true in the acute period of increased self-consciousness in adolescents during the socialising and social normalization within educational settings. Viewing participants as more than cognitive agents transforms 'flows of information' into 'warm data' experienced by communities of practitioners (Bateson 2015, p5). The semiotics of information is divergent and empirical exploration of 20 news articles and 16 information system exerts show definitional ambiguities which have practical consequences (Baskarada 2013), despite efforts to provide consistent foundations for information science (eg Brier 2001).

The data that is 'A', 'B' or 'C', is informational primarily in how it dictates the behaviour of the teacher, the relationality with the teacher and amongst students, and the subsequent activities which are available for the students: A-State are capable of more interesting and engaging activities. The knowledge to create an A-State class is beyond the capacity of any individual, however. The capacity for an individual to self-regulate may be insufficient if members of a class exhibit loss of control, awareness, and so on, which will be the norm amongst a classroom of young people. It is insufficient to know. It is important to act. And to act without knowing exactly what or how outcomes will result. This is before-the-fact, information-as-action, regulation of cognition played out in every classroom. Bateson's 'warm data' (Bateson 2015) does not simply evoke the embodied nature of the data, but the real causal powers which actualise between bodies in a community. Hence, the informational divergence through words, which is common for adult 'communities of practice', is compensated by the convergence to social cohesion. 'ABC' Class data-information structure appears to offer a socially relational basis to data.

Informal Knowledge Sharing supports formal Knowledge Management through network of trusted relationships ('Guanxi' in China), forming transactive memory networks which improve teamwork (Davison et al 2013). It is important to recognise that knowledge is not transactive as a possession, but availability and quality (credibility) defines the value of the relationship within a trust network (Davison et al 2013, p92). Transactive memory systems provide a crowdsourced solution to participants facing their own specific contextual conditions (Newell & Edelman 2008), especially when facing a mutual goal (Zhang et al 2007). Of the three indicators developed by Lewis to measure transactive memory system (Lewis 2003), specialisation (ie knowledge and recognition) and credibility (ie actual trust) were shown to be more significant than coordination (orchestrated knowledge transfer) in relation to knowledge transfer (Wang et al 2018). Informal workarounds in the workplace can decrease centralised organisation control, and instead of vilifying these in situ solutions research is conducted to learn from such impromptu solutions and encorporate them into formal implementation (Ignatiadis & Nandhakumar 2009).

Davison and Martinson describe a problem in organisational implementation which is echoed in many fields (anthropologists imposing 'sensitive' anthropological models, teachers imposing proven learning strategies), in order to emphasise that the specifics of context must come first in the adoption and adaption and innovation of user engagement. Grounded theory is the intended solution to the problem of universalism and particularism through its generation of substantive theory (Urquhart 2016).

The evidence that trust relationships, contextual conditions and mutual goals are more significant than coordinated knowledge transfer, correlates to an A versus C State class. It correlates to 'peer teaching', though we must be careful to avoid importing conceptual bias of C-state, and perhaps refer to it as 'learning facilitation'. Context, by which we mean the unique relationality within a class on any specific day, comes first in the adoption and adaption and innovation of learner engagement.

The astute academic reader will notice that I am breaking the rules of academic practice by reading an alternative interpretation to the evidence provided by scholars above[24]. However, ABC State may not just exist as a social condition of students in secondary school. It may refer to our ability in whatever social organisation, to self-organise. Enforcement of procedure indicates a C State, even within the academy of scholars to which I am appealing to enter based on the work here presented. The reflexive condition, the bidirectional causality of structure-agency (Bhaskar's 'dialectics of structure and agency' (Bhaskar [1993] 2008b, p.153)) is implicate in data, in words. And so, let us continue with this line of analysis[25] by penetrating the utility of number, and explore alternatives to the reductive and abstractive relationship of 'world' and 'data'.

Rotman (2000) describes three types of mathematicians (the platonic, the formalist, the idealist) which correspond to different types of mathematics: platonic maths is the application of number and their relationship to an idealised world, triangles and cubes, and allows a mapping to the physical world; formalist maths is symbolic manipulation, pure maths of number and their relation; idealist maths is the inchoate psychic substrate from which mathematics emerges. The first is a realist's position and does not require a mathematician, since the mathematical world is discovered; the second requires agency in as much as processing is required, a job which can be equally performed by computer; the third requires a mind to perform the mathematics. Science operates in the first mode, mathematicians in the second (see Lakoff & Nunez (2000) for an interesting exploration of embodied mathematics); Rotman provides little insight into the third type, though it is based on a postmodern philosophy of mathematics. Deleuze and Guattari's 'A Thousand Plateaus' (1987) distinguishes two types of number: the numbering number, and the numbered number. According to Deleuze and Guattari's extensive symbolic mapping, the numbered number is 'royal', part of The State's military apparatus and signifies logos, major science, the 'regime of signs'; it is what we understand as number, and arithmetic has been integral to civilisation logistics, measurement, calculation and technology. Numbered number is the objectification of number, and it positions itself outwith human perception as ontologically

[24] With the practice of Reflexive Reading (Pinto 2021, 2020), this may be experienced as a valid form when attempting to apply a complex mapping. Knyazeva attributes interaction of complex systems to Haken's synergetics (1977), admitting to the limited transference of synergetic models (one-to-one, specific case, not generalised). Synergetics provides more of a metaphoric, analogic, and isomorphic function, more a hermeneutic method for relating across different emergent ontological levels (Knyazeva 2002).

[25] Ie Konorski's 'Information cannot be separated from its utilisation' (Konorski 1962).

real and thus capable of mapping the world of objects as "laws" of physics and hard sciences. Time is objectified, enabling a regimental enforcement and identical repetition. In contrast, the numbering number is 'nomadic', where the process of counting is sequential, science is endogenous or intrinsic and cannot be extracted or abstracted from the subject, the object of attention is situated within its context, there is no abstraction or comparison to an objective 'law'. Time remains open and receptive to change. It is this 'nomadic' form of science which is comparable to the intuitive mathematician.

The ABC Classes meta-method appears to conform to this 'nomadic' science. The 'ABC' Class data is not an objectification of social state. It is a reflection of the participants social state. It cannot be abstracted from the uniqueness of the conditions. It is informative, certainly, for the subsequent behaviour of participants. But it is permanently open to the potential of re-evaluation because of the ongoing social state of the class. A-State, if it is induced in a class, is a 'nomadic space', temporal and receptive to change. The temporalisation and contextualisation of number, or data, does not represent an extension of data but its transformation. Will the participants operating in an A-State of relationality, develop more appropriate tools and methodology for the study of people? Or, will participants remain in a C-State of relationality which conforms to the consequence system, with its implicit consequential morality which transfuses the boundaries of the educational system, and supports and recreates the predominant political frame within which we all appear to be within? This is not polemic. Rather, an effort to draw attention to how theory is grounded, to give rise to meta-methods which support a 'nomadic science', a form of social science which is relational and implicitly reflexive at the point of data [And operational by children].

