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ADAPTING CAMERA-PEN PEDAGOGY FOR IMPLEMENTATION WITHIN ECEC

Exploring barriers and difficulties in technology
integration using a teacher action research approach

ABSTRACT

Nicholas Newman: Adapting camera-pen pedagogy for implementation within ECEC
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Despite the increasing emphasis on the significance of children's media education, multiliteracies, and ICT competencies within ECEC, technology is generally considered to be under-used and underutilised within ECEC educational facilities. Whilst research has prominently advocated for the integration of technology within pedagogical approaches and highlighted the benefits and consistencies of an integrated approach, there is a considerable lack of evidence-based research into how educators can utilise technology purposefully within the ECEC environment.

The Camera-pen pedagogical approach marries the use of the camera with the traditional usage of the pen, not only for documentation, but also for problem solving, utilising the camera as a tool for learning. This thesis attempts to explore camera-pen pedagogy as a viable method of technology implementation and integration within children's everyday learning experiences, and as a tool for utilisation and adaptation within the ECEC environment. Utilising a teacher action research approach. During my exploratory learning experience, I identify and explore the various challenges and barriers faced when attempting to plan and implement an unfamiliar, technologically integrated pedagogical approach within an ECEC setting, in an attempt further enhance my knowledges and understandings of camera-pen as a pedagogical approach in addition the various challenges faced when integrating technology within an ECEC setting, and to further develop my professional expertise as a confident and competent educator.

The present research projects findings highlight that there is no one-size fits all methodology to teaching nor technology integration. Every classroom, learning environment, and child is unique and thus presents a different challenge towards the way in which we perceive, implement, and understand our pedagogical practices and our philosophies towards education. We must exercise our agency as educators with an openness and understanding that challenges will be ever present, and that by reflecting, self-evaluating and attempting to overcome them with carefully considered, critical, and often collaborative thinking, planning, and implementation, we may develop pedagogies not in the interest of our own efficiency or our own expectation of achieved goals, but in the interest and consideration of every child.

Keywords: Action research, camera-pen, technology, barriers, pre-school, self-reflection, ECEC

The originality of this thesis has been checked using the Turnitin OriginalityCheck service.

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1 INTRODUCTION

As educators within our ever changing, ever diversifying world of education, we have a duty to integrate often new and innovative technologies into our everyday pedagogical approaches (National Core Curriculum for Early Childhood Education and Care 2018 [NCC for ECEC], 2019). Despite the increasing emphasis on the significance of children's media education, multiliteracies, and ICT competencies within ECEC (OECD, 2019; NCC for ECEC, 2019), technology is generally reported to be under-used and underutilised within ECEC educational facilities (Tsumura & Robinson, 2017; Blackwell, 2013; Parette et al., 2010), with recent reports indicating that educators feel underprepared and inexperienced in ICT utilization for teaching (OECD, 2019; Education and training monitor, 2019). Specific to the Finnish context, research findings suggest that educators experience shortcomings in achieving their learning objectives in relation to the implementation of media education, ICT and multiliteracies due to a lack of pedagogical material, experience and training, and an overall lack of accessibility, tools, and concrete methods for utilising technology within the ECEC environment (Suoninen, 2008; Eskelinen et al., 2019). Furthermore, as we transition towards a curriculum that considers children's learning and development holistically, taking into consideration the child's individual interests and life at home (NCC for ECEC, 2019), research has highlighted an inconsistency between home life and ECEC whilst raising the concern that children are experiencing much more technology in their homes than in classrooms (Blackwell, 2013; Parette et al., 2010; Tsumura & Robinson, 2017).

Whilst research has prominently advocated for the integration of technology within pedagogical approaches and highlights the benefits and consistencies of an integrated approach (Henderson & Yeow, 2012; Russell & Hughes, 2014; Falloon, 2015; Dundar and Akcayir, 2012; 2014), there is a considerable lack of evidence-based research into how educators can utilise technology purposefully within the ECEC environment (Liu et al., 2016). Furthermore, research has identified barriers towards the facilitation of integration and implementation of technology within pedagogy and the curriculum (Tsumura & Robertson, 2017; Blackwell, 2013; Vaughan & Beers, 2016; Ertmer, 1999; Liu et al., 2016). It is these specific barriers that I will be focusing on for

the purpose of my research topic and question, adopting an action research approach to explore, reflect, and critically evaluate my own practice and experiences whilst investigating how camera-pen pedagogy may be adapted for implementation within early years settings.

2 CAMERA-PEN PEDAGOGY

'Camera-pen pedagogy' (Kiesiläinen, 2006) marries the use of the camera with the traditional usage of the pen, not only for documentation, but also for problem solving, utilising the camera as a tool for child centred learning both within and outside of the classroom. Just as we write and document our scientific explorations, our studies, the camera-pen pedagogy facilitates children's analysis and evaluation of their methodology and process of thinking, something that may often go amiss typically when school aged children are writing answers to pre-determined questions when problem solving in 2D (on paper or worksheets). The concept of the camera-pen relies on the children's imaginative use of the camera to document their problem-solving process and as a tool to record, analyse, and evaluate their findings. As Jaakkola (2017) describes, "The idea of the pedagogical framework of the camera-pen is to do carefully planned exercises in which the learner is challenged to think, act, and interact with a specific focus, using the camera solely as a tool." (Jaakkola, 2017, p. 42).

Kiesiläinen (2017) describes 'Camera-pen pedagogy' as "...a pedagogical model in which learning is guided by the simple video shooting tasks." (p. 11). Referring to the availability and accessibility of the camera as a tool for learning in its many technological forms, Kiesiläinen suggests that the adaptability of the pedagogical approach for children of different ages and capabilities, in varied environments and towards a multitude of different learning goals, make the approach particularly valuable and viable for all educators as a form of utilizing technology within the classroom. Tasks may be short and simple, but they may also be combined or planned as a set of tasks towards a longer-term project. As Kiesiläinen states, "Shooting is not production, but a way to work and communicate." (p. 11). The images or video's captured are typically viewed directly on the device screen within the workgroup or small group, recording valuable scientific information for reviewing thoughts and processes, but rarely for the purpose of evaluation. Within this regard, the camera is considered an instrument of thinking. As Kiesiläinen states, "In camera-pen work, the camera is an aid to thinking that both thinks and expresses thinking. Describing is an active cognitive process in which thoughts are shaped into living images in collaboration with the camera and material reality." (p. 12). Within this regard, the camera acts as an

excellent tool for observation, analysing and structuring thoughts, and both thinking and acting collaboratively, thus, “The camera makes thinking visible”. (p. 12). According to Kiesiläinen, through the utilisation of camera-pen pedagogy, children and educators may collaboratively explore the thought processes both within and behind their collective and meaningful learning experiences whilst maintaining a child-centred approach towards education and learning.

Camera-pen pedagogy typically consists of two stages: the image/video capture stage (shooting), and the viewing task, both of which are designed to “guide students’ thinking, action, and interaction so that learning takes place.” (p. 12). Children are typically divided into small groups or pairs (although it is possible to complete the task alone) to solve a task as set by the educator, a form of problem-solving activity that may be resolved by active observation, analysing the immediate surroundings, and then describing one’s findings. When children have collected and recorded their findings, they return and the viewing task may commence, again either in smaller groups collaboratively with educators, or within the larger group.

Within this regard, the videos or images as captured/recorded by students may be researched, interpreted, or utilized as learning material. The activity and the video’s recorded may also be part of a longer learning process. As Jaakkola (2017) states, “The goal is to produce ideas, thoughts, and interactions, or to solve problems visually by taking notes, collecting evidence and making observations. Most products of such processes are clips of only a couple of tens of seconds.” (p. 42). Furthermore, clips may be deleted immediately after viewing as their purpose as part of the learning experience has been fulfilled. Thus, the camera’s utilisation as a tool for scientific exploration and discovery, as a potential alternative pedagogical approach towards children’s learning, replaces the traditional usage of the pen and paper for documentation purposes whilst facilitating both inclusion and children’s agency, and furthermore, integrating technology within the classroom.

2.1 Aligning my pedagogical philosophy with the National Curriculum and Camera-pen pedagogy

The way in which we view the child, and the way in which we perceive the ‘learner’, plays a significant role in the approaches we take towards education. As educators, it is critical for us to reflect upon our experiences, both in the past and the present, and critically analyse what and why we view things the way in which we do, how we act towards children and how we negotiate education, in addition to the ways in which we devise pedagogies and the educational curriculum.

The conception of learning as highlighted within the NCC for ECEC (2019) is based upon five core principles; the significance of children's interactions with others, their environment, and the importance of play; the child's active agency; integration of existing knowledges, experiences and competencies in connection with the world around them and diverse cultural backgrounds; positive emotions, safety and sense of belonging; and children's right to meaningful, joyful learning experiences and successes provided within carefully planned goal oriented activities (NCC for ECEC, 2019, p. 22). Thus, pedagogical planning of meaningful learning experiences within ECEC should be guided by both the underlying theories and conceptions of learning, and the various learning objectives as highlighted within the National Curriculum.

As a fundamental part of my pedagogical philosophy and approach towards ECEC, I believe that through socio-constructivism, inquisitiveness and children's agency may be facilitated through meaningful, life-long learning experiences and open discussions pertaining to children's own individual interests and epistemological curiosities (Freire, 2001). However, discussions alone may not act as facilitators of new knowledges and learning experiences without careful consideration of power relations. As an educator part of my philosophy is to acknowledge children's agency within discussions pertaining to their individual interests, to respect their individual perspectives and opinions, in addition to encouraging the respect of the opinions of others. Discussions should facilitate learning opportunities, not subtract from them. Thus, when actively participating within children's discussions and activities, educators should be mindful of the use of questions. Questions should not be utilized solely to test the child's knowledge, but to provide further insight, intrigue, to fuel their innate curiosities to discover more and question more, "...it is important to give children time to respond and, wherever possible, build further questions from their contributions." (Colwell et al., 2015, p. 283). As the socio-constructivist approach highlights, it is the learning experience, the role and participation of the individual within the social construction of knowledge that is of primary concern.

The freedom to express one's own ideas and opinions and explore one's own interests, both collectively and independently, are imperative towards promoting children's agency and active participation in learning experiences. Thus, as stated within the NCC for ECEC (2019), the child should be viewed as capable, agentic, and independent in their abilities to make decisions and influence the world around them. The impetus here is on the educator to harness the child's innate desire to learn and discover for themselves, to allow for experimentation, questioning and exploration, and deviation from the 'plan' to facilitate deeper learning through meaningful experiences

utilising children's epistemological curiosities (Freire, 2001) as a platform for life-long learning.

Piaget (1995), often described as the founder of constructivism, believed that educators ascertain a responsibility to forge a prosperous environment within which children problem solve and learn through active discovery. This theory is further reinforced by Vygotsky's (1929) theory on the zone of proximal development, that children require challenge, and often require 'scaffolding', to generate deeper meaning through active adaptive learning experiences. As purported by Henniger (1999):

... the child creates rather than receives knowledge, and the teacher guides or facilitates this process of discovery. Unlike a traditional classroom where the teacher might lecture or perform demonstrations in front of a group of passive students, the students in a constructivist classroom actively learn by doing. (p. 40).

