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Towards a dynamic interactive model of resilience (DIMoR) for education and learning contexts

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Towards a dynamic interactive model of resilience (DIMoR) for education and learning contexts

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Abstract

This paper explores a range of theoretical models of resilience and human development to understand the concept of resilience as it has developed over time and how it is understood today. These include both classic and contemporary ideas such as those of Bronfenbrenner (1995), Masten (1994), Rutter (2013) and, more recently, Downes (2017) and Ungar (2018). Building on this analysis, the paper proposes a new model, taking key elements of established theories to offer a dynamic and interactive model of resilience (DIMoR). This model recognises individual agency and its complex reciprocal interactions both with other individuals but also with the wider system within which the individual is situated. This paper positions the DIMoR as a means of understanding resilience in a range of educational contexts.

Introduction

In recent years there has been much discussion about resilience both in relation to individuals and their ability to deal with the stresses of modern life (Hargreaves 2018), or societies and their ability to cope with and adapt to environmental crises (Bendell 2018). While an interest in resilience is not new, the need for it has increased as the pace of life, speed of change and complexities of our world increase (De la Sablonniere 2017). Statistics concerning, for example, the volume of people suffering from poor mental health, the rate of species extinction and numbers of wildfires and floods, suggest that as humans we are struggling and that our environment is struggling too (IPCC 2018).

From this perspective, resilience appears to be an inherent trait, something to be fortified, often with outside help. It also implies that the power or control is with others and that the individual or system is expected to comply and develop the strength to better withstand external pressure. Alongside this implication is the sense of trying to preserve or protect and to maintain things as they are. This is often found in definitions of resilience (e.g. Dent and Cameron 2003) that refer to the ability to bounce back, to recover and to revert to shape, which seemingly ignore the fact that experiences cause change and that system trajectories are altered through impact.

Hence a model of resilience is needed that, rather than looking at individuals or systems to see what can be done to *make* them more resilient against external forces, takes a holistic and analytical approach that explores the dynamic and interactive factors involved to see what conditions could be changed to allow for resilience to *emerge*.

This paper draws upon a systematic literature review of models of resilience to present a Dynamic Interactive Model of Resilience (DIMoR) that encapsulates the key elements of existing models while offering a more nuanced and complex systems approach to resilience. The central contribution of the DIMoR model is to synthesise earlier conceptions and draw on systems thinking and complexity theory (Morin 2008) to produce a model that recognises the socio-ecologically embedded nature of the individual while acknowledging the individual's agency as they journey through real-life contexts.

Education settings have been shown to be hubs for fostering the development of resilience (Stallard *et al.* 2003; Banerjee *et al.* 2016) and this paper considers the DIMoR within the context of education and how it may be applied as a framework to support the emergence of both individual and school (organisational) resilience.

The paper outlines the model itself before providing the theoretical background and foundations underpinning the model. It will then present potential applications of the model and conclude by reflecting on the broader context and considering further developments.

Our Model

The Dynamic Interactive Model of Resilience (DIMoR) is presented in Figure 1 below. It features a web-like structure which represents a wider set of systems that shape and structure experience and interactions. These range from immediate systems closest to the individual, for example family and neighbourhood, to those literally, or virtually, more distant such as the wider community context, local or government policies and cultural contexts. These sub-systems interact both with each other and with the individual. The solid vertical and horizontal lines going across the entire structure comprise two axes; one a continuum between vulnerability and invulnerability that, in short, refers to the characteristics of any given system and which are discussed later in this paper. The other axis takes account of the protective factors that exist to shelter and nurture the individual against the risks or adversity that threaten it. In this model, resilience is an emergent property of interactions between all these aspects i.e. of vulnerability, invulnerability, protective factors, risk, adversity and surrounding sub-systems, rather than being inherent in the individual. To emphasise the interactive and context-

bound nature of resilience and to illustrate complexity, the individual sub-system is perceived as moving on a trajectory (the thick blue line) through its life course interacting with others, each with their own surrounding sub-systems and all within wider surrounding webs. These are represented in the figure as the smaller 'orbs' within the wider structure, each with their own vulnerability-invulnerability/protective-risk factors matrix. Each interaction affects the individual as a sub-system, but so does the individual impact on the other surrounding and interacting systems in a dynamic and reciprocal way. In this way, the entire model is dynamic.