Complexity of Self-Organisation and Emergence of 'Dissipative Control'

We have described the pedagogical qualities that are exemplified in classes which demonstrate 'dissipative control' (Doll 2012a, p222) in Section 3. Doll's mapping of Kauffman's heuristic about complexity to social classes sets the foundation for our intervention and deserves to be quoted in full here:

- Stuart Kauffman, neither a Deweyan, Piagetian, nor educator— but heuristic in his own right as a complexity theorist— posits that self-organizing systems develop or emerge when "just the right amount" includes (a) a critical, active mass, (b) only a few operating connections at any given time, and (c) a simple set of operating rules (Kauffman 1995, Ch. 4)…. Using Kaufmann's frame as a metaphor for the structure and dynamics of classrooms, I see his "(a)" as the collection of a viable, active group of learner-students, teacher included, his "(b)" as the emergence of varying, interconnected, dynamic foci (the "aliveness" of situations as it were), and his "(c)" as the *few basic procedures* needed for having the energy generated by these interactive situations be iteratively or matrixically connected. Use of this frame does of course pretty well destroy the usual rubrics of classroom management— the centralizing of control with the teacher, the use of linear lesson plans, the detail of advanced organizers or syllabi, rules of conduct, and traditional evaluations. Control is dissipated into the group, community, network, system, and indeed frames itself. Lesson plans are nonlinear and for me, recursive, depending on the interactions developing within the situations. Details dealing with organization, conduct, evaluation are all the result of reflections on occurrences rather than on pre-set formulae or

> procedures to be followed.
> (Trueit 2012, p226; Doll 2000)

Doll's 'Complexity in the Classroom' (Doll 2000, 2012) applies chaos theory (dance not march, explorative learning), self-organisation (spontaneous occurrence, ie emergence sui generis without forcing, bifurcation points), fractals (maths of iteration) to the learning environment. Doll falls short of a 'measure' of self-organisation in classes, ABC Classes. The closest we get to a succinct description of the 'few basic procedures' quoted above is 'reflective habits' and 'a time-developmental process of cooperative interaction' (Doll 2012, p224). Let us review Doll's derivation of 'dissipative control' and an attempt to discern greater refinement on what is meant by a 'few basic procedures'.

In 'Classroom Management' (Doll 2012), Doll considers a system of 'dissipated control' (Doll 2012a, p222), seeded in Dewey, which resides not unilaterally with the teacher nor with the students but instead "resides in the nature of the situations" themselves (Dewey 1966 [1916], p39). (Dewey's metaphor of boatsman indirectly references 'cybernetics'.) To stabilise the self-directed learning of a student Dewey notes the tempering function of the history of relationships between learners and teachers, though Doll reinterprets this point: 'A combinatory dynamic is at work here. The teacher does steer but does so by tapping into the creative energy [currently] existent in the classroom.' (Doll 2012 p225). The state of 'dissipative control' correlates to A-State. Attempts to understand how this arises often fall into categorisation of emergent behaviour. For example, Gang applies Doll's postmodern curriculum methodology to teaching and evaluation to derive a dynamic instructional teaching experience for English literature studies (Gang 2015). Gang extracts four important elements to Doll's pedagogy: perturbation (to excite the students' attention); control is not from an external authority, rather 'authority moves into the situation'; recursion translated as reflexivity, deriving experiential transformation; and as a result, teaching shifts from didactic to dialogic (Doll 1993, p101). Attempts to isolate the principles are non-trivial; the oriental concept of 'wuwei' applied to classroom demonstrates this: 'ongoing interactions within and between the micro-system and the macro-system' and 'the peer relationships among students also need to shift from mirroring social hierarchy to collaboration and compassion' (Wang 2019). What is missing for these descriptions is a method on how this A-State emerges. To do so, we must examine what is meant by self-organisation, just as Doll has extensively in his writing, however our focus guided by exactly how ABC Classes map social dynamics.

Andersson sees 'societal systems… as a type of system where complexity is mixed with complicatedness, yielding an emergent quality – wickedness – to which neither complexity science, systems approaches, mathematical models or combinations between them lend themselves very well' (Andersson et al 2014, p148). This is contrasted against 'complex realism', critical realism and complexity applied to social systems (Harvey & Reed, 1996), which differentiates 'restricted' versus 'general' complexity. Simon's concept of 'near-decomposability' (Simon 1996) to enable short-run studies of hermetically sealed environments is operational for engineering systems (and the ideal scientific method), but becomes inoperable in environments with dynamic interdependence. Andersson stresses the necessity for narrative theorising and formal theorising; extending the reach of formal models into both complex and complicatedness, while 'reverse-engineering' from narrative theories which are situated within complex and complicatedness arenas. Andersson appropriated the term from 'wicked problems',

as situations in the real world which defy modelling (Rittel & Weber 1973), whose whose models produce cascading problems.

There is a notable omission of reflexivity in Andersson's work, perhaps to distance itself from wicked in a moral sense. However, reflexivity as we have observed is a sticky problem for the scientific method, and the moral aspect of solving wicked problems has been described in terms of complexity: 'whoever attempts to tame a part of a wicked problem, but not the whole, is morally wrong' (Churchman 1967, p142). In contrast and potentially complementary to a western approach, an eastern approach to complex problems is to locate complex (wicked) problems as mentally sourced (Tuan 2002); this appears to indicate the knotty issue of reflexivity.

