Risk literacy: concepts and pedagogical implications for Early Childhood Education

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**Abstract**

Taking risks and enjoying challenges are fundamental to the lives of young children from a developmental and evolutionary point of view. However, in modern societies, the increasing concern about the dangers and injuries has led to the escalation in regulation and provisions for the safety of young children. This intent to establish secure and risk-free environments for young children reaches in some cases the other end of the spectrum; that of overprotection, constraining children’s drive to explore, dare and experiment. This paper explores the relationship between children and risk, by focusing on the processes of thinking and acting, drawing on positive and negative discourses around risk. The paper proposes that more interest should be directed towards enabling children’s own knowledge and understanding of risk, through Early Childhood Education (ECE) and risk literacy. Namely, the use of graphical representations, children’s probabilistic and possibility thinking, the risk culture of the classroom and a cross-curricular approach are pedagogical implications that could inform policy and practice in ECE aiming at present and future agents who are risk literate.

**Keywords**

Risk literacy, early childhood, pedagogy, processes of risk

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**Introduction**

Recently there has been a lot of concern regarding risks and young children. Within the wider context of risk western society (Beck, 2006) new realities, new technologies, socially-driven facts, transitions, increasing urbanization and all sort of different ‘*stressors*’ in contemporary life characterize not only our own but also young children’s experiences. It could be argued that because children are vulnerable, inexperienced, and young (Munro, 2011) with ‘*specific’* needs and rights to be met, it is adults’ responsibility to guard and care for them. From this perspective, adults try to eliminate the potential dangers and provide young children with safe and stable environments, either within or outside formal educational settings. This effort is mainly linked to specific policies and provisions of protection and safeguarding that, and in turn, have led to an ongoing debate as to what are the respective benefits or impacts on children’s development and wellbeing.

Taking risks and engaging in risky behavior and uncertainty are part of everyday life in human societies and will always be present in various manifestations. Adults’ attitudes of supervision and in some cases of ‘strict’ regulations (Sandseter, 2010) have led to the undesired outcome of altering children’s experiences and play opportunities. Wyver et al (2010) argue that there is overloaded ‘surplus safety’ today leading to a new reality; that of ‘no risk’. Bundy et al (2009) highlight that this ‘no risk’ is a risk itself as it distorts and limits children’s freedom by having negative implications on their growth. For example, children’s outdoor play has been influenced drastically by this increased alert regarding the risk of accidents and injuries and the fear of litigation. This, consequently, has huge consequences on children’s health and wellbeing, as contested by many scholars, researchers, educationalists (i.e. Brussoni, Olsen, Pike, Sleet, 2012); like lack of physical activity, obesity, sedentary lifestyle, isolation, disconnection from nature.

As a matter of fact, adults’ views, perceptions and actions are one side of the coin. Thus, this paper proposes the consideration of children’s own understanding of risk. This other side of the coin takes into account the agentic and active role of children, by considering their voices, opinions and understandings (Tobin, 2005). It recommends that ECE can serve as a vehicle to transform the ‘cotton wool’ child to the risk literate child. A child who has developed risk-taking skills and judgment, competence and capacities to face uncertainty and instability. If children themselves do not develop the capacity to reason and own the consequences of their decisions, then they will not be able to cope with risks and hazards, opportunities and challenges, not just at present, but also in their futures.

The aim of this paper is to explore the relationship between children and risk and to argue that children’s risk literacy can be encouraged in early childhood educational settings. The rationale of risk literacy lies beneath the broader notion of multiliteracies and refers to the ability to deal with uncertainty in an informed way (Gigerenzer, 2008). Risk education have already been implemented in some curricula for older children and adolescents and seem to be effective (i.e. Eichler and Vogel, 2015; Shearn, 2004; Till, 2014). Thus, the main argument in this paper illustrates the importance of considering risk literacy, as an essential and timely skill and attitude within Early Childhood Education (ECE).