[Figure 1 Here]

In the systematic literature review we examine the models that have contributed to and led to the development of DIMoR, before then presenting how DIMoR was constructed using these ideas. This is to acknowledge the individual contributions of established models and to show how these combine to produce a dynamic model which incorporates the complexity of resilience both at an individual (agentic) and ecological level.

Literature Review

Study Selection

A database search was undertaken to complete a systematic review of the literature to locate conceptual models which consider the interactive nature of resilience. The guiding principles from Petticrew & Roberts, (2006) were used to structure and provide a framework from which to conduct the systematic literature. The aim of the systematic literature review was to establish existing systemic models of resilience in order to review, consolidate and develop understanding. The database search was conducted on 19th February 2020 using PsychINFO, Web of Science and ERIC (for search strategy see Appendix 1). 4,915 documents were identified and duplicates were filtered out using Mendeley reference manager. Initial screening led to 28 eligible articles, following which two reviewers screened the articles based on exclusion and inclusion criteria (see Appendix 2) resulting in 10 articles. These 10 articles were then screened in full text resulting in 6 papers being included. An additional paper-based search was conducted based on the reviewers' prior knowledge of the field and four further papers were added (see Appendix 2). These papers were used to examine models of human development and resilience research and critique their contribution to fostering a multi-dimensional and system level understanding of resilience.

Models of resilience

The importance of a life-span approach to understanding resilience has been accepted within the literature for some time and was initially advocated by Werner & Smith (1982) in their seminal longitudinal study on resilient survivors. The work of Wang, Haertal & Walberg (1997) began to highlight the interaction of personal vulnerabilities of individuals and the interaction with their surrounding ecology acting as a protective mechanism in developing resilience. Daniel, Wassell & Gilligan (1999) explored this idea of an interaction between personal vulnerability and resilience within their model depicted in Figure 2.

[Figure 2 here]

Their model depicts two dimensions; that of protective factors and adversity which is primarily intrinsic and the other of vulnerability and resilience; highlighting extrinsic factors. This relationship between the two dimensions is not precise and they suggest that there is also an interaction between internal and external factors. Examples of internal factors identified by Daniel, Wassell & Gilligan (1999) include temperament, self-esteem and sociability; with examples of external factors including having a secure base and an environment that is not over-protective and which encourages emotional expression. There is, therefore, a need to ensure that we are clear about the individuality of each person and the impact of their life history and current context alongside the idea of the individual being an active participant in their own lives. The potential outcome, however, of having an intrinsic dimension of resilience is a 'trait' construct of resilience, which is challenged by key authors on resilience such as Masten (1994). She advocates caution against this approach due to the potential to label some individuals having resilient 'ability' and others not. This carries with it the risk of resilience being conceptualised as having a deterministic quality.

Daniel, Wassell & Gilligan (1999) suggest that the intrinsic/extrinsic dimensions provide an assessment framework at all ecological levels and although there is agreement in the more recent literature about the importance of this wider systemic perspective (Ungar 2011), this model potentially falls short. There are concerns around the use of 'poles' to differentiate between the concepts; for example, rather than resilience being the opposite of vulnerability, it may, as Southwick *et al.* (2015) suggest, be the absence of vulnerability. There is also an argument that vulnerability and invulnerability can both operate as protective as well as risk factors. For example, Werner (1993) found that some individuals who had experienced trauma, (and therefore labelled as vulnerable), were in fact more resilient due to the very nature of

experiencing trauma. Similarly, Schoon (2006) suggests that the development of resilience depends on the level of exposure to risk so some individuals could appear less vulnerable merely as a result of not yet having experience of adversity. Consequently, this paper advocates a more nuanced, less polarised notion of resilience in which the ‘resilience’ pole is replaced by the concept of ‘invulnerability’.

