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1.Importance of the Transition between Kindergarten and School

One of the main objectives of the Alt-Er project is to foster resilient learning environments in order to prevent early school leaving and help to provide children with the best possible start to their education. The following work will lay out the case for and against certain practices as policy and practice recommendations for using Information and Communication Technologies (ICT) and storytelling to do so. When looking at the schedule around Early Childhood Education and Care (ECEC) there are several important phases that can be identified as crucial and valuable in setting a course for an activated, engaged, and inquisitive life. The transition phase between kindergarten and school is one such phase, profound both socially and psychologically, and represents a time wherein self-directed narrative creation can be an effective tool in building resilience and creating engagement with learning. In addition, there is evidence that ICT has a specific and marked potential in effectively engaging this important type of meaning making through its novel, multimodal, and collaborative nature. Here, Alt-Er sets out to prescribe a framework for using ICT and storytelling, two separate but complementary strategies, to create opportunities for self-directed creativity on both sides of the transition out of kindergarten, and in doing so attempt to create a better and more equal school start for children across Europe.

Alt-Er aims to achieve its goals by creating a student-centered App for self-directed creativity while also providing a high quality Toolbox of other apps, games, and activities that can help to enhance the efficiency of ECEC supporting children's development and motivation to learn. Alt-Er also works towards, in the face of scepticism, a framework that justifies and explains the use of ICT in doing so. The pedagogical framework described below presents a basis for understanding the thought behind learning activities centered on digitally delivered narrative and aesthetic knowledge that is based on animation and game-based learning (GBL) which are known to have a strong, visual language with many positive didactic forces. Through use of the Alt-Er platform and framework, the quality of ECEC can potentially be enhanced, ideally improving learning outcomes, helping to ensure a positive beginning to formal schooling.

When using animation and GBL teachers can involve children actively in their own learning process. Being active, students go behind given phenomena; they learn, understand, control and in the process they feel amused in the course of learning. Cognitive psychology and pedagogy emphasize that new creative tools have remarkable potential because of their open, diverse, and multi-modal character and in this way Alt-Er aims to be beneficial for all children in a learning context as teaching goals and strategies become more inclusive.

While ECEC is essentially a responsibility of the member states, and educational guidelines differ between countries, there is a considerable scope for the EU to add value to ECEC by facilitating the identification and exchange of good practices. Creating and carrying out Alt-Er as a transnational project helps to ensure that the developed deliverables are built on varied understandings and will be applicable in multiple countries. As evidenced by the associated reporting package, Alt-Er used workshop environments and the extensive external networks of each partner to determine solutions that are applicable in each partner country and beyond meaning that the outputs will have the potential to be integrated into the existing educational guidelines and daily learning activities of a range of locales. As such, and in order to develop a pedagogical framework and user-friendly tools that are inclusive and embrace children from varied social and cultural backgrounds, Alt-Er involves people, skills, and understandings that exist across national borders.

1.1. Teaching and Creativity

In the current climate, there are concerns that compete for the direction of Early Childhood Education and Care. A great deal of educative practice focuses on high-stakes and state-mandated testing, which results in a lack of consideration of creativity as a tactic in learning – this is supported by the absence of assessment requirements on creativity, which is a substantial contributor to the undervaluation of creativity in education (Lucas, Claxton & Spencer, 2013).

This is particularly interesting when considering the widespread concern for raising the level of educational achievements to meet the global demand for an educated, 21st century workforce. A workforce able to meet the demands required for future economic development (Jeffrey, 2006), and in which creativity stands as a central competence valued as one of the most important by

21st century employers, as: “[...] *creativity in education enables a country to compete in a global market, having a flexible workforce, facing national economic challenges, feeding the ‘creative industries’ and enabling youth to adapt to technological change.*” (Lucas, Claxton & Spencer, 2013, pp. 9).

There is an increasing demand for creative minds in this future workforce, and it is only natural to accommodate this demand through education. Research is still needed in order to identify structures for and develop creativity in education, starting critically with a need for training programs for educators (Craft, 2001). Research has suggested that creativity can be developed and that all children have creative capabilities not to be neglected by schools by limiting education to mere transmission of knowledge and skills (Cheung & Leung, 2013). The demand then falls to teachers being properly trained and experienced in using creativity in their efforts.

Teaching creatively is a term presented by Cheung and Leung (2013) within Creative Pedagogy, which, simply put, is teacher-focused pedagogy with the aim of using imaginative approaches to make learning more interesting and effective. On the other hand, there is *teaching for creativity*, which is learner-focused with the aim of fostering creative thinking and behavior among children through different teaching methods and strategies.

These two creativity aspects are argued to be closely interrelated, and many different approaches for teachers to develop creativity in children have been determined. Malaguzzi (1993) concludes (as cited in Cheung & Leung, 2013) *“that the optimum conditions for developing creativity in children are interpersonal exchanges in which conflicts are negotiated, ideas are compared, and actions are the decisive elements [...] teachers can act as supporters and coaches, facilitators, and models of creativity for children”*.

Alt-Er draws from and is based upon these two modes of creativity, but focuses on exposing educators to new strategies and focusing on steps teachers can take to build relationships on the individual level with their students. In studies, drawing and decoding artistic works have been shown to provide insight (in that it comes directly from the children) into the knowledge, perspectives, and interests of young people (Einarsdottir, Dockett & Perry, 2009) through the creative process, which presents connections to the mental state of the children in question.

1.2. The Interplay Between Kindergarten, School, and Family

Internationally, there is growing attention to the transition from kindergarten to school and the effects it might have on children going through this shift. The importance of this period has been recognized in the OECD Starting Strong 2 report, which highlights both opportunities and challenges in this transition, with an opportunity defined as a stimulus to growth and development, and a challenge defined as the risk of regression and failure if the transition is too abrupt or handled without care (as referred in Dockett et al., 2014). Thus, the transition from kindergarten to school has no one-size-fits-all solution and is understood and implemented in many different ways and in different contexts. Despite this, communication between the different institutions and the direct involvement of families, teaching young people to learn in different socio-cultural settings have been shown to smooth transitions for children (Dockett et al., 2014). Alt-Er works to build bridges between kindergarten and primary school environments by being deployed on both sides of the transition, but is also meant to create a shared space for learning in both the home and those formal school environments, scaffolding learning across contexts.

Social interaction is crucial in a child's development and children should be seen as:

"[...] inherently engaged in the social world even from birth, advancing throughout development in their skill in independently carrying out and organizing activities of their culture." (Rogoff, 1990, as cited in Vogler et al., 2008, pp: 10). *Guided participation* is a concept that includes communication as a vital part of encouraging child development, building on Vygotsky's zone of proximal development, which mainly focuses on cultural mediation. The concept takes into account not only the active engagement of children but also the role of peers and caregivers (i.e. adults), between whom communication has a significant role in children's transition between institutions (Vogler et al., 2008).

Looking at children and the many transitions they face in their early life, *life course theory* focuses on and understands human development as occurring through involvement with social institutions and organizations and in addition, it emphasizes that social history and human development cannot be detached (Vogler et al., 2008). The life course perspective places tremendous weight and importance on time, context, process, and meaning making on both human development and family life (Bengtson and Allen 1993). The family is perceived as a micro social group within a macro social context—a "collection of individuals with shared history who interact within ever-

changing social contexts across ever increasing time and space" (Bengtson and Allen 1993, p. 470). As such, life course theory reflects an intersection of social and historical factors with personal biography and development. Alt-Er ensures that these diverse social contexts value each other and work together to promote education with its cross deployment across contexts thought to create the best results.

Supporting young children and their caregivers, both at home and in school, is a vital part of successful school-transitions and there exists evidence that with proper consideration and training, that ICT programmes and properties hold the potential to create success in this area. Without professional and political commitment, though, it may affect the well-being of children in the transition phases (Vogler et al., 2008). This reflects core values of this framework and the project built upon it, as the use of Alt-Er in both home and classroom contexts which will create opportunities for engagement and self actualization through new constructs for learning.

1.3. Learning through Dialogue

The importance of dialogue between children and adults lies within the social interaction taking place, with research showing that any adult understanding of children's needs and priorities is bound to the attention paid to the messages and communication style of the child. This is to say that attentive adults are more likely to engage in dialogue, and dialogue in turn fosters a better understanding of a child's learning needs and potential concerns (White & Redder, 2014).

This emphasis on communication (both among children and between child and adult) being critically important is shared by Samuelsson and Carlsson (2008) who state:

- *"A teacher must be aware of both child's and her/his own perspectives - this is of paramount importance;*
- *Both the child and the teacher must be involved/engaged in the process;*
- *The teacher's goal direction and sensitivity to the child's perspective have to work simultaneously; and*
- *Both the communication and interaction between teachers and children and between children are necessary [...] "* (p:631).

To clarify the view that they present - ECEC should be organized in such a fashion that it supports the greatest amount of interaction possible between children, as well as between children and adults, keeping an emphasis on the importance of them having grounds for discussion.

The content or object of learning, in the case of Alt-Er, the artefacts that make up the world, constitute the foundation from which the interaction processes take place, such as dialogue - thus, creating a solid platform for learning through conversation going beyond the simple aspects of verbal communication. There is an underlying social intercourse taking place ranging between verbal communication and the visual through gestures and body language (White & Redder, 2014), which adults would be wise to include when considering ECEC.

Considering the shift seen today with an ever-increasing use of digital technologies in not only the home, but also the labor market and in educational institutions - and considering the high demand on autonomous, problem solving individuals needed for any future workforce, it would be logical to take into account the development of learner autonomy and the importance of pedagogical tools that support the development of those necessary skills. In his paper about learning as dialogue, Little (1995) points out the negotiation of the meaning of the learning material between learner and teacher - constitutes the teacher making a decision about what is possible for the learner to determine as learning objectives on their own. In the negotiation of this, communication takes place between learner and teacher - both verbally and non-verbally. The sense of this lies in adults and educators “*[...] of having a strong sense of personal responsibility for their teaching, exercising via continuous reflection and analysis the highest possible degree of affective and cognitive control of the teaching process, and exploiting the freedom that this confers.*” (Little, 1995, p:179).

1.4. Learning through Inquiry

In a considered process of inquiry-based learning, concepts and activities focus on moving students away from the traditional step-by-step instructions, rote memorization, and reproduction of expected results practiced in many educational institutions. Inquiry-based learning is about teaching students how to be scientists; e.g. the emphasis is on how to think scientifically – or become self-directed problem solvers (Tan, Yeo & Lim, 2005).

