Boing and physical literacy: A play-based movement programme for community, school and sport

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Introduction

This case study offers an overview of a research project currently being undertaken at the University of Gloucestershire and Oxford Brookes University (United Kingdom). Our aim is to support practitioners to create playful, active and inclusive practice that promotes the development of physical literacy in community, school and sport settings. In order to design purposeful, playful and rich environments, there is a need for practitioners to appreciate the reciprocity between a learner and their environment (Kugler & Turvey, 1987). This individual-environment fit, as we introduced in Chapter 2, allows us to consider how engagement with the environment will invite or afford movement solutions. This fundamental premise has allowed us as a team to consider the purposeful design of playful environments that act as a vehicle to support the journey of a child's physical literacy development. The use of the term journey is one that we are cautious about, as far from suggesting an end point or destination to be reached, we are merely suggesting that young people's learning experience is akin to the wayfinding experiences previously discussed in this book. We wanted to encourage problem-solving through various inclusive, engaging and motivating activities; therefore, as a team of academics, we developed what we called the Playtank (an online resource of playful environments and delivery materials called playgames) based on foundational principles. Our founding idea was that if our students (at the time based at Oxford Brookes University) could focus on the pedagogy of supporting their learners, rather than spending all their time planning lessons, then we could truly accelerate their practice in-situ. We developed a realisation that utilising a nonlinear pedagogical approach, underpinned by an Ecological Dynamics framework, would allow us to design a rich landscape of affordances, inviting individuals to engage with an array of movement possibilities to support their physical literacy journey. It has allowed us to create learning environments that are poised on the edge of chaos but that can be tweaked by practitioners before and during sessions to manage the instability (i.e., chaos) to promote learning. The rules of a game, the size of the area, the number of children on each team and the amount and size of equipment available were all manipulated to create environments that offer the opportunities aligned to the chosen developmental focus of the practitioner and/or children. As we have progressed, the Boing project has matured into one where we are engaging in the practitioner landscape by designing workshops for practitioner educational purposes as well as supporting the development of playgames to support practitioners as they engage young people.

Boing: A Play-Based Curriculum to Nurture Physical Literacy Through Active Play

As we have suggested earlier in the book, physical literacy can be embedded (i.e., via direct perception and self-organisation) and embodied (i.e., information specified by our perceptual systems and capabilities). This interaction with the environment is key to finding movement solutions to problems posed in sport, physical activity or physical education settings. Bernstein (1967, p. 228) defined the ability to solve emerging motor problems (such as a new game, movement or a complex problem in our case) as dexterity and suggested that a need for flexibility is key in skill development to encourage learners to seek solutions to the same or similar motor problems. With this in mind, we have been focused on developing playful games for primary aged children through a Sport England funded project called Boing (more information can be found at www.boingkids.co.uk). As part of this project, we have advocated that practitioners design variability into their activities and set appropriate problems for learners. In this project, we designed a series of 130 playgames (our name for the games we have designed), utilising an Ecological Dynamics framework to promote the endowment of physical literacy (Roberts, Newcombe & Davids, 2019). In our design, we suggested that when designing practice tasks, practitioners should utilise 6 key principles to engage their learners through play, namely:

1. Practitioners as environment designers
2. Affordance driven practice design
3. Manipulation of constraints
4. Co-adaption and collaboration
5. Managed chaos
6. Dexterity and degeneracy

The integration of these principles in designing practice tasks provides a framework to support the embedding of theoretical tenets of Ecological Dynamics into practice. In essence, we have attempted to operationalise theory in practice for coaches and teachers in their context. It is important to note that no one principle is viewed by us as having more importance than any of the others. Furthermore, it is essential that these principles are employed as a guide and not a prescriptive set of rules, provided with the purpose of supporting practitioners with the tools to be the architects of their learning environments.

