Complexity theory and schools as learning organisations: an exploration of the operational differences between the universal same-age model and schools that have transitioned to multi-age tutor groups

Abstract

A significant number of secondary (high) schools in the UK, Australia and New Zealand have adopted an organisational construct called vertical tutoring (VT). For a short session each day, tutor groups meet within a house structure often (and intentionally) without any taught programme or script. The unusual feature of these schools is the multi-age (multi-grade) composition of tutor groups, a break with the universal and traditional same-age structure. The reasons for this move and a description of the operating processes schools employ are largely underreported and absent from the research literature. This paper uses complexity theory to compare the two systems. It finds substantive differences between the two models. A conclusion is drawn that the tranche of schools that have transitioned to a multi-age system by engaging with critical reflection are complex in form, have emergent capabilities, and a higher level of organisational consciousness. Same-age schools are merely complicated and far from complex, rendering them unable to cope with modern demands. This suggests that the same-age system in universal use is no longer appropriate for an increasingly joined-up world. It also finds significant tangential support in the research literature for multi-age grouping.

Keywords

Systems thinking; complexity theory; multi-age systems; systemic change; vertical tutoring (VT)

Introduction

The author of this paper continues to be involved as participant/observer with many schools worldwide and has experience of Headship in same-age and mixed-age schools. As Alhadeff-Jones (2013) notes, ‘Research is produced and/or inhibited by the multiple changes and effects that are constitutive of the ways the author, the system of ideas and the object of study respectively evolve and mutually interact.’ The critical approach here leans toward description of school management behaviour in two age-related contexts, but will also be interpretive, examining, judgemental and challenging.

The intentions of this paper are as follows. 1. To revisit the complex/complicated dichotomy 2. To show how systemic thinking is errantly applied to schools by failing to distinguish between a learning organisation (complex) and school organisation (complicated) 3. To show how VT schools have (re)discovered a way of working that is ethical and has the potential to absorb complexity in a way that is ecologically coherent and able to embrace diversity.

At the heart of this paper is a contradiction regarding the terminology used to describe schools as social organisations, one that concerns the distinction between the adjectives, ‘complicated’ and ‘complex’. Although these descriptors are often used interchangeably, the importance of distinguishing between them (Glouberman and Zimmerman, 2002; Miller and Page, 2007; Cuban, 2013; Nason, 2017) is essential in the kind of ‘uncertain and constantly changing organizational environment of the information society’ described by Fidan and Balci (2017). Various analogies highlight the difference. For example, Glouberman and Zimmerman note that sending a rocket to the moon is complicated requiring a formulaic approach and high levels of planning and expertise to ensure a successful and predictable outcome. ‘Sending one rocket increases assurance that the next mission will be a success. In some critical ways, rockets are similar to each other and because of this there can be a relatively high degree of certainty of outcome.’ Raising a child, however, is complex. Although experience and expertise help, the outcome is not predictable, and success can never be assured. As Fidan and Balci (2017:13) argue, ‘[…] the most significant reason for such complexity is the diversification of students and their expectations,’ the first of a long list of factors that include the involvement of numerous actors, multiple procedures and protocols, and regulations emanating from unions and governments. A ‘one-size-fits-all’ (Barnard, 2013; Fidan and Balci) that seeks to standardise is not only unable to meet the needs of clients but is also unable to innovate.

How a school reacts as a system to the complexity it exists to absorb and how it copes, not only determines whether it is complex or complicated but what may be reasonably asked of it. According to Nobel prize-winner, Murray Gell-Mann (1995) and systems thinkers in general, complex non-linear systems cannot be analysed ‘by determining in advance a set of properties or aspects that are studied separately and then combining those partial approaches to form a picture of the whole. Instead, it is necessary to look at the whole system […] allowing possible simplifications to emerge from the work.’ McMaster (1996) describes complexity as state of pattern recognition new patterns, while complicatedness is concerned with parts and sub-systems. Miller and Page (2007: 27) argue that complex patterns of interaction occur because ‘social agents’ actively seek connections and often ‘couple’ with ‘previously disparate parts of the system.’