Knyazeva attributes interaction of complex systems to Haken's synergetics (Haken 1977), admitting to the limited transference of synergetic models (one-to-one, specific case, not generalised), and traces its theoretical developments through theory of *dissipative structures* (Prigonine & Stengers 1984; Prigogine 1989), theory of deterministic chaos (Mandelbrot 1982), theory of self-organised criticality (Bak 1997), and theory of autopoiesis (Maturana & Varela 1980; Maturana 1975; Arnoldi 2006). Prigogine described the emergence of patterns in nature as a shift from 'being to becoming', 'the natural contains essential elements of randomness and irreversibility', 'spontaneous activity' (Prigogine & Stengers 1984). 'Classic thermodynamics leads to the concept of "equilibrium structures" such as crystals. Benard cells are structures too, but of a quite different nature. That is why we have introduced the notion of '*dissipative structure*,' to emphasise the close association, at first paradoxical, in such situations between structure and order on the one side, and dissipation… on the other' (Prigogine & Stengers 1984, p143). Dissipation is not just waste, friction, heat, but rather dissipation leads to organisation and order. Dissipative structures maintain their form far from equilibrium. Synergetics provides more of a metaphoric, analogic, and isomorphic function (ie hermeneutic function) between different emergent ontological levels (Knyazeva 2002). Since then theories of supervalency levels of self-organising have been proposed (Pervova & Kelasev 2019), which share similarities with the relationship of upward and downward causality between causal powers of emergent systems and their components (Lawson 2013).

Self-organisation typifies complexification: molecular organisation, surfactants with hydrophilic heads and hydrophobic tails forming micelles in water (or reverse micelles in oil) or double layer vesicles the forerunner for liposomes and cellular membranes (Capra & Luisi 2014, p145). Mathematically, self-organisation is visibly exemplified by Conway's Game of Life (Gardner 1970) where automata emerge from simple cellular rules, categorised as still life (where the pattern remains fixed), oscillators (where a pattern cycles through set number of patterns), and space ships (where pattern cycles and effects movement). This is self-organisation by design where the rules and initial conditions are controlled.

For the purposes of understanding the internal structure of ABC Classes, we turn to Reynolds who was the first computer scientist to produce a realistic simulation of flocking (Reynolds 1987). Reynolds skill was in abstracting from the complexity of the phenomenon of flocking the necessary elements to code, based on an insight into 'fuzzy objects' or 'subobject' of intentional particles. Although gravity was simulated, many other physics rules were not, nor were any of the physiological conditions of feathers and wings (or similarly the buoyancy of fish in their

equivalent, schooling). The visually arresting effect of 'murmuration', included the ability for a large cloud to split and reform, were based on the following three rules (Reynolds 1987, p28):

- 'Collision Avoidance: avoid collisions with nearby flockmates
- Velocity Matching: attempt to match velocity with nearby flockmates
- Flock Centering: attempt to stay close to nearby flockmates'

Each subobject operates as an individual 'boid'. Each individual boid's movement is based on a calculation of neighbouring boids: avoiding them while matching their speed and orientation, and locating themselves within an average position in relation to neighbours. Each boid is performing the same calculation and thus the behaviour is reflexive: as boid (X) moves closer to compensate for the movement of neighbours (Y) and (Z), so (Y) and (Z) may move away to avoid a collision which may in turn bring them closer or further apart. The boids are constantly jostling for position, and because they are in constant forwards motion, this results in the flocking phenomenon.

Reynold's original model has had many variations, for example adding evolutionary algorithms to learn flocking behaviours (Ramos et al 2019). The history of multi-agent systems, mathematical methods, simulation models and control theory can provide insight into collective behaviours generally (Wang & Lu 2019), demonstrating a variety of explorative paths, including a financial model of community flocking (Ha et al 2015), biological models (eg Pfeifer et al 2007), how attitude correlations generate coopetive and cooperosity states of consensus (Tangredi et al 2017). Raafat et al categorise computed models (physical flocking simulations, math models eg cellular automata, computational models eg traffic, graph analysis eg social graph, virals) which are considered macro-level pattern based (relational between entities) versus micro-level transmission based models, divided into non-mentalising (eg emotional contagion and mirror neurons, or social contagion, mobs, memes) and mentalising types (eg social influence and conformity, or relational models and information cascades).

Two early pioneering methods indicate the jump required to simulate social engagement. Lewin attempted to model the total situation of sociological facts because of the interdependence of all levels of interactions (physical, cognitive, emotive); he termed it field theory and generated geometries and methods (Lewin 1939). Moreno was the first social psychologists to map likes amongst a group of people and derived the first social graph: the sociogram (Moreno 1951). It showed the most popular people in a network, as well as those who were neglected. By adding 'dislike', Gronland derived five 'social' categories (Gronland 1959): Popular (liked by many and disliked by few), Neglected (liked and disliked by few), Rejected (liked by few and disliked by many), Controversial (liked and disliked by many), Average (none of the above). This shows an equivalent jump to Reynolds' Boids program. There was no definition of feathers or gravity or anything resembling actual birds, nor any definition of the phenomenon of 'flocking'. The result of the self-organised set of rules produced a behaviour on a screen that the observer can interpret as 'flocking'. Similarly, these affective evaluations (like, dislike), derive social categories which correspond to social groupings, and over a period of time, individuals who occupy these socio-positions exhibit personality types.

Global digital infrastructure has produced immense databases of social media big data; data scientists are learning how to use powerful social graph analysis tools (Rogers 2013) as information science blurs into art, and aggregation of data on individual produces thick data

(Wang 2013), a stochastic extension to Geertz's thick description (Geertz 1973). The tendency in social science is to apply mathematical models of complexity to large sets of data (eg Byrne 1998), which according to Andersson suggests complicatedness not complexity (Andersson et al 2014). To apply complexity at the micro level, we take a different approach to data: to generate 'warm data' which thereby thickens relationships in the real world (Bateson 2015). The sociogram generates representational social groupings from categories which are essentially subjective (like/dislike). The original data for sociograms is sourced in individual evaluations. The sociogram is a spatial representation of the relationships between people and the formation of groups, and this gives rise to the supposition of categories and personality types which correlate in some way to the ongoing psycho-social engagement between people. It is true that the 'ABC' Class data is evaluated by individuals, however it is attributed to the collective state of the class. It is the sociological equivalent of the individual like/dislike evaluation; however, there is no representational mapping, no externalisation; instead the effect is on the internal relationships between participants in the class.

The essential mapping in Reynolds' boids (Reynolds 1987) is contiguous in that birds are flying in 3d space, and they are presented by boids on a 2d surface (which simulates a 3d space). It is spatial. We are taking this 'flocking' as systemically similar to A-state classes, which is non-spatial but rather the psycho-social dynamics of a class. The simulation is instructional because it provides a multi-agent modelling of a complex phenomenon, flocking or murmuration. The definition of ABC Classes relies on the reflexive agency of the participants. The rules derived by Reynolds control the movement of the boids relative to one another. These rules are implicit within the participants, a multiplicity of beliefs which influence motivation and action, as we have seen (section 2), and formulated in various programmes by schools as 'expectations'. For the rubric of the ABC Classes, this is referred to as 'self-discipline' and it is located in the individual. However, this 'self-discipline' is defined relative to the collective state of the class. Because students are not dots on a screen, and we are not simulating them, we make use of whatever their metacognition is regarding their own state (self-discipline) and relate it to whatever their metacogntition is regarding their wider social context, the context of the classroom of peers and the teacher.