**Risk and young children**

Risk is a complex and multidimensional notion, usually linked to negative connotations. There is no one definition for risk and as Adams (2006) underlines, risk is “the product of the probability and utility of some future event” (p. 30); this future event is uncertain and could be either positive or negative, either a damage or an opportunity. However, the discourse around risk, today, addresses mainly issues of threat, danger, ‘moral panic’ (Garland, 2008), injury, maltreatment. This discourse considering risk as a ‘harmful situation to be avoided’ mistakenly excludes cases where risk can be the foundation for change, possibility, autonomy, creativity or novelty. As Bernstein (1996) quotes there should be a change in “the perception of risk from chance of loss into opportunity for gain, from fate and original design to sophisticated, probability-based forecasts of the future, and from helplessness to choice” (p. 337).

Growth, by definition, involves taking risks and moving out of the comfort zone aiming at experiencing novel situations and perspectives (Dweck, 2000). Risk taking is regarded as being significant in children’s wellbeing as it empowers their physical proneness and independence (Stephenson, 2003), their emotional vigilance, like excitement and pleasure, as well as their broader learning and development (Eichsteller and Holthoff, 2009). Children enjoy challenges and driven by their curiosity and ‘can do’ attitude they learn to interact with their environment, to link causes and effects and to become responsible for their decisions and actions, especially during play.

Risky play is a key part of children’s development and evolutionary growth as it has an adaptive function in reducing fear of stimuli (Sandseter and Kennair, 2011) and survival instincts. In risky play children try out new strategies, behaviors and actions, they collaborate, overcome conflicts and fears, build autonomy, self-esteem, fantasy, motivation, confidence, aspiration, judgment and familiarize themselves with failure, errors, success and satisfaction. As noted by Thompson (2005) play is not a risk-free activity. On the contrary, it is a space for adventure, ingenuity, freedom, experimentation, trophies, scars, bruises, disappointment and frustration.

Through risk-taking, children can consider alternative courses of action and less obvious routes while solving dilemmas and making decisions (Rolfe, 2010); they can learn to be resilient (Newman and Blackburn, 2002), to regulate their emotions and sensation-seeking (Apter, 2007) and they can develop their autonomy and mastery over themselves and their surroundings (Nikiforidou, Pange and Chadjipadelis, 2012). Risk-taking is interconnected with aspects of cognitive, social, emotional and biological development (Boyer 2006). Through diverse contexts and play situations children have been found capable to reason and face feasibilities, estimate odds and therefore make probability judgments and deal both semantically and conceptually with the evaluation of future events (Nikiforidou, Pange and Chadjipadelis, 2013). Moreover, children, as young as 4 years, understand and rationalize safety and non-safety matters. In this sense, according to Eichsteller and Holthoff (2009), young children can make the distinction between the acceptable and unacceptable risk and reach the point where they can realize that *feeling safe* is different from *being safe*.

Indeed, everyone has a propensity to take risks and can be regarded as a risk ‘*expert*’ (Adams, 2006). Through practice and experience even young children get trained in the management of risky situations. Adams (2006) goes on to propose a conceptual model, the risk thermostat, where risk-taking decisions represent a balancing act in which perceptions of risk are weighed against propensity to take risk. He argues that this propensity varies from one individual to another and that it is influenced by the potential rewards and losses, especially if they are experienced from first-hand. Infants balance rewards and ‘accidents’ at a continuous level through apprehension, determination and intense concentration that leads them to become junior risk managers.

Thus, risk confrontation has two processes; the first process is linked to the awareness and perception of the risky situation (objective and subjective thinking and understanding) and the second process is linked to the action and behavior upon the risky situation (engagement or avoidance). Both processes are strongly interwoven and their relation is not directional or sequential; as such, the use of the words ‘first’ and ‘second’ does not imply order or series of emergence (fig. 1). For instance, if a group of 3 year olds are introduced for the first time to a climbing frame, not all of them will climb straight away or not all of them will decide to climb at all. Some might first think about it, observe what others do and then choose to have a go or not; in this case, thinking precedes action. Others might have a go straight away without second thoughts; in this case, action comes in place with limited or no thinking. In addition, the risk-taking decision, given that climbing is risky, can be influenced by personal impulsivity and dispositions, different personalities and temperaments, adult encouragement, peer influence, prior experiences, rational or intuitive decision making either during the thinking and/or the acting processes.