The remarkable thing about social worlds is how quickly such connections and change can lead to complexity. Social agents must predict and react to the actions and predictions of other agents. The various connections inherent in social systems exacerbate these actions as agents become closely coupled to one another. The result of such a system is that agent interactions become highly nonlinear, the system becomes difficult to decompose, and complexity ensues.

For Miller and Page, the elements in a complicated system are independent from one another. It can reduce or omit some elements without altering the systems behaviour. For example, schools can choose to reduce the amount of information sent home to parents via school reports and reduce interaction with school staff (five minutes with key subject teachers once per year). They might eventually replace these by providing IT access only. The school as a social system redefines what counts as partnership and moves on. Complexity arises when elements (staff, students, and parents) are highly dependent on each. To create ‘a professionally collaborative school’ (Hargreaves and O’Connor, 2017) first requires the school to be socially collaborative (Barnard, 2018). Miller and Page (p.9) describe complexity as ‘a deep property of a system whereas complication is not.’ We might imagine a school as a place where myriad dialogues occur, wherein each element is receiving, synthesising and exchanging information. If these exchanges (feedback loops) are partial, missing, broken or excessively controlled, delays and mistakes occur, something Seddon (2008) describes as failure demand. As Kauffman (1993) suggests, the number of nodes and connections in a network play a critical role in determining how a system behaves. While Senge (1990) offered us the tablets of stone to describe the formative disciplines of a learning organisation, a working model for a school never materialised. Schools prior to and after Senge, remain structurally the same, a feature noted by King and Frick (1999).

Another way of understanding organisations (like schools) is to examine the way they see problems and are persuaded to go about resolving them. Flood and Romm (2018) applied the concepts of single-loop learning (SLL) and double loop learning (Argyris and Schön, 1974) to provide useful insights into organisational behaviour. According to Flood and Romm, SLL asks the question, “are we doing things right.” Arguably, this is the question schools have continued to ask since their same-age inception 175 years ago. Schools seek strategies from within the parameters that govern their work, what they have learnt from experience. Today, schools are besotted by the idea that the ‘quality’ of teachers, more training, pedagogy and their ability to collaborate professionally are the fixes required to repair the system (basically a teacher problem to cope with a pupil problem). The SSL question is applied everywhere in schools. When children misbehave and bully others, the fix required is to add on a pro-social programme. These fixes and add-ons have no impact on system fundamentals and serve to accept the school as a complicated place where defective elements (actors) often need attention. DLL poses a more profound question, “are we doing the right things.” When something goes wrong (e.g. a collapse in staff recruitment and retention, or when mental health issues among actors reach epidemic proportions) trying to fix the system using existing strategies (e.g to provide well-being courses for staff, resilience training for pupils or training a member of staff to support good mental health) is not only ineffective in the long term but increases costs. DLL corrects errors and addresses the way the organisation learns (Argyris and Schon, 1978: 2-3) by modifying underlying organisational behaviours. It reframes the problem by examining the likely causes, a complex approach requiring reflexivity rather a change of technique, fixes, and add-ons.

Flood and Romm (2018: 264) take organisational complexity a stage further by offering a description of ‘triple loop learning’ that incorporates social inclusion and a reconsideration of how ‘power relations are being and can become differentially enacted,’ endorsing the interpretation taken by Snell and Chak (1988) of deutero-learning:

* Inventing—becoming aware of the limitations of all grand frameworks; creating ways of coming up with new structures of thought and action suitable for particular occasions and monitoring the effects of these frames.
* Collective mindfulness. Members discover how they and predecessors have facilitated or inhibited learning and produce new structures and strategies for learning.

It seems that schools are still toying with the mechanical complications of SLL, trying to fix recurring problems with fixes (policy changes and regulation) and add-ons (more support staff and pro-social programmes): they are yet to undertake the guided reflexivity needed for DLL and remain far from any path to new structures and the kind of patterning that any mindful organisation might exhibit. There can be no doubt that the hierarchical and multi-layered management structure of a secondary school (its self-organisation) is deeply embedded, and continues to be erroneously described as complex. Unfortunately, hierarchy is a blunt management tool and as Laloux (2014) says, ‘can only accommodate systems with very little complexity.’ Yet schooling has been constructed around this central management concept for a very long time and there are no signs that much in the way of DLL has been applied to the construction of new models, something that this has proved problematic for systems thinking. It seems that the existing model in near universal use is seen as either benign or immovable. Phlaeging (2014: 8) notes that treat a complex organisation (like a school) as a complicated system is ‘a fundamental thinking mistake, an over simplification.’