With an increasing focus on creativity in education, and the shift from teacher-centered teaching method to a social-constructivist approach, using play and games as teaching methods proves an important strategy for development, especially with creativity as the main learning goal (Sullivan, 2011). This type of creativity is vital now and in the future as *“professionals in many scientific, mathematical, and engineering fields articulate the need for creative and innovative thinkers in their professions and advocate for the use of playful learning methods to assist students in developing the intellectual abilities required for excellence in these fields.”* (Bergen, 2009) and for the way it provides for the demand of a workforce with 21st century competencies presented earlier in this paper.

1.5. Learning through Creative Expression

First, when considering creativity in children and attempting to develop creative thinking through teaching and subsequent learning, it is important to keep in mind that most learning requires children to be actively engaged in experimenting and raising their own questions and finding answers, how this process fits the definition of creative thinking - during which children should be able to express their own styles and personalities (Zachopoulou, 2007).

The age of the child plays a major part in their creative development, as those in the early stages of life easily travel between the worlds of fantasy and reality, which promotes the development of their creative skills - important considering that Tegano et al. (1991) stated (as cited in Zachopoulou, 2007, p. 15) that: *“when children engage in fantasy they are free from the influences of evaluation and are more likely to think of unconventional ideas”*

It is imperative that one consider a common existing intent to focus on including play as a way to make learning fun with the aim of children not realizing they are learning, hiding the educative intent of a given practice. There is a risk that free and creative play in this manner is pushed into a tight corner, creating the assumption that it is advantageous for children to not be aware when they are learning. However, the reality is that children are eager to learn and enjoy when they realize they have done so - thus, free play should not be seen as freedom from adult involvement (Schousboe, 2013) and without mooring to educational goals. Adult mediation is a way for children

to be equipped with appropriate tools to focus on the intended learning outcomes in the creative processes they undergo in different contexts, giving them the necessary foundation for expressing themselves, with intent, through creative engagement.

Creativity provides children with a means for expressing themselves in ways sometimes unapproachable for in other ways; i.e. movement, free thinking, and an active process of exploration. Encouraging imaginative thinking and providing the tools necessary for children to do so is highly beneficial for their individual development and as skills training for complex problem solving. This is coveted by 21st-century employers as creative thinking skills and critical thinking strategies could: “ [...] *improve children’s ability to generate different movement patterns.*” (Schousboe, 2013, p. 18). One can see how children learn a great deal through discussing, arguing their points, and exploring each other's ideas and ways of thinking, but also how they experience an investigation into and a transference of culture in this process.

1.6. Learning through Digital Technologies

Information and communication technologies have a major impact on the people and environment that surrounds children as well as their process of learning - and research shows that ICT provides many opportunities to strengthen early childhood learning (Bolstad, 2004).

When addressing the opportunities for implementing ICT in early childhood learning, Bolstad (2004, p. 2-3) lists three points to highlight what technologies offer, which are:

- *Opportunities to support and enhance children’s learning and play experiences;*
- *Opportunities to support and strengthen practitioners’ professional learning and development; and*
- *Opportunities to support and strengthen relationships and communication between early childhood centres, parents, and other people connected to the early childhood education setting.*

Interestingly, when children are left alone, in most cases they tend to engage in fantasies and create imaginary worlds through play or games. Looking at the degree to which ICT supports children’s learning and play, educators are eager to implement this aspect of children’s play into

education through digital technologies, but often through activities deemed important or of high value by adults and teachers, which are not particularly motivating for the children (Baecker & Posner, 1999).

In the context of children's play, Bolstad (2004) argues - based on previously existing literature - that technology should never drive the process on its own - as argued above, strict targets highly valued by adults might not motivate children, so "*[...] All planning for the introduction of ICT by children and adults in early childhood education should be grounded in a clear understanding of the purposes, practices, and social context of early childhood education.*" (Bolstad, 2004, p: 3).

With this in mind, the transition phase of early childhood education may be a crucial time to introduce ICT, as in this phase there is less pressure on meeting the same strict educational targets introduced later in educative systems. Developing a solid pedagogical framework for ICT in early childhood helps bridge the gap, as can be seen in the third point above, for children from different backgrounds - creating as equal a base for scaffolding development through cooperation across contexts.

2. Perspectives on ICT

In the modern, wired world, young children encounter ICT technologies long before they start primary education, and in many cases before they go to preschool. With this in mind, it can be assumed that they are exposed to both positive and negative impacts of digital technologies in this period. With the growth of digital educational structures and learning tools it can also be assumed that ICT will continue to represent a significant part of children's learning throughout their education and into their adult lives. Studies on ICT in the execution of early childhood education have shown that (Bolstad, 2004):

1. ICT has an effect on the people and environments that surround young children's learning
2. ICT offers new opportunities to strengthen many aspects of early childhood education practice
3. There is strong support and interest across the whole education sector for the development and integration of ICT into education policy, curriculum, and practice

To the first point, the current period does mark the infancy of ICT and an incomplete understanding of its effects. While there might be a tremendous potential for growth and learning, there is also a distinct need for considered investigation into the effects that ICT has on everyone, especially young people. What can be done, in the face of uncertainty, is make best efforts to use ICT in responsible and thoughtful ways. This leads nicely into agreement with the sentiment of the second point, that there are effective strategies that can ensure ICT is an overall benefit to young learners – and that self-directed creativity (as is laid out and facilitated by Alt-Er) is one effective strategy for its deployment.

Alt-Er fosters communication and collaboration between teachers, parents, and classmates, and in doing so bridges the gap between the home and schools as atmospheres for learning with a focus on personally directed narrative creation, a deeply important exercise in building young minds. The project team hopes that this framework and the engaging storytelling made possible by the Alt-Er application and Toolbox are suitable solutions that work to justify the strong support and interest that have been evidenced in third point to exist in the education sector for thoughtful and effective integration of ICT into education policy, curriculum, and practice.

An important consideration put forth by Siraj-Blatchford and Whitebread (2003) suggests that it is highly valuable for young children to start developing their technological literacy, increasingly considered to represent an essential point of curriculum in any broad and balanced educational training for the twenty-first century. In doing so, it is extremely important to have well defined procedures and strategies for how to engage ICT to effectively achieve learning objectives with a clear understanding of the purposes, practices, and social context of early childhood education. Alt-Er, being based on years of research and activity in the field of ECEC represents a novel approach that builds on longstanding tradition, and which takes self-directed storytelling - a celebrated tactic for creating engagement - and moves it into a digital frame.

One measure of the important role ICT can play in education is based on the context it can provide for children's activities and any resultant cognitive development. Not only does it represent a learning rich environment that can help to motivate children to engage in education, ICT can deliver content and activities that engender and support strong and productive emotions for children (Unesco, 2010). Alt-Er is designed with great care as regards socio-emotional understanding and development. Many of the scenarios presented will produce emotion through their demand that students think not only about the action depicted, but possible catalysts for it as well as the inevitable consequences.

Studies suggest that ICT use can provide a context for collaboration, cooperation, and positive learning experiences between children, or between children and adults (Bolstad, 2004) and to this point Alt-Er is supremely capable of creating an environment for sharing, collaboration, and cooperation between young people among themselves or with adults, be they parents or teachers.

In the development of the Alt-Er platform, particular attention was paid to the ways in which ICT helps to support learning environment by fostering:

1. Communication and collaboration. ICT provides a variety of ways for children to weave together words, pictures, and sounds, thereby providing a range of ways for children to communicate their ideas, thoughts, and feelings (Bolstad, 2004). By using ICT, children naturally touch on collaborative frames for problem solving, drawing, video recording, or construction, and using screen-based applications (Siraj-Blatchford and Siraj-Blatchford, 2006).

2. Creativity. According to Siraj-Blatchford and Siraj-Blatchford (2006), well-designed ICT applications assume a wide variety of possible responses from a child and allow a child to try different things out and, if they do not work, to try something else. There is an immense potential in ICT applications that offer the possibility of open-ended decision-making and problem solving. According to Edwards and Hiler (1993), in order to support creativity, children need to be encouraged to look playfully for alternative ways of doing things, to see that there is always a choice, to make connections between things, to make unusual comparisons, and to see things from the point of view of others. These ideas are supported by The Next Generation Forum, an American-based research group, which states that new technologies can be very powerful in supporting the creative potential of young children (Siraj-Blatchford and Siraj-Blachford, 2006). By presenting ICT usage as technological and creative toys, it can help to change a number of important aspects of children and learning, for example, can help to improve learning relationships between children and teachers; ICT usage empowers children by granting them a voice they have never had before and opens new ways of designing dynamic methods which can help to put children in touch with ideas and concepts that might formerly be beyond their reach.

3. Cultural awareness. According to Danid Masoumi (2015), ICT helps to enhance children's cultural awareness by reacting to social needs for intercultural and multilingual approaches. In addition, it helps teachers to exemplify cultural and ethical differences and similarities. According to Thuston's research (2004), such opportunities help enhance young children's understanding and appreciation of cultural diversity, and thus reduce social stratification and therefore increase social inclusion.

4. Learning to learn. As the Siraj-Blatchford and Siraj-Blatchford study (2006) suggests there is strong evidence that computers can be applied to help the development of metacognition and learning to learn. A number of studies support this idea, and add that well designed and appropriately used ICT applications help to encourage discussion, problem solving, risk taking and flexible thinking. It allows children to engage in self-directed creativity and can be tailored to children's individual needs and as a result reduce barriers for children with special physical or learning needs.

In order for any ICT tool to be determined to enrich the learning environment, its development values must be carefully examined. The New Zealand Council for Educational Research (2004) in its recommendations for ICT implementation in ECEC, suggest to assess software and the contribution of computer games according to Verenikina et al., 2003 as presented below.

Theories about the purpose or value of play	Relevant questions for practitioners to assess software
General characteristics of play	
Play is a spontaneous, self-initiated, and self-regulated activity	• Does this computer game allow children to freely engage in play? Does it provide freedom of choice?
Children are actively involved in creating their play and are in control of it	• Does this computer game allow children to create their own scenarios, rules, and characters of the play?
Play includes a dimension of pretend	• Does this computer game enable children to act in an imaginary, "as if" situation?
Classical theories of play	
Play discharges natural energy of the body	• Does this computer game allow for discharge of natural energy? If so, in what sense?
Play alleviates boredom while the natural motor functions of the body are restored	• Does this computer game engage the interests of the child (with particular children in mind as this criterion is considered)?
Play restores energy that is expended in work	• Does this computer game allow for rest and relaxation in an enjoyable and engaging way?
Play affords opportunities to develop skills necessary for functioning as adults	• Does this computer game provide opportunities for developing adult skills?
Modern theories of play	
Play reduces anxiety by giving children a sense of control over their world and an acceptable way to express forbidden impulses	• Does this computer game enable children to gain a sense of control over events that they could not control in their lives, including traumatic experiences?
Play consolidates learning that has already taken place, while allowing the possibility of new learning in a relaxed atmosphere	• Does this computer game have the potential to consolidate existing learning? If so, what kind of learning? Does it have the potential to develop new concepts and skills? Does it engage the child in such approaches as problem-solving and self-discovery?
Play promotes the ability to comprehend multiple layers of meaning	• Does this computer game operate at literal and figurative levels of meaning? Does it enable children to reflect on the rules and means of communication?
Play promotes sense of self in terms of personal identity and social relations with others	• Does this computer game develop a sense of a child's own identity? Does it develop a child's sense of his/her own social identities in relation to others? If so, how?
Socio-cultural theories of play	
Play promotes abstract thought by separating meaning from objects and actions and using actions and objects in symbolic ways	• Does this computer game involve and develop use of symbolic meaning? If so, in what ways?
Play allows children to reach beyond their actual development in their cognition and self-regulation	• Does this computer game allow children to engage in their zone of proximal development and function above their everyday abilities in cognitive and socio-emotional areas?
In play, children achieve mental representations of social roles and the rules of society	• Does this computer game provide children with an opportunity to act out and explore the roles and rules of functioning in adult society? Does it allow for group work and collaboration?