The importance of context on human development is highlighted within Bronfenbrenner’s bio-ecological model (1995) that emphasises its importance through the use of nested systems which are centred around individuals. As these nested sub-systems become more physically distant in proximity to the individual, their influence on the individual also becomes more distal. These ideas are developed by Ungar (2013) who highlights the impact that the interactions between individuals and their contexts have on the development of resilience. Ungar (2011) acknowledges the challenges of creating a model that portrays the individual as a system within their ecological context (which is a system in its own right) *and* captures the complexity of interactions that occur. He argues that a within-individual focus when defining resilience can result in a narrow understanding of the concept. A result of this has been practitioners seeking to measure resilience with a focus on outcomes rather than the interaction process, reinforcing trait and character narratives around resilience. The necessity to quantify resilience and determine success (or not) of individual interventions continues to drive (educational) practice (Esquivel, Doll & Oades-Sese 2011). This fails to recognise the wider contexts in which the individual exists and therefore the broader opportunities for intervention.

Ungar (2011) states quite clearly a need to measure the complexity of the environment, rather than the complex individual. This principle of decentricity is also supported by the principle of complexity, in which the multi-layered expression of variables is too diverse to predict a single trajectory. Added to this, Ungar’s analysis of cultural relativity indicates that bi-directional adaptive processes are sensitive to culture and context. This has also led to the realisation that adaptation within adversity can result in the atypical use of resources that are not considered socially acceptable and yet, within an understanding of an individual’s context, can be understood as positively developing resilience. In applying these principles to the concept of resilience when developing a theoretical model, we need to be cautious in implying predicted trajectories, or predetermined outcomes against which to judge success.

Ungar (2013) suggests key principles that influence interactions in the development of resilience; there are many means to a single end (equifinality), protective factors can have

different impacts depending on context and time (differential impact), and individuals' perspectives and interpretation of events, and the subsequent impact on the development of resilience, is informed by their cultural context (cultural moderation). Whilst Ungar discusses the need to avoid deterministic outcomes, there is a danger of the concept of equifinality implying an 'end' product of resilience which is a contradiction in itself. Instead, this paper advocates recognition of the changeable nature of resilience over time. In assessing both the quality of the interaction between individual and context as well as the characteristics of these components, Ungar (2013) suggests an emphasis on the environment as often being more important than an emphasis on the individuals themselves. However, a less hierarchical relationship between the environment and the individual is suggested by Downes (2017). This idea leads us to the conclusion that a model of resilience should reflect complexity, but not chaos; it should encompass fluidity of movement and the idea that resilience is not a static characteristic (Doll 2011), but is changeable over time within multiple systems.

Downes' (2017) review of Ungar's model also challenges his focus on family, community and culture and indicates an additional need to incorporate governmental systemic supports and services and include outreach to marginalised families to enable relational connection. This idea that resilience in itself is not static, but rather can fluctuate and is an adaptive process in the context of these wider sub-systems, is also highlighted in the resilience review conducted by Fritz *et al* (2018). Their systematic review of literature emphasises the attempts of research to identify the interactive nature of childhood adversity and protective factors whilst recognising that these factors do not function in isolation, rather that there is complexity in their interrelations. In his exploration of factors that may help us grasp this dynamic process, Downes (2017) uses Bronfenbrenner's (1979 & 1995) social-ecological systems approach to move to a broader understanding of resilience, moving away from it simply being an individual 'measurable' consideration to embrace systemic dimensions including ideas of space and time. He argues that our understanding of resilience needs to consider the 'interactive tension between diametric and concentric relational spaces' (p2), thus recognising the importance of a multi-level concept of resilience. There are many variables which will influence the outcome, but he goes on to suggest that not all of these variables can be isolated and quantified. Raymond *et al.* (2018) suggest that protective factors can be cumulative such that social-emotional competencies enable more effective use of other available resources. Downes (2017) draws on the work of Levi-Strauss (1962; 1963; 1973) to explain the need to move away from dual or binary visualisations to an understanding that structures within a system are mutually

interactive; that is, an increase in one, usually means a decrease in the other which he terms as a 'dynamic compensatory quality', which Ungar (2018) recognises as 'dynamic competition'. Importantly, Downes concludes from this observation that if changes are made to what he terms as 'supporting background conditions' (for example individual experience), then resilience can be impacted. He uses this idea to add a note of caution to any intervention, suggesting that when we intervene there is a danger of marginalising a different group due to 'diametric oppositional relations'. So Downes argues that system change is 'an interplay between diametric and concentric spaces of relation' where diametric space is the blockage and that developing resilience is moving these blocked systems through inclusion and connection. Southwick *et al.* (2015) promote ideas around the complexity of the interlinked nature of families, cultures, community, the individual and their environment and the constant interaction and change that results from these interactions; they argue therefore that it is critical to frame interventions at a number of levels to positively impact on resilience.