Systems thinking is exploring two avenues. For example, Goleman and Senge (2014) appear to have accepted that in terms of their traditional hierarchical self-organising structure, schools are as they are; consequently, Senge for his part has reduced what systems thinking has to offer to a set of tools for schools to incorporate into their teaching and learning methodology. Similarly, Heinrich and Kupers (2018) explore how complexity might be introduced into high schools as a programme, suggesting that ‘An understanding of complexity arguably plays a crucial part in preparing students […] for their role as stakeholders in deeply connected 21st century challenges.’ All (there are many similar approaches) are valid, helpful and worthy of exploration but remain add-ons in form: none change structure and fail to bridge the SLL and DLL divide, let alone venture into TLL. It seems ironic that systems thinking by-passes completely the school as a system, that we should happily add to a school’s complications without impacting on the relationships, interconnectivities and interdependencies within the school itself. If schools are to teach complexity and systems thinking, is it too much to ask that systems thinkers help schools reflect on their means of self-organisation and create the more complex and mindful learning structures advocated by Senge (1990), Snell and Chak (1998), McIntyre-Mills (2014: 147) and others.

By accepting the complications inherent in existing school structures, it is to make a facile systems error and resort to reductionism, seeking to repair staff and children damaged by their attempt to accommodate the system in play because of the system’s inability to accommodate them. Evidence for this SLL approach is reflected in four distinct areas. 1. The intense pressure and accountability on teacher performity (Ball, 2003) resulting in increased workload (push management). 2. The increasing demand for pro-social programmes (PSHE) to address (fix) perceived problems such as relationships, resilience, grit and a can-do mindset (add-ons and fixes). 3. The idea that better leaders can be trained to manage the existing system in better ways. 4. The redefining and weakening of parent ‘partnership’ to parent ‘engagement’. While these factors (elements) are important and worthy of attention it is essential not to be beguiled by them to the detriment of reflection and the unlearning needed to dissolve the kind of management structure emanating from the same-age organisation.

The second avenue holds greater possibilities for schools. Grisold and Peschl (2017) propose changing knowledge structures by challenging underlying assumptions and beliefs. They reference the work of Nonaka and Takeuchi (1995) who advocate the importance of accessing the multiplicity of feedback loops needed to make knowledge explicit and inspire innovation. An idea implicit in complexity theory (CT) is the need for organisations to be joined to more of themselves. For Grisold and Peschl (2017: 349), this involves an exploration of hinderances to knowledge production and the need for research into the kind of successful change processes that prevent ‘old models’ from ‘dominating their thinking.’ In the second half of this paper an existing and ‘successful’ working model, one based on multi-age groups and a practical example of CT, is described.

Some of the features of such a model are described by Hawkins and James (2018), who keep to the tenets of systems thinking and CT. Rather than break the school down into silos and information access levels leading to delays, missed information and reworking (failure demand), they explore the idea of ‘complex evolving loosely linked systems (CELLS)’. Hawkins and James present the school as an organisation beset by complications and obstructions stemming from organisational factors and a ‘heterogeneity of interactors’ that affect ‘interactional capability.’ Importantly, they extend the school as a system to include parents and students as significant actors. Like many papers, in the absence of a viable and working CT model, it flirts with reductionism: nevertheless, Hawkins and James set out many of the factors (feedback loops, interconnectivity, interdependencies, information flow etc) that define a complex organisation, creating clear water between the existing reductionist command approach and an alternative CT model. The CELLs are a helpful concept and are evident in VT schools where they take on both a tight and loose properties.

Morrison (2010: 385-386) calls for CT to move beyond nascent theory by answering a number of questions that realise the substantive nature of the link between theory and practice, that go beyond ‘management speak’.