Figure 2. Questions for assessing the contribution of computer games to children play (adapted from Verenikina et al., 2003 as cited in Bolstad R., Early Childhood Education New Zealand Council for Educational Research, 2004)

Alt-Er is thought to be effective as measured by this agenda, as evidenced by the commonality between the platforms functionality and the ideals described therein.

As regards to *General Characteristics of Play* - Alt-Er allows children to freely engage in play and provides freedom of choice, and does so with a dimension that promotes children acting out imaginary "as if" scenarios, important to development. Even when used without prompts, the Alt-Er world is built in the pursuit of building a space for young people to make meaning through self-directed creativity via an exploration of whatever can be imagined to be taking place in each of the presented scenes.

As regards *Classical Theories of Play*, Alt-Er allows for *restful relaxation* while providing opportunities for developing adult skills, and does so with a focus on engaging the interests of the child - as the game and its assigned meanings and determined course of actions are self-directed. Alt-Er presents training not only in emotional and social development areas made possible by its use of common scenes from life, with the added benefit of providing a means to discuss the point where screen engagement becomes too much, and why and how it should be limited.

As regards *Modern Theories of Play* - Alt-Er is an effective tool in the development of a sense of self and one that operates on a literal and figurative level to create opportunities for comprehension of multiple layers of meaning. It also functions as a means for consolidating existing learning in the sense that the totality of a child's understandings will be used to create meaning in the Alt-Er world, drawing on both formal and informally derived knowledge to build a world of stories from the prompts and scenes.

As regards to *Socio-cultural Theories of Play* - Alt-Er develops use of symbolic meaning, provides children with the opportunity to explore the roles and rules of functioning in an adult society, and can be collaborative in its deployment. Each scene is open to interpretation and point of view, particularly interesting in the sense that children achieve a mental representation of social roles and the rules of society by assuming the role of the "other" in this context. The toys, characters, and stories utilised in children's play are seen to be significant artefacts from their social and cultural settings; thus, in play, children are acquiring the tools and meanings of their culture.

Over the past few years, the amount of computer software targeted at young audiences has significantly increased. To make it appropriate to the target age of children, such software is usually presented in a playful manner. It can range from educational software, designed to enhance literacy and numeracy skills, to commercial arcade games produced for recreational purposes. To make the educational content of these software packages more attractive for

children, they are often presented in a play oriented manner often equating play with fun, thereby diminishing the potential developmental value of such software in enhancing children's generic, higher order cognitive skills for the best impact upon which the learning should be fun. On the other hand, there is a significant underestimation of the potential developmental value of computer play designed for the purposes of children's recreation and entertainment. Educators still typically perceive computer games as a recreational or 'toy' technology only (Buchanan, 2004). This is not surprising, as children's spontaneous play sometimes, and traditionally, is seen as an activity which is opposite to work. While the Alt-Er framework represents a starting point, there is a need to further develop a theoretically-based set of criteria that will allow educators to assess individual pieces of computer software and judge their developmental value when choosing particular products for their classroom settings, or advising parents on the purchase of computer play packages for their children.

The above issues, concerns, and intents - which were considered at each stage throughout the development, testing, and ultimate creation of Alt-Er - are thought to be in line with The New Zealand Council for Educational Research (2004) and the myriad researchers consulted in this process, creating valuable framework and practice that conforms to existing recommendations for ICT implementation in early childhood education. When taken as a package, these understandings and guiding principles outline a strategy that can justify the use of certain ICT solutions, provide teachers and parents with a roadmap for judging their efficacy, and create meaningful engagement across contexts to further the educational benefits of self-directed creativity.

3. Developmental Appropriateness

According to the 2010 Unesco report “Recognizing the Potential of ICT in Early Childhood Education”, the guiding principle in major literature reviews on ICT in ECEC is a concept referred to as Developmental Appropriateness. It provides guidelines for teachers, decision makers and software developers for determining the appropriateness of ICT applications in the early years (Blatchford J. & Whitebread D, 2003). The guiding principles will be presented below (Unesco, 2010;Blatchford & Whitebread , 2003, Bolstad, 2004) and afterwards discussed in relation to Alt-Er Toolbox development.

1. **The ICT tool should be educational.** This principle states that ICT tools in general have to be educational in nature, and therefore this effectively excludes all applications where clear learning aims cannot be identified. In addition, it is supposed to be developmentally appropriate - in order to encourage development - including aspects of creativity, self expression, and language.

Alt-Er strives to use pedagogically valid and proven strategies and underlying goals in the pursuit of educational experiences for children. Alt-Er focuses on the power of creativity and storytelling to allow for these opportunities for learning. By providing a blank slate for meaning making in each scene, Alt-Er unlocks personally driven and conceived thinking and understandings. These will not only allow for socio-emotional growth on the part of the student, but also present a valuable opportunity for understanding of the students themselves by teachers, parents and pedagogues. The glimpse that the stories chosen to be told gives into the mind of the child is invaluable as an effective tool to help judge a student’s mindset, but also track growth and development. The categories chosen for inclusion in the scripting of the scenes are based on valuable areas for development in young minds, and adhere to important milestones for learning. With each of the five categories practitioners can tie the material and conversations back to important areas for personal growth - *Health and Personal Hygiene, Knowledge of the World, Social Skills, Cooperation, and Emotional Control* which have been found to be important areas for development in young minds.

Teaching correct and acceptable *Health and Personal Hygiene* principles is vital to achieve life-long habits in the prevention and spread of illnesses and infections, but also

to maintain a suitable appearance and avoid offending others, bridging both health concerns and a specific aspect of socio-emotional development.

Knowledge of the World is an overtly general category that was chosen in the belief that the more children know about the world around them from an early age, the more suited they are to grapple with new ideas and concepts in the future. It is important for children to understand social structures and how they work, but the investigation that goes on in determining this is a skill in and of itself. Inquisitiveness will develop children's abilities to think issues through for themselves and breeds a resilience in learning contexts that will serve them well in life.

Cooperation is a classic and vital part of learning to function in society and will be a crucial skill to have developed in these important years. To value the contribution of others as part of a team and respect the responsibilities that individuals have to the others around them are critical skills that benefit all.

Emotional control or self-regulation has become recognized for its foundational role in promoting wellbeing throughout life. Talking about and practicing self-regulation can engender resilience and goal oriented thinking with the effect of establishing the best possible habits for physical, emotional, and social growth and educational excellence. Emotional control and the resilience it can potentially create are especially valuable for consideration in this transition phase from kindergarten to primary school, where children are faced with one of their first periods of tumult.

2. **ICT tools should be encourage collaboration.** According to Light and Butterworth (1992), *joint attention and children learning to share* provides more effective cognitive challenges for young children. When children are engaged in collaborative play, it provides an environment for children to express their personal constructions and articulate their thinking. Collaboration is well suited to providing opportunities for cognitive conflict and efforts to reach consensus and for the co-construction of potential solutions in a creative processes of problem solving.

Collaboration is a valuable aspect of and context for learning, and as such Alt-Er was created to embrace and provide opportunity for collaborative use. Alt-Er allows for a multitude of modes of deployment, both in the classroom and at home, but also functions as a singular, paired, or group activity. Collaborative use of the platform and the Toolbox are highly recommended and will create opportunities not present in solo use, as engagement with Alt-Er in a group setting will create the grounds for training in group dynamics and social integration. Alt-Er provides prompts and leading questions for teachers and parents to use with students, but these are a starting point for discussion and meaning making that has been shown to occur naturally when Alt-Er is presented as a group activity. The associative play at work in group deployment of Alt-Er creates engagement, cooperation, communication and marks the start of learning how to negotiate and get along in a group for children in the lower range of the appropriate age band, while the cooperative play makes it possible for them to work as a team, develop an interest in their peers, and strive towards common goals for children in the older segment.

3. **The ICT tool should support integration and play.** ICT applications should be integrated as thoroughly as possible with other established early education practices in order to make the curriculum relevant to children (Unesco, 2010). In order for children to understand and most benefit from educative aspects of ICT, it needs to be used in a meaningful context, with real purpose and in pursuit of real problem solving. Computer applications provide means that help children to interact and engage in a much wider range of “virtual artifacts” and environments that would otherwise be possible. Play is considered the leading activity for young children as well as the driving force in the child's development of new forms and motivation, and as such, ICT tools should have a strong focus on integrating aspects of play in their application. ICT tools need to be designed for applied to particular purposes - but it is important to note - the inappropriate practice is to integrate ICT tools as a reward or punishment (Blatchford & Whitebread, 2003).

Alt-er is built with a distinct “openness” that allows not only for deployment with a wide range of ages, but which also makes it complementary to nearly any curriculum or learning area. When used under the direction of an adult, be they parents or teachers, scenarios in the Alt-er world can be tied back to issues and concerns that dovetail with agendas set forth by both kindergartens and primary schools. If the students in question had begun formal training in counting, for example, the scenarios presented in the Alt-er world can

be used to simply illustrate, train, and test the learning and knowledge of the child on that subject. On top of this the Alt-er platform and Toolbox represent, at their core, playful and expressive means for having conversations and sparking realizations that will open young minds and can impart important learning by way of their playful structure. There are no winners or losers in Alt-er, just a wide range of opinions and voices that are equally valid and valuable, and which can give clues to a child's development and any potential areas of concern. The integratory value of having a group exploration of the space is thought to be one of the most exciting aspects of use of the Alt-er platform. Alt-Er allows for each member of the group to assign importance and meaning, while also giving the experience of stating it before the group, a valuable action in knowing and believing in oneself, but also in understanding the importance of listening to others.

4. **The ICT tool should leave the child in control.** It is suggested that the ICT applications should be controlled by the child; they should not control the child's interaction through programmed learning or any other behaviorist device.