Downes (2017) also promotes the role of lived experience in resilience. He makes a useful analogy of an individual's 'lived experience' as a river actively influencing what is within it, working as dynamic interactive spatial background. He suggests that this experience is more than cognition, affect, behaviour and interpersonal or social interaction, but also the background relational space mediating and interacting with these dimensions of being human. However, this analogy perhaps does not fully acknowledge his critique of Ungar in missing the concept of agency as being key within resilience. The use of a river minimises the potential of individual agency to change trajectory, however the emphasis on fluctuation and changing of direction is core to a more nuanced understanding of resilience.

Downes (2017) dissects the constructivist interpretation of agency in the ability to make choices, suggesting that this choice-making is conditioned by culture and therefore resilience is about being able to resist cultural pressures - resistance might, for example, take the form of leaving a group or remaining within the group and maintaining a separate identity. This helps to lead him to the conclusion that when faced with adversity we do not 'bounce back' to the same position, rather we are influenced by our experiences and thus make adaptive changes as a result of them. Ungar (2011), through his principle of 'atypicality', argues that these adaptations may not always be considered socially acceptable or desirable, but nevertheless are functional and in his 2018 paper suggests that this demonstrates our unique capacity for agency.

The work of Southwick *et al.* (2015) points to the idea of hysteresis as being a useful concept to illustrate this fundamental change in individuals or systems. This notion of agency, adaptability and the importance of ‘space’ would seem to fit with more recent thinking around resilience (Downes 2017). Morin (2008) suggests however, that these ideas around systems are in their own way reductionist in that the system is presented as a whole and does not fully acknowledge the interaction between the parts and the whole and also the interaction between the parts within the whole in their own right. This thinking therefore has the potential to extend Downes’ (2017) model by recognising further how other individuals, each with the same diametric/concentric issues, are all influencing each other in the same space within wider systemic conditions. These exchanges in turn impact on the surrounding interactions within and between these sub-systems, some of which are more distal than others.

Constructing our Dynamic Interactive Model of Resilience

These various models from Daniel *et al.*, Bronfenbrenner, Ungar and Downes have each added to and developed our understanding of resilience situated within given contexts and have led to our model which, in addition, draws on complexity theory. We present a representation of resilience that considers both individual agency as well as the range of complex sub-systems of which the individual is a part. The range of (reciprocal) interacting sub-systems is likely to reflect the particular context, domain and temporal conditions of the individual sub-system as suggested by Ungar through his concepts of *equifinality*, *differential impact* and *cultural moderation*. This is because the context and conditions will interact with the individual and shape their resilience at that time and in that situation.

In building this model, we began by adapting Daniel *et al.*’s model (Figure 2) by replacing their notion of resilience on the x-axis of the model with vulnerability at one end of the continuum and invulnerability at the other (Figure 3). This is because we believed that resilience is not at one end of a spectrum, rather that resilience is the emergent property of the range of dynamic and reciprocal interactions between the individual and contextual systems and sub-systems. Moreover, resilience at the opposite end of the scale to vulnerability suggests that if an individual is invulnerable then they must be resilient. However, this leaves no room for vulnerability and suggests a simplistic view of resilience. Evidence suggests that for learning to occur, there needs to be an optimum space where there is some vulnerability which creates an ‘openness to learning’ rather than an invulnerable ‘rigidness’ which can prevent learning (Deakin-Crick *et al.* 2017). We believe that resilience is an emergent property from risk-protective factors and vulnerability-invulnerability factors and, for this reason, we present

resilience as coming out of the cross-roads of these elements. Resilience is also context and domain specific, based on Ungar's principles of equifinality, differential impact and cultural moderation, as well as Downes' notion of agency.