This moves CT from being an abstraction to indicating how it can address the real-world problems of how power is negotiated, circulates through schools, is fluid and is used in a freedom-promoting rather than a freedom-constraining way. How is the balance between control and permanent creativity to be achieved, and how does CT help leaders and managers in this enterprise?

Morrison poses important questions that require succinct answers, while Hawkins and James (p. 745) invite interested parties to elaborate on the idea of ‘complex, evolving, loosely linked systems (CELLS)’ an approach designed ‘to give complexity the central place it warrants in analyses of school organisation.’ This paper serves as a contribution by illustrating how a number of complex VT schools have moved from complicatedness to complexity and (paradoxically) to a simpler way. All that follows reflects the knowledge and learning from the author’s role as a participant observer in the many schools that have transitioned from a same-age system to a multi-age system, one where tutor groups (not classes) are populated from students of all ages.

Vertical Tutoring as a Complex Adaptive System

To progress any understanding of same-age (complicated) versus multi-age (complex) systems, two precursory concepts are needed; the first is Ashby’s law or requisite variety (1991) and the second is the nature of wicked problems (Rittel and Webber, 1974). Ashby’s law simply stated, says that an organisation must be sufficiently complex (joined-up and adaptive) to cope with the complexity of demand it exists to absorb. Any frailties at this point, create ‘failure demand’, described by Seddon (2003:26) as ‘demand caused by failure to do something or do something right by the customer,’—importantly, failure demand is a systemic failure not a people failure! If a school has a system where reliance on teachers (SLL theory) constitutes the dominant management construct, failure demand is inevitable and more-so in challenging social circumstances. A teacher cannot respond to the complexity of emotional and learning needs alone given that teachers are considerably outnumbered. As soon as a school tries to control complexity through organisation by same-age, it falls foul of Ashby’s law of requisite variety and starts to get complicated fast.

It begins by ignoring family structures of support and social learning (separation by age) and continues to assume that the same-age hypothesis is compatible with child development, cognitive development, and social development, contrary to the research literature (Bronfenbrenner, 1992; Vygotsky, 1978; Bowlby, 1969; Bowker and Spencer, 2010; Salmivalli, 2010). In brief, Bronfenbrenner shows the importance of ‘nested systems’ an ecological complexity of environments that children (and adults) need for sound development (bioecological systems theory). Bowlby (1969) emphasised the importance of our familial need to belong and the damage caused by loss, while Vygotsky (1978) developed socio-cultural theory, the importance of learning within a social and multi-age context. In an unusual paper, Bowker and Spencer (2010) drew attention to the ‘surprising’ prevalence and importance of multi-age (cross-grade) friendship in schools, especially for lonely girls and anxious boys. Finally, Samivalli (2010) and many others (Rodkin et al., 2006; Farmer et a., 2010) indicate how bullying originates within same-age groups; schools then spend five years trying to fix a problem caused (it seems) by same-age design. It can be no surprise that as the same-age model embeds itself, complications arise that require ever more fixes and add-ons that cause it to become ever more complicated. Problems are never resolved, nor can they be. When more complex demands are made on schools, they are forced to apply more add-ons and fixes (described above). These require more staff, more referral mechanisms, more managers, more programmes and more time: costs and bureaucracy increase exponentially as the system continues to be stress-tested. The school copes by allocating multiple responsibilities to managers (increasing workload) and tries to develop a rule-bound system of compliance (herding cats!). The school can easily become hyper-complicated (not complex!) as failure demand increases the school moves from a social ‘mess’ (Ackoff, 1974 and 1981) to a ‘wicked problem’ (Rittel and Webber, 1973), one highlighted by recruitment and retention issues, loss of well-being, a rise in mental health issues among staff and students—collateral system damage—and the failure of reform. This leads to yet more add-ons, fixes, and interventions and so the Mobius loop persists.