In accordance with thinking and practice that outlines student-centered and controlled learning as deeply valuable for its ability to create independent thinkers, Alt-Er is built to be primarily directed by the young people using it with intuitive controls and a minimum of external resources demanded of it. With a brief introduction to the Alt-Er world, most children will have no trouble moving between scenes and making personal meaning of the presented scenarios. These scenarios, it is important to add, do not prescribe any specific goal, but rather present a nearly blank slate for students to interpret and infer what they will. In the same way that the scenarios are open to interpretation, the gameplay is not regimented or beholden to a set of rules, leaving the child to determine where to go on the map by virtue of which scenes are of interest to them personally.

5. **The ICT tool should be transparent and intuitive.** It is advised that ICT tools should be transparent so their functions would be clearly defined and intuitive (Unesco, 2010).

In creating a platform and experience that would be suitable for the age range in question, it was imperative that it not be too difficult to understand or use for the lowest section of that band. As such all unnecessary steps and segmentations have been removed. The written prompts and questions are simple enough for many new and developing readers

in the first year of primary school, and are thought to be motivational and effective in regards to reading and writing skills development.

6. **The ICT tool should avoid violence or stereotyping.** Its is extremely important to be alert for violence, stereotypical depictions, or actions related to social class, ethnicity and gender in developing or activating ICT tools for children. Particular importance should be placed on matters of violence and sexual violence - materials must not condone nor encourage anti-social behaviour of this kind; nor should they play on the fears of the vulnerable (ASA, 2002). Whenever ICT applications fail to meet the presented criteria, it cannot be justified for the use in educational context.

Violent and antisocial behaviors are minor, rare, and only ever presented in the Alt-Er platform and Toolbox as opportunities to investigate their inappropriateness, meant to make children think more about why some people engage in them. Specific examples show a negative correlation with violence, like a horse who reacts poorly to the threat of being whipped and which is thought to spur a tangential conversations for different audiences - about appropriate, calm reactions, for example with older children, and the importance of being kind to creatures great and small for younger ones. There are a wide variety of races presented in the platform, and great care was taken to avoid stereotyping or insensitivity as regard the depictions of any race.

7. **The integration of ICT should support the development of awareness of health and safety issues.** It is suggested that the time spent using any desktop computer application by child should not extend beyond 20 minutes at a time in case of 3-year olds and maximum of 40 minutes by the age of 8 (Unesco, 2010). If the child, or group of children, are very much engaged in an ICT activity and the completion requires a longer period, this should be allowed but it is not desirable to encourage children to do this regularly. In addition, it is important that, while learning about ICT in their world, children also learn how to manage their own space and select the right tools to use when sitting at a computer. Use of the computer or other ICT tools, should not be at the expense of outdoor opportunities and experiences (Siraj-Blatchford & Siraj-Blatchford, 2000).

Any ICT strategy is going to be problematic and divisive when the question of “screen time” enters the debate, but Alt-Er is thought to be less egregious than other tools in this regard as it is not a passive experience. Much the opposite in fact, as Alt-Er demands

self-directed creativity, investigation, and storytelling as the platform itself simply presents scenarios, but makes no value judgements and prescribes no meaning to the events. Alt-Er can easily be used in short deployments where several scenes are set out as a framework for tackling specific topics, or students can be left to explore on their own for longer but age appropriate periods. Alt-Er is an easy process to break into segments of any length as there is no “finish line”, but it instead functions as an ongoing exploration which can be brought to a close at any time without the problem of reaching a certain point or saving any progress first.

8. **The integration of ICT should support the involvement of parents.** Research shows that when parents, teachers and children collaborate, it leads to improved academic performance (Siraj-Blatchford et al., 2002). According to Unesco research (2010), ECEC centers reported that when using ICT with support of teachers and parents, children showed a more positive attitude towards learning and were better behaved.

Creating an environment open and inviting to parental involvement was a guiding principle of the Alt-Er platform, and one that has been a primary pursuit from the beginning of the work undertaken to create the platform, Toolbox, and this framework itself. Alt-Er creates a simple way for learning and education to bridge the gap between home and school, functioning in much the same way when used with teachers or parents, and creating valuable links between the two settings. This framework itself is an effort to make the ideas behind Alt-Er and the benefits to using it clear to a variety of audiences including parents, justifying the platform and hopefully encouraging them to use Alt-Er in a process of talking with their children. Engaging with and exploring Alt-Er in both the home and school, with parents, siblings, teachers, and/or friends allows for learning to become a more holistic and naturally occurring process, that is thought to make life-long learners out of activated and engaged young people.

The above outlined principles as developed by Unesco provide an excellent guide for planning and providing ICT learning opportunities for children and present considered curriculum guidelines for use across Europe (Nutkins et al., 2013). It is suggested that educators and parents engage in a discussion in relation to each recommendation and discuss how it can fit best in the general philosophy, practice and learning curriculum in each particular setting. It is strongly suggested to use the presented principles as an

evaluation tool for programs or other ICT applications (Siraj-Blatchford & Whitebread, 2003). Developmentally appropriate practices can help to ensure that age appropriate, individual, and culturally appropriate educational material is well used in the teaching environment and adapted in teaching curriculum, especially now in the rapidly changing early childhood education environment. To each of these points, the Alt-Er platform and Toolbox represent effective and considered engagement with ICT in pursuit of more effective ECEC through age appropriate self directed creativity and storytelling.

4. Importance of Storytelling

From early childhood, young people use narrative creation and storytelling as a way of thinking, constructing stories and explanations in their search to understand and make sense of the world. Storytelling is recognized as a critical aspect of human thought and development - it positively affects social, emotional, and lingual development and has a heavy influence on identity formation (Engel, 1999, 2005; Fox, 1993; McCabe and Bliss, 2003 as cited in Cremin et al, 2017). The educationalist Rosen (1984) argues that story plays a profoundly important part in children's cognitive and emotional development and puts forth that there is a great importance in narrative creation, claiming it "is nothing if not a supreme means of rendering otherwise chaotic, shapeless events into a coherent whole saturated with meaning" (Rosen, 1988: 164).

Narrative creation also fosters imagination development, making an imaginative space to play and ponder which enables thinking about the world, people, and relationships (Egan, 2005; Vygostky, 1978). It enables young people to assume widely varied roles, engage in "what if" situations, and use a variety of symbolic resources to construct potential worlds (Nicolopoulou, 2005; Baumer et al. 2005, Gupta, 2009 as cited in Cremin et al., 2017). The "what if" and "as if" concept as regards children aged three to eleven is called "possibility thinking" (Craft, 2001). A number of studies (Chappell et al., 2008; Craft et al., 2012a; Craft et al., 2012b as cited in Cremin et al., 2017) analyzing possibility thinking reveals that reciprocal relationships exist between questioning, imagination, and narrative with all three building on the back of formal educational structures and practice.

Storytelling helps to form and sustain a shared culture of collaboration, experimentation, and a cross-fertilization of ideas that serves as a powerful matrix for social, cognitive, and linguistic development (Nicolopoulou et al., 2014). These were considered to be vital pursuits of the project and each has been carefully considered as valuable results of the open ended and self-directed creativity at work in Alt-Er.

With regard to the transition period and the desired effect of lessening early school leaving, research shows that early narrative competences help to create a secure foundation for emergent literacy and long-term success in schooling (e.g. McCabe and Bliss, 2003; Tabors et al., 2001 as cited in Cremin et al.,2017). Studies report that early narrative skills are linked to and predictive

of reading comprehension in later primary school years (Dickinson and Tabors, 2001; Griffin et al., 2004 as referred in Cremin et al., 2017). Additionally, storytelling supports the development of important skills that are required for success in the twenty-first century – skills such as creativity, risk taking, and coping with uncertainty (Fisher et al., 2011). When retelling and re-enacting stories in the early years (regardless of whether these are based on traditional oral stories, printed texts or life experiences), play enriches the language children use as they improvise and adopt perspectives on the world around them (e.g. Rowe, 1998, 2000; Sawyer, 2003 as cited in Cremin et al., 2017). This is one of the true strengths of Alt-Er, that when deployed in a group setting, meaning making is paired with presentation - in the form of expression of the ideas and concepts to the group, parents, or teachers. This presentation is a vital part of young people finding their voice and having pride in personally directed active engagement with the group through narrative/storytelling.

Moreover, research suggests that an oral language approach to emergent literacy can help to bridge the gap between home and school, and there is a strong body of research evidence suggesting that participation in storytelling and story acting can significantly promote young children's oral and narrative development (Cremin et al., 2017). This is particularly interesting in consideration of the ease with which Alt-Er can bridge the classroom and the home by providing a simple interface that can work in either environment and embraces the oral language approach with the shared resources of both teachers and parents.

The storytelling and story-acting practice demonstrates the following characteristics of a learning ecology (Nicolopoulou, Cole, 2010):

- It has tasks or problems that children are asked to, or want to, solve (e.g. make decisions about how the stories should develop)
- It encourages particular kinds of discourse (as when children disseminate their stories)
- It establishes particular norms of participation (e.g. turn-taking, the number of children on stage, active listening to other people's stories)
- It provides specific cultural tools and material means (e.g. the tools used to record the stories, the 'story stage')
- It offers teachers practical means to orchestrate relations among these elements

More specifically, storytelling can be used to support the literacy skills of children by (Phillips, L.1999):

- Exposing children to a broad range of narratives
- Providing opportunities to play with words, with story, and with text
- Inviting children to retell or re enact a story after a storytelling experience
- Employing effective questioning to extend retelling and comprehension skills
- Embracing the creation of personal stories expressed in any form, be it orally, by depiction, or written down
- Extending their skills by playing with the story in a number of different forms (visual arts, dramatic play, stop motion film-making)

A number of studies analyzing story-telling practice and implementation at schools suggest that there is compelling evidence of the contribution this practice can make to children's language development, narrative skills, cognitive abilities, and social and emotional competence.

It has been shown that storytelling plays a crucial role in children's identity formation, and in their efforts to explore complex concepts that they encounter in their daily lives, particularly when offered in contexts that are genuinely meaningful, engaging, and stimulating for the children themselves. Finding ways to bridge the gap between home and school through verbal and self-directed storytelling exercises is a valuable step in creating the best possible start to studies for young people.

The Alt-Er App uses narrative creation and storytelling as the basis of its function, and in doing so can activate these and other potential benefits for young minds, while the Toolbox consists of numerous other platforms and processes for narrative based and self directed creativity. Areas for exploration include sender and receiver roles of messages and content, depiction of complex issues in a symbolic manner, and understanding emotional stimuli and response mechanisms. Each of these are valid and worthy of exploration in a creativity and student based pedagogic model as they instigate the activity as a jumping off point to larger issues and development areas.