Furthermore, the concept of play and being playful is an integral part of both my educational philosophy and both national curriculums for ECEC and pre-primary education (NCC for ECEC, 2019; National core curriculum for pre-primary education 2014, 2016). As Grieshaber & McArdle(2010) states "in the field of early childhood education, we fear we are losing the battle over play, and in some places the academic push-down has at least one foot in the door." (p. 110). Such sentiments capture an essence shared by progressive, collaborative and constructivist approaches to education and learning: "that learning in the classroom is the opposite of what it can and should be. Instead of being boring, difficult, artificial, and individual, learning should be fun, natural, authentic and social." (Siljander et al., 2017, p. 15), echoing the assertions of Comenius that knowledge should be a pleasure, not a burden, to those who seek it. The facilitation of epistemological curiosity (Freire, 2001) within a learning environment should be based upon the interests of the child, and not predetermined by educator's interpretation, or misinterpretation, of their role and responsibilities, nor by those of examinations or false expectations of development or skills acquisition, often referred to as 'falling behind' or 'failing', for the only failure is to not acknowledge and facilitate the joys of learning, and learning through play (Grieshaber & McArdle, 2010).

Part of my philosophy is to actively encourage the sharing of individual experiences and attitudes to provide a vastness of new, shared knowledges and experiences, from which the children can relate and draw upon their own conclusions. Furthermore, it is important to acknowledge our 'unfinishedness' when referring to learning. Learning is a progressive process and not an end goal, we are constantly unlearning, relearning (remembering or recollecting suppressed knowledges), and learning in our ongoing pursuit of new knowledges, our 'epistemological curiosity' (Freire, 2001). In doing so, as educators we renounce our position as authoritarian or

powerful at the forefront of learning, and rather become active participants, entangled within the joyful experience of knowledge acquisition.

The subject of 'child-centredness', whilst universal definitions of the term vary considerably depending on one's own understandings and positionings regarding children as learners, plays a significant role in my considerations towards pedagogical implementation and my personal pedagogical philosophy towards ECEC. As Kumpulainen (2018) states, a child-centred approach "...focuses on the intrinsic value of childhood and the positive development and well-being of children and families" (p. 39). It places the child at the centre of their own individual learning experiences, with learning considered as a holistic process, whilst acknowledging the significant role of "...children's agency and the sociocultural nature of learning and development, with a focus on children's active interaction with peers, teachers, adults, community members, and the environment." (p 39). This emphasis on children's agency encourages children's active participation in planning, creating, and evaluating their own activities, experiences, and learning environments (NCC for ECEC, 2018; Alasuutari, Karila, Alila, & Eskelinen, 2014; Hilppö, Lipponen, Kumpulainen, & Rainio, 2016; Sairanen & Kumpulainen, 2014). As Kumpulainen further adds, this process aims to enhance "...children's trust in their own abilities and strengths as learners—through positive emotional experiences and opportunities for child-directed play, inquiry, and imagination... regarded as an essential aspect of ECEC." (Kumpulainen, 2018, p. 39; Kumpulainen, Lipponen, Hilppö, & Mikkola, 2013).

Whilst the NCC for ECEC (2019) highlights play as an important aspect of both pedagogical implementation and the exploration of children's epistemological curiosities (Freire, 2001), as Grieshaber & McArdle (2010) highlight, play is not always fair, natural, 'free', nor fun for those who seemingly participate or those who find themselves excluded. Therefore, as Grieshaber & McArdle (2010) emphasize, educators must be much more than passive observers or conversely 'directors' of play. Small group activities thus offer an opportunity to connect with children intimately, to share emotional experiences, and to learn from one another in our collaborative, collective learning experiences whilst acknowledging our unfinishedness (Freire, 2001) and our responsibilities to attend to each child's individual needs, interests, and facilitate their motivation to learn. As educators we must support the child's learning through discursive methods (Arthur et al., 2018), such as child led, adult guided discussions pertaining to real world issues and their epistemological curiosities (Freire, 2001), and encourage children's active participation in exploratory learning experiences whilst fulfilling their rights to an inclusive, equitable learning environment (NCC for ECEC, 2019).

Utilising the Camera-pen pedagogical approach to facilitate children's meaningful learning experiences based upon their own individual interests, identified through discussions with both the children and their group teacher, and by facilitating children's curiosity towards new knowledges, otherwise known as their epistemological curiosities, may potentially provide a practical and useful tool towards facilitating technology integration within ECEC classrooms. According to Jaakkola (2017), the inherent characteristics of cameras naturally support the learner's construction and organisation of ideas and their processing of information, thus acting as a facilitator of meaningful learning experiences and a tool for analysis, reflection, and evaluation of their learning process. However, as I will further discuss, research has identified various barriers to technology integration and implementation within ECEC environments (Falloon, 2015; Frey, Fisher, & Lapp, 2015; Chou et al., 2012; Tsumura & Robertson, 2017; Vaughan & Beers, 2016; Ertmer, 1999; Wartella et al., 2013).

2.2 Barriers to successful implementation and integration of technologies within educational practices

The following section considers previous research findings regarding the various barriers and challenges that an educator may face when attempting to integrate technology within educational practices.

2.2.1 Time

As Liu et al. (2016) state, "Literature has indicated, however, that merely giving the iPad to teachers and students does not guarantee their use for the benefits." (p. 160). Whilst examining teachers use of iPads, specifically their comfort level, perception, and utilisation within the ECEC classroom, Liu et al. found that teachers prominently faced the logistical challenges of a distinct lack of sufficient time for integrating technology into instruction, including time for gathering materials and preparing meaningful educational experiences (planning and preparation). They also found that such issues were further compounded by unplanned and unpredictable accessibility issues (such as connectivity, device malfunction, student distraction) which directly influenced time required for task completion. Such findings were consistent with other research findings highlighting '*time*' as a prominent barrier and limitation for technology adoption and implementation within the classroom (Falloon, 2015; Frey, Fisher, & Lapp, 2015; Chou et al., 2012; Tsumura & Robertson, 2017; Vaughan & Beers, 2016; Ertmer, 1999; Wartella et al., 2013). Their findings were also consistent with those of Tsumura & Robinson (2017), who concluded that time had a

direct influence on the innovative utilisation of technologies with prior experience being a pre-requisite for effective utilisation.

2.2.2 Educator's perceptions and philosophies

With regards to overcoming '*time*' as an obstacle for technology integration within the ECEC classroom, research has suggested that even over extended periods of time with technology available and present within classrooms, limited changes in pedagogical approaches of teachers may be observed (Lindahl & Folkesson, 2012; Tondeur et al., 2008). Thus, additional factors such as educator's philosophical approach to teaching, educators' perceptions, and understandings of the utilization of technology may be considered limiting factors or barriers towards change (Blackwell, 2013). Blackwell (2013) also noted of how "lack of initial training led teachers to feel unprepared in not only how to use the technology device itself but how to integrate the iPad into their teaching practices." (p. 14). Liu et al. (2016) further identified teachers' perceptions concerning the importance and usefulness of technologies as critical factors influencing both frequency of use and how technologies could be utilized within the classroom. They concluded that sustained and targeted professional development must be facilitated to increase educators' comfort and confidence in technology utilization and innovative use, increasing educators' awareness of the capabilities, benefits, and possibilities for technology integration and implementation as part of an integrated ECEC curriculum.

2.2.3 Support

Blackwell (2013) further highlighted '*support*' as a confounding variable and barrier towards technology integration, concluding that additional staff as support during lessons was considered necessary, particularly by educators unfamiliar with the devices, as it enabled teachers to focus more attention on students learning than the device itself. Such findings are concurrent with other research findings which suggest that ongoing support both within the classroom during activities and that having a supportive administration in addition to facilitating professional development plays a key role in how teachers feel about technology (Liu et al., 2016; Blackwell, 2013; Tsumura & Robinson, 2017; Ertmer et al., 2012; Blackwell et al., 2014; Wartella et al., 2013).

2.2.4 Access

Generally, within research, '*support*' further relates to '*access*' to technology as a limiting factor within pedagogical approaches attempting to integrate technology within the curriculum with regards to the availability of tablets for children and educators. As findings within Liu et al. (2016) highlight, educators' access to technological devices increased their confidence in utilization and innovation, and furthermore educators highlighted that "access to more devices would help facilitate instructional practices" (p. 174). Thus, if a child-centred approach to pedagogy is to be facilitated, participation and inclusion must be facilitated by providing enough tablets or devices for all children and educators during the activities.

2.2.5 Prior experience

Research suggests that educators encounter difficulties in incorporating technology in student-centred and developmentally appropriate ways (Blackwell et al., 2014; Parette et al., 2010), and that lack of familiarity and thus prior experience may be a contributing factor (Tsumura & Robinson, 2017; Chen & Chang, 2006). According to Chen & Chang (2006), children's access to technology is "contingent upon teachers' skills in using and integrating technology" (p. 170), with research suggesting that even with technology as part of the educational curriculum, a large proportion of early childhood teachers fail to incorporate technology into the classroom (Blackwell et al., 2014; Liu et al., 2016). Tsumura & Robinson (2017) also concluded that prior experience remained a significant factor when considering educators attitudes towards technology utilisation and educators' willingness to integrate technology within their pedagogical approaches within the classroom. As Vaughan & Beers (2016) state, "Technology as part of the curriculum then is not integrating specific times during lessons for children to have access to technology, but instead finding ways to integrate technology into the lessons in a more authentic and meaningful manner" (p. 330).

2.2.6 Ease of use

According to Gimbert and Cristol (2004), integrating technology within ECEC pedagogies requires collaboration and support through a personalized learning process. Such processes include the facilitation of exploration and experimentation with technologies within pedagogies, in addition to meaningful utilization within pre-planned activities (Kiesiläinen, 2006; Vaughan & Beers, 2016). In addition to the barriers previously identified within research, Buchanan et al. (2013) identified two

further key barriers to the adoption of new technologies: structural constraints that may exist, and the perceived usefulness of the tool. Such findings align with those reported within Davis (1989)'s technology acceptance model, which suggests that perceived usefulness, in addition to ease of usage, directly correlates with user's past experiences and interactions with technology, and therefore directly influence both present and future usage.

As Blackwell (2013) concludes, utilising a student-centred approach to pedagogical activities with students creating their own content using specific design features (video, audio, photo capabilities) helped some educators to overcome certain '*time*' and 'support' related barriers. Additionally, a supportive operational culture, including positive facilitation of experimentation and exploration of devices, time for planning, activities, and evaluative processes, i.e., "...reflecting, revising, and reworking their general teaching practices "...allows educators to develop their own pedagogical and philosophical approaches to technology integration "...to embrace the full potentials that technology has to offer." (p. 22). Blackwell further attests to the importance of "providing teachers with examples of how to incorporate the technology in innovative and creative ways for fostering learning" (p. 22).