Principle 1: Practitioners as Environment Designers

In this section, we outline the importance of carefully designed environments. Whilst we have developed a number of environments as part of the Boing project, a key evolution to these playgames is that of encouraging practitioners to manipulate the game to meet the needs of the individuals in their context (see Figure 1). We have been careful to attend to the development of a learner's physical literacy in our design of playgames by providing carefully designed environments which offer an array of affordances for each specific group with which we worked. We have been able to work with over 700 coaches and teachers and a range of partners to support the development of the project and we are committed to the idea that the learning environment facilitates problem-solving which in turn shapes the movement solutions of the learners (see Figure 2). Observing the children engaged in decision-making is a positive sign, as we believe they are more likely to be exploring their own development across many different domains (e.g., their physical, emotional or social development) when immersed in solution finding (see earlier discussions on wayfinding). If we are to attend to the holistic development of children, it is important to embrace the embodied nature of physical literacy (see Figure 3).

Thus, it is important to ensure that the decisions of when, why and how to act are invited through the interactions with the environment and not directly by the teacher or coach. If we are supporting children to, for example, develop and realise their ability to hop and balance using a single leg landing then we need to provide an environment that facilitates the development of this understanding. For instance, in the Bears in the Woods playgame (visit www.boingplaytank.co.uk/playgame-bearsinthewoods; see Figures 4 and 5), the task constraints are manipulated to encourage stepping, jumping or hopping from one disc to another carefully placing the discs so that we can challenge an understanding of which distances invite hopping and which do not as a function of the variable distances between spots. Further, the encouragement to move from spot to spot in time with the beat of a drum is an example of inviting functional movement through task constraint manipulation. Success within the environment is characterised by increased self-realisation which is evident in more efficient and strategic routes being planned and executed by the children. Practitioners must therefore carefully consider the ways in which learning environments are designed. In doing so, practitioners can ensure learners find themselves immersed in appropriately challenging, yet achievable activities that promote high levels of perceived competence.

Principle 2: Affordance Driven Practice Design

When designing-in affordances into the playgames, the essential question practitioners must ask is 'does the environment offer, invite and/or encourage learners to explore the opportunities for action related to the current development focus?' For example, it might be that we want to develop weight transfer, or balance, or deceleration. Designing learning tasks through the manipulation of constraints to provide affordances for action requires practitioners to be 'problem setters' who are able to implicitly invite desired perception-action couplings. The Affordance Driven principle proposes that the actions are shaped through the learner exploring the relevant landscape of affordances in the environment. So, if we want to develop deceleration (as an example of a physical development focus), then we would need to design a landscape that requires speed to be high with some demand for acceleration (small end zones, or challenging obstacles at high speed where change of direction is needed). The ability to act upon an appropriate affordance at any one moment is a key part of learning to play and solve problems with effective movement solutions. It is vital to consider that recognising when to act (perception) is as important as the movement itself (action) and the two must remain coupled to the learning environment. Just because an affordance is available does not mean an individual should use it and knowing when a learner 'ought' to use an available affordance is perhaps just as important as knowing how to use it (Heft, 2003). We might, for example, set an obstacle course or set of challenges which are not 'standardised' and ask learners to move around in the quickest way, but not in a pre-ordained or predictive order. Encouraging a learner in this example to try and search for the best solution, trialling different routes and exploring movement, acceleration and deceleration that is based as much on decision making as it is movement capability. A playgame we have developed that encourages this type of practice is Tik Tok (www.boingplaytank.co.uk/playgame-ticktock), which has a course, and a series of 'taggers' to encourage variability and changes in speed, movement direction. In our playgame, the learner negotiates the traffic of other children as well as set structures. In simple terms, well-structured environment design must offer learners the opportunity to move beyond 'what' they must do, and towards an understanding that allows them to construct for themselves the 'how, why, where and when' of movement. In essence, we need to ask if the answer that the problem elicits regarding the decisions and movements of an individual is the intention of that specific environment.