5. Arguments against ICT Usage

The following section presents the prevailing arguments against the use of ICT in schooling contexts, vital for presenting the most complete framework and best practices for ICT use and game-based learning. A consolidation of these arguments will be found in the recommendations section as they inform the best possible deployment of Alt-Er and other game based, creative pursuits in the classroom.

The question of how to implement and most benefit from the use of information and communications technology in teaching is central to realizing the ambitions expressed by the 21st century skills. Although there are many opinions as to what skills, exactly, will be demanded by the labor market of the future, ICT usage has been identified as a crucial component for achieving standards of competence.

There are two sides to this need for ICT usage and training. First, as the OECD report (2015, p:3) states, “*Students unable to navigate through a complex digital landscape will no longer be able to participate fully in the economic, social and cultural life around them*”. In light of the widespread and revolutionary integration of ICT in the modern world, there is simply a need for students to learn *with, through, and by means of* such technology. Second, students will have to become more capable *in general*. For example, the Partnership for 21st Century Skills argues “*It is imperative that the [Common Core State Standards] be considered the “floor”—not the “ceiling”— when it comes to expectations for student performance in the 21st century.*” (P21, 2011,p:3). The abilities necessary for critical thinking, creativity, collaboration, and communication must be enhanced further in order to enable complex problem solving of the major known and as of yet unknown challenges of society. In short, ICT usage is recognized as both a core subject matter *and* an enabler for reaching higher standards in other core subject matters.

It is no surprise, then, that a considerable amount of research has gone into figuring out how to use ICT in practice. In the following paragraphs, a systematic overview of *the case against current ICT practices* will be presented, in order to identify the challenges to overcome in order to successfully obtain the benefits outlined above, and thereby present the most complete and considered framework possible.

Two general categories regarding arguments of ICT practice will be presented. The first category concerns research evidence. On the one hand, it identifies common mistakes in positive ICT writing, where at times the case for ICT is overstated. On the other hand, it presents results from the latest longitudinal studies and literature reviews in order to shed some light on the macro-evidence for the efficacy of current ICT practices. There is a lack of macro-level evidence concerning the efficacy of ICT usage in educational contexts.

The second category concerns the attitudes and skills of professionals and practitioners in teaching. This research aims to examine the obstacles expressed by those responsible for the ground level work and implementation of ICT. Practitioners express a need for both technological and pedagogical knowledge regarding ICT usage.

This following part of the framework aims to present the meanings of different claims. The table below outlines different ways to understand the strength and content of a claim:

Statement Modality <u>Assertive</u> <u>Commitment</u>	Possibility	Actuality	Necessity
<u>Doxastic</u>	I believe P is possible	I believe P is the case	I believe P is necessarily the case
<u>Epistemic</u>	I know P is possible	I know P is the case	I know P is necessarily the case

Table 1. Analysis Framework

The 'Assertive Commitment' aspect refers to how strongly a claim commits to what it asserts. A doxastic commitment starts and ends with a belief about the proposition P while an epistemic commitment requires knowledge about the proposition P. The important element here is not

exactly what knowledge or beliefs are, but that there is a significant difference between a doxastic assertive commitment and an epistemic assertive commitment. The 'Statement Modality' aspect refers to the strength of the either explicit or implicit modifier linked to what the claim asserts. A possibility claim is a claim that the proposition P could be the case. An actuality claim is a claim that the proposition P *is* the case. A necessity claim is a claim that the proposition P *must* be the case. In order to separate actuality from necessity, this study will regard actuality as expressing contingency i.e. that while P is the case, it might not have been. Necessity, on the other hand, expresses that P is *always* the case.

The variations of the table are arranged such that moving up, or to the left makes a claim weaker, while moving down or to the right makes the claim stronger. What is of interest in the coming analysis is whether initial claims and further representations of those claims are consistent in accordance with the aspects outlined above.

5.1. Category 1 – The Research Evidence

Initial presentation and analysis of the general ICT-positive argument

The positive attitude towards ICT usage in teaching has been captured particularly well by Lindahl and Folkesson: *“Research has shown positive effects on children’s learning and development, thus justifying the intensified use of ICT in the educational system.”* (Lindahl, Folkesson 2012: p:422). There are two components to this argument.

The first part of the sentence expresses a descriptive epistemic actuality claim: “It is known that ICT usage has positive effects on children’s learning and development”. The second part of the sentence adds furthermore a normative epistemic actuality claim: “because of the first part of this sentence, it is known that we are justified in intensifying ICT usage in the educational system. This study will refer to these as “the descriptive claim” and “the normative claim” from now on. In short, it is known what ought to be done in light of what is known to be the case.

Unfortunately, further analysis of this claim *also* captures a pattern in the writings of ICT advocates. It is rare that research is in agreement with both the descriptive and normative claims

of the general argument outlined above. The three sources intended by Lindahl & Folkesson to demonstrate the quoted point have this to say about their findings:

“Given numerous potential confounding factors and the wide developmental stages of children being affected, it is almost impossible to make a broad-based general argument for or against computer use at school and home.” (McCarrick, Li 2007,p:91)

“One should bear in mind the small size of research samples, which will have affected the results of the intervention programmes.” (Vernadakis et al., 2005,p:103)

“There has been a proliferation of reports, articles and websites that make claims for the benefits to be derived from children using computers but the evidence base for much of this writing is weak.” (Plowman, Stephen, 2003,p:150)

The study by McCarrick and Li is a meta-study of existing empirical research between 1985 and 2004 on preschool ICT usage. The quote from their text does not support the epistemic actuality claim expressed by Lindahl and Folkesson. Rather than claiming epistemic actuality for both the descriptive and normative claim, McCarrick and Li find it “almost impossible” to make the normative claim due to the enormous complexity of the descriptive claim.

The paper by Vernadakis et al is a brief literature review concerning specifically computer assisted instruction between 1996 and 2003. While their overall conclusion is positive towards specifically ICT usage in education, they urge that the small sample sizes undermine general arguments towards ICT usage and instead justify further research. This means that Vernadakis et al. might support the descriptive claim expressed by Lindahl and Folkesson but would find the normative claim too strong.

Plowman and Stephen deliver a literature review of research between 1996 and 2002 on specifically pre-school children using ICT. While they might agree with the normative claim, they question the evidential basis for the descriptive claim. They express that *“ fundamental design problem for educational applications is the lack of an explicit pedagogical model to underpin use.”* (Plowman, Stephen, 2003, p: 160). There is a need of good models for understanding what sound pedagogical ICT usage is. According to Plowman & Stephen (2003), ICT usage in education has the *possibility* of resulting in positive effects, but it cannot be said that ICT usage *as such* will result in said effects.

In summary, the general argument for ICT usage in education justifies a normative claim concerning its use with a descriptive claim concerning its efficacy. The validation for those claims, however, have been shown to not agree with important aspects of the general argument. This is one example of a general problem with ICT-positive research. The conclusions drawn in one paper are enlarged to cognitive actuality when cited and are thus overstepping their justificatory reach. This weakens the overall credibility of ICT-positive claims until their evidential basis has been thoroughly assessed.

Macro-evidence of ICT efficacy

Let us assume that epistemic sliding is an unfortunate pattern that takes place in enough ICT-positive research to be relevant. If the strongest evidence concerning ICT usage is still positive, then surely some writing habits are not enough to overturn the descriptive claim. In the end, the crucial point is whether the evidence *does* stack up in favor of the descriptive claim and not how accurately it is represented elsewhere. What follows, therefore, is a look at some of the newest research at a high level of generality.

The 2015 OECD report provides an international perspective on the usage of ICT in the educational system and its impact on PISA scores. The executive summary is clear:

“But where [information and communication technologies] are used in the classroom, their impact on student performance is mixed, at best. In fact, PISA results show no appreciable improvements in student achievement in reading, mathematics or science in the countries that had invested heavily in ICT for education. [...] But while PISA results suggest that limited use of computers at school may be better than not using computers at all, using them more intensively than the current OECD average tends to be associated with significantly poorer student performance.” (OECD 2015,p:15-16).

This poses problems for the descriptive and normative claims. Recall that the descriptive claim is rooted in research on *current ICT practice* showing that said usage benefits children and thus justifying *future* intensified ICT usage. The findings of the report undermine both claims. It shows *no appreciable improvement* from heavy investment into ICT, which is counter to the claim of epistemic actuality that research shows that ICT usage has positive effects on the development and learning of children. On the other hand, even if it assumed that had said positive effects, the report still finds that *more intensive use trends towards significantly poorer student performance*.

This undermines the normative claim independently of the descriptive claim. It states that the above considerations are just for the descriptive and normative claims as such, but they are competing against other claims concerning what to do to improve the education system as well. The report finds the following:

“And perhaps the most disappointing finding of the report is that technology is of little help in bridging the skills divide between advantaged and disadvantaged students. Put simply, ensuring that every child attains a baseline level of proficiency in reading and mathematics seems to do more to create equal opportunities in a digital world than can be achieved by expanding or subsidizing access to high- tech devices and services.” (OECD, 2015,p:3).

So, in order to make sure that every student is well suited for the labor market of tomorrow, the first step would not be to intensify ICT usage, but rather to improve the didactic processes necessary for baseline proficiency in reading and mathematics. If current ICT practice was the answer to this problem, then the report would not have found the results discussed above. Indeed, as the report finds, *“[...] technology can amplify great teaching, but great technology cannot replace poor teaching.”* (OECD 2015, p: 16). In order to exploit the potential of ICT, it must first improve the level of teaching. ICT usage is not a fix or a substitute for investment into teachers, rather it seems to be the case that investment into teaching is a precondition for good ICT usage.

In summary, the OECD report finds that current ICT practices do not show appreciable improvements in student achievement and the potential of future ICT practices are limited by current teaching proficiency. Improving the general level of proficiency in teaching is a precondition for exploiting the potential of ICT in education.

The priority of good teaching over simply using ICT is echoed in the 2009 report “How are digital games used in schools?” which encompasses a survey of teachers, policymakers, some case studies and a literature review:

Research into using games for learning carried out over the past 20 years, but with very mixed results, shows that skills, knowledge and attitudes can be improved by means of Game-Based Learning (GBL), given the right environment. However, the choice of game along with the environment in which it is situated and the teacher’s role as moderator are vital if the desired learning outcomes are to be achieved. Video games can supplement traditional learning but not replace it (Wastiau et al., 2009,p:5).

The first thing to note is that the main takeaway from the report is an epistemic possibility claim: “We know that it *can* work under the right circumstances”. The learning environment and the capabilities of the teacher are placed on equal footing with the correct choice of technology. The ideal use scenario indicated by the report is also limited to “supplementation” rather than replacing or wholesale transformation of traditional learning. The report also cautions against extrapolating too much from this result:

“The practices analyzed confirm the positive impact of the classroom use of digital games. They nevertheless remain small in number, and more in-depth analysis, including cases where the use of digital games did not match the teacher’s expectations, would be required for a more precise evaluation.” (Wastiau et al 2009: 5).