3 RESEARCH METHODOLOGY

3.1 Research question

Utilising an action research approach, I propose the research question ‘how can camera-pen pedagogy be adapted for utilisation within ECEC?’. To attempt to answer my initial research question, I utilised a series of evaluative questions (see appendix A) orientated around general curiosities regarding the camera-pen pedagogical implementation within an ECEC setting, such as ‘how did I take into consideration past research findings when planning my activity?’, ‘how was the learning experience from children’s and educators’ perspectives?’, ‘What barriers did I, and children, face when utilising camera-pen pedagogy?’, ‘How may these barriers affect my learning objectives for the activity and future implementation possibilities in ECEC settings?’ and furthermore, ‘What could I do differently or how could I overcome these barriers?’.

My aim was to explore and critically reflect upon my own experiences of utilising camera-pen as a pedagogical approach within the ECEC environment, utilising observations and collective feedback from both children and professional educators with the aim of improving the utilisation of technology and camera-pen pedagogy within my future educational practices. As Tsumura & Robertson (2017) state, “...if teachers are given time to do their own action research, their professional knowledge will increase, as will their ability to incorporate technology into their classrooms.” (p. 1367).

3.2 Research approach and data collection

To investigate my research question, I performed what MacNaughton & Hughes (2008) refer to as a ‘teacher action research project for professional change’. Teacher action research involves “...the purposeful examination of teacher practice to improve teacher performance and student learning.” (Tsumura & Robertson, 2017, p. 1362). As action research is considered an effective method of facilitating reflective and evaluative procedures towards change and professional development in educator’s own professional practices, in addition to organizational and community practices, this was the research method chosen.

Utilising the 'action research cycle' outlined within MacNaughton & Hughes (2008, p. 2), I completed two action research cycles to explore how camera-pen pedagogy may be adapted for implementation within ECEC. To do so, I first approached the subject of children's interests by performing an initial discussion with the educator responsible for the group of children regarding important information relating to formulating a meaningful, carefully considered pedagogical plan (See Appendix A). After gathering the relevant information, I devised an initial lesson plan based upon Kiesiläinen's (2006) lesson plan examples of camera-pen pedagogy implementation within school environments, adapting learning experiences for children within ECEC based upon the guidelines and aims as outlined within the Finnish national curriculum (NCC for ECEC, 2019; Phase 1 & 2). I then implemented the devised lesson plan, utilising camera-pen pedagogy as my main form of pedagogical approach to learning, and in doing so, I aimed to explore camera-pen pedagogy as an approach towards technology implementation within the ECEC environment, and furthermore, increase my understanding and experience of barriers that may limit or prevent the implementation of technology in ECEC settings (Phase 3).

3.3 Data collection

During phase 3 of the action research process, data was collected in the form of observations, transcriptions of discussions based upon feedback from both children and educators present, in addition to the utilisation of a reflective journal documenting my own exploration and experiences in implementing technology and camera-pen pedagogy within ECEC settings.

3.4 Data analysis

Data was analysed employing what MacNaughton & Hughes refer to as 'critical reflection' utilising an interpretivist approach. "Critical reflection involves individuals interpreting and re-interpreting their practice so that they can act more 'wisely', i.e., more carefully, thoughtfully, considerately, intelligently and selflessly." (MacNaughton & Hughes, 2008, p. 104). This was achieved through a series of reflection questions elaborated during the preparation stage (see Appendix A). My critical observations and findings were then implemented into a second lesson plan within a second action research cycle, actuated as stated within the first cycle. The goal of repeating cycles was to provide new knowledges and experiences, in addition to a critical and evaluative insight into the adaptations made, and offer new knowledges regarding potential

solutions to barriers concerning the implementation of camera-pen pedagogy within the ECEC environment.

Through critical reflection, I aimed to analyse and explore my own experiences and utilisation of camera-pen pedagogy as a form of technology implementation within ECEC, and furthermore, investigate the implications, barriers, and experiences of both children and educators during the planned implementation, assessing and exploring potential solutions or adaptations of the pedagogical approach with regards to implementation within ECEC settings (Phase 4), thus, increasing my knowledge, understanding, and practical awareness of barriers to technology implementation in ECEC settings. Reflections were then further analysed for themes and key words relating to the research question, and findings discussed in relation to previous literature regarding adaptations made and potential solutions to barriers influencing the implementation of camera-pen pedagogy, and furthermore technology, within ECEC settings.



Figure 1. Mac Naughton & Hughes (2008). *The Action Research Cycle*.

3.5 Ethical considerations

As data collected will comprise of self-reflections, observations, and transcribed discussions (written in reflection after the discussions have occurred within a reflective journal), no personal data concerning the participants were recorded, thus ensuring confidentiality. All participants were informed of the purpose of the project, and

furthermore were verbally informed of their right to withdraw from the project at any point in time during the activity prior to their participation. A debriefing discussion was planned and implemented at the end of the project whereby both children and educators were invited to share feedback of their experiences. Consent was required from the educator supervising and participating in the project, in addition to the acknowledgement of informal acceptance from the daycare director, and was collected via a formal consent form. Children were not required to provide consent due to the activity being part of their regular daycare day, in addition to the activity plan being previewed by the supervising educator. To ensure transparency, parents were informed of relevant information regarding the project, and their children's active involvement within the project via a poster placed in a clearly visible location within the daycare facility.

3.6 Data Management

Data was collected and stored on a personal computer with password protection. Data collected and stored during the project was disposed of securely after the research project had concluded to ensure data protection. Furthermore, in accordance with Kiesiläinen (2017)'s pedagogical implementation guide, images and videos captured on tablet devices were deleted immediately after they had served their purpose as part of the children's learning experiences, and therefore were not stored for future evaluative or reflective purposes.

Additionally, the present research project was sent to the participating supervising educator after it had been concluded for future use in the hope that it may provide insight, valuable knowledges and findings regarding 'camera-pen' as a pedagogical method for technology implementation within ECEC settings.

4 THE FIRST CAMERA-PEN PROJECT: CHILDREN'S INTERESTS WITHIN ECEC

This section describes in detail the first project's planning, implementation, and evaluation. Before planning the first activity, a preparatory discussion was performed with the children's teacher to obtain vital information for consideration when planning the first camera-pen activity (see appendix A for pre-planning questions). The educator highlighted that the class comprised of an average of twenty-one children aged between five and six years. Children were described as being "capable" and "familiar" with tablets as they often had access to them and played with them during their "free-play", at least "twice per week". Furthermore, the educator stated that typically the group was supervised by two staff members during after-preschool hours (between 1pm and 5pm). It was highlighted that two children required additional attention within the group, particularly during activities that required lengthily periods of attentiveness and concentration, and that noisy environments were particularly distractive to their capabilities to maintain attentiveness. Children's interests were described as varied; however, it was highlighted that they enjoyed playing with the various toys in various 'stations' within the classroom. A typical activity length was stated as approximately one hour.

4.1 Planning and implementing the first project

Taking into consideration the information provided within the discussions with the children's teacher, in addition to prior knowledges and previous research findings, I attempted to devise an activity plan with an initial aim of exploring children's interests within the classroom, whilst utilising the camera as a tool for the collection and sharing of information relating to children's learning experiences. In theory, children were to utilise the camera application within the tablet to collaboratively explore their interests within the classroom environment, and furthermore to review and discuss their thoughts, feelings, and motivations both during and after the activity. The activity was planned with careful consideration of guidelines and the objectives as stated within the

NCC for ECEC (2019), with the overall aim of developing children's technology literacy skills whilst they experiment and explore playfully with technology, familiarising children with technology as a tool for learning (See appendix B for in depth lesson plans).

When planning the activity, I attempted to consider various factors that could directly influence children's learning experiences based upon the pre-planning questions answered by the supervising educator, such as time restrictions, group size, children's interests, capabilities with tablets, and the number of staff present for supportive needs during the activity. I must admit, however, that I was a lot less confident in my own capabilities in constructing a learning activity utilising the camera-pen approach due to my lack of experience in utilising tablets and the pedagogical approach. As a consequence, I tried to plan a very simple activity based upon children's own individual interests, with children taking pictures and sharing them during later discussions with the group. Additionally, I attempted to facilitate children's inclusion and participation through a brief discussion regarding the significance of '*sharing*' and giving one another equal opportunity to utilise the tablets prior to the activity. Furthermore, I tried to be an active participant in each of the groups throughout the activity, however this proved rather difficult as a result of having one less member of staff than was previously planned for, in addition to a number of children requiring additional support.

Neither the supervising educator nor I had actuated a camera-pen based activity previous, however I had briefly explained the concepts and theoretical basis of camera-pen pedagogy according to Kiesiläinen's (2006) descriptions as a method of utilising the camera as a tool for learning. We were both perhaps anxious and uncertain as to how the integration of technology utilising an unfamiliar pedagogical approach would actualise in practice within the ECEC environment, however, we remained considerably optimistic and enthusiastic as the activity seemed to be simple to actuate. We were also fairly confident due to our decision to group children into groups of four to encourage shared usage of the tablet, in addition to minimising the time required by each group for the completion of the activity. There were enough tablets provided for children to group into three, however we had anticipated that there may be complications and difficulties regarding children's sharing and inclusion due to the aforementioned difficulties in concentration and attentiveness of two children within the group, therefore it had been suggested that we reserve a tablet in case we needed to facilitate inclusion on a more individual basis if children were not comfortable or able to work within their chosen groups.

4.2 Challenges encountered during the first activity implementation

4.2.1 Time

Various aspects of time were identified within the data analysis as barriers to the implementation and integration of technology within ECEC practices. In concurrence with Liu et al.'s (2016) findings, time proposed significant implications on logistical and organisational factors during the activity in addition to influencing pedagogical factors related to the role of the educator as a facilitator of children's inclusion, equity, support and participation.

Children were able to acknowledge individuality and be themselves, although again I stress that some were obviously more influential in conveying and actuating their ideas, whereas others required more individual and support to facilitate their inclusion within the group. Children were respectful in acknowledging each other's individual differences, although some children they were less willing to express why they took certain pictures to the entire group, particularly in instances where they took pictures of toys they enjoyed but did not wish to share (perhaps being a little embarrassed) by the prospect of revealing that they do still enjoy cuddly toys or kitchen play (gender or age stereotypes) – this opened up an avenue to discuss important issues regarding gender and stereotypes, however time restricted this discussion.

As the extract from my reflective diary clearly indicates, time limited discussions both during the activity and during the reflection phase. Whilst children had seemingly enjoyed their experiences and explorations utilising the camera, there were limited time for discussions at the end of the activity. This was further confounded by the large number of children who required individual attention. However, both the supervising educator and I agreed that this was more directly related to the distribution of time per child with regards to the large number of children within the group and the lack of supportive staff present rather than time as a sole limiting factor. Such sentiments were also echoed by children's responses during the evaluative questions and reflections.

Children stated that they liked having the tablets around, and that they were easy to use for them as they have used them many times before, but again they suggested they didn't get enough time to take their own pictures, or that some had more time than others and that wasn't fair.

As previously stated within Liu et al. (2016), "merely giving the iPad to teachers and students does not guarantee their use for the benefits" (p. 160). This was especially evident during the first implementation of the camera-pen activity, particularly regarding the amount of time and thus support afforded for each individual child, as children's distractions and concentrations waned as the activity prolonged.