Fig 1: Processes of risk

For the purposes of this paper process 1, thinking and understanding risk, is the main focus of discussion. This process relates to the cognitive approach of risk. It entails both *knowledge* elements and *dispositional* elements (Gal, 2002), both objective and subjective ways of interpreting and analyzing the situation, that interlink in multiple ways. The knowledge elements involve cognitive components such as literacy skills, statistical knowledge, mathematical knowledge, probabilistic thinking, context knowledge and critical capacities. Under this paradigm, risk can be understood and confronted objectively, through calculations and speculations. Risk can be quantifiable, measured and anticipated. On the contrary, dispositional elements are considered as non-cognitive aspects that involve subjective beliefs, emotions and attitudes as well as the personal point of view of each individual. Under this paradigm, risk is not perceived in the same way by individuals and more impulsive, societal, cultural or external influences construct personal understandings of risk.

Specifically, Morrongiello and Lasenby (2006) have suggested that risky decision-making is shaped by many factors. They list personal differences, like age, gender and prior experiences, parental/familial factors, like parenting style and sibling effects and finally, situational factors such as the neighborhood and peer interactions. Furthermore, Little (2006) agrees that age, gender, socialization practices, personality traits, policy provisions are some of the components that characterize risk-taking in early years. Subsequently, whether a child will make a risky decision or not and engage with risk-taking or risk-aversion (process 2) depends on many dynamics, but also on their own, personal understanding and representation of risk (process 1).

Despite the complexity of the relationship between risk and young children, children’s restriction in taking risks means restriction in opportunities for learning, knowing, understanding and acting upon uncertainty and unfamiliarity. ECE and risk literacy are proposed to be fundamental in re-constructing this restriction. Children need to engage with ‘*reasonable*’ risks in a *safe* environment in order to gain learning experiences that will enable them to become *risk-literate* *experts.* Supporting young children to take risks with, and for an educational goal or incentive, can be regarded as a means of safeguarding them.This paper addresses the role of risk literacy in ECE in supporting young children’s risk process of thinking and understanding (process 1), in a proactive way.

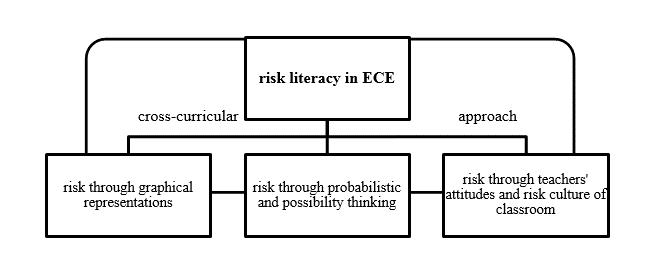
**Risk literacy as part of Early Childhood Education**

Learning to be a part of the literate world builds up over a lifetime (Copeland and Keefe, 2007). Defining risk literacy in a vast changing world where ‘*old’* certainties are being rapidly transformed and replaced by new realities is complex. Challenges, dangers, hazards and opportunities need sustainable and advantageous decisions. Risk literacy (Gigerenzer, 2008), as a novice type of multiliteracies, involves the capacity, awareness and competence to face a risk, both at cognitive (process 1) and behavioral (process 2) levels. It is a lifelong skill and attitude that shapes informed and educated agents who can evaluate a risky or riskless situation.