[Figure 3 here]

We then propose an adapted ecological model which retains the idea of the range of nested systems of Bronfenbrenner, but which recognises the interaction of these systems and the interconnectivity of structures that shape the system. These include, for example, the state, laws, policies and physical aspects, such as location and communities that can structure experiences. This is presented as a web-like structure, but retaining concentricity. Having a web-like structure connects the concentric circles from Bronfenbrenner's model to indicate the structural nature of the micro-, meso-, exo- and macro-systems which shape experience. These are dependent on the principles of equifinality, differential impact and cultural moderation as well as the individual's agency within relational contexts. The adaptation of Daniel *et al.*'s model, as described in the figure above, was then super-imposed on top of the web-like structure, thereby taking account of both the (structural) systems around the individual (system) as well as the individual's own risk-protective/vulnerability-invulnerability matrix. An interaction of all these is, we propose, what shapes the emergent property of resilience (represented by the dotted lines).

[Figure 4 here]

The next part of our model building takes the individual sub-system in the figure above and, 'zooming out', places it within a much wider context (system) that illustrates the range of other such 'individual sub-systems' that are also situated within a yet wider contextual system of society, which is itself embedded in the systems of the Earth's biosphere (Folke 2016). These wider sub-systems feature the same web-like structure and the same risk-protective/vulnerability-invulnerability matrix that would be present within any individual sub-system or organisation.

[Figure 5 here]

The result is our Dynamic Interactive Model of Resilience (DIMoR), represented below, which attempts to encapsulate the complexity of this system. The smaller ‘sub-systems’ (orbs) added to the DIMoR figure below represent the individual sub-systems as they navigate any given wider system. For example, the individual pupil navigating the school system whilst reciprocally interacting both with other pupils and teachers as well as the school as a system. Zooming out further, the school in turn can be seen as part of the education system, and further again to society, to global society and so on.

[Figure 6 here]

The DIMoR, as a theoretical model, illustrates how individual sub-systems move through life navigating a wide range of other individual sub-systems within the wider web-like system of society. Dynamic and reciprocal interactions between any of these systems can influence the trajectory of the individual sub-systems and also the system itself. Resilience is, therefore, a domain and context specific emergent property of these interactions. Consequently, resilience cannot simply be an individual trait, but rather is a responsive feature which changes shape and structure within its own risk-protective, vulnerability-invulnerability framework as a result of interactions with other sub-systems within the wider system in which it is situated, and interactions with the wider system itself. It is important to note that the individual sub-system could be any unit, such as a pupil, teacher, school, organisation, business, community and so forth.

In this way the DIMoR builds on the existing models of Daniel *et al.*, Ungar and Bronfenbrenner, draws on complexity theory and, like Downes, acknowledges individual agency. Most importantly, it forefronts the reciprocal interactions which shape resilience in the individual and which can in turn shape the resilience of society. This model represents the dynamic nature of resilience that is context, domain and even relationship specific; this has been alluded to in previous models but not fully expressed in one model.

In terms of this model’s contribution to education, we believe education settings can be hubs for fostering the development of resilience and that this complex, dynamic understanding can support the efforts of school/education leaders.

This is not achieved through the ‘injection’ of interventions, but rather the fostering of conditions through school culture, support systems, connecting with external agencies, teacher training and so forth, which allow resilience to emerge. While this focus on connectivity is not

new, we recognise and acknowledge the individual agency, itself a complex sub-system, which has to navigate contexts that are also complex adaptive systems. For example, the individual pupil (or teacher) in a school is a complex system located within the wider ecological system of family, school, community and society. The individual as a sub-system has their own vulnerabilities, risk and protective factors as well as their own agency and personal disposition that will inform their approach in a given context. Similarly, the school has its own vulnerabilities, risks, protective factors (financial, external policies, PTAs, governing bodies and executives etc.) that structure and influence the experiences of an individual (e.g. pupil) sub-system.

The DIMoR model thus develops the idea from Downes (2017) that individuals, within diametric and concentric relationships, are all interacting with each other in the same space and it acknowledges the importance of agency of the individuals within this process.

Using the DIMoR

We have shown how the DIMoR challenges basic understandings of resilience as a response to adversity such as bouncing back from adverse experiences (Smith *et al.* 2008), or bending to accommodate challenges in order to return to an earlier point of balance or satisfaction (Johnson 2008). The DIMoR also challenges approaches to resilience which focus upon personal traits or skills as being the foundations of resilient individuals (Ang *et al.* 2018) and consequently the approaches which promote the teachability of resilience or attempt to measure an individual's resilience.