Time was highlighted by all participants as being a factor of limitation regarding children's participation, their inclusion, and their agency. Within the evaluative discussions, some children had expressed that they wished they had more time with the tablet to take more pictures, whilst others suggested they had enough time, or that the activity was too long.

Such inconsistencies in children's expressed experiences highlights the presence and significance of power relations within children's playful learning experiences, in addition to the significant role of educators as active participants in facilitating an inclusive and equitable learning environment (Grieshaber & McArdle, 2010). Some children evidently had more time with the tablet than others, whilst time restrictions limited children's capabilities to discuss and explore their interests with others within the group. Whilst the number of tablets was considered as sufficient for the group size (eight tablets for twenty-one children), this was evidently not the case. Such findings further support the assertions made by educators within Liu et al. (2016), that "access to more devices would help facilitate instructional practices" (p. 174). Ideally each child would have had access to their own tablet for a designated period of time during the activity, thus better facilitating inclusion and the exploration of children's epistemological curiosities (Freire, 2001). Various other suggestions were made during the evaluative discussions of the activity corresponding to how time could have been better managed, including utilising turn taking during the activity with the use of a timer to indicate when children's turns were over, conducting the activity with smaller groups, in addition to the utilisation of an alternative, more peaceful environment to help facilitate concentration, additional time for discussion, and furthermore inclusive practices such as educators active participation. It was concluded that such alterations were prevented from being performed during the activity implementation due to access to equipment and the limited number of staff present.

4.2.2 Support, participation, and inclusion

Whilst the activity had originally been planned with the understanding that three adults would be participating and actively supporting children, only two adults were present during the implementation due to unforeseen circumstances. From past experiences within ECEC facilities, this is a common occurrence and a persistent problem that requires a certain flexibility and understanding when considering pedagogical practices. The ratio of children to adults was altered significantly, and thus the availability of support for children diminished. After a brief discussion with the supervising educator, we still believed that the planned activity could be implemented

with only two staff present, and that the learning goals could still be successfully achieved. However, within the evaluative discussions and reflections, the consequence of this deficit in support became even more apparent.

Not all children could participate equally, partially due to support. There were not really enough staff to observe and participate in all groups at once, and it was obvious that some children had less time and agency than others. Children who were afforded time with the tablet were expressive, and those that had less time perhaps still could express themselves, but maybe they felt a little hurried as the activity drew to a close and other children got distracted... those who had difficulties could not be supported throughout the activity, especially if they needed a lot of individual support and the additional challenge of working within a group... Children shared tablets, but more staff could have helped, arranging the activity slightly differently may also have helped, and power relations were obvious even though we tried to make sure every group shared equally, it was obviously not the case. Many needed additional attention regarding using the tablet.

As this extract from the evaluative discussions with the supervising educator shows, not all children were supported equitably during the activity, and consequently their participation and inclusion were negatively impacted. Such findings reinforce those of Blackwell (2013), highlighting '*support*' as a confounding variable and barrier towards technology integration, and that additional staff as support during activities is necessary, particularly for educators unfamiliar with the devices, as it enabled teachers to focus more attention on students learning than the device itself.

During the activity it became increasingly evident that the number of children requiring support and the number of groups per adult complicated the facilitation of equity, inclusive practices, and support structures such as scaffolding and modelling, and directive support such as questioning and discussions. This significantly altered my role as an active participant, to one that was more focused on directing, instructing, controlling and negotiating children's sharing of tablets and attentiveness towards the activity, particularly during the picture taking phase, in an attempt to facilitate inclusion.

4.2.3 Access to technology

During evaluative discussions pertaining to activity, a number of children suggested that they did not enjoy sharing the tablet, and furthermore, they did not feel that equitable participation was facilitated.

Some children suggested that they didn't enjoy sharing the tablet, that they didn't get enough time with the tablet. They didn't enjoy taking turns or waiting. Some children stated they didn't enjoy the activity because they

didn't get to play games with the tablet. Some also said that members in their group did not share fairly.

As previously stated within Liu et al. (2016), '*support*' directly relates to '*access*' to technology as a limiting factor within pedagogical approaches attempting to integrate technology. Whilst children had the opportunity to choose their own groups, there were children who were less willing or capable of collaborating within a group, and thus access to technology and not being able to utilise their own tablet for explorative purposes only confounded children's difficulties regarding participation and inclusion. Furthermore, this negated attempts to facilitate supportive and inclusive practices as I often felt that my role as an active participant was complicated by the numerous difficulties faced, particularly those relating to equal opportunity, turn taking, and the sharing of the tablet. Such difficulties and frustrations can be seen in the following reflective extract:

I would describe my aspired role as an educator as an active participant throughout the activity, with a responsibility of guiding and supporting the children where required, however my role often felt like one of more of a negotiator of conflict or inclusion when attempting to resolve children's difficulties with either concentration on the task or their difficulties regarding working in a group and sharing the tablets. Clearly, the number of children requiring support during the activity, and the number of groups per adult, complicated the application of equitable and inclusive practices and support structures, such as scaffolding, modelling, and directional support such as questioning and discussions during the activity.... Most children were happy to work within a group, and those that seemed to have difficulties were actively supported, however it was admittedly particularly difficult to maintain support for all groups and individuals who required.

My capabilities as an educator to facilitate a child-centred approach were clearly implicated by the various difficulties faced, and as reflections indicate, access to technology was one of the most significant factors influencing children's enjoyment, participation, agency, inclusion, and sense of belonging during the activity. Thus, if we consider the significance of a child-centred approach to pedagogy as referred within Kumpulainen (2018) within future iterations of the activity, participation and inclusion should be facilitated by either providing enough tablets for all children and educators, or alternatively the utilisation of small groups with adequate adult support for each individual child. This must further be complimented by the provision of equitable support structures and adequate time for each individual to participate.

4.2.4 *Facilitating Agency*

Children were able to express themselves, however some more than others due to the lack of support. Some children were more agentic than others and power relations were clearly observable. I and the supervising educator attempted to facilitate children's agency within their group and inclusion as best as we could, but it was not possible to observe all children in all groups at once, and some required much more support and attention than others.

As can be clearly observed within the aforementioned reflective extract, children's agency was directly influenced by the lack of staff present and the lack of support available as a consequence. This further imposed limitations upon our capabilities to adapt and restructure the activity within the educational environment. As Grieshaber and McArdle (2010) assert, power relations are ever present within children's play. Play is not always fun, fair, easy, nor natural for children, and thus it is our responsibility as educators to actively participate within children's playful learning experiences, to co-construct knowledge and provide support structures and equity towards a more inclusive and equitable learning environment. This becomes increasingly difficult to achieve when there are unforeseen alterations to planned activities resulting in a lack of staff and therefore support for each individual child at a detriment to children's agentic and participatory capabilities.

The following extract detailing the supervising educators response to a question regarding the facilitation of agency during the activity:

Not all children could participate equally, partially due to support. There were not really enough staff to observe and participate in all groups at once, and it was obvious that some children had less time and agency than others. Children who were afforded time with the tablet were expressive, and those that had less time perhaps still could express themselves, but maybe they felt a little hurried as the activity drew to a close and other children got distracted... some had more time than others with the tablet, whilst some were less confident to participate in group work and have their agency both acknowledged and heard without significant individual support...

Whilst such occurrences could have been potentially foreseen, constructing implementing a new pedagogical approach is in itself a learning experience for developing professionals, and thus being both flexible and open to new challenges which present themselves, and furthermore being reactive and reflective when difficulties are encountered, could also be perceived as key skills acquired through experience and knowledge acquisition, an aspect of learning that Freire (2001) refers to as our '*unfinishedness*'. Whilst we could not facilitate inclusion through the utilisation of more tablets, and we could not simply conjure more staff to support both the

educational team or the children, we did attempt to facilitate an inclusive, fair, and enjoyable environment as best as we possibly could within the limitations of the educational environment and with the resources available, and in attempting to do so, most children did seem to enjoy the activity, and furthermore, most expressed a genuine interest in both utilising tablets as tools for learning and exploring their educational environment through the camera lens collectively with their peers.

4.2.5 Prerequisite for a peaceful learning environment

The constraints within the physical environment, in combination with the number of children present within the classroom presented a challenge for both educators and children during the activity. Some children were unable to remain attentive and were easily distracted by the noise and actions of others. Groups often dispersed and children's wandering epistemological curiosities created a myriad of distractions and humorous entertainment opportunities as children struggled to wait for their turn to utilise the tablet, or otherwise they simply lost interest in what the individual with the tablet was doing or attempting to do. The environment was often too chaotic and perhaps too stimulating for some children to maintain concentration regarding the task presented, as the following extract shows:

The environment proved a distraction for some of the children, and the noise level rose as children excitedly explored their groups interests through the use of the camera, in addition to the many distractions that preoccupied their attention. Some also found it particularly difficult to remain within their group and wandered to investigate others often humorous discoveries and expressions of joy, in addition to the distraction of their favourite toys, which some resorted to playing with.

Whilst an alternative solution discussed during the activity with the supervising educator would have been to facilitate small groups in a separate environment, the lack of staff present meant that this was not possible as the adult:child ratio could not be further compromised.

4.2.6 Competence and past experience

Research suggests that educators encounter difficulties in incorporating technology in student-centred and developmentally appropriate ways due to a lack of familiarity, prior experience, and an overall lack of confidence (Tsumura & Robinson, 2017; Chen & Chang, 2006; Liu et al., 2016). Furthermore, According to Chen & Chang

(2006), children's access to technology is "contingent upon teachers' skills in using and integrating technology" (p. 170).

As can be observed within the following reflective diary extract, a lack of competence, in addition to my lack of past experience, clearly influenced my capabilities and understandings of the challenges faced when attempting to integrate camera-pen pedagogy and technology within the ECEC setting.

The activity went quite well in consideration of achieving the educational goals, however a certain amount of flexibility and freedom had to be accepted with regards to children's exploration of epistemological curiosities and their distractions away from the original task, especially considering that this was the first time I had implemented this form of pedagogy and my uncertainties and lack of experience regarding the integration of technology within ECEC settings. The lack of confidence and perhaps scepticism of my own capabilities seemed to be sensed by children, and their behaviours and reactions towards myself as a new member of the group, and towards the task, were particularly evident as a result. I felt that this uncertainty impeded by capabilities to provide sufficient support as I was often distracted in my own efforts to ensure the successful implementation of the approach rather than focusing on children's individual needs and interests.

4.3 Summary of the first project's findings

As this was the first time that I had attempted to implement camera-pen based pedagogy within an ECEC classroom environment, and with regards to my lack of knowledge and prior experience regarding the integration of technology within the ECEC environment, I struggled to adapt and overcome various difficulties faced during the project implementation. Such barriers to integration related to time, support, children's participation, equity and inclusion, the facilitation of children's agency, and access to technology. Children were able to participate, but not equally, and power relations (Grieshaber & McArdle, 2010) were clearly evident within children's playful, collaborative learning experiences, thus leading to inequitable participation (sharing) and utilisation of tablets. Both myself and the supervising educator expressed difficulties in providing equitable support for all children who required assistance, in addition to maintaining active participation to facilitate an inclusive, collaborative, child-centred learning experience. As a consequence, issues pertaining to children's participation could not always be acted upon, and thus whilst children expressed enjoyment and pleasure in utilising the camera's to explore, collect, and share their experiences, data, and newfound knowledges, one may argue that the activity may not be considered child-centred (Kumpulainen, 2018).