ABC Classes & Transformational Praxis

Spatial imagery is rejected by Bhaskar when attempting to conceptualise social emergence (Bhaskar 1978, p85). The basic model of two people combined as one dancing pair, or two interlocutors engaged in intimate conversation, or a single classroom of thirty students; the physical domain dominates our thinking. The students are equated to nodes on a graph or elements of the cell or lipids that constitute the cell wall; the concept of autopoiesis emerged from study of biological systems after all (Maturana 1975). However, severed of this spatial metaphor (or biological domain), discussion of systems and emergence, autopoiesis, becomes very abstract, either in terms of words (cf Luhmann [1984] 1995), or topological or algebraically complex maths. Luhmann adopted autopoiesis in his social systems theory: the 'radical temporalisation of the concept of element' (Luhmann 1984, p11), whole-part relation replaced with system-environment, self-reference, resulting in meaning-constituted systems consisting of a double horizon of meaning dimensions, so that structures are temporal limitations not determinate (Callaghan 1998). Luhmann's theory may be clarified by considering self-reference concepts borrowed from cybernetics, specifically self-regulation, self-organisation, self-

observation, and self-production (Guy 2018), however Luhmann morosely[26] predicted the complexification and complicatedness of academia (as we explored in section 3): 'Furthermore, systems theory, itself struggling to surmount the prevailing predispositions of the European tradition, is becoming more complex (and not simply more complicated in terms of models or variables). Evaluation and even understanding becomes difficult.' (Luhman 1982, p137).

The meta-method of ABC Classes defines an ontological state of psycho-social dynamics in terms of the participants who are members of that psycho-social dynamic. The definition by-passes relationships. It engages the 'intentional embodied causally efficacious agency' (Bhaskar [1993] 2008b, p277) that is the student or teacher, and the concurrent social ontology which results from multiple agencies.

The state of standard classrooms default to C-State because of the consequence system, the linear delivery of the consequence procedure and its influence and corollaries in curriculum delivery and so on. The teacher's role is well defined for maintaining a C-State class, as we have described (Section 1). The description provided by Doll of 'dissipative control' (Doll 2012a, p222), the pedagogies of Dewey (1966 [1916]), Schon etc where the teacher is learning facilitator, appear to match A-State. The ABC Classes provides a simple framework for students to exercise whatever skills they have available to them to achieve collectively an A-State. The teacher is liberated from the need to implement the consequence procedure, and subsequently relax the various corollaries which compose the supporting consequence system. The teacher has more time to assist students, provide richer learning activities. The relationships change. The system changes.

What system results from classes which consistently achieve A or B state is worthy of study. The Methodology describes a standard methodology for capturing some qualitative data from teachers who implement the ABC Classes. This will only provide experientially close observations. We may only consider the potential influence of AB-State classes systemically beyond the environment within a classroom. As a first suggestion, I would consider an increase in the interest of students in improving their learning environment through the adoption of learning technologies which have been proven to be useful in classes. That is, students are the agency in reducing the practice-theory divide.

In this way, we hope to have achieved Objective 5: review complexity and self-organising systems to support and improve ABC Classes intervention and its A-B-C as a relational-reflexive data-information mapping.

Addendum

I have been careful to include material which conforms to standard theoretical frameworks. The attempts by Doll to apply mathematical form to psycho-social dynamics is exemplary, but his work remains side-lined. It is hoped that the work presented here may bring more attention to Doll's work.

I have been careful not to include iterative mathematical interpretations which lend themselves, it seems to me, to fractals. The mathematics of fractals, beyond their abstract quality, are

[26] Archer described Luhmann as his own "self-despairing subject" (2010, p285). A sociological perspective can often weigh heavily on the agency of the individual.

characteristically applied to physical mappings (eg representing biological forms such as trees or geophysical forms such as coasts) or data compression algorithms. The application of fractals to social dynamics has not been seriously attempted in academia and we are not in a position to do so now. The same with the mathematics of the Mobius strip. However, an attempt has been made to do the groundwork, at least metaphorically or conceptually, interpreted or translated to the ABC Classes structure.

Kreinath introduces a temporalised metaphoric mapping of social behaviour (play and ritual) to properties of sound-music (rhythm, pulsation, intensity), with an additional filter of a scale-independent self-similarity (ie fractal) (Kreinath & Shapiro 2019). Bateson's construct of 'Framing' as a hierarchy of classes[27] in the context of play and ritual, is further developed with the one-sided property of mobius strip by Neuman in order to provide an original conception cognitive/metacognitive interplay: 'These boundaries constitute oppositions of self/non-self or play/non-play by continuously oscillating between communication and meta-communication and introducing different levels of abstraction' (Kreinath 2012, p51). Specifically, Neuman's application of the mobius strip to semiotics is based on the reflexive loop which Bateson added to Russell's Theory of Types and the self-inclusion of Spencer-Brown's Laws of Form, enabling a conjuction of 'form' and 'boundary', the translation and rotation in third dimension of the Mobius strip being mapped to temporal sequence and repetition in social world (providing an opening for self-similar fractal dynamics) (Neuman 2003). Rather than treating play-ritual as oppositional rigid conceptual frameworks, Shapiro considers them as experiential dynamics of divergence and convergence, which tend to horizontal deregulation or linear hierarchisation (Shapiro 2019). 'Analytical emphasis thus shifts from that which happens inside the "playful" and "ritualized" temporalities, respectively, to the moments or processes of transition between them' (Shapiro 2019, p21). Methodological shift from static structures, boundaries, binaries and dialectics towards temporalisation of generic rhythm, pulsation, intensity; potentialities and possibilities of engagement with alterity ('the other'); reconfiguring knowledge which instantises social order.