The DIMoR encourages educators, and others working to support the outcomes of individuals, to move their focus away from identifying levels of resilience for those individuals towards considering a range of environmental, relational and psychological factors which impact on individuals and groups of people in a dynamic way. The DIMoR provides a lens through which to consider these factors and begin to identify the influences they have upon the two axes of protective & risk factors, and vulnerability & invulnerability, and how emergent resilience is influenced. This lens supports a holistic understanding of the individual or group within the educational context and therefore can provide practitioners with a more pertinent perspective on approaches to support the emergence of resilience of learners. An example follows which shows how a school could use the DIMoR to support their understanding of resilience.

In this example we consider an effort to enhance resilience in the face of unrelenting negative environmental news in the media and the impact this might have on pupils' mental health. The

approach draws heavily on the concept of action competence (Jensen & Schnack 1997) that promotes engagement in community-based contexts. Pupils are tasked with identifying local issues or problems that they wish to tackle. They explore the issue in small teams looking at various aspects including, crucially, the question of *why* the issue occurs there. The team then outlines a vision of how they would improve the situation before taking action. The project closes with an evaluation of the resulting changes, both in relation to the issue itself and in terms of the pupils' own personal development. It is principally this reflective stage that provides staff and pupils with opportunities to explore, among other things, the emergence of resilience.

The DIMoR prompts settings to consider the differential impact (Ungar 2013) of such projects on individuals as well as reflecting on the spaces of relation (Downes 2017) that might support and develop relationships as a way of promoting emergent resilience. Action competence projects generally enhance inter-personal relationships, but the DIMoR demands an openness to the way in which these relationships might improve or diminish an individual's self-esteem over time. In this example the school is no longer the dominant context so the impact of that setting alone is put in perspective. The wider environment encountered by the pupils will have cultural-historical, socio-economic and ecological dimensions that might offer possibilities for personal connection. All of this will need to be explored and interpreted flexibly in relation to the implications that they have upon the risk/protection and vulnerability/invulnerability profiles of pupils. In this example pupils' potential vulnerabilities in the face of a bleak environmental outlook can be understood in multiple ways while simultaneously addressing their concerns by providing a forum in which they can share their feelings, by increasing their sense of agency and by taking action (however apparently insignificant), as a positive contribution to the complex adaptive sub-systems of which they are a part.

At the systemic level, the holistic nature of the DIMoR challenges practitioners through its consideration of a number of factors and its grounding in notions of complexity. This calls into question simplistic notions of measurement and the teaching of resilience as practitioners will need to navigate agency, relational, environmental, cultural and temporal implications for the vulnerability and risk axes in their endeavour to support resilience. In this example the DIMoR invites educational institutions to explore the wider ecology of learning in which their learners are immersed. As a key actor in this ecology, a school might consider its role in promoting positive outcomes by, for example, analysing the different purposes and values that are in play in different sites of learning, from the internet to friends and strangers, and by highlighting

conflicts or distortions that will inevitably occur. This process is not unlike what Wals (2019) terms ‘sustainability-oriented learning’ something he defines as:

“...an organic and relational process of continuous framing, reframing, tuning and fine-tuning, disruption and accommodation, and action and reflection, which is guided by a moral compass inspired by an ethic of care.” (Wals 2019, 61)

In order to support practitioners to use the DIMoR when planning for and working with learners, an explicit framework based on DIMoR is needed to help school leaders, practitioners, learners and other concerned people, for example parents and carers, to identify areas of concern. This framework needs to provide an approach through which interactions can be identified and contextual relevance evaluated thereby supporting practitioners to make decisions about which areas to focus upon and ways in which they may be addressed.

Conclusion

This paper has made the case for a new model of resilience. It argues that some representations view resilience as something that is within the system and that is a fixed trait or quality that can perhaps be measured, while others fail to take account of the complexity of the system itself, its agency, the influence of surrounding sub-systems and the potential impact of interactions that take place between and within systems. Drawing on preceding seminal models of resilience, this paper proposes a revised conceptualisation that considers resilience as an emergent and time-bound property that is the result of context and interactions that have taken place until and at that moment. It recognises that given its contextual and temporal nature, resilience will be different for all individual sub-systems and constantly changing. Consequently, we propose that resilience be considered as something that is dynamic and interactive.