Most, if not all of these issues were relational, and each barrier encountered influenced my capabilities as an educator to both act as an active participant, and to facilitate a positive, equitable, inclusive learning experience for all children. Furthermore, each of these factors related directly to the number of staff available, or lack of, and thus to our capabilities of providing adequate support corresponding to each individual child's needs and requirements and thus could be considered directly influential in achieving the aims as highlighted within the NCC for ECEC (2019). The learning environment must also be carefully considered with regards facilitating of a peaceful, inclusive, and positive learning experience for all children.

5 THE SECOND CAMERA-PEN PROJECT IMPLEMENTATION: UTILISING VIDEO RECORDING FOR ANALYTICAL AND REFLECTIVE PURPOSES

Reflecting upon the previously implemented camera-pen activity and the challenges faced, it became clear that certain aspects of the pedagogy required adapting in order to facilitate a more inclusive and equitable approach to ECEC and a more positive learning experience for all children. The previous decision to employ a freer, child directed, and exploratory learning experience based upon children's individual and collective curiosities would have perhaps worked better if the environment was much more open, for example in a forest where children could both collectively explore and play whilst searching and identifying various curiosities and recording them as captured videos or images for sharing and discussion at a later opportunity, rather than in a spatially limited and relatively crowded classroom. Additionally, the activity may have flowed more consistently, and inclusion and equity better facilitated with the provision and active participation of additional staff. However, as time was a distinct limitation, my lack of previous experience and knowledge with regards to the implementation of the camera-pen pedagogy, in addition to my positioning as a visitor within the ECEC environment, certain possibilities to restructure and rearrange the activity and the learning environment were limited. The aforementioned challenges and experiences, in addition to the time limitations and requirements to utilise this form of pedagogy within a large group propelled me to reconceptualise the utilisation of technology as a tool within children's learning experiences and thus to adapt the camera-pen pedagogical approach with careful consideration of the group of children, their capabilities, and their previously expressed interests as a basis for a more creative, yet structured, child-centred learning experience.

5.1 Planning the second camera-pen activity

Upon careful consideration of the challenges faced and the feedback acquired as part of the reflective process during the initial camera-pen activity, various alterations to

the pedagogical approach were considered and implemented. The activity was once again planned with the consideration of three staff members being present during the activity.

My main considerations for the second activity oriented the difficulties faced due to the lack of staff present and the large number of children within the learning environment. Such challenges led to a lack of affordances and supportive structures concerning equity provision and inclusive practices. Consequently, children seemed to have difficulties maintaining concentration and discussions pertaining to the activity within a larger group within the more chaotic learning environment. There was also the consideration of difficulties faced regarding the influences of power relations regarding children's agency and participation (Grieshaber & McArdle, 2010). As a result, a more structured and child interest-orientated activity was planned with the aim of utilising a smaller group size and a separate learning environment. Such solutions were supported by new knowledges and research findings pertaining to the positive impacts of smaller group sizes on children's development (Magnuson, Ruhm & Waldfogel, 2007; Yan & Lin, 2005), and an increase in the overall quality of pedagogical implementation as a result (Hattie, 2005; Brühwiler & Blatchford, 2011; Slot et al., 2015; Pessanha et al., 2017). Conversely, research also suggests that the larger the group size, the poorer the socio-emotional support for each individual child, and the lower quality of pedagogical implementation (Slot et al., 2015). Such findings aligned with my previous experiences and the difficulties faced during the first activity.

During evaluative discussions, children had expressed their interest in volcanoes and science experiments, and thus a scientific experiment orientated around children's epistemological curiosities of chemical reactions and explosions was planned. Such adaptations pertaining to children's interests also helped to facilitate a more inclusive environment whereby children were also included within the planning stage of the activity.

Furthermore, the aim of the first picture taking activity focused on exploring children's interests within the classroom rather than around a single specific and collective topic of interest as expressed by the children. Upon reflection, children seemed more interested in experimenting and playing with the tablets within the classroom than focusing on objective forms of their interests, thus, playing with technology was for them much more interesting than exploring their interests as a theme. This may well be due to the concrete nature of their curiosities, and to put it simply, they may well just love playing and experimenting with tablets. For the objective purpose of scientific discovery, I decided to utilise the tablet as a documentative tool within a much more structured, yet concretely defined child interest-orientated activity,

exploring acid-base chemical reactions utilising volcanoes as a base theme (See appendix B for detailed lesson plan).

The scientific experiment was also structured so that small groups of between four to six children, accompanied by a single educator, were to rotate their participation within a set timeframe specific to the planned activity rather than all groups participating at the same time. This was due to the distractive atmosphere and environment produced as a consequence of multiple groups operating within the same confined space and the number of children present. This would, theoretically, allow the one educator to dedicate their attention to the exploration of children's knowledges and interests pertaining to the experimental activity, in addition to better facilitating an equitable and inclusive environment, rather than focusing on multiple groups at once.

The camera was also designated a lesser significance within the activity. Rather than being a central component as it was during the first activity, it served as more of a peripheral tool for reflective and evaluative purposes during the concluding stages of the second activity.

5.2 Activity implementation reflection

The activity progressed well, whilst children visibly expressed joy at exploring and creating the chemical reaction in the imaginative concept of a volcanic eruption. The children were particularly fascinated with the volcano prop constructed for the purpose of the activity, and furthermore stated that they enjoyed working together as "part of a team" to make the volcano "explode". The activity seemed to facilitate children's intrigues and epistemological curiosities pertaining to science, their past experiences, and volcanic eruptions.

Regarding the achievement of learning outcomes, children were able to familiarise themselves with technology as a tool for both recording, reviewing and evaluating scientific exploration within a controlled environment. Children enjoyed expressing themselves, sharing their attitudes and excitement at watching a scientific experiment live and once again during the review and evaluative discussion at the end of the activity.

Children visibly practiced social skills such as teamwork and working together in a group to successfully create a volcanic reaction. Children were very interested in collectively reviewing the recorded footage of the eruption (chemical reaction) and shared their experiences and past knowledges regarding volcanoes, including various other scientifically relevant knowledges. Children also capably shared their responsibilities whilst taking turns during the experiment, with the smaller group size

and the learning environment facilitating a more peaceful, calmer and perhaps more concentrated learning experience. Children practiced self-regulation, focus, and teamwork as part of successful learning experience, celebrating their successes and active participation, in addition to successfully recreating a scientific experiment within a 'playful' environment. Children worked well together, they were generally interested in the activity, the selected topic, and were active in both discussion and participation. They were actively curious throughout the experiment and furthermore seemed to excitedly watch the recorded footage whilst discussing their findings and conclusions at the end of the activity. The activity facilitated a more positive learning experience for all of the children involved, in addition to the purposeful utilisation of technology within the learning process whilst children could be involved directly in the planning phases of the activity and supported more readily during the implementation and discussion phases.

Children were much more capable of expressing themselves and facilitated an inclusive environment whilst supporting one another's ideas and supported one another when faced with uncertainties as of what to do within a small group. Democratic practices were also willingly practiced as an accepted way of making decisions regarding the colour of the volcanic reaction.

5.3 Challenges during the second camera-pen activity implementation

5.3.1 Support, Participation & Inclusion

As was the case within the previous implementation of the activity, '*support*' was identified as a potential challenge and barrier to both the integration of technology and children's equitable inclusion during the activity.

Whilst the activity was planned with the intention of three staff members being present and available for supportive purposes, only two were available as one staff member was required elsewhere due to staff shortages. Fortunately, yet circumstantially, there were quite a few less children within the group and this enabled us to proceed with the original plan of rotating multiple small groups between two different classroom environments. This proved particularly influential in creating a more peaceful and inclusive learning environment, and as such children could be supported when required.

The lack of staff in this instance did not negatively influence my capabilities to implement a small group pedagogical approach, however, this may be considered fortuitous as there were less children present, otherwise the activity would have required re-evaluation and restructuring within the classroom environment. It also demonstrates how significantly entangled the facilitation of a child-centred approach

(Kumpulainen, 2018) is with both the learning environment and the supportive capabilities of staff, particularly regarding the number of staff present and their active participation within children's learning experiences. When we further consider the complications of implementing a new pedagogical approach, one of which the educator may not be familiar, it becomes even more clear as to why educators often encounter difficulties in incorporating technology in student-centred and developmentally appropriate ways (Blackwell et al., 2014; Parette et al., 2010).

In consideration of a more supportive and inclusive environment, both the children and the supervising educator reflected positively on children's inclusion and participation during the activity and children's overall positive feelings as expressed both during and after the activity. As I had noted within my reflective diary:

Children expressed that they felt part of a 'team' and made the reaction happen successfully collaboratively. They also emphasised that they particularly enjoyed watching the reaction multiple times with their friends and sharing their experiences and knowledges together with their friends.

Such statements further highlight the significance of facilitating collaborative practices when considering an inclusive learning environment. The supervising educator also stated that:

Children were included throughout the process including in the planning phase in consideration of their interests. I think children were more included and felt as part of the activity and part of a team as certain children required more support than others. All children could be supported I think children felt joy from being a part of something much larger, a collective learning experience, but in a much smaller group than they usually are in the classroom. Having less children (*present*) really helped them to concentrate.

According to the FINEEC guidelines and recommendations for evaluating the quality of ECEC (2019), children's learning environments, the structural marginal conditions, and various other aspects such as group size, adult-child ratio, and the personnel structure (including power relations, equity, distribution of responsibilities and the facilitation of professional development), all have a direct impact on the quality of children's learning experiences, and thus indirectly pedagogical aspects such as the planning and implementation of activities. Whilst numerous studies on group size and adult ratio have provided inconsistent findings, some reported positive impacts of smaller group sizes on children's development (Magnuson, Ruhm & Waldfogel, 2007; Yan & Lin, 2005), and an increase in the quality of pedagogical implementation (Hattie, 2005; Brühwiler & Blatchford, 2011; Slot et al., 2015; Pessanha et al., 2017). Concurring with such findings, Slot et al. (2015) also found that the larger the group

size, the poorer the socio-emotional support for each individual child, and the lower quality of pedagogical implementation.

With regards to facilitating an inclusive and child-centred environment for play-based learning (Kumpulainen, 2018), Sandseter and Seland (2017) identified that “relations, both with other children and with the practitioners, are important for children’s wellbeing - particularly, liking the other children and experiencing that the children are kind to each other in the ECEC.” (p. 1585). My experiences during this project have been consistent with such findings and further highlighted the significance and influence of both educators active participation and support structures on the provision and facilitation of equitable, inclusive and positive learning environments (Hattie, 2005; Brühwiler & Blatchford, 2011; Slot et al., 2015; Pessanha et al., 2017) and furthermore on children’s participation and power relations (Grieshaber & McArdle, 2010). As an educator, I felt much more able to connect with children on a personal level, encouraging a positive learning environment through discursive methods (Arthur et al., 2018) such as facilitating child led, adult guided discussions, utilising directional and stimulating questions and open conversations with children regarding their epistemological curiosities (Freire, 2001) pertaining to the activity.