Here, in other words, is an initial indication of the *potential* of using ICT enabled game-based learning in classrooms to *supplement* traditional learning. Rather than verify the truth of the positive effects of ICT usage and then justify an intensified presence of ICT in the educational system, the conclusion here is to justify further research into determining how game-based learning can supplement traditional learning at a more general level of abstraction.

Game-based learning is further investigated by Boyle et al. in the 2015 “update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games” which included a focus on digital learning games. The authors present the following point for discussion:

“Since games are frequently championed as a novel, engaging and active new method for supporting 21st century skills and behavior change, it was disappointing that games for learning are still used most frequently to support knowledge acquisition. This seems to be a rather pedestrian use of games compared with the speculation about their potential.” (Boyle et al., 2015,p:187).

Knowledge acquisition is understood as acquiring “know-how” in this case, which does fall short of the ambitions described in the 21st century skills. Important to note here is that while the authors do find evidence of positive outcomes from using games and games-based learning, ICT usage resulting in those outcomes is far from living up to the speculated potential and innovation they *could* offer.

The 2004 literature review by Rachel Bolstad “The Role and Potential of ICT in Early Childhood Education” is focused specifically on preschool children in New Zealand. The main finding regarding the efficacy of ICT usage in that professional context is the following:

“Case studies show that ICT can be used to support aspects of learning including language development and mathematical thinking, and can also provide unique opportunities for scaffolding and supporting learning for children with special learning needs, and children from diverse cultural or language backgrounds.” (Bolstad, 2004, p:72).

Note the use of “support” for “aspects” of learning, which again places ICT usage in a supplemental role to *some* learning. This is much weaker than the descriptive claim, although it might still substantiate the normative claim. Bolstad’s review identifies preconditions for good ICT usage similar to the two reports we have already presented:

The value that ICT can add to young children’s learning environments depends on the choices practitioners make about which tools to select, and when and how to use these; and their understandings about how these tools can support children’s learning, development, and play. (Bolstad, 2004,p:72)

It is seen here again that teacher competence is marked as a necessary condition for exploiting the value of ICT usage in working with preschool children. One last thing to note about the evidence presented by Bolstad for the positive effects of ICT is the following:

“Case studies show how early childhood education practitioners have used ICT to support a range of practices they believe to directly or indirectly support children’s learning and development.” (Bolstad, 2004,p:73)

In other words, this is evidence of doxastic actuality claims from among practitioners. What *can* be concluded based on this is that those working the ground floor *believe* that ICT has positive effects on children’s learning and development, not that it *has* those effects. The belief that something is effective does not establish the knowledge that it is effective. Overall, what the review shows is that ICT usage has proven compatible with educational practice and that educational practitioners believe it to be worth using for some tasks.

The final piece of research to be presented here is the “Association Between Screen Time and Children’s Performance on a Developmental Screening Test” study by Madigan et al., (2019). The

lagged cohort study observed relations between child development and the amount of screen time the child was exposed to. They present the following finding:

“Results suggest that screen time is likely the initial factor: greater screen time at 24 months was associated with poorer performance on developmental screening tests at 36 months, and similarly, greater screen time at 36 months was associated with lower scores on developmental screening tests at 60 months. The obverse association was not observed.” (Madigan et al, 2019,p:5)

It was previously unclear whether the directionality between development and screen time went towards children with slower development having more screen time or more screen time leading to children with slower development. Screen time being the suggested initial factor puts further pressure on proper ICT usage in education, particularly so for early education and childcare. Taking this result as an argument against ICT usage in general would be overstating its impact, but it certainly highlights the need for *good* ICT usage. With poor usage of screen time being detrimental, it is imperative that ICT activities for young children are structured and carried out in accordance with best practice pedagogy.

Looking at the review finding of this category, the overall argument is that the level of pedagogical proficiency is the limiting factor in exploiting the potential of ICT usage in education in order to facilitate the creation of 21st century skills as well as better learning outcomes in general. The skills of educational practitioners must be increased and the pedagogical models for ICT usage must be improved.

5.2. Category 2 – Challenges for Practitioners

The challenges for practitioner category identifies the challenges facing the educational practitioners responsible for carrying out the ICT usage discussed in the previous section. This will be done by reviewing three studies about the obstacles expressed by the practitioners themselves.

Magen-Nagar & Firstater (2019) aimed specifically at uncovering beliefs about ICT usage from kindergarten teachers. Their study reveals three distinct categories of obstacles to better ICT usage: developmental, pedagogical, and didactic obstacles.

The developmental category refers to worries regarding the natural and social development of the children. Here practitioners worry that computers in particular may “[...] enable [the children] to avoid coping with their difficulties.” (Magen-Naga, 2019, p:175). The difficulties mentioned here are particularly social in nature i.e. the ICT (computers, in this case) enable children to escape from social interactions with other children. This runs counter to the ambition of the teachers to foster healthy social relations among their students. There exists therefore a need for a framework describing how to integrate ICT usage into teaching without hindering the children’s development.

The didactic category refers to obstacles regarding teaching methods and environment management. The teachers expressed a need for guidance in organizing the use of the computers e.g. how much time a child should spend on the computer, what they should be doing while they are on the computer, etc. They also lack a didactically sound and standardized way to assess and evaluate what goes on when the children are using the ICT:

“The majority of the teachers in this study do not track the children’s activities systematically, and instead assess their work spontaneously and randomly. [...] The teachers’ reports indicate that even when they do keep track of the children’s activities on the computer, they only monitor the children’s’ behavior without assessing their learning, achievements, or what use they make of the activity.” (Magen-Nagar & Firstater, 2019,p:174)

The general takeaway from this worry is that teachers need help with evaluating the children’s ICT usage as well as knowledge regarding the goals and methods of ICT-assisted learning.

Additionally, the didactic category also contains two worries regarding the technology itself. First, older teachers specifically expressed that they lacked sufficient knowledge to use the computer in question. Their own lack of familiarity with ICT translates to a lack of confidence in using the technology, which results in very conservative and safe usage in the classroom. Second, the teachers expressed worries regarding the maintenance of the computer. The user permissions are set such that the children can change various things about the software, which the teachers either have to spend time correcting or do not know how to actually correct. The software itself was also reported to freeze from time to time, which the teachers were not sure what to do about (Magen-Nagar, 2019, p: 174-175).

The pedagogical category refers to learning theories and classroom management methods. This category revealed two main attitudes towards ICT usage:

“First, they think that kindergarten education has more important roles (e.g., “I think there are many other important activities in the kindergarten”) and that time should be spent on other things (e.g., “These nine hours we devote to things outside the domain of this square,” “What they have in kindergarten, they won’t have later on, such as social play and crafts, working with their hands”). [...] Second, there are the negative implications of ICT for child development, mainly social development.” (Magen-Nagar, 2019, p:171 – 172)

This is a fundamental concern. The teachers do not see the presence and use of ICT as having a central part to play when it comes to the central functions and objectives of the kindergarten. They are very particular about wanting to protect their vision of an ideal childhood; the children can always intensify their ICT usage later on. Note that this worry about social development is different from the one we noted earlier. The first issue regarding social development concerned how to implement ICT in practice. This worry about social development concerns the theoretical compatibility between pedagogical knowledge, ICT usage, and childhood ideals. In other words, the first concern is about practical compatibility while the second one is about theoretical compatibility.

Fenty & Anderson (2014) also targeted practitioners in early childhood settings aiming to uncover the knowledge, beliefs, and current practices present. The following results were revealed (Fenty & Anderson, 2014, p:125):

- Participants generally recognized the value and potential of ICT in early childhood settings
- There is a lack of technological knowledge to realize that value and potential
- There is a lack of pedagogical knowledge to realize that value and potential
- There is a lack of updated technology with which to realize that value and potential
- There is a lack of consensus regarding how to implement ICT in practice

While the participants in this study were generally positive towards ICT and recognized the need to incorporate technology into daily lessons, it shows a pattern similar to Magen-Nagar & Firstater. Interestingly, the level of technology available to Fenty & Andersons participants was significantly higher than Magen-Nagar & Firstater, suggesting that the solution is not to simply introduce more widespread access to more advanced ICT devices (Fenty & Anderson, 2014, p:116).

It should be noted, however, that while Fenty & Anderson uncover a generally more positive attitude towards ICT among their study participants, they also uncover many of the same expressed obstacles and worries that we saw from Magen-Nagar & Firstater's less ICT-positive teachers. This is not to say that positive attitudes towards ICT has no role to play. Teachers with personal interest, experience with technology, and comparatively more experience with teaching were found to have a much higher chance of using ICT during instruction Fenty & Anderson (2014, p:116).

Lindahl & Folkesson (2012) further expand the picture of ICT usage among educational practitioners by exploring tensions between different norms present in teaching. They identify that “[...] there appears to be a problem concerning how educators need to balance between the child's independence and need for guidance.” (Lindahl & Folkesson 2012, p: 434). The teachers find it difficult to be flexible and dynamic in their control of the learning situation. How much freedom should they allow the children to have and how much assistance are they able to give within the learning environment? This again highlights the need for a technological-pedagogical model of how to use these tools in educational contexts.

In summary, the picture presented here is that the biggest obstacles to exploiting the value and potential of ICT in education is pedagogical and technological knowledge. Whether the studied practitioners were personally for or against ICT usage, they expressed a common desire for detailed and proficient guidance in how, when, and why to implement ICT usage in teaching. This suggests that personal prejudice against ICT usage is not a leading factor in the lacking ICT results since the worries and obstacles expressed by both ICT-positive and ICT-negative practitioners were very similar.

The above paragraphs aimed to reconstruct a case against ICT usage in educational contexts. This was done in order to uncover knowledge regarding the most important areas of innovation for new ICT drives and projects. A number of issues with overstating the ICT-positive case were identified, a lack of macro-level evidence of ICT efficacy in educational contexts was discovered, and a lack of pedagogical as well as technological knowledge of how to make use of ICT were determined to be mitigating factors. The general argument for the ICT-positive case consisted of a descriptive claim and a normative claim. It was shown that research cited in favor of the general argument often rejected either the descriptive or the normative claim. The macro-level evidence concerning educational ICT efficacy shows that once ICT access and usage reaches the OECD

average, further increase in access or usage do not result in appreciable improvement in learning outcomes. At the ground level the research conducted here has identified a general expression of a need for more knowledge both regarding the technology and the pedagogy associated with it.