Risk literacy in ECE can extend children’s risk experiences in a structured and goal-specific way, as is the case with older children. For instance, risk education programs for children aged 5-16 have three basic objectives, according to Shearn (2004); ‘Awareness raising – strategies designed to disseminate knowledge and understanding of sources of harm; transferable skills – progressive approaches that aim to develop transferable life skills (relating to the risk assessment and control); and behavior modification – approaches that aim to reduce risk taking behavior” (p.6)’. An intervention study with elementary school children, carried out by Till (2014), suggests that it is possible to foster basic competencies for risk assessment and probabilistic decision making in fourth class children through playful activities, the use of hands-on materials and meaningful iconic representations. In ECE the implementation of risk literacy and risk education are recently emerging fields of research and interest. Lavrysen et al (2015) carried out a three-month training program with four- and six- year olds to support that risk perception and risk competence can be improved and measured within the classroom. They propose that risk competence can be detected by the risk detection test and observational questionnaires they used and that it can be improved through an intensive offer of risky-play activities.

The learning experiences that take place in the context of the classroom can convey opportunities for examination, inquiry and wonder, especially regarding the processes of thinking and understanding risk. In this direction, it is proposed that, from a pedagogical perspective, graphical representations (*knowledge element*), children’s probabilistic thinking *(knowledge element*) and risk culture of the classroom *(dispositional element)* are pedagogical aspects that could facilitate young children’s risk literacy under a cross-curricular approach (fig 2).

Fig 2: Pedagogical considerations of risk literacy in ECE



*The use of graphical representations in risk scenarios*

Communicating risk through graphical representations and data is a key pedagogical aspect of risk literacy. The ability to understand and communicate visual information, relationships and ideas represented in maps, graphs, diagrams, pictures, symbols and charts of different types come under graphical literacy or graphicacy (Wilmot, 1999). Graphicacy has two directions based on the information flow; the incoming, inbound and the outgoing, outbound.

Young children have been found to have the capacity as part of their statistical thinking to describe, organize, represent and interpret data (i.e. Jones, Langrall, Thornton and Mogill, 1997; Till, 2014). Carruthers and Worthington (2005) have illustrated the power of young children's mathematical graphics and thinking by supporting the developmental dimensions of mathematical graphics from 3-8 years. In addition, raising children’s awareness of ‘hazard symbols’ and the identification of the hazards these symbols refer to is another aspect of communicating risk. Overall, in order to make the risky decisions and outcomes more comprehensive, documentation, decision trees and graphical representations are very useful in assisting children to cognitively process risk related information.

*Connecting risk with reasoning, probabilistic notions and possibility thinking*

Another knowledge aspect related to risk literacy is the ability to reason and rationalize actions and decisions through aspects of probabilistic and possibility thinking. Being and becoming risk literate means being able to think, explain and process possibilities and probabilities, future events, alternative pathways, uncertain choices, possible options, probable outcomes.

According to Burnard, Craft and Grainger (2006) possibility thinking can be stimulated through question-posing and question-responding, play, making connections, innovation, being imaginative, self-determination and intentionality. Risk taking fosters possibility thinking and creativity whilst implying a ‘what if’ or ‘as if’ mindset (Craft, 2001). Young children's possibility thinking involves a move from convergent to more divergent thinking where new ideas, consideration of possible options, imagination of alternatives emerge through the blend of individual, collaborative and communal creativity (Craft, McConnon and Paige-Smith, 2012). Within this framework, time and space to play and explore, to speculate, to imagine and to consider possibilities for future actions are the basic characteristics of the pedagogy of possibility thinking.

Additionally, young children have been found to cognitively perceive randomness at some extent and make links between cause and effect (Kushnir and Gopnik 2005), the most and least probable outcome, random sampling and base rate information (Denison, Konopczynski, Garcia and Xu, 2006). Studies have shown that children as young as 4 demonstrate an understanding of probabilities and expected value, adjust preferences based upon probabilities, indicate notions of probabilistic thinking and possess specific concepts and skills associated with probabilistic reasoning (i.e. Nikiforidou et al, 2013). Therefore, risk literacy can be connected to probabilistic tasks with dice, cards, disks, games of guessing and prediction in exploring the possible future outcomes.