Principle 3: Manipulation of Constraints

If we understand which affordances within the landscape are most inviting for a group of children, we will be able to manipulate key constraints in a learning environment to support learners in searching for and discovering, effective solutions to a movement problem. Practitioners can manipulate constraints to shift the learner's intentions, to support the development of new bodily attributes (e.g., increased muscle strength, flexibility, postural stability), to improve motor skills or through promoting on-going perceptual learning to increase differentiation. The ability to learn to act upon the most appropriate affordance at any one moment is a key part of learning to play games; however, in their desire to focus practice there is often a temptation by coaches and teachers to over-constrain practice by introducing rules or restrictions to explicitly force 'desired' actions (see Renshaw et al., 2019 for a discussion on avoiding the over constraining trap). It is therefore imperative that practitioners do not just consider which constraints are manipulated, but also how and why they are embedded in the learning environment. Examples of poor practice include practices such as the 'you must make 5 passes before scoring' rule often seen in invasion games. This type of constraint over-emphasises the mere reproduction of an action and misses the key point in invasion games: that learners need to understand the function of a pass to a teammate and perhaps what other opportunities to act there are in an environment. The simple manipulation of task constraints allowed us to encourage multiple editions of the same problem to occur within the one environment. For example, in the Dragon Catching environment, a game based on 'capture the flag,' we can increase the width of the access point by ensuring there are multiple dragons to defend and capture. An interesting observation of this in practice is that the learners will migrate to the iteration of the game they feel most comfortable engaging with, which evidences self-realisation in action.

Principle 4: Co-adaptation and Collaboration

Principle number four is based on the notion of collaboration. We have seen in our playgames that children working together is important when nurturing and promoting physical literacy beyond physical competence and towards a more holistic understanding of the concept as espoused in this book. On the Boing project, it has been important for us to support learners in developing an understanding of how their interaction with others within the environment can impact on both their own development, and upon others.

These important pro-social and psychological aspects of development have been integral to the project given the range of contexts we have been working in. To do this, we have developed a number of our playgames that move the emphasis from individual competition onto collaboration. The presence of affordances that promote collaboration can be an important aspect of exploration for young people. For example, in our playgame Chain Tag (see www.boingplaytank.co.uk/playgame-chaintag) we have observed that children are beginning to take note of others learners capabilities (whether they are quicker, slower, stronger, taller, better or worse decision makers) because success is predicated on being able to move and problem solve together. We have observed in Boing sessions that a learner's interactions with others within an environment can have a significant impact on exploring inherent self-organisation tendencies. This continuous process has been characterised as co-adaptation. With each learner's behaviours constrained by the information from the actions of the other learners in the environment (Passos, Araujo & Davids, 2016) there are opportunities to shape behaviour with carefully designed practices focused on collaboration and co-adaptation. Practitioners should avoid setting problems for learners to solve in environments devoid of other learners. Task constraints must be manipulated to provide learners with the opportunity to collaborate and co-adapt. For example, the environment created by the Chain Tag playgame is an example of how a game based on the rules of the traditional tag game can be adapted and manipulated to focus on collaboration. In this game, players are expected to join together in order to form a chain and cannot separate the chain in order to tag others. This can be adapted in many of the games where joining learners up as pairs in any of the games provides an increased emphasis on collaboration as well as being a useful method for differentiation as seen in Figure 6.

Principle 5: Managed Chaos

Bowes and Jones (2006) discussed the notion that complex systems are open to fluctuations and consist of complex chaotic behaviours. Put simply, the learners in the practice environment will endeavour to make sense of the chaos they are presented with by interacting with the task constraints by intentional and goal-directed means. This leads us to the deliberate manipulation of control parameters (via task constraints) to move individuals into less stable areas and create these phase transitions (Handford et al., 1997). It is proposed that if a system is poised at the edge of chaos (at a point where there are many solutions available) it has the ability to create emergent problem-resolving behaviours (Langton, 1990). This tipping point on the edge of chaos is a location of instability for learners, which is useful in facilitating exploration of different movement solutions. If a system is located in a region which is too stable, then the resultant behaviours may be accordingly static, with little demand made on the inherent pattern forming system tendencies. In contrast, any system that is located in a region which is always too unstable will become inherently chaotic and unmanageable (Davids et al., 2003). If the designed practice task is not capable of providing opportunities for learners to resolve consistent questions, then the system may be too chaotic.

Furthermore, if a novice learner is placed into an environment with a large number of other learners who are also searching for their own performance outcomes, the information at a localised level could become too difficult to perceive and act upon. If we take Escape the Zoo as an example, starting the game in its simplest form (i.e., starting the game with all learners being zoo animals to collect food from the wild) will help manage the information flows perceived by these learners. The practitioner can then add task constraints (i.e., adding a zookeeper) to increase the level of instability in the game. To help find the balance between stability and instability, we need the children engaged in constant and active play. In order to facilitate constant and active play, we aimed to design environments that are more continuous and self-generating in nature, where the teacher is not needed to initiate the start and the finish of the active period. This has been achieved through the manipulation of task constraints to create environments that regenerate on an infinite, continuous loop. The design of environments where the instability in the system is constantly shifting is based on the notion that complex systems exhibit tendencies towards stability and instability, supporting learners in continuously (re)organising in response to a constellation of available constraints (Renshaw et al., 2010).