6. Participatory Model for Transitions

Overall, the research and activities conducted during the execution of the Alt-Er project have determined that there are barriers to the use of ICT and creative, student centered learning strategies in the periods before and after the transition from kindergarten to school environments. A number of potential concerns can be addressed through application of properly considered activities and means to make their value and harmony clear to pedagogic concerns. This demands a thorough mapping of the pedagogic tenants at work, the potential benefits of ICT, and the ways self-directed creativity can be a part of Alt-Er and other existing applications, which can be used in the classroom.

The following Participatory Model for Transitions has been developed by Lisa Gjedde - a task complementary to her long career in working with media children as a Researcher at Aalborg University - to create a base of understanding of and address skepticism about the use of ICT in ECEC, while at the same time drawing important connections between self-created storytelling and valuable pedagogic intent. Additionally, the framework makes considered effort to highlight the possible benefits which come from multi-modal deployment of the Alt-Er strategies across contexts of school and the home to scaffold the potential benefits and engagement with learning.

This framework and model are not specific to Alt-Er, but rather they lay out a process for using storytelling to validate and expand the potential of any ICT property, as long as the whole is taken into consideration in the selection of the given activity. The model below consists of six areas, Creative and Narrative Explorations, School Family Communications, Artifacts as Prompts for Dialogue, Resilience through Socio-emotional Development, Developing Shared Dialogues, and Continuity Across Contexts, each of which will be further described below.

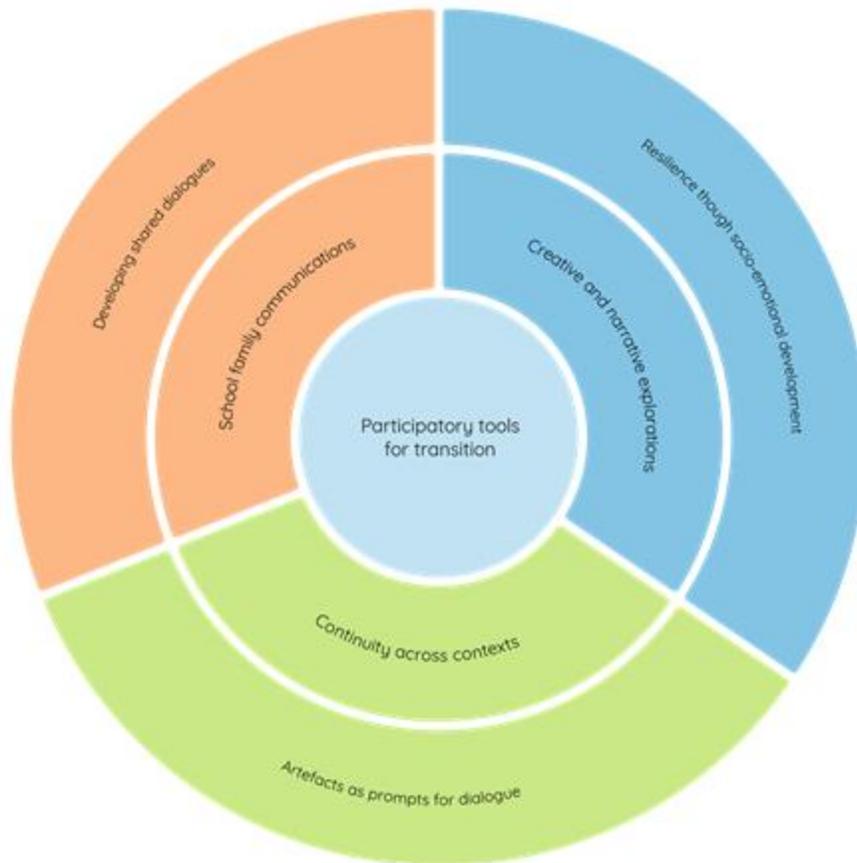


Fig. 1. *Participatory Model for Transitions, Lisa Gjedde (2018)*

6.1. Creative and Narrative Explorations

- Creativity stands as one of the central competences most valued in 21st century employees – as such, it is deeply important to accommodate this increasing demand for creative minds through education, starting with training programs for teachers
- Teaching creatively and using imaginative approaches to make learning more interesting and effective provides opportunities for children to express their own styles and personalities
- Teaching for creativity aims to foster creative thinking and behavior among children through different teaching methods and strategies
- Storytelling supports development of creativity, risk taking, and coping with uncertainty

- Early narrative competences are linked to and predictive of reading comprehension in later primary school years and help to create a secure foundation for future literacy and long term success in schooling

6.2. School Family Communications

- Communication between different institutions and the direct involvement of families, as well as teaching children to work in different social and cultural settings have been shown to smooth transitions for children
- Guided participation takes into account not only the active engagement of children, but also the role of peers and caregivers between whom communication and has a significant role in children`s transition between institutions are critical to ease transitions
- Using ICT with support of teachers and parents, can result in a more positive attitudes towards learning
- Parents, teachers and children working in collaborative way together leads to improved academic performance

6.3. Artifacts as Prompts for Dialogue

- Both surface level and symbolic levels of meaning can be explored through dialogue based on depictions
- Artifacts are reflective of the real world with which young people in the transition period are still coming to terms with and building their understandings of the world around them
- Narrative creation fosters imagination development, creating an imaginative space to play and ponder which enables thinking about the world, people and relationships
- Encouraging imaginative thinking and providing tools necessary for children to think imaginatively is highly beneficial for individual development and the ability for complex problem solving

6.4. Developing Shared Dialogues

- Adults understanding of children's needs and priorities is linked to the attention paid to the communication style of the child - attentive adults are more likely to engage in dialogue, and dialogue in turn fosters a better understanding of a child's learning needs
- A teacher must be aware of both child's and his/hers own perspectives, possible only through dialogue with that student
- Both children and the teacher must be involved/engaged in the process and present
- The goals of the teacher and a sensitivity to the child's perspective have to work simultaneously

6.5. Resilience through Socio-emotional Development

- Social interaction is crucial in any child's development and children should be seen as inherently engaged in the social world from birth
- Social engagement prompts development of skills in independently carrying out and organizing activities in their culture
- Adult mediation is a way for children to be equipped with appropriate tools to focus on the learning outcomes in the creative processes they undergo in different contexts, giving them the necessary foundation for expressing themselves
- ICT usage empowers children by granting them a voice they may have never had before and opens new ways of designing dynamic methods which can help to put children in touch with ideas and concepts formerly beyond their reach
- Storytelling is recognized as a critical aspect of human thought and development, it positively affects social, emotional and lingual development and has a heavy influence of identity formation
- Children should be provided with a different tools to express their ideas and emotions in a safe environment, ideally in a self-directed manner

6.6. Continuity across Contexts

- Teachers act as supporters, coaches, facilitators and models of creativity for children
- The family is perceived as a micro social group within a macro social context - a collection of individuals with shared history who interact within ever changing social contexts across increasing time and space
- Parents and teachers working in the same mediated space benefit retention and engagement
- Supporting and creating links between young children and their caregivers both at home and in school is a vital part of successful school transitions
- There exists a marked importance for collaboration and communication between kindergarten and preschool to ensure smooth and successful transition for children

As can be seen here, there are important considerations behind the conception and execution of the Alt-Er Framework, App, and Toolbox which relate to a variety of relevant and interrelated aspects of ECEC and transitional phases for young students. The framework and model present the importance of self-directed creativity in the form of narrative building and communication, and tie those to concrete aspects of the life and developmental schedule of young learners. Alt-Er takes the additional step of laying out how ICT can be a successful mechanism for engaging those activities, based on thoughtful consideration of the technology in question, the reasons for using it, and the potential benefits that can come of the process. The core takeaways will be featured in the following section which can be regarded as recommendations for just such thoughtful use of ICT and storytelling in creating a successful start to education for young people.

7. The Alt-Er Toolbox

The links and suggestions provided in the Alt-Er Toolbox represent furtherances of many of the concepts inherent to the Alt-Er App and have strong resonance with the associated Framework. They exemplify student centered learning activities that can help promote socio-emotional development through creativity, agency, and collaboration and take the Alt-Er construct into an even deeper level of personally directed creation. Whereas with the Alt-Er App children play the role of interpreter, the additional Toolbox actions function in a more productive capacity where new content is conceived, developed, and created.

7.1. Stop Motion

Stop motion animation is a great medium for activating creativity and storytelling in young minds as it allows for any conceivable story to be convincingly brought to life. The process involves drawing and artistry in a way that film does not, but still has the peripheral benefits of stage based progression through scripting, storyboarding, and final production. Groups are best suited to undertake production considering the varied roles demanded of creating a stop motion animated piece, but individual efforts can also be highly rewarding. Alt-Er based character sheets are available for use in the execution of stop motion productions, creating further continuity across concepts in fully activating Alt-Er as a learning platform. As with live action film, the final piece is an excellent bridge to the home and activates the parents as viewers, ideally sparking further productions outside the school environment.

7.2. Video Editing – Film Production

Functioning in many of the same ways that stop motion animation production does, film production will allow young people to find a voice of their own in the creation of a short live action film. Filmmaking and video editing exercises will create opportunities for students to make a narrative film that depicts scenes and actions they find relevant, and will allow for a presentation aspect in showing the films in the classroom. The skills and understandings of film media will be a benefit

to young people in the future by providing them with tactile skills in film production, but also give them a head start in understanding the increasingly important role of media in the modern world.

7.3. Sound Editing

Sound editing is an important part of filmmaking, but it is also a valuable art in and of itself. Creating and editing sound and music will allow for a different creative exploration and can activate subtle learning with deep impact on emotional development. Sound editing place importance on the tone and feeling made possible through sound. The main areas of sound editing are dialogue, effects, and music. Students can use scripts to record dialogue for short films, create sound effects for specific actions in the films, and make soundtracks to accompany the film. Fun exercises can include sound hunting, where students armed with a recording device search for relevant and interesting sounds or getting background soundscapes for use in the film. Examples include crinkling a bag of chips to simulate a fire or rustling a ball of tape to mimic footsteps in the grass.

7.4. Photo Editing

Photo editing will provide an ample space for exploration and creativity, allowing students to make personally driven alterations to existing or new photographs. Photography in itself needs no introduction as a deeply creative pursuit, one where attention to detail is greatly rewarded. The process of taking photos and altering them in a photo-editing program though, expands those creative possibilities. Photo editing exercises will allow students to apply filters, flip and zoom images, and engage with the subtlety of framing an image in different ways. An interesting overlap between this and the filmmaking apps could be to have students create posters for their short films.

7.5. Game Creation

Video games are an emergent media in terms of engaging self directed creativity, but one that will resonate thoroughly with young audiences who are very familiar with gaming constructs.

Assuming the control of the creation of a game though, changes perspective and expands the thinking about the media as a whole. The skills developed in creating a game/experience in the suggested apps will not only be a creative exercise, but can also inform and expose young people to hard skills demanded of programming. Activating areas that deal with risk/reward, goal orientation, and patience, creating games can be a fantastic means for engaging children with curriculum through carefully planned use.