5.3.2 Facilitating agency

As the following extract from my reflective diary shows, children’s agency was considered regarding various aspects of the experiment in addition to the facilitation of a more inclusive, peaceful, and structured learning environment.

Children were able to choose the colours of the reaction, smell the vinegar if they wished, feel the materials if they so wished, and choose the colour of the volcanic reaction mix using food colourings. They were also able to voice their knowledges and interests pertaining to the reaction, and choose or negotiate the role they wished to play as either “scientists” or as what children suggested could be “the television camera man capturing the volcanic reaction”– as every child had their own individual role to play in creating a successful ‘volcanic’ reaction.

The promotion of children’s agency was a particularly prominent issue encountered within the first camera-pen pedagogical activity, and thus, in promoting a more inclusive and supportive environment through the utilisation of a separate, more peaceful learning environment for the project in addition to the facilitation of a small group activity, children were more cooperative towards educators propositions and felt more included as part of a “team” during the learning experience. Such aspects helped to balance my multiple roles as an educator during the activity, as active participant,

encouraging democratic processes and facilitating supportive structures, as a 'negotiator' of power relations, and furthermore as an 'instructor' providing children with instructions as to how they may resolve or overcome problems encountered during the activity. Children's successful cooperation and agency were particularly evident within my reflective diary as stated by the supervising educator during our reflective discussions:

The activity whilst structured remained playful and everyone could join in and express themselves. Responsibility was shared, the cooperation was clear and their aim to make the volcano explode was collective. Each child had a role and enjoyed being a part of something larger, a collective learning experience. Children helped one another when they needed help. and also celebrated their successes together, which is always nice to see and experience.

5.3.3 Access

The only difficulty concerning access to technology involved the sharing of the tablet during the reflection and evaluative process at the end of the activity. Within my reflective diary, I noted that "The tablet screen was particularly small, it would have been better to share the reflection and recording on a larger screen to allow everyone to see the reaction clearly.". Whilst considering the impact of such a limitation as tablet size on both inclusion and participation, the size of the tablet screen becomes a particularly significant factor when considering the planned approach towards technology utilisation. Within this camera-pen activity, the tablet was utilised for the purpose of recording a significant moment during children's learning experiences and for the facilitation of reflection and exploration of epistemological curiosities pertaining to the chemical reaction. Thus, when reviewing and reflecting upon children's individual experiences regarding the activity, it is particularly important that all children have equal viewing opportunity and furthermore equitable opportunity to participate within discussions.

Power relations (Grieshaber and McArdle, 2010) were particularly evident during this phase of the activity, yet due to the smaller group size, I was able to intervene and encourage sharing and opportunities for discussion, but the limitations of the screen size were prevalent. Children often had to view the video multiple times and individually as they missed certain parts and asserted that they could not see well. This also limited the time for discussions pertaining to their experiences and interests regarding the activity. Both the supervising educator and I reflected that a larger screen for sharing the videos, or even facilitating a collective reviewing of all of the reactions in a larger classroom with the group as a whole as a separate discussion activity, may have better

facilitated participation and inclusion, in addition to providing more time for reflection, evaluation and feedback from the children.

5.3.4 Time

Time was once again highlighted as a limiting factor during the activity, particularly during the reflection and discussion phase. This was particularly evident within the following extract from my learning diary during discussions with the supervising educator:

Children were more interested in the volcano at the end than the reviewing process, a separate space might be best and a large screen, maybe review the explosions concurrently as a larger project. The environment was much better prepared for this kind of activity and the structure facilitated children's participation and inclusion. However, it was more difficult to engage with the tablet for all children during the reflection and reviewing part. This was mostly to do with the time limit, having freedom and time to separate the reviewing process from the experiment may well have been beneficial. However, I do understand that freedom and time as a researcher are a limitation of implementing.

Children also stated that they enjoyed watching the volcano "...explode over and over again" and wanted to show it to their friends in other groups. They also suggested that they would have liked to see it on a larger screen as "the tablet screen was a bit small".

As I have often found during my teaching practices, '*time*' towards the conclusive stage of an activity is often problematic and poses many challenges for children, particularly for those enveloped and immersed in their curiosities and newfound knowledges within the activity, and those who require additional support. Ending play, thus, is a challenge for all educators, often involving transition phases and negotiations pertaining to power relations (Grieshaber & McArdle, 2010). Within this instance, time was particularly limited, and the structure of the activity was purposefully rigid. Whilst the supervising educator had suggested a separation of the activity and the reflective reviewing phase of the activity, this was not possible due to time limitations, however as previously stated, such a change may have better facilitated key aspects of a child-centred approach such as inclusion and participation. Whilst this may have been the case, it is also important to acknowledge that such changes would have presented various alternative challenges, particularly regarding a larger group size and discussion opportunities.

5.3.5 Competence and practical experience

According to Chen & Chang (2006), children's access to technology is "contingent upon teachers' skills in using and integrating technology" (p. 170). As this was only my second attempt to implement and adapt camera-pen pedagogy within the ECEC environment, I felt particularly uncertain as to how the activity would go, yet due to my past experiences as an educator, I also understood the significance of being flexible in one's approach and that every learning experience is co-constructed and collaborative and thus must be open to both adaptation and change, despite the challenges faced. I did not know how to fully utilise the tablets potential during the activity, and relied upon my preconceptions of children's interests and knowledges, in addition to children's own suggestions as expressed previously regarding their excitement and epistemological curiosity towards science and volcanoes, to plan and attempt to facilitate a meaningful learning experience for all children whilst integrating technology. Fortunately, children were particularly enthusiastic towards the topic of volcanoes and their active participation in what was for many a new learning experience in conducting a scientific experiment.

As Vaughan & Beers (2016) state, "Technology as part of the curriculum then is not integrating specific times during lessons for children to have access to technology, but instead finding ways to integrate technology into the lessons in a more authentic and meaningful manner" (p. 330). With regards Vaughan and Beers' statement, the chosen adaptation of the camera-pen pedagogical approach both planned and implemented seemed to facilitate a more 'meaningful' and 'authentic' integration of technology, utilising the camera as a tool for learning (Kiesiläinen, 2006) within a more child-centred learning experience. This assertion is supported by within the following extract from my self-reflective learning diary:

Whilst discussions could only be brief due to time restrictions, the conversations flowed and revolved around children's epistemological curiosities whilst performing the experiment and later in the reviewing of the reaction on the tablet. Children enjoyed utilising the tablet in a meaningful and productive manner as part of the scientific method of experimentation, exploration, and knowledge acquisition. The camera, whilst peripheral during the activity, became an important tool for data collection and analysis, as children experienced its usefulness as a tool for learning.

Integrating technology within children's meaningful, positive, and child interest-oriented learning experiences was in itself a significant challenge due to my unfamiliarity with the camera-pen pedagogical approach, and furthermore considering my lack of knowledge and experience of tablet utilisation within ECEC practices. Such

findings support the assertion that educators lack of familiarity and prior experience with technology act as barriers towards technology integration within child-centred and developmentally appropriate educational practices (Blackwell et al., 2014; Parette et al., 2010; Tsumura & Robinson, 2017; Chen & Chang, 2006).

5.4 Summary of findings

During the second camera-pen project implementation several challenges encountered during the first activity implementation re-emerged. The prominent challenge of '*time*' re-emerged towards the end of the activity implementation due to the structure and duration of the activity, and children's inquisitiveness and desire to explore and experiment with both the volcano, in addition to their wishes to review the captured footage multiple times. This limited discussions and reflective opportunity; however, children were both agentic and discursive during the activity and whilst viewing and reflecting on their findings when utilising the tablet collectively.

'Support', 'inclusion' and 'participation' were better facilitated by utilising a small group activity approach implemented within a separate environment in addition to the implementation of a more rigid structure. Such adaptations facilitated a more peaceful and positive learning environment where my dual role as an active participation and an 'instructor' could be more easily actualised, and thus I could provide each individual child with adequate, equitable support and therefore maintain a more inclusive, child-centred learning experience (Kumpulainen, 2018). Children expressed joys at achieving a successful reaction and vocalised their satisfaction and appreciation of being a part of a successful "team". Children's agency was also considered to have been better facilitated as a result of the successful implementation of a more child-centred approach. This was particularly dependent upon the facilitation of inclusive practices, support structures, and a peaceful, positive, and carefully considered learning environment, achieved through the utilisation of decreased child: adult ratio.

Children's access to technology presented less of a challenge with regards to children's participation as the tablet maintained a lesser significant role within the second activity in comparison to the first. One issue pertaining to '*access*' occurred as a result of utilising a single tablet for the reflection stage as the screen was insufficient in size for all six children and the educator to view satisfactorily. Various solutions were discussed during our reflections, such as altering the structure and length of the activity by dividing the activity into two and utilising a larger screen, however these were

limited by access to technology and furthermore the limited time and rigidity of the scheduled project implementation.

Competence and prior experience remained a factor, as my overall confidence and uncertainty in utilising and integrating technology within an ECEC environment limited my understanding and appreciation of inclusive factors such as screen size and participation, however acknowledging the pertinence of flexibility and the unpredictable nature of collaborative and co-constructed learning experiences helped me to maintain a relaxed, positive and enthusiastic approach to both my and children's active participation and collaborative learning journey.

The overall feeling as apparent within the reflective diary and within discussions with both children and the supervising educator regarding the second activity was that the structuring, planning, and the implementation better facilitated a technologically integrated, more meaningful, child-centred approach, and thus positively impacted children's learning experiences and the quality of ECEC provision (FINEEC, 2019).

6 DISCUSSION AND CONCLUSION

6.1 Reliability and limitations

As MacNaughton and Hughes (2008) specify, the reliability of a research paper is often determined by the decisions made in consideration of the research methodology implemented. Thus, the decision to utilise a qualitative action research project, its implementation and evaluation process, and the results obtained and displayed within this paper were directly influenced by my understanding of key concepts relating to ECEC, my competences regarding the planning and implementation of a child-centred approach (Kumpulainen, 2018), my previous knowledges and experiences in integrating technology within the ECEC practices, my personality, and furthermore my pedagogical philosophy towards children's learning. For these reasons, in addition to the understanding that every child is both unique and individual, and that every learning environment presents its own set of different difficulties and challenges, the findings within the present research may not achieve the repeatability.

The present research project aimed to investigate camera-pen pedagogy (Kiesiläinen, 2006) as a potential method of integrating technology within the ECEC environment as a tool for learning, whilst exploring the potential challenges or barriers educators may face when attempting to integrate technology within an ECEC setting. Due to the nature of the quantitative action research study, the limitations regarding the scope, sample size and time, the personal influence upon the study and its findings as presented within the present paper, and the utilisation of specifically adapted camera-pen pedagogical technique (Kiesiläinen, 2006), generalisations of research findings were purposefully avoided (MacNaughton and Hughes, 2008). The reliability of the study was maintained through the careful consideration of the preferred research method for this particular investigative study (qualitative teacher action research), by the consistent implementation of the action research process, in addition to the appropriate selection of data collection and analysis methods (MacNaughton and Hughes, 2008). The pre-planning and evaluative questions (Appendix A) were developed with the intention of facilitating a consistent, critical, and reliable focus on particular issues pertaining to the planning and implementation of technology

integrated pedagogical practices within ECEC in the Finnish context, in addition to the goals and aims of ECEC as outlined within the NCC for ECEC (2019).