Principle 6: Dexterity and Degeneracy

Bernstein (1967, p. 228) defined dexterity as the ability to find a motor solution to solve any emerging motor problem functionally, quickly, rationally and resourcefully. He identified the need for flexibility in skill development to encourage learners to seek different solutions to the same or similar problems, thus advocating the need for practice task design to incorporate variability into learning contexts. In neurobiology, this is known as exploring system degeneracy (Edelman & Gally, 2001). In movement behaviour, degeneracy supports the greater flexibility, adaptability and robustness needed for a learner's functionality during task completion. Repetition without repetition is Bernstein's response to the perceived oversimplification within the traditional model for skill acquisition and the inclusion of variability. Providing environments which allow lots of problem-solving opportunities is essential in allowing learners to repeatedly search and explore effective adaptable movement solutions. The presence of functional variability is a hallmark of more skilled performers (Davids, Bennett & Newell, 2006) and the generation of functionally variable movement patterns is an important characteristic of skilled learners operating within a dynamic environment. As a result, manipulation of task constraints in practice environments must offer both repetition and variation to facilitate this process (Travassos et al., 2012). Practitioners can purposely manipulate task constraints to increase the variability. Taking Tidy my Room as an example, this is achieved by increasing the number of rooms, the number of people in each room or the size, weight, surface, colour – of equipment. In summary, learners need to be provided with task constraints that allow them to explore dexterity in their interactions with the performance environment. Another example can be seen in Figure 7.

Summary

In summary, we have attempted to address some specific challenges that our undergraduate students were facing in their pedagogy of coaching the individual. Taking away some of the time to plan and organise sessions allowed us to focus on their development as practitioners in being able to teach or coach young people using an Ecological Dynamics framework whilst adopting a nonlinear pedagogy to nurture physical literacy. Importantly, this afforded us the opportunity to understand some of the challenges in developing truly nonlinear approaches to developing physical literacy as it forced us to face the realities of developing the whole person and not just focusing on skill acquisition. By approaching the development of physical literacy through the design of purposeful environments, developed on the six principles of Boing, we have seen an emergent understanding of movement activity of which has given us some of the evidential and empirical basis to confidently support practitioner education through our funded Sport England project. Adopting an ecological lens is helpful to comprehend why interactions occur and more importantly how these are encouraged (Handford et al., 1997). Most pertinent to these is the recognition of the importance of affordances, which are defined by Gibson (1967) as opportunities for action provided by the environment or ecology, we exist in. Understanding that affordances are environmental properties (Gibson quoted in Weiss & Haber, 1999, p. 129) available as resources for the individual that can be utilised to regulate behaviour (Silva et al., 2014) has been central to the design of Boing's playgames.

We would urge researchers and practitioners to utilise the free website to access the Boing playgames and begin to critically engage in thinking about how we might nurture the physical literacy journey.