Unfortunately for wicked problems, there is ‘a no stopping rule’ and ‘no definitive formulation of a wicked problem’ (Rittel and Webber, 1973) and certainly no quick fix. Levin et al. (2007) describe the characteristics of ‘super wicked problems’ and among the criteria for these are the thoughts that a) time is running out; b) there is no central authority; c) those seeking to resolve the problem are also causing it; c) policies discount the future irrationally. Schools are at best messy but are fast becoming a wicked problem; in their present state they may well be contributing to the future ‘black swan’ events described by Taleb (2007). As Pflaeging (2014: 8-9) observed, ‘To treat complex organizations as complicated is a fundamental systems mistake, an over simplification’; adding, ‘Complexity can be neither managed nor reduced. We can only confront it with human mastery.’ A ray of hope is offered by Conklin (2005), namely, ‘The problem is not understood until after the formulation of a solution.’ That formulation can arise by abduction, hypothesising from across disparate disciplines, and by accident (TLL). Sometimes, when resolving an issue (say, parent partnership and/or assessment for learning), a different perspective emerges that clarifies the picture and results in a new way of understanding, a fresh perspective.

For the purposes of this paper, there are two broad operational systems, same-age and mixed-age. The same-age system is now 175 years ago and began when small mixed-age schools were replaced by larger schools that adopted the Prussian (the Finland of its day) same-age structure and means of organisation.

In systems terminology, organisation by age is a leverage point, ‘a point of power’ (Meadows, 2009) long ignored and far from benign. It determines how large schools operate, and even when recognised as a leverage point, operators persist in pushing it in the same direction, convinced it can be made to work if only they try harder. This is what is happening in schools. It starts by division into grades or same-age year groups, then setting or streaming, and as the model roles out over time, separation increases, and new schools evolve based on yet more separation; by post-code, gender, class, religion, ethnicity, choice, ability, eventually flowering (arguably) into identity politics and political polarisation. As more complex demands are made on schools, the school responds in complicated (not complex) ways by adding on more programmes and employing more support and clerical staff. To do this it has to cut down on work elsewhere (reducing information sent home, redefining what counts as parent partnership, bundling job descriptions, forming MATs). Internally, the school continues to be less joined-up making failure demand endemic.

Schools that have multi-age tutor groups (VT) are common in Australia and the UK. In this generic model the tutor groups are mixed by age usually for pastoral reasons. There is no fundamental change to the management structure of these schools and these schools can become even more complicated to run as systems. Some even revert to their original same-age form when complications outweigh the benefits of mixed-age groups. The tranche of multi-age schools of interest here is very different. These schools opted for reflexive learning, a guided process that allowed each school to expose the assumptions inherent in the same-age model, a process that involved considerable unlearning and a systemic view of how schools operate. These schools realise that their previous same-age system was no longer usable and had to be abandoned, a process that will continue over time. The genesis of this new tranche of complex VT schools began with one school in 1988.

The school had a population of 1100 students aged 12-16 and served what was called an area of social deprivation. The new school principal devised a non-hierarchical school model that placed each student at the centre. Around the students were the four key players (actors) needed to support and promote learning. These were parents, teachers, the child’s tutor, and other students. It was a simple model. Unfortunately, the same-age system in use prevented these conversations from taking place and this meant that any learning relationships between actors was slow to form if they formed at all. So much seemed to be serendipity. Meetings were strictly controlled and information difficult to share. The model required all actors to communicate with all other actors, a complex model rather than the complicated one the school had. Unfortunately, there was no way of actuating the flatter model. At the time, the school did not recognise the same-age system in use as being messy or wicked. It was certainly difficult, obstructive, rule-bound, problematic and high in boundary maintenance issues but was the same for all schools. The system was the system.

The school developed a data tracking system with a local software company that had the potential to help with prediction, support and intervention but the system restricted application. Staff (some of whom had children at the school), realised that the information the data system gave was not only useful to departments but to parents and students too. The problem was how to share the information. Parents had five-minute sessions with teachers once per year and classroom time was very restricted. The solution was to mix change the tutor groups from same-groups and make the tutor the key. This had several benefits.