Because our focus is on an evaluation of a social state, the relationship described above as a temporalized Mobius strip may be describe as an *ontological and epistemic fold*. Our focus is on the social, not the psychological. The social ontology of ABC State. This operates at the temporal level of evaluation, as 'A', 'B' or 'C', with consequential results in the alteration of the teacher's role and subsequent behaviour of all participants. And as described by Kreinath, in the continuous oscillation of communication and metacommunication (sociological perspective) or cognition and metacognition (psychological perspective). This we may term is its fractal nature, operating at different temporal scales and across multiple reflexive agencies: the self-same process dictating the role of the teacher from lesson to lesson, and in the moment of intentionality. As such, the social ontology of the state of the class is a moving moment across a multi-reflexive environment (social ontology) which may be 'sampled' at any instant by any participant (psychological epistemology). Hence the ontological-epistemic fold as a processual function. It is information-as-action not information-as-knowledge, regulation of cognition not knowledge of cognition, or in its finest form, awareness of social not knowledge of social.

[27] Which I understand as 'operational awareness'; that is, not the knowledge of 'hierarchy of classes' but the mental operation of such a from.

Methodology of Research

The School Intervention describes a quasi-experiment in secondary schools to 'test' the ABC Classes meta-method as an intervention. The philosophical assumptions are critical realist ontology and dualist epistemology. Though the ABC Classes meta-method is implemented as a quasi-experiment by researcher, it is experienced as self-contained, participatory action research. The rationale for the Research Design is to provide an individual-collective meta-method for students and teachers.

ABC Classes approximates a quasi-experiment in relation to before/after measurements and evaluations of student behaviour, and iterative social learning within classes attaining ABC states. However, the ABC Classes is a meta-method designed for dense multi-reflexive environments which departs from hard-science derived experimental methods regarding causality attributable to variables or constructs (Pickard 2013, pp119-125; Robson & McCartan 2016, pp126-132). Statistical tools have severally restricted applicability[28].

Objective 6 -- ABC Classes: Action Research by Teachers

Lewin rejected behaviourism with its negative view of human nature requiring autocratic leadership, and was emancipatory in involving the participants in their own decisions through democratic means (Adelman 1993). Lewin's process was not inductive or deductive but pragmatic, generating cycles of hypothesis and action to fit the context within which the participants found themselves, in a kind of iterative quasi-experiment. The method remains pertinent to this day: to utilise 'independence, equality, and co-operation' (Lewin 1946), seeking 'the wisest solutions and the best practical administrative alternatives' (Marrow 1969, p81), 'the clarification of hypothetical, "if so", questions was fundamental to all social science research' (Adelman 1993, p8); minority group integration through social conflict resolution (Bargal et al. 1992); 'Action research is a practical form of enquiry that enables anyone in every job and walk of life to investigate and evaluate their work' (McNiff 2017, p9).

With the increased adoption of participatory research and action research, there has been a movement for the inclusion of students in the process. This is a non-trivial matter. Inviting youth into research introduces multidimensional methodological complexity and ethical principles (Seymour et al. 2017; Kelly 2018), though it may expand the actual contextual conditions of participants skills, capacities and purposes (Sinclair 2004). To avoid the disillusionment in participatory decision-making processes, sustainable involvement of youth in reform must operate through actionable engagement (defining, shaping, managing, implementing) with organisation and educational institutional forms (Levin 2000; Hill et al. 2004). For positive change to occur it must be embedded and iterative, not conciliatory one-off events; key stakeholders are essential to achieve tangible outcomes, and the inherent asymmetrical relationship between inter-generational participants implicit in participatory research projects involving youth, necessitates means of managing institutionalised asymmetric power relations (Akerstrom & Brunnberg 2013; Sinclair 2004; Hill 2019). And the process of student involvement itself may be seen as structurally cyclic at multiple levels, eg participant metacognition in the face of navigation of power and facing practical difficulties (O'Brien &

[28] See theoretical basis for Reflexive Reading (Pinto 2020, 2021). Each case is context specific.

Moules 2007), conversation circles and mutual sharing of experience (Akerstrom et al. 2015), 'collective praxis approach' places the instigating researcher as a facilitator (Caitlin 2007), and consultative institutional support (Lundy et al. 2011). The majority of complication exists at their interface with adult organisational structures, which also applies to education (Vanderstraeten 2002).

The activity of a teacher in inspiring children to learn is considered an important part of the job, forming positive relationships resulting in higher academic achievement (Hill 2019; Kindermann 2016). Teachers' soft-skills, emotional intelligence and social skills help create a 'prosocial classroom' (Jennings & Greenberg 2009) and may be the target of initial teacher training or Continued Professional Development, but these are at best inferred from formally defined 'expectations' as an aspirational code of conduct or demonstrated by the teacher's character and behaviour (Short et al. 2018). Lewin also pioneered intra-group relational methods known as 'sensitivity training' (otherwise known as encounter group, training group, or T-Group): 'Everyone is required to state their here-and-now observations throughout the process. In this sharing, criteria such as directness, authenticity, congruence (i.e. between experience and expression), and empathy are emphasised' (Dash 2007, p.1279). Lensed as action research or sensitivity training, teachers are actively engaged with the social wellbeing of students which aligns to the principle purpose of action research; 'reducing Action Research to a set of methods or techniques and obscuring action research's central aim which is the creation of more democratic, just, fair, and/or sustainable human situations' (Greenwood 2007, p.133).

Against the back drop of expectations and soft skills and healthy learning ambience, the occurrence of 'low level disruption' is almost exclusively attributed to a breakdown in the classroom order, attributed to the failure of the teacher to maintain control (Mayer 1995; Gottfredson et al 2005; Skiba et al 1997). The failure of the teacher, the failure of school discipline policy. The social order in a class is essentially autocratic and is supported by a government-sanctioned consequence system: 'students themselves are clear that staff will deal with bad behaviour' (Ofsted 2014, p25). Because of the self-developing nature of young people and their learning to exercise soft-skills of their own, their desire to socially interact may become misguided and (if prevented) redirected towards subversion of the expected social order. In this light, 'low-level disruption' may be seen more as a misalignment towards social cohesion, an experience which is somewhat tolerated as the teacher negotiates with their soft-skills a positive social environment and less as a sign of lack of control by the teacher or a failure of the discipline policy. There is, however a systemic failure: nowhere is there a formal operational mechanism or method which supports a democratic, cooperative, hypothetical 'what if' inquiry to the social order of the whole class.

From this perspective, it is possible to see the structural similarity of researcher-participants in action research to that of the teacher-student relationship albeit operating at an entirely implicit level: the goal of emancipatory social action goes unrecognised, and the resulting social or soft skills may be tacit, intangible knowledge embodied both in students and in the teacher. This is entirely compatible with Action Research: 'The central actions taken are purposeful and aim at creating desired outcomes and they are evaluated according to how well they produce those outcomes. Hence the knowledge creation process is based on the inquirer's norms, value and interests.' (Levin & Greenwood 2001). If we consider 'low-level disruption' as continuously sampled evidence of a negative correlation to emancipatory social action, it is feasible to

appreciate that current practices in schools may be understood as Action Research conducted badly.