7.6. Scriptwriting

Scriptwriting represents an activity most closely tied to traditionally considered storytelling, simply creating a narrative from a single child or the shared minds of a class. The process encourages far more opportunities for cooperation and collaboration in group settings, but is still productive in solo or one on one use. Determining motives for and skills in reading human behavior are beneficial aspects that can be easily affected in the process of scriptwriting. Describing the why behind the actions is a positive and generative way to develop and describe rationale, influence, and intent.

7.7. Green Screen Studio

Green screen, or chroma-keying as it is also known, is a process where you work with a colored screen to create background for video, allowing anyone to place actors or actions in fantastic settings. The term green screen comes from the traditional green color used for the screen, allowing you to replace everything that is green. For example if you have a green background, you can change the background into a beach by putting a picture of a beach in the background using an app. If you have wear a green shirt, only your neck and head and would be visible allowing the green covering your body to disappear into the wall, essentially becoming the chosen background.

8. Recommendations for ICT Usage in ECEC

The research and exploration of ICT and storytelling in ECEC undertaken in this project has led to a base of understandings about its use in practice. Analysis suggests that of the main obstacles to ICT use is attitudes towards the technologies and how teachers use them. This is evidenced by their use not as a technological means to renew and refresh their teaching, but simply to search for information, replace the traditional books with digital alternatives, and for purposes of illustration. Such use creates limited learning that leads to a mismatch between ICT use and students' achievements (Hsu, 2016). It also neglects to contextualize ICT by way of student centered pedagogy, and the important role it can play in self-directed creativity. The conclusion emerging from this finding is that schools and teachers do not always realize the pedagogical potential of ICT, and do not use it to implement new pedagogies or develop thinking and creativity, and so the didactic tools being used remain traditional (Noga & Firstater, 2019).

The following paragraphs will serve as a guide to the most effective use of ICT, storytelling, and the Alt-Er platform itself in Early Childhood Education and Care contexts, and will prescribe a process for the application of ICT in educational pursuits in advance of, during, and following the transitional phase.

As evidenced earlier, effective ICT implementation mainly depends on attitudes and knowledge related to the use of ICT and the specific ICT property in question. The importance of professional development by teachers as regards ICT competence is publicly acknowledged and widely supported (Unesco ICT- CST, 2008).

A 2019 report *The Obstacles to ICT Implementation in the Kindergarten Environment: Kindergarten Teachers' Beliefs* (Noga & Firstater, 2019) reveal three main obstacle-related categories, of which the first two are most salient:

1. pedagogically, despite acknowledgment of its value, ICT does not play a key role in the kindergarten teachers' education philosophy;
2. didactically, ICT is used mainly as a source of information and for instructional illustration, rather than as a means to new teaching strategies; and
3. developmentally, computer use affects children's social development, especially those with special needs, but not always positively.

The main conclusion is that kindergarten teachers neither overcome these obstacles nor utilize ICT potential to its fullest; hence, teachers should be encouraged to participate in ICT-related professional training to understand the didactic opportunities ICT offers early childhood education and its developmentally related pros and cons in order to adopt innovative ICT-related pedagogies.

The New Zealand Council for Educational Research (2004) suggests that effective ICT implementation in ECEC is highly dependent on choices that teachers/practitioners make – which tools to select, with what purpose, and when and how to use it. Effective professional development in regard to ICT incorporates teachers' own inspirations, aspirations, skills, and knowledge, using ICT to provide different opportunities for teachers to learn and explore ways of working in their own early childhood education settings. This is to say that it is of vital importance that teachers and parents come to terms with underlying pedagogic theory and goals that put forth and show how ICT can act as valuable tools for young people.

Effective implementation also depends on practitioners' knowledge of contemporary theories about learning and development, and emergent linkages between them and ICT. This is to say that practitioners need to be familiar with contemporary theories and recognize how ICT usage can be integrated and utilized to create the desired effects. In this regard, a sampling of the pedagogic theory at work in the Alr-Er Framework is a suitable start, highlighting the importance of story-telling and creativity as a potential for social-emotional development and presenting digital strategies for activating those areas.

ICT tools should not be seen as a way of superseding or displacing other educative activities. According to Siraj-Blatchford and Siraj-Blatchford (2006 as cited in Kalas, 2010), ICT usage should not come at the expense of other activities. To the contrary, ICT implementation in ECEC should be seen as a complementary activity that is best used to support children in their learning and play (see advantages of ICT usage in ECEC in section 2 above). This is to say that ICT should not be used to replace a currently running and effective strategy, but rather that it should be considered in existing contexts to determine methods by which it can best be used to further and scaffold the learning areas and goals prescribed for the period.

According to DATEC (Siraj- Blatchford & Whitebread, 2003, p:11), time spent using ICT applications should be comparatively short, normally not meant to exceed 10 to 20 minutes at a

time in the case of 3-4 year-olds while it can be extended to a maximum of 40 minutes by the age of eight. Practitioners should ensure that screen time be used in moderation and remember that the most effective way to enhance children development is “ through high-quality caregiver-child interactions without the distraction of screens” (Madigan et al., 2019) This is to say that use periods for any ICT tools should stay within reasonable constraints, and that their use should be offset by engaged discussion with students about the process, its reasoning, and values that are critical to its use.

It has been determined that creating a strategy for learning that bridges the home and school environments is a strong tool in heading off disruptive and negative issues common in the transition phase. Alt-Er is meant to be used in both the school but also the home, with the benefits multiplying across the different settings and contexts for learning. More than two decades ago, Staker (1993) proposed a list of possible strategies how to promote collaboration among parents, schools, and children in related to ICT at ECEC, which follow:

- Workshops for parents in small groups, where they could talk about children’s work with ICT
- Allowing parents observe children at work with ICT applications
- Displaying children’s ICT-related work in the school entrance hall to inform parents and stimulate their interest
- Parents being invited to work with groups of children in the classroom
- Children being able to borrow ICT equipment from schools
- Parents being offered advice on the software, which could be specifically purchased for use at home

As the Unesco report on ICT usage in ECEC (2010) states that at times parents have various misconceptions with regard to ICT usage in ECEC, resulting from parents concerns and anxieties that their children will be exposed to aggression and violence. Parents fear that they will not be able to help and understand their children in the ICT area, they will fail to protect from potential threats and will not understand why and how their children are using ICT - therefore there is a great need for parents’ involvement in ICT usage at schools and kindergartens. The Unesco study (2010) in relation to ICT usage in ECEC presents the following strategies regarding how to improve parents perception and knowledge of ICT:

- encourage parents to enter (both metaphorically and in real life) the classroom, to be active along with their younger children, to get involved in and experience ICT activities
- arrange open classes for parents (and teachers from other settings) to demonstrate approach and activities engaging ICT , so parents may familiarize themselves and experience different ICT applications
- organize special workshops for parents, where they are presented with the appropriateness of 'rules of action', which they should follow at home as well
- clarify the importance of early childhood education and the potential role of ICT in it to ensure systematic cooperation with families
- organize presentations of educational activities of a class followed by analysis and recommendations
- clarify educational goals, learning strategies, and activities in relation to ICT integration as well as presenting examples of videos, recordings, and different project and activities outputs
- collect and present electronic portfolios of children`s products and distribute it to parents

These prescriptions aim to help parents understand the value of ICT activities in early childhood education – and to consider and critically assess the process through which they are utilized. Moreover, it helps to build cooperation across home and school contexts, creating learning opportunities from the experience, as well as adopting valuable rules and procedures for safe and productive use of ICT in the home. Finally, it helps to create a dialogue regarding educational programs, goals, and forms that can inform an understanding of the goals and strategies for their accomplishment that underpin education for years to come.

The literature review and analysis conducted by Standford et al. (2015) regarding teaching with computer games in formal education suggests that the following factors play an important role in shaping how teachers understand the potential of games in schools and how they are able to implement it:

- Technical infrastructure
- Institutional and professional factors, such as time, space, cultures of collaboration, knowledge sharing, classroom rituals etc.
- The extent to which games can be 'disaggregated' and appropriated to meet specific needs

- Teachers personal experience of game play and their personal and professional identities as teacher
- Cultural expectations of children's attitudes to and expertise in playing computer games

Standford et al. (2015) continues, suggesting the following factors to take into account for teachers and school while implementing ICT activities:

- Teachers should have clear knowledge about learning objectives they are aiming to achieve and identify the precise role that ICT plays in it
- Games should not have to be used in their entirety to support educational goals – in some cases, certain elements of the games and be extracted and applied for specific purposes
- Teachers and students should have sufficient time to get familiar with the game
- There needs to be sufficient time for reflection and review of game based activities to be systematically implemented into curriculum, being aware that some time might be needed to assess any technical issues that might exist
- Working with “expert” student groups could be beneficial while implementing new teaching and learning approaches.

As regards policy in the European Union and beyond, the project group have determined corollary outputs from The Early Learning in the Knowledge Society conference held in Brussels in 2003, which proposed the following policy recommendations for effective development of ICT competence of ECEC teachers (Siraj-Blatchford & Siraj-Blatchford, 2006, p:69):

- to include Early Childhood Education and Care in national ICT strategies for education
- to provide initial training and ongoing professional development for all practitioners
- to optimize ICT policies by supporting parental involvement
- to support knowledge building and cooperation at all levels for practitioners, policy-makers, and parents

9. Alt-Er Specific Recommendations

- Familiarize yourself with the framework, App, and Toolbox to create the best opportunity for benefit
- Consider presented theories that highlight the benefits of learner based and creative strategies for learning and development
- Discuss the framework, App, and Toolbox with colleagues, staff, and parents to create a unified front
- Discuss the application and its intent with the class prior to its deployment, including the learning goals
- Do not “hide” the learning, seek and embrace opportunities to point out lessons in the activity
- Act as a supporter or coach for creativity, with an open mind to the suggestions from the children
- Scaffold the experience – consider the home an extension of the classroom and support further use of the app with family and friends outside school
- Pay attention to the cues that may come from the inputs, consider their implications and when possible build on those notes
- Embrace the benefits possible through exposure to both the technology but also the varied viewpoints of the others in the class
- Seek opportunities to encourage and facilitate collaboration and communication
- Allow time for unstructured exploration, a valuable path to self-reliance
- Encourage storytelling and the development of narrative, both fictional and from personal experience
- Look for opportunities to discuss the agenzized learning goals of your curriculum through the ICT lens
- Look for opportunities to discuss symbolism as well as practical depictions
- Mix groups to encourage further integration of the students and presentation to new audiences
- Train social norms through turn taking, attentive listening, and presentation/feedback
- Consider screen time guidelines for the age group question
- Look for opportunities to teach “how to think”
- When in doubt, ask them why!

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