Furthermore, the intentional choice to reflect on the implementation process and my role as an educator as critically as possible throughout the research process, with a particular descriptive focus on observations and statements pertaining to events and challenges met during the research project, was an attempt to offer the reader with a comprehensive perspective as to how and why the research findings were obtained (McAteer, 2013). I would hope that readers consider and acknowledge the individuality and personal nature of the research project, in particular when considering the research outcomes critically, the lack of generalisation of results, and the lack of replication that occurs as a consequence of the nature of the study, with regards to the nature of the study, it's intentional design, and my main objective of improving my professional knowledge and practice pertaining to camera-pen pedagogical implementation and the integration of technology within ECEC environments.

With regards to my initially proposed research question 'how can camera-pen pedagogy be adapted for utilisation within ECEC?', the research project offered many valuable insights and experiences into the numerous challenges which may complicate and prevent the integration of technology within ECEC pedagogical practices, in addition to providing various potential solutions, philosophical considerations, and perspectives as to how camera-pen pedagogy may be better adapted for utilisation within an ECEC environment. Furthermore, the project provided me with an invaluable opportunity to learn more about and explore camera-pen pedagogy as a potentially viable, adaptable, and versatile method of integrating technology meaningfully within children's everyday ECEC learning experiences. As research suggests, educators often encounter difficulties in incorporating technology in student-centred and developmentally appropriate ways (Blackwell et al., 2014; Parette et al., 2010). This may be due to a lack of familiarity, competence, prior experience and confidence in one's own capabilities with technology (Tsumura & Robinson, 2017; Chen & Chang, 2006; Liu et al., 2016), each factor of which influences one's own belief in the pedagogical approach implemented as highlighted within this study. Such experiences have helped me to grow as a professional, and furthermore have improved my confidence and willingness to integrate technology meaningfully within children's everyday learning experiences, to implement unfamiliar pedagogies with an understanding and appreciation of risk, and even more so to appreciate significant role of evaluative practices within our professional development as educators with the aim of implementing a child-centred approach to ECEC.

Camera-pen pedagogy is but one of many pedagogical approaches towards integrating technology within educational experiences, and thus should be considered as a tool for meaningful technology implementation rather than a philosophy. Furthermore, as this project has highlighted, there is no one-size fits all methodology to teaching, nor is there for technology integration. Every classroom, every learning environment, and every child for that matter presents a different challenge towards the way in which we perceive, implement, and understand our pedagogical practices, our decisions made, and our philosophies towards education. We must exercise our intentions as educators with an openness and understanding that challenges will be ever present, and that by reflecting, self-evaluating and attempting to overcome them with carefully considered, critical, and often collaborative thinking, planning, and implementation, we may develop pedagogies not in the interest of our own efficiency or our own expectation of achieved goals, but in the interest and consideration of every child. It is within this regard that the quotation by Liu et al., (2016) resonates, that "...merely giving the iPad to teachers and students does not guarantee their use for the benefits." (p. 160). Such simple phraseology highlights the significance of our co-dependency, our unfinishedness perhaps (Freire, 2001) within our meaningful, collaborative learning experiences as educators with children, and I constant requirement to self-evaluate, to learn, and to improve, with our goal of facilitating a truly child-centred educational curriculum.

As a final thought, I was particularly pleased and pleasantly surprised at my own capabilities to plan and implement changes to an unfamiliar pedagogical approach, utilising unfamiliar tools in an unfamiliar setting, and furthermore to overcome various challenges experienced during the project pertaining to the integration of technology within the ECEC setting. My evident lack of experience and knowledges regarding technology integration within ECEC settings, in addition to the numerous challenges faced during the project implementation, would suggest that there is a need, and perhaps a requirement, for further professional development and training opportunities for both present and future qualified professionals within the field to both learn and develop their confidence and capabilities with technology, particularly considering the ever diversifying and increasingly technologized educational environments that we now practice within. As to whether professionals should receive financial reimbursement for their time spent learning new pedagogical initiatives during working hours through professional training programmes, or whether such they should be introduced and taught during undergraduate teaching programmes, remains a topic of discrepancy and controversy. Thus, closer examination and further study of the various barriers to

educators implementation and utilisation of technology are necessary towards improving educators facilitation of a technologically integrated curriculum.

7 LITERATURE

- Arthur, L., Beecher, B., Death, E., Dockett, S., & Farmer, S. (2018). *Programming & planning in early childhood settings* (7th edition.).
- Alasuutari, M., Karila, K., Alila, K., & Eskelinen, M. (2014). *Vaikuta varhaiskasvatukseen: Lasten ja vanhempien kuuleminen osana varhaiskasvatuksen lainsäädäntöprosessia*. Opetus- ja kulttuuriministeriön työryhmämuistioita ja -selvityksiä 2014:13. Helsinki: Opetus- ja kulttuuriministeriö.
- Blackwell, C. (2013). Teacher practices with mobile technology: integrating tablet computers into the early childhood classroom. *Journal of Education Research*, 7(4), 1-25
- Blackwell, C. K., Lauricella, A. R., & Wartella, E. (2014). Factors influencing digital technology use in early childhood education. *Computers & Education*, 77, 82–90. doi:10.1016/j.compedu.2014.04.013.
- Blackwell, C. K., Lauricella, A. R., Wartella, E., Robb, M., & Schomburg, R. (2013). Adoption and use of technology in early education: The interplay of extrinsic barriers and teacher attitudes. *Computers & Education*, 69, 310-319.
- Brühwiler, C. & Blatchford, P. (2011). Effects of class size and adaptive teaching competency on classroom processes and academic outcome. *Learning and Instruction*, 21(1), 95–108.
- Buchanan, T., Sainter, P., & Saunders, G. (2013). Factors affecting faculty use of learning technologies: Implications for models of technology adoption. *Journal of Computers in Higher Education*, 25(1), 1–11. doi:10.1007/s12528-013-9066-6.
- Chen, J.-Q. & Chang, C. (2006). Using computers in early childhood classrooms: Teachers' attitudes, skills and practices. *Journal of Early Childhood Research*, 4, 169-188.
- Chou, C., Block, L., & Jesness, R. (2012). A case study of mobile learning pilot project in K–12 schools. *Journal of Educational Technology Development and Exchange*, 5(2), 11–26.

- Colwell, J., Beaumont, H., Bradford, H., Canavan, J., Cook, E., Kingston, D., Linklater, H., Lynch, S., McDonald, C., Nutkins, S., Ottewell, S., Randall, C., & Waller, T. (2015). *Reflective teaching in early education*. London: Bloomsbury. p. 283.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. doi:10.2307/249008.
- Dundar, H., & Akcayir, M. (2012). Tablet vs. paper: The effect on learners' reading performance. *International Electronic Journal of Elementary Education*, 4(3), 441–450.
- Dundar, H., & Akcayir, M. (2014). Implementing tablet PCs in schools: Students' attitudes and opinions. *Computers in Human Behavior*, 32, 40–46.
- Education and training Monitor 2019: executive summary. (2019). Publications Office. <https://op.europa.eu/en/publication-detail/-/publication/217756af-ac58-11ea-bb7a-01aa75ed71a1/language-en>
- Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education*, 59(2), 423-435.
- Ertmer. (1999). Addressing First- and Second-Order Barriers to Change: Strategies for Technology Integration. *Educational Technology Research and Development*, 47(4), 47–61. <https://doi.org/10.1007/BF02299597>
- Eskelinen, M., Gammelgård, L., Hjelt H., Kivistö, A., Lerkkanen, M-K., Marjanen, J., Mattila, V., Paananen, M., Repo, L., and Ulvinen, J. (2019). Varhaiskasvatuksen Laatu Arjessa. Varhaiskasvatussuunnitelmien toteutuminen päiväkodeissa ja perhepäivähoidossa. [pdf] Kansallinen koulutuksen arviointikeskus. https://karvi.fi/app/uploads/2019/09/KARVI_1519.pdf
- Falloon, G. (2015). What's the difference? Learning collaboratively using iPads in conventional classrooms. *Computers & Education*, 84, 62–77
- Freire, P. (2001). *Pedagogy of freedom: Ethics, democracy and civic courage*. Rowman & Littlefield.
- Frey, N., Fisher, D., & Lapp, D. (2015). iPad deployment in a diverse urban high school: A formative experiment. *Reading & Writing Quarterly*, 31(2), 135—150.
- Gimbert, B., & Cristol, D. (2004). Teaching curriculum with technology: Enhancing children's technological competence during early childhood. *Early Childhood Education Journal*, 31(3), 207–216.
- Grieshaber, S., & McArdle, F. (2010). *The trouble with play*. Open University Press.
- Hattie, J. (2005). The paradox of reducing class size and improving learning outcomes. *International Journal of Educational Research*, 43(6), 387–425.

- Henderson, S., & Yeow, J. (2012, January). iPad in education: A case study of iPad adoption and use in a primary school. Paper presented at the Hawaii International Conference on System Sciences, Maui, HI.
- Hilppö, J., Lipponen, L., Kumpulainen, K., & Rainio, A. (2016). Children's Sense of Agency in Preschool: A Sociocultural Investigation. *International Journal of Early Years Education*. DOI: <http://dx.doi.org/10.1080/09669760.2016.1167676>.
- Jaakkola, M. (2017). Let the Camera Be Your Pen: The camera-pen learning approach fosters visual thinking in the classroom. *Nordicom-Information*, 39 (2), 42-45.
- Kiesiläinen, I. (2006). Video camera at schoolwork: How could the camera be as the pen? Core. <https://core.ac.uk/reader/39896467>
- Kiesiläinen, I. (2017). Kamerakynän pedagogiikka: opettajan käsikirja. [The pedagogy of the camera-pen: A teacher's guide.] ISBN 978-952-93-9099-1. [http://www.mystinenportaali.com/mediakasvatus/kamerakynan_pedagogiikka_-_opettajan_kasikirja_\(2017\)_web.pdf](http://www.mystinenportaali.com/mediakasvatus/kamerakynan_pedagogiikka_-_opettajan_kasikirja_(2017)_web.pdf)
- Kumpulainen, K. (2018). A principled, personalised, trusting and child-centric ECEC system in Finland. In S. L. Kagan (Ed.), *The Early Advantage 1: Early Childhood Systems That Lead by Example* (pp.72-98), New York: Teachers College Press.
- Kumpulainen, K., Lipponen, L., Hilppö, J., & Mikkola, A. (2013). Building on the positive in children's lives: A coparticipatory study on the social construction of children's sense of agency. *Early Child Development and Care*. DOI:10.1080/03004430.2013.778253
- Lindahl, M. G. & Folkesson, A. (2012). Can we let computers change practice? Educators' interpretations of preschool tradition. *Computers in Human Behavior*, 28(5), 1728-1737. doi: 10.1016/j.chb.2012.04.012.
- Liu, M., Navarrete, C., Scordino, R., Kang, J., Ko, Y., & Lim, M. (2016). Examining Teachers' Use of iPads: Comfort Level, Perception, and Use. *Journal of Research on Technology in Education*, 48:3, 159-180. DOI: 10.1080/15391523.2016.1175853
- MacNaughton, G., & Hughes, P. (2008). *Doing Action Research in Early Childhood Studies*. McGraw-Hill Education.
- Magnuson, K. A., Ruhm, C. & Waldfogel, J. (2007). The persistence of preschool effects: Do subsequent classroom experiences matter? *Early Childhood Research Quarterly*, 22(1), 18–38.
- McAteer, M. (2013). *Action research in education* . SAGE.