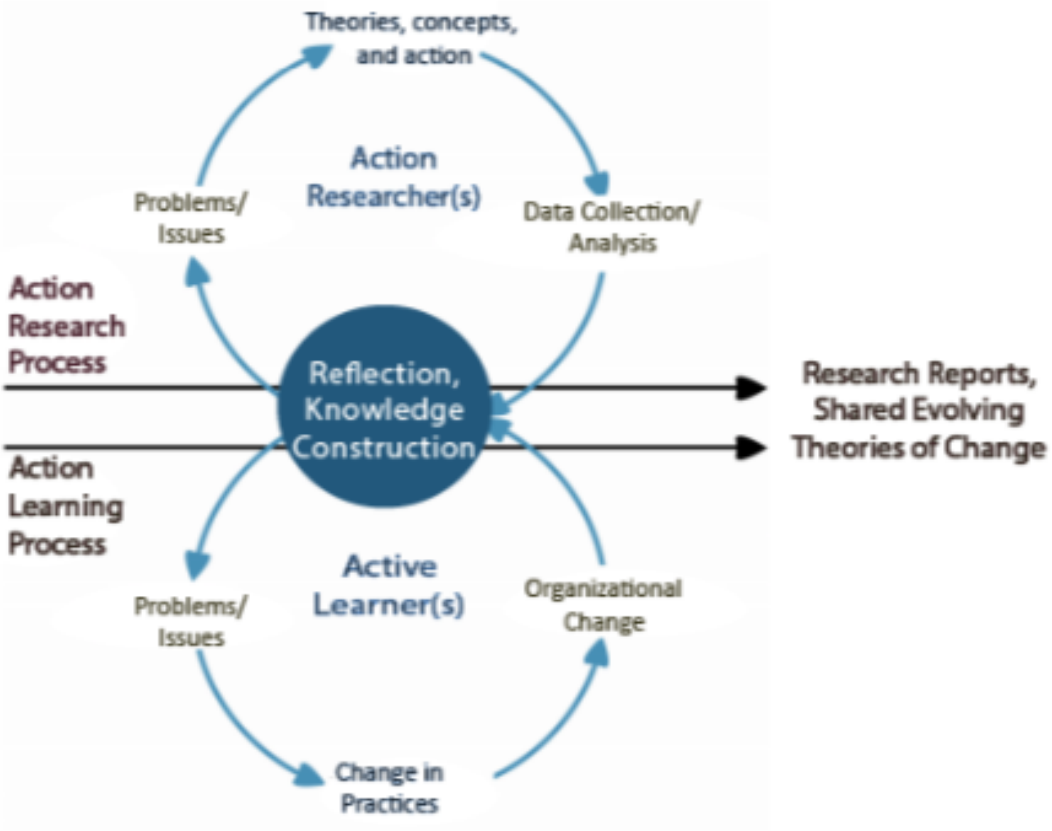
Action Research is compatible with Critical Realism (Cassell & Johnson 2006), which demonstrates the underlabour performed by Bhaskar (Holland 2019a, 2019b; Lopez & Potter 2001; Lawson 2012) for social science. By retaining our interpretation of teacher as action researcher, the compatibility of critical realism reads as follows: the alignment to emancipation (students becoming self-directed learners and achieving scholastic success); the researcher's capacity to broaden the empirical understanding of participants by introducing real powers and generative mechanisms which are not perceived (bringing awareness of consequences of unseen or absent actions); the temporal process of actualization (that performance in current class corresponds to performance in distal exams, cf 'The scope of time ahead which influences present behavior' Lewin 1939, p879); the researcher's awareness of ontic depth and causal mechanisms assists the formulation of participant actions (students 'being able to perceive these forces is the first step in controlling them, rather than being controlled by them' Friedman and Rogers 2009, p.44); the relativity of epistemic perspectives (where awareness and knowledge of students regarding social engagement is limited and varied, something to facilitated by the teacher in order to strengthen social cohesion). Which is to say, 'if subjects are engaged through multiple standpoints, then objectivity [ie the shared social world of the class] becomes significant as a lever of agency in the service of dialogue and debate and of transformations' (Morgan and Olsen 2008, p.107)

The method of Action Research frames the researcher (ie teacher) as an assistant who helps participants (ie students) to achieve better morale and productivity (ie performance in class); this requires democratic involvement in the daily social process. We face two generative mechanisms which Critical Realism may help us resolve: the ontological mismatch of social and individual, and institutional recreation of itself. Firstly, results of social order on a daily basis are measured retrospectively by individual academic achievement (topic reviews, end-of term or year exams, national GCSE exams). The daily process is social, the resulting measure of success is individual. In addition, failure in the daily process which is interpreted as 'low-level disruption' (rather than misaligned social cohesion) is met by individual sanctions. In sum, the social contract in schools is poorly structured. Secondly, researchers are employing adult-scale techniques, which assume an accepted institutional order (work as payment and hierarchical power structures, social order through judicial and penal system) and socially normalized dialogue (Valentine 2011; Alderson 2016). Adolescents in school do not possess such a stable social state; they are not paid to attend. Whatever the institutionalised order imposed in school, there is considerable effort to undoing it in adult education (cf Organisational Science) which is aimed at encouraging independence, equality and cooperation (Lewin 1946). Thus, the opportunity arises for a version of Action Research that is operational with adolescents and teachers to prevent this level of institutionalisation.

So far, we have been able to appreciate that 'low-level disruption' may be understood as Action Research which is conducted badly because there is a lack of formal method or technique or specific instrument; and so it automatically collapses the actual evidence of social cohesion (chatting, calling out) into an explanation of failure of classroom management or institutional support mechanism. Then we addressed the theoretical complementarity between Action Research and Critical Realism which has not been fully realised. Now it remains to show how a natural extension or variation of Action Research can be formed by fusing it with Action

Learning to form a continuous and iterative ‘self-developing’ process where the participants form their own social cohesion: the meta-method of ABC Classes.