* Deep learning conversations between a tutor, parents and student could be phased across the year based on critical learning/feedback times rather than calendar convenience.
* Having only four meetings, tutors could decide with parents and students the length of time needed and agree a convenient time within a given week. Meetings became mandatory.
* For the meeting to have substance, a full written report that included data and strategies for improvement were sent home the week before and formed the basis for discussion.
* From the meeting, actors would agree general strategies for improvement which actors would monitor. These were recorded and added to the next report home/assessment.

This early VT model of the school was now operational and proved popular with parents and students. It could have stopped at that point but instead, the model started to take on a life of its own and today continues to surprise as living systems do. As Kaufman (1993) said, the number of nodes and the number of connections in a network have a crucial effect on the system’s behaviour. The school had reduced the size of tutor groups (no more than four students per year group) and increased the number of tutors. In tutor time, tutors were no longer required to deliver pro-social programmes but were required to engage with students, communicate, monitor and support. Older students were trained to be mentors and every child had leadership responsibilities. The system was designing itself, growing resilience, building relationships, developing loose and tight networks (Granovetter, 1977), transferring energy from the outside (parents) in. Empathy was designed in and citizenship practised rather than preached. Behaviour improved and so did learning.

Only from their new perspective, did the school now understand the mess from which they had escaped just as Conklin predicted. The school had not only complexified by joining to more of itself increasing connectivity and appreciating interdependencies, it had become complexity dependent and this ironically made it simpler. Oliver Wendell Holmes Jr. reputedly said, ‘I would not give a fig for the simplicity this side of complexity, but I would give my life for the simplicity on the other side of complexity’ and this makes perfect sense to a complex VT school. Sean Snyder (2013) in the OECD Working Paper No. 96 offers a useful discussion of CT and cites the definition of Kaput et al., (2005).

* The interconnected components’ behaviour is not explained by the properties of the components, but rather emerges from the interaction of the components.
* The system is non-linear and relies on feedback to mould and shape its evolution.
* The system operates on multiple time-scales and levels simultaneously.

In the multi-age model, value is created from the myriad feedback loops and dialogics that combine to harvest information and create knowledge just as Haffeld, (2012: 453) suggests. Learning is not peculiar to the domain of the teacher; both the teacher and the student need to know that the complete system is supporting them emotionally, that learning ultimately depends on a ‘complexity of interactions,’ (Johnson, 2008). Without a viable working model, something Barnard (2018) calls ‘the socially collaborative school,’ the OECD paper prevaricates and stalls but manages to cover the salient points from ecology, ontology and psychology. The important point to remember when it comes to change is this; only schools can alter their behaviour and they will only do this if they see a good reason to do so as the work of Maturana and Varela (1980) suggests. Operational change cannot be implemented or mandated from the outside without incurring severe damage to participants.

The school in question became very successful and gained an outstanding Ofsted, attracting wide interest from other schools. There was, however, no happy ending. When the principal and other staff left, the incoming team scrapped VT very quickly and returned the school to the safe harbour of the same-age system they knew. The school declined and has yet to regain outstanding status. As for the former principal (myself), he repeated the transition to VT in a much larger school and now teaches schools worldwide.

So how is the multi-age model developing and where does it need to be?

The key management principles set out below (bulleted) are the result of trialling and modification undertaken by complex VT schools to achieve an effective working model that coalesces around communications and support for learning.

1. All white-collar employees are tutors (and some blue) regardless of status, including managers, school leaders, non-teaching staff, clerical staff, librarians, support staff, and technicians. This ensures as far as possible two tutors (one lead and one co-tutor) per group, one of whom is a teacher. This practice has a considerable number of benefits. Senior managers are not remote from the value work and have direct feedback about how the system is operating and a full understanding of challenges, modifications and training needs. Tutees are well known even if one tutor leaves. Parents have direct access to tutors and vice versa. The hierarchical structure is still evident but responsibility for support and learning has shifted significantly tutors. Leadership is gradually being redistributed to the base where decisions and interventions needs to be made. This reduces failure demand and enables the school to absorb complexity. [Harris (2007), and Mifsud (2017) provide useful overviews and insights into the theory and practice of distributed leadership].