*Considering teacher’s attitudes and risk culture of the classroom*

Another aspect of great importance in supporting risk literacy in the preschool classrooms relates to teachers’ attitudes and behaviors with regard to risk taking. Shearn (2004) found in his report that teachers’ approaches to risk education appear to be based on clearly defined ‘do’s’ and ‘don’ts’, while the predominant discourse used includes far more ‘safety’ connotations rather than ‘risk’ connotations. Of course, teachers should have the aptitude and training in order to encourage and promote activities that provoke disequilibrium and conflicts beyond the usual comfort zone of the classroom and children’s current status, at the time, of thinking or feeling (Brown, 2008).

Cognitive conflicts that lead to conceptual changes and learning might occur through group discussions, argumentation, problem-based learning, collaborative practices, role play or other techniques where children construct knowledge and experiences while participating actively (DeVries and Kohlberg, 1990). Through child-centered didactic approaches children are the actors and initiators in processing the information and making decisions while developing risk assessment, risk avoidance and risk adaptation, in a meaningful way. It is crucial for children, at this age, to undergo experiences in order to interact, make mistakes and discover. Such experiences are mainly encouraged through play and active engagement (Eichsteller and Holthoff, 2009) that shape the risk culture of the classroom.

*Facing risk as a cross-curricular theme*

Risk is complex and linked to many aspects of children’s lives. It cannot be detached and associated, for instance, only with hygiene and health aspects. Thus, it can be related with issues of safety and security in road traffic, with issues of potential dangers and threats on the internet, with issues of caring for nature and so on. In this sense, risk literacy can be supported by formal education through and across curriculum topics (Russell, 2015). Through this ‘rounded’ approach, the integration of knowledge, ideas and concepts within and across subject areas and broader life experiences, encourages meaningful learning (Hayes, 2010). Risk education can be embedded into existing schemes of work, for each key stage and can be reached through case studies, vignettes and practical activities (Shearn, 2004).

Rolfe (2010) states that risk and reward can be explored in a variety of curriculum subjects and activities drawing upon personal, social, health and economic education programs. Accordingly, Spiegelhalter (2009) underlines that risk literacy can be taught as part of the course of mathematics and statistics, but also as part of science, civic and social education. Eichler and Vogel (2015) agree that an explicit risk curriculum is missing and risk is mainly associated with proportions, conditional probabilities, expected values. Pupils from early ages can gain an understanding of the probabilities and the challenges related to different aspects of everyday life in a holistic way. For example, what are the risks of not placing our palm in front of our mouth when coughing (*health*)? What are the risks for children who speak a different language (*culture*)? What are the risks of building a village close to the seaside (*geography*)?

**Final thoughts and next steps**

Children from early in life are, and to some extend have to be, exposed to risks. Risks are interconnected with their holistic development (Boyer, 2006) and evolutionary growth (Brussoni et al, 2012; Sandseter and Kennair, 2011). Children can assess risks by themselves and are confident and capable learners who build their character and personality traits over risky experiences, mistakes or achievements. Through experience, errors and triumphs, and driven by curiosity, excitement and fear, young children learn to cope with uncertainty. Thus, as Adams (2006) states, they are in the state of being and becoming risk ‘experts’ who, through practice, learn to manage their propensity to take risks by balancing expected rewards to perceived costs of failure. These risk-taking skills are mainly cognitive and dispositional and are progressively refined and influenced by many factors; personal differences, parental factors and situational elements (Morrongiello and Lasenby, 2006).

Undeniably, safety has always been an issue for those involved in working with or looking after children and adults have the duty and responsibility of safeguarding children, as a matter of priority. Ensuring safety in any environment related to children is key in children’s wellbeing and growth. Thus, today there are cases in modern societies where child safety has gone too far and a heightened awareness of what is risky (Thompson, 2005) has led to a culture of ‘no risk’ (Bundy et al, 2009). The fear of litigation, increased societal alarms about child safety, moral panics have led to the increase of policies and practices that limit children’s freedom and play opportunities. In this direction there are concerns that children today experience excessive overprotection and ‘surplus safety’ (Wyver et al, 2010); a reality with detrimental, in some cases, implications on their lifestyles and development.