Action Learning is a cycle of iterative learning which evolved in organizational practice (Riel 2010-2019):



(From Riel 2010-2019: ‘Figure 3: Relationship between action research and action learning)

This may be usefully transposed to cycles of ‘individual learning’ and ‘collective learning’, where all participants are learning relative to themselves (the bottom cycle in the diagram), and relative to the class through the intervention of the teacher as action-researcher (the top cycle above). First, according to the ABC Classes meta-method, because of the concurrency of learning, especially for students new to a school (including Year 7 students new to secondary school) as well as new teachers to the profession, the responsibility of the state of the class lies in all participants67, with accountability correctly attributed to the adult. Second, it is not the exclusive power of the teacher to operate within the context of the whole class, but that adults have wider awareness (epistemic horizon) than adolescents. To avoid ‘egalitarian incrementalism’ (Porter and Shortall 2009), a criticism of Grounded Theory where the description of the system is limited to the participants (in this case the young field of view of students), the action-researcher (ie teacher) provides a wider scope. Critical Realism permits the addition of expanding frame beyond participant perspective, providing wider issues, causal

powers, generative mechanisms (Ram et al. 2014). The teacher may be reflexive, aware, objective, advisory, consultative. Third, the internalisation of all this experience amongst students and teachers generates a ‘continuous intervention’. The externalised effects of the intervention are the improvements in verbalisation and explication, as demonstrated and reported by students and teacher. Fourth, all participants are future-planning and future-determining, equivalent to ‘meaning-making’ and ‘causality’. This formulation of action-research as a meta-method reveals ABC Classes is not just an explanation, ‘this class is A-state because…’, but that the act of evaluation of ABC-state is determining the structure of relations for the next class, that is, which role the teacher will fulfil. Iteratively each lesson, and yet continuous within each less to ameliorate the social cohesion. Sixth, adults have the tendency to think in bounded organisations and the roles of people within them (eg ‘teachers’, ‘students’). Informed by the informal relationships and identity-bounded groupings of friendship groupings (the authentic field through which collaborative work operates), so the notion of ‘us’ and ‘them’ is dissolved. The generative mechanism of adult institutions is pertinent only in the reinforcement of the consequence system which defines the C state. Nowhere in this description is there ‘classroom management’.

The elegance of the intervention introduced in schools, ABC Classes, generates its own data for the use of the participants themselves. It is sufficient to describe how the structural qualities of the ABC Classes intervention share a similar form to Action Research, and as such constitutes a concrete meta-method according to Critical Realism. The meta-method may alleviate some of the problems reviewed earlier; namely, allowing the emergence of collaborative skills, enabling greater self-determination and self-regulation of students which simultaneously shifts the adult role from teacher/disciplinarian (C-state) to learning-facilitator/role-model (A-state). Consequently, research for improving motivation, self-efficacy, gaol-orientation may be invited by students and teachers to help them maintain AB state classes, which potentially improves school-university relations may help reduce the theory-practice gap.

In this way, we hope to have achieved Objective 6: reframe the psycho-social dynamics in a classroom as a form of immersed or self-contained Action Research, in order to propose ABC state as a supporting data-tool.

Objective 7 -- School Intervention

Preparations include deciding exactly how many classes are involved in the intervention, gathering data on the classes (behaviour, academic evaluation, attitude) and how the intervention are delivered to the students (through teachers or researcher). The teachers record the state of the class, record events in a diary, and gather for reflective sessions. The researcher returns to capture legacy of the intervention, and the PhD Thesis is given to the involved schools once completed.

Preparations

Meeting with head teacher will determine the scale of the intervention, whether specific classes or whole year group, and the duration of the intervention (half-term or full term, though ABC Classes may continue to be used by teachers subsequently). Parents' consent is informed electronically with opt-out option which will exclude student data from the research. The researcher introduces the intervention to teachers who in turn deliver the intervention to their own students[29]. The schedule for delivery and dates for Teacher Reflective Sessions are pre-arranged.

Before & After Institutional Data Collection & Teacher Evaluation

Data is gathered for all students and recorded in spreadsheets according to Data Management System. Data includes name, class, teacher, anonymous assignation, behaviour record (number of C1, C2, C3, C4, C5 over previous term), Attitude-to-Learning (AtL, evaluation by teacher 1-4), academic grade (previous grade %, expected next grade %), evaluation of interpersonal intelligence (teacher evaluation 1-10). The raw data is anonymised before analysis.

Delivering & Conducting the Intervention

The ABC Classes is delivered to the students. The minimal requirement is for teachers to record the perceived State of the class, and to teach accordingly. Because of the reflexive nature of the meta-method, the teacher has full discretion on how the ABC State is evaluated (by teacher, inviting evaluation by class or specific members), whether it is conducted openly or secretly, and how it is 'used' to help a class organise themselves.

Teachers are invited to participate in bi-weekly recorded Teacher Reflective Sessions[30]. Teachers are encouraged to add qualitative feedback accounting for specific events; these may become like regular diaries of behaviour for some teachers, or more like irregular entries for notable events for others, regarding students or their own behaviour. The researcher is available online to answer queries and may be invited for drop-in sessions to gather qualitative data from students; in return, the researcher may contact teachers with queries regarding the State of their class, querying specific students indicated as possessing high inter-personal intelligence.

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[29] There is no training of teachers. The C State equates to standard teaching practice. It is up to the students and teachers to achieve AB state if desired. The degree of commitment of teachers is part of the research result.

[30] Unlike the control conditions of a quasi-experiment, reflective sessions capture the open social dimensionality of the ABC State meta-method. If understood as action research conducted by the teacher, collegiate support helps teachers operate within ABC State meta-method.

Data Analysis

All raw data is anonymised before analysis.

The institutional data before and after are compared for changes in behaviour and AfL, with possible analysis of academic results compared to expectations, or to classes not conducting the intervention, or to previous years with identical exams to provide baseline comparison.

The longitudinal 'ABC' evaluations of classes is graphed. Qualitative comments are mapped to 'ABC' evaluations, over changes or periods of stability.

Content Analysis of qualitative data applies open and axial coding regarding motivation, awareness, attitude, engagement. Themes, patterns and relationships and exceptions are identified from word and phrase repetitions compared between teachers of the same students, or across lessons by the same teacher; special attention to emergent metaphors and analogues. Categories are summarised to generate causal mechanisms for the behaviour within classes, as well as evaluation of the ABC Classes intervention on teacher and student behaviour, and learning ambience of class.

Feedback To School

Researcher visits school to gather any further qualitative data from teachers and students, and evaluate legacy of the intervention, whether teachers are using it or not. The results of the research will be contained in the Thesis which will be presented to the schools involved upon completion of the PhD.