2. Tutors act as ‘leaders of learning’ and information hubs because of their unique position; schools (as learning systems) are designed around the centrality of the tutor and child as the central working construct. The learning relationships, confidence and resilience grown in tutor time transfer to the classroom making the teacher’s task easier. Because everyone is involved in the learning process, the system, though complex, is easily understood.

3. All students are trained and supported to be leaders and mentors as they progress through the school; it is the development of endless learning support and mentoring relationships that makes the school complex (information rich) rather than separational and complicated! In many ways the sense of family is reborn in the 20/25 minutes of tutor time. Schools have discovered that the 20/25 minutes before morning break is ideal for tutor time.

4. The school adopts a house or college system (schools within schools - a nested system advocated by Bronfenbrenner (1992). The Head of House is effectively the Head of a small School and acts as such. This may seem like a new power structure but is mainly a support and advisory role (with teeth). The house system revitalises competition and co-operation and adds to a sense of belonging.

5. Deep learning conversations (DLC) are introduced at all critical learning times – a forty minute + session involving tutors, each tutee, and parents that take place at an agreed convenient time for all parties. This ensures attendance. Reports and information feedback (strategies for improvement) allow for enhanced learning conversations, and the emergence of thick data. Cursory data sheets alone are insufficient. In effect, this is a time shared by tutors, staff, and students when learning is reviewed, and a commitment made for supported strategies for improvement. This is the hub that enables and drives flow, the recursive way information moves and is interpreted and activated in the system.

6. The DLC (above) is a summative assessment of learning and so knits with the formative assessment processes emanating from classrooms. Assessment for learning (AfL) incorporates written strategies for achievement supported by thick dialogics plus data to increase information and flow, one that involves all players (staff, students, parents). All actors are now communicating and are contributors to knowledge and learning support processes; this recursive process contains within it the emergent properties for self-management.

7. Tutors do not teach PSHE or other pro-social programmes. Tutor time is the tutors’ time. Resilience, empathy, and social networking via citizenship are designed-in to the relationships of VT and no longer added-on unless complementary action is needed.

8. The role of system leadership has a recursive nature. Leadership and followership become interchangeable. The school leader must certainly hold her ground when mistakes inevitably occur and act as a servant leader at other times.

Schools may not always adhere fully to these principles, but they are derived from mature VT schools that continue to innovate and trial new approaches. These school report a significant reduction in bullying and anti-social behaviour, a better learning culture and improved relationships among actors. They include grammar schools, independent schools, schools that were once failing, church schools, single-sex schools and international schools. There are many things that can go wrong, given that these school operate alongside a powerful same-age mindset and a powerful external control system that subjugates values. Without the involvement of senior staff as tutors, the system is severely compromised and so is leadership.

**Concluding Remarks**

Complex VT schools are setting-up camp in the foothills of management change and have a long climb ahead. They have successfully transitioned from a same-age system to a mixed-age system using critical reflection (Fook, 2010; Flood and Romm, 2018) a process that enables them to ‘see’ the obstacles of their previous iteration very clearly and unlearn them. Given the complications of same-age organisation, shared meaning, value purposes and co-construction remain desirables often too challenging to realise. For multi-age schools they are the design constructs on which the organisation and its participants depend opening the possibility of further innovation and emergence. Laloux (214: 261) offers three working assumptions from FAVI, a French industrial company. “People are systematically considered to be good (reliable, self-motivated, trustworthy, intelligent); there is no performance without happiness; value is created on the shop floor.” For Laloux, multi-age organisation aspires to ‘Teal’ the colour ascribed to organisations with a higher level of consciousness.

Today, practitioners and pundits are beginning to question system fundamentals as their interest in qualitative research throws doubt on management practices, received axioms, and previously held epistemological rationales. Goodlad and Anderson (1987) wrote:

Many teachers probably do not realize fully how unfaithful to gradedness they find it necessary to be in their daily work with children. That each child's unique needs must be accepted in good spirit is rarely resisted by such teachers.

While the system is being debated, one group of schools has found a new direction. They have rejected the same-age school model and started to build a multi-age one in its place, a movement that until now, has flown under the research radar. Hopefully this paper and their work will inspire more interest.

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