The DIMoR suggests that, when considering the resilience of an individual sub-system, e.g. child, school, business or society, a holistic approach is taken that analyses within-system factors as well as interactions with external systems that may have influenced or continue to influence current levels of resilience. This has implications for interventions. The paper suggests that, given the individual, contextual and temporal nature of resilience, it is not something that can be measured in a standardised or deterministic way, nor is it something that can easily be taught using a pre-designed programme. Instead, it recommends that interventions should be bespoke and should take account of wider contexts. As a consequence, an intervention *may* be aimed at the sub-system itself (e.g. the child), but equally at an interacting

sub-system/s within a level (e.g. a peer or peers), surrounding system/s (e.g. family or home environment) or at a number of elements at various levels.

The DIMoR can contribute to a more nuanced and complex systems approach to resilience and will help practitioners to conduct more holistic analyses of contexts in an effort to then create circumstances in which resilience can emerge – both for the target individual sub-system and for those with which it interacts.

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Appendix 1

Search Strategy

Topic: Systems approach to resilience

Database search: PsychINFO, ERIC, Web of Science

Key concepts	Resilience	Systems thinking	Complexity	Develop	Setting
Alternative terms / synonyms	bounce back* grit determin* academic buoyancy perseverance adversity tough*	framework* structure* Organisation* dynamic systems	complex*	Development* Interact* Chang*	Education* OR school* OR communit*
Search terms with operators	resilien* grit determine tough	“systems thinking” framework* structure* organisation* model*	complex*	Development* Interact* Chang*	Education* OR school* OR communit*

Appendix 2

Inclusion/ Exclusion criteria and identified papers

TYPES OF...	INCLUSION CRITERIA	EXCLUSIONS CRITERIA	RATIONALE
Topic	Need to be on the topic of resilience (concept) and systems theory	Those that do not refer to resilience	Key focus
Studies	Qualitative focus (interviews / focus groups)		Focus on range of factors that are unlikely to hold specific measures (human experience)
Settings / context	Organisations such as Education / health / social care / community / challenging / stressful contexts (risk factors)	Those specific to industry & business / science (that include different 'drivers')	Complexity of systems needs to be captured but focus is on developing R as a human characteristic, therefore industry / science less relevant
Intervention	Promotion / development / understanding of R Application of theory / framework or model	Not isolated or specific interventions to promote resilience	Focus on a complex systems approach
Outcomes	That seek to comment on framework / structure / approach / interactions / promote agency	Not isolated or specific	Develop an understanding of the interaction within systems
Geog content	Worldwide Written in English		All relevant in terms of developing concept of Resilience but accessible to the authors native language
Time period	2011 onwards		Post Ungars theory model of Resilience

Papers identified using: PsychINFO, ERIC and Web of Science
Esquivel, G.B., Doll, B., Oades-Sese, G.V. (2011) Introduction to the special issue: Resilience in schools. <i>Psychology in the Schools</i> . Vol.48(7), pp. 649-651.
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Raymond, I.J., Iasiello, M., Jarden, A., Kelly, D.M., (2018) Resilient futures: An individual and system-led approach to improve the well-being and resilience of disadvantaged young Australians. <i>Translational Issues in Psychological Science</i> . Vol.4(3), pp. 228-244.
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Ungar, M. (2011) The social ecology of resilience: Addressing contextual and cultural ambiguity of a nascent construct. <i>American Journal of Orthopsychiatry</i> . Vol.81(1), pp. 1-17.
Papers added after paper based search
Doll, B, Jones, K, Osborn, A, Dooley, K, Turner, A. (2011) The promise and caution of resilience models for schools. <i>Psychology in the Schools</i> . Vol. 48(7), pp. 652-659.
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Ungar, M., Ghazinour, M., & Richter, J. (2013). Annual research review: What is resilience within the social ecology of human development?. <i>Journal of child psychology and psychiatry</i> , 54(4), 348-366.
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