The Teacher as Researcher, and Researching ABC Classes

The coding and categorisation of qualitative data of the quasi-experiment (ie teacher participant commentary) may provide insight into the internal operation of the ABC State. These are etic observations provided for academic analysis. The results may establish ABC Classes as a construct in social science for a measure of 'social cohesion' or 'self-organisation', leading to application in other schools and perhaps extend into other social settings such as workplaces, offices, departments.

The actual experience of the students and teachers and their iterative collective feedback as ABC Classes generates a self-contained narrative. In contrast to the quasi-experiment, where the data is for academic consumption, the data is consumed by the participants themselves as a form of self-organised action research. This entails a reframing of relation: academics are in service to the practitioners[31]. The qualitative data in combination with longitudinal ABC Classes is a reflection of what a unique group of individuals have managed to achieve according to the innate values and skills demonstrated over a specific period of time. The focus then is not on aggregating generalised knowledge nor on specific instructions to be transferred to another school context, but on developing methods for understanding the generative mechanisms operations amongst any specific collective. The result of the meta-method is greater sensitivity for the participants.

[31] This language pattern operationalises 'dual lens research' (Robertson et al. 2017).

In this way, we hope to have achieved Objective 7: propose a research design which tests the effect of intervention on student behaviour using before and after data collection of student behaviour, teacher's evaluation of student performance (Attitude-for-Learning, AfL, and qualitative feedback), and scholarly attainment.

Management Tools

Plan

See Gantt Chart in Appendix[32]. The research is across five phases or Threads: 1) Administrative Tasks, 2) School Engagement, 3) Ongoing Literature Review and Skill Development, 4) Data Analsysis, 5) Thesis Submission Process. Provisional dates are provided to ensure the PhD is completed within 3 years (inclusive of 2021). The focus of the PhD is on research conducted in schools regarding ABC Classes.

Ethics Status

Ethics Committee approval for the ABC Classes is in preparation (see appendix), delayed by Coronavirus and feasibility of conducting research in school first term 2021. Students will participate in the intervention as a normal part of their school experience, as an initiative introduced by the school with the aim of improving relations and academic performance. The minimal nature of the ABC intervention offers low risk to participants, as the risks of participating are the same as those experienced in everyday life for students and teachers. Teachers will be given an informed consent letter and Parents will be informed by newsletter with opt-out option for data of their children to be removed from the study. Selective feedback by teachers about student behaviour during reflective sessions or meetings is given in confidence, and is anonymised using a master key before analysis.

DDP & Professional Development

The researcher has participated in near-all INF6904 and Ethics course FCS6100 though the workshops went online with Coronavirus. A number of courses were taken throughout the year (Research Methods, Data Management, Data Collection Workshop, Collaborative Workshop on Reflexivity, Tools for Literature Searching, Beyond the Impact Factor webinar, Journal Review Process), though additional courses have been postponed due to Coronavirus lockdown from 16 March 2020. Attended seminars within the Information Systems Research Group, seminar and workshop with Robert Davison, Cathy Urquhart's online seminar on Grounded Theory, and visiting lecturers Geoff Bunn and Susanne Langer from Manchester Metropolitan University 'Somewhere Over the Rainbow' regarding marketization of academia. To secure schools for research, five appointments have been made with heads of schools who have all demonstrated favourable responses, and I have attended Mercia Trust Conference and followed up with the head of the academy trust. Records of experience and development are kept on PebblePad.

The most appropriate statistical methods will need to be determined based on the quantitative data generated, for linear regression or correlation of multiple variables. Training is required to ensure the researcher can use appropriate statistical tools, and coding analysis tools (Nvivo).

[32] Because of Coronavirus, dates are nominal. The research will begin when opportunity arises.

Data Management Plan

Data Management Plan (attached as appendix) details the technical administrative structure to ensure data is secure, anonymised, checked by supervisors.

Objective 8 -- Conclusions Drawn from Results

Extension & Applications

Potential variations of ABC Classes may be explored beyond secondary education. Worthwhile extension of meta-methods to further Transformative Justice (Gready & Robins 2014; Kershnar 2007).

Potential Outcomes

A research outcome may provide significant qualitative support for the ABC Classes meta-method because of improved self-organised behaviour. This will change the role and thus behaviour of the teacher and induce a shift from disciplinarian and knowledge-deliverer to learning-facilitator. Alternatively, results may indicate the requirement of a specialist role, a 'classroom coordinator', who synthesises social learning techniques with students to complement the knowledge-expertise of the teacher. Either way, the ABC Classes structure is paradigmatically on par with the Consequence System common in mainstream schools.

In this way, we hope to have achieved Objective 8: correlate the longitudinal outcome of ABC Classes with qualitative feedback to ascertain the degree of 'transformational praxis' undergone: does the teacher feel less like a disciplinarian and more like a learning-facilitator?

Appendices

Appendices contain subject-system admin (ethics, data management plan, Gantt chart, TNA), as well as additional appendices on object-system materials (ABC Classes intervention material for teachers).

I Administration

Abstract (278)

This Confirmation Report aims to reduce the practice-theory gap. The social dynamics within secondary school classrooms are complex. The fragmented knowledge of academia is complicated. Combined, these constitute a 'wicked system' (Andersson 2014, 2018). Systemic problems arise with inter-disciplinarity and the silo problem within academia, and in schools a persistence of institutional discipline amid pernicious 'low-level disruption', and between them the increased practice-theory gap because of replication and transference challenges. The problem space is understood as dense reflexive-active environments (Lepskiy 2018a, 2018b, 2015), a formulation of third order cybernetics, and specific and practical 'meta-method' is proposed for both schools. Students conduct an intervention to improve social cohesion, 'ABC Classes', based on action-learning (Riel 2010-2020), a variation of participatory action-research (Lewin 1939). Collective social states are self-evaluated and self-generated against a spectrum of self-organisation; since results are not be generalised as laws (positivist paradigm) nor transferred from one context to another (interpretivist paradigm), a generative mechanism is described (transcendent dialectical critical realist meta-theory (Bhaskar 2000)): this sets up the potential 'self-generation' of ABC Classes in different schools. This Report presents how the meta-method requires two years to conduct 'ABC Classes' research in schools and consolidate the theoretical basis.

Attachments

The following appendices are attached to the Confirmation Report:

- Ethics (Ethics Application, Ethics Consent for Teachers)
- Data Management Plan
- Gantt Chart (PhD Timeline)

III School Engagement Material

Event Diary input form is provided through University Google, and a two-pager for teachers is attached :

- Event Diary Template: https://forms.gle/hn3wD3TNVGSBkQcy9
- ABC Class Intervention (two-pager)

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