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Illustrations

Figure 1. Boing workshop supporting the development of Boing principles

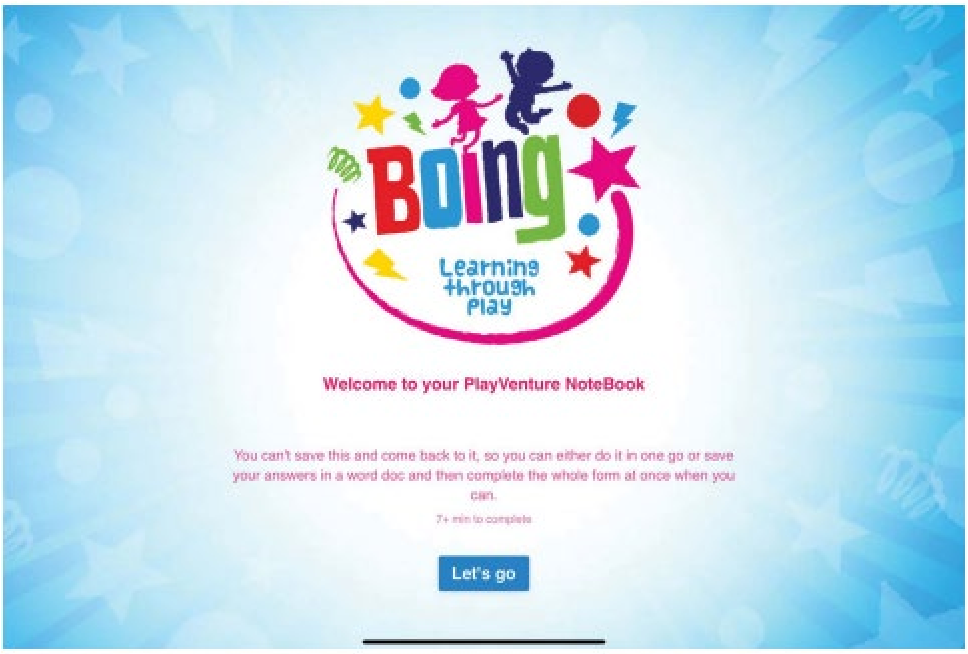

Figure 2. The online playventure: an interactive approach to supporting practitioner development

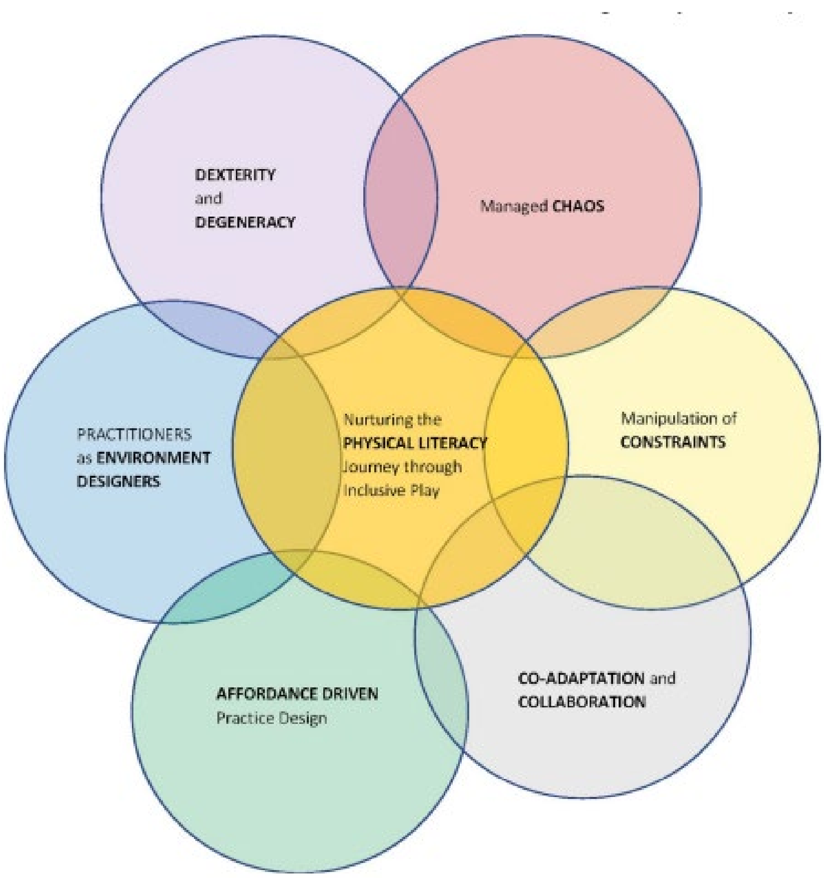

Figure 3. Principles for practice design to nurture the physical literacy journey for practitioners (Adapted from Roberts et al., 2019)

Figure 4. Some primary aged children playing Bears in the Woods

Figure 5. Children will plot their route through Bears in the Woods and find their own way to jump and land depending on their capabilities

Figure 6. Children collaborating in a game of Space Rangers in order to successfully solve the game

Figure 7. A game of Escape the Zoo that is poised on the edge of chaos, offering an abundance of movement possibilities