Besides attempting to control and eliminate risk from children’s lives, another way forward is to invest in children’s personal knowledge and understanding of how to best manage risk; under the principles of risk literacy. By giving children an active role and ownership of their learning (Tobin, 2005) we can promote their own perception and attitude towards risk. If children are provided with the space to manage their own risks and decisions in a controlled environment, like that of their classroom, they will become more skilled, and subsequently literate, in confronting the unpredictable nature of the world later on in their lives (Gill, 2007). Risk literacy could be regarded as a way of ensuring optimal child development while preserving children’s safety and wellbeing.

The educational setting of early childhood can play a significant role in transforming the ‘overprotected’ children into agents who are able to cognitively elaborate on risks (process 1) and act upon them (process 2). ECE can serve as a foundational place and time for children to experience the unknown, discuss about hazardous situations, engage with probabilistic and possibility thinking and make use of graphical representations related to risk. Thereby, the main aim of risk education that applies to older children according to Shearn (2004), that of raising children’s risk awareness, can be initiated at a certain level from ECE through a goal-specific perspective. As Eichler and Vogel (2015) state risk is not only about calculations but also about comprehending and dealing with the wider context in which it occurs, by applying broader knowledge and critical skills. Hence, young children need a variety of pedagogical opportunities within their daily routines to learn about risk in its various forms and applications (Martignon and Krauss, 2009; Till, 2014; Lavrysen et al, 2015; Nikiforidou et al, 2012).

Firstly, keeping records and graphical representations is a key component, in terms of communicating risk (Russell, 2015). Graphs, symbols, marks, signs, tables, pictures facilitate children to schematize and visualize the relevant information of a risky problem. These representations enable children to develop their mathematical and statistical thinking and skills of decoding and encoding data (Carruthers and Worthington, 2005; Wilmot 1999). Secondly, risk literacy can be enhanced in conjunction with probabilistic notions (Jones et al, 1997) and possibility thinking (Craft, 2001). Cognitively and intuitively children have shown evidence of understanding, predicting and making links between a state or cause and the probable or upcoming outcome (i.e Denison et al, 2006; Kushnir and Gopnik 2005; Nikiforidou et al, 2013). This capacity of inferring for future events assists in interpreting the facts and, in turn, in perceiving whether a condition is risky or riskless.

The dispositional element of risk in ECE can be affected by the risk culture of the classroom. Teachers who are supportive of new materials, games, activities who are creative and receptive of mistakes can produce a ‘riskily safe’ and resilient ambiance in the classroom. Such stance can be reinforced through the usage of language that relates to both risk and safety (Shearn, 2004), through open-ended questions and through stimulating materials and safe environments (Eichler and Vogel, 2015). Through training sessions teachers could develop the perception that risk is not only a case of threat but also an opportunity for learning (Little, 2006). This perception, in turn, would encourage children to go beyond their familiar boundaries and develop a ‘have a go’ attitude. Finally, risk is suggested to be approached through a cross-curricular way. Although risk literacy is likely to be associated directly with Mathematics and Statistics, other parts of the curriculum are underpinned by risk-related concepts too (Eichler and Vogel, 2015; Spiegelhalter, 2009).

Overall, it is proposed that risk could be experiential, contextualized, meaningful and child-centered in ECE. The argument stands as to foster risk literacy in ways that enhance children’s knowledge and understanding elements of risk (objective approach), as a response to promoting their ownership and independence in making decisions and handling uncertainty. Future research is necessary to give further insights in how risk literacy can be embedded practically in ECE curricula and pedagogy. Risk literacy issues, including instruction and guidance, curriculum objectives, learning goals, teaching packages, variety of resources, teacher training and use of more constructive risk discourse should be taken into consideration. Furthermore, elements of the behavioral response to risk (process 2) could be examined further in identifying whether and how they could inform risk literacy programs and initiatives.

To sum up, being literate in confronting and managing risk and uncertainty can be regarded as an essential competence in the 21st century of ‘world risk societies’ (Beck, 2006). Risk literacy is valuable and if introduced from ECE it can lead to risk knowledgeable children who will gain the foundations of deciding and acting in an effective, reasonable and creative manner.

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