- National core curriculum for early childhood education and care 2018.* (2019). Finnish National Agency for Education.
- National core curriculum for pre-primary education 2014.* (2016). Finnish National Board of Education.
- OECD. (2019). TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners, TALIS.
- Parette, H. P., Quesenberry, A. C., & Blum, C. (2010). Missing the boat with technology usage in early childhood settings: A 21st century view of developmentally appropriate practice. *Early Childhood Education Journal*, 37(5), 335-343. <http://dx.doi.org/10.1007/s10643-009-0352-x>
- Pessanha, M., Peixoto, C., Barros, S., Cadima, J., Pinto, A. I., Coelho, V., & Bryant, D. M. (2017). Stability and change in teacher-infant interaction quality over time. *Early Childhood Research Quarterly*, 40, 87-97.
- Piaget, J. (1995) Logical operations and social life, in L. Smith (ed.) *Sociological Studies*. London: Routledge.
- Russell, G. S., & Hughes, J. E. (2014). iTeach and iLearn with iPads in secondary English language arts. In C. Miller & A. Doering (Eds.) *The new landscape of mobile learning: Re-designing education in an app-based world* (pp. 292–307). New York, NY: Routledge.
- Sairanen, H., & Kumpulainen, K. (2014). A visual narrative inquiry into children's sense of agency in preschool and first grade. *International Journal of Educational Psychology*, 3(2), 143-176. doi: 10.4471/ijep.2014.09
- Sandseter, E., & Seland, M. (2017). 4–6-year-Old Children's Experience of Subjective WellBeing and Social Relations in ECEC Institutions. *Child Indicators Research*, 11(5), 1585–1601. <https://doi.org/10.1007/s12187-017-9504-5>
- Siljander, P., Kontio, K., & Pikkarainen, E. (2017). *Schools in Transition Linking Past, Present, and Future in Educational Practice* (1st ed. 2017.). SensePublishers. <https://doi.org/10.1007/978-94-6300-827-3>
- Slot, P., Melhuish, E., Ereky-Stevens, K., Petrogiannis, K., Ariescu, A., Penderi, E., Rentzou, K., Tawell, A., Broekhuizen, M., & Leseman, P. (2015). A review of research on the effects of early childhood Education and Care (ECEC) upon child development. CARE project; Curriculum Quality Analysis and Impact Review of European Early Childhood Education and Care (ECEC).
- Suoninen, A. (2008). *Mediakasvatus päiväkodissa ja esiopetuksessa. Mediakasvatuksen tilan ja Mediamuffinssi-oppimateriaalien käyttöönoton*

- arviointi syksyllä 2007*. [pdf] Jyväskylän yliopisto Nykykulttuurin tutkimuskeskus.
https://staff.jyu.fi/Members/kuilju/mediakasvatus_paivakodissa_raportti.pdf
- Tondeur, J., Hermans, R., van Braak, J., & Valcke, M. (2008). Exploring the link between teachers' educational belief profiles and different types of computer use in the classroom. *Computers in Human Behaviour*, 24, 2541-2553. doi: 10.1016/j.chb.2008.02.020.
- Tsumura, L., & Robertson, L. (2017). Implementing Technology in an Early Years Program: Teachers and Students as Metacognitive Thinkers. *International Journal for Infonomics*, 10(3). <https://doi.org/10.20533/iji.1742.4712.2017.0166>
- Vaughan, M., & Beers, C. (2016). Using an Exploratory Professional Development Initiative to Introduce iPads in the Early Childhood Education Classroom. *Early Childhood Education Journal*, 1-11.
- Vlasov, J., Salminen, J., Repo, L., Karila, K., Kinnunen, S., Mattila, V., Nukarinen, T., Parrila, S., & Sulonen, H. (2019). Guidelines and recommendations for evaluating the quality of early childhood education and care. Finnish Education Evaluation Centre. https://karvi.fi/app/uploads/2019/03/FINEEC_Guidelines-andrecommendations_web.pdf
- Vygotsky, L. (1929) The problem of the cultural development of the child, *Journal of Genetic Psychology*, 36: 415 – 34.
- Wartella, E., Blackwell, C., Lauricella, A., & Robb, M. (2013). Technology in the lives of educators and early childhood programs. Report for the Fred Rogers Center, Latrobe, PA and the Center on Media and Human Development, Evanston, IL.
- Yan, W. & Lin, Q. (2005). Effects of class size and length of day on kindergartners' academic achievement: Findings from early childhood longitudinal study. *Early Education and Development*, 16(1), 49-68.

8 APPENDIX

8.1 Appendix A

8.1.1 *Pre-planning questions for the Supervising Educator:*

1. What age range are the children within the group?
2. What is the group size?
3. How many staff will be present during the activity?
4. Do any children require special assistance or have any learning difficulties that I could or should consider within my pedagogical planning?
5. How would you describe children's access to technology at home and within the daycare?
6. How would you describe their capabilities or prior experiences with technology?
7. What is a typical duration of an activity? (When is the best possible time for the activity fitting in with your daily schedule?)
8. What are the children's interests? Do you have any particular focus or topic at present that children are particularly excited about exploring?

8.1.2 *Questions for initial Self-reflection and Evaluation:*

1. How did I take into consideration past research findings, my own personal experiences, and knowledges when planning and implementing the activity?
2. How did the activity go? Did the activity go to plan? Were the learning outcomes achievable? Were there any surprising or unexpected goals achieved? What went well? What difficulties did you or the children encounter during the activity?
3. From your observations and experiences, was the activity fun for the children? Did the activity facilitate play and social interaction within the children's learning experience? How did the activity facilitate children's epistemological curiosities towards new knowledges?
4. Was children's active agency facilitated during the activity?
5. Were children able to express their previous knowledges and were they integrated within the pedagogical approach?
6. Did the activity encourage the expression of positive emotions?
7. Did the activities facilitate new learning experiences and competencies in connection with the world around them?
8. Were children's diverse cultural backgrounds considered during planning and implementation of the pedagogical approach? How did this affect implementation? How did children's individual differences influence the intended child-centred pedagogical approach?
9. How would you describe children's interactions with the technology?

10. How was inclusion facilitated?
11. Did the activity facilitate a sense of belonging?
12. How would you describe your role as an educator during the implementation?
Were you able to actively participate within the learning experience, or were you more of a director of the learning experience?
13. What changes would you make in consideration of the experience and the self-reflection to improve the activity/pedagogical implementation? What do you hope to achieve with each of these changes, and how might they be implemented during the next activity?
14. (Cycle 2) Based upon repeated questions as stated above, how did changes made influence the pedagogical planning, approach, and implementation of camera-pen pedagogy within the ECEC setting?

8.1.3 Questions for the Children:

1. Did you enjoy the activity?
 - a. If so: What did you particularly enjoy?
 - b. If not, what did you not enjoy?
2. How did it feel to use the camera in your activities?
3. Did you find the camera useful to document and share your ideas and findings?
4. Did you have any difficulties during the activity?
5. What could we do differently to make it even better or more enjoyable/fun?
6. Did you feel that you each had enough time with the cameras?
7. Did you all feel that you were a part of your groups work? Did you get to share your ideas and explore what you wanted to explore?
8. What kinds of things would you like to explore next time using the cameras?
9. (Cycle 2) Would you like to use cameras or technology more often during your activities?

8.1.4 Questions for the Supervising educator:

1. How do you feel the activity went? Would you describe the activity as 'playful' and 'fun'? Was children's play, their curiosities and exploration of new knowledges facilitated?
2. Were children's interests considered within the activity? Were children actively engaged? Was there a freedom to explore their individual interests?
3. Do you feel that the pedagogical goals were achieved using this pedagogical approach?
4. Were children's positive learning experiences and social interactions facilitated during the activity?
5. Could children incorporate previous knowledges, experiences, and competencies in connection with the world around them during the activity?
6. Was children's participation and active agency facilitated? Were children able to positively express themselves during the activity?
7. Did you feel that children's inclusion was facilitated? If so, how? If not, how could it be better facilitated?
8. Did the activity consider the diversity and individual differences within the group?
9. Did you encounter any difficulties, or perceive any difficulties during the activity? Were there any limiting factors or anything that did not go to plan?

10. What would you change about the planning, implementation, or overall pedagogical implementation in consideration of difficulties faced, or adapting the procedure to be more aligned with the curriculum and learning goals?
11. Would you use this approach during your future practices? What factors may limit your ability to implement such an approach to technology integration?

8.2 Appendix B

8.2.1 Activity 1: Favourite things to do in preschool

Meaningfulness of the activity:

As I am new to the group, a good starting point is familiarisation between both myself and the children. The activity aims to encourage and facilitate children's acknowledgment and sharing of knowledges, individual differences, and similarities, based upon children's individual interests within the ECEC environment. Utilising technology is also somewhat of a rarity according to research findings, and whilst tablets are available for teacher instructed use, children are rarely afforded the opportunity to experiment and explore technology within their own individual learning experiences.

Objectives:

Language and interaction: To facilitate the sharing of information with children in a playful and joyful experience that affords children the opportunity to share their interests, backgrounds, or anything further they wish with their peer group, in addition to expressing themselves in their own individual way.

Social skills: As children 'children explore, interpret, and express themselves', positive feedback and collective joy in play promote self-confidence and a sense of belonging within the pre-school community.

The acknowledgement of individuality: Children are encouraged to recognise both their collective and individual agency to express themselves, to evaluate, compare their individual interests with others as part of their community. 'They are guided to take others into consideration and to respect each other's individuality.' (Section 3, National core curriculum for Pre-primary education, 2014).

To familiarise oneself with, and utilise, technology as a tool for learning: As children familiarise themselves with tablets, they may express themselves and their feelings, their attitudes, and values through the camera's lens and through discussions relating to the images or videos captured. They may also begin to understand the camera as a tool for both documentation and reflection, relating directly to their individual learning process.

Areas of transversal competence:

Multi-literacy and competence in information and communication technology: Children both interact with, and discover using, multi-literacies (videos and images captured using technology), in addition to being directly involved in the pedagogical documentation process. Children can learn that technology is not only utilized for a singular form (such as play), but also as a tool for documenting their learning process, for reflection, and for data collection, thus encouraging a scientific method of investigation and problem-solving utilizing technology.

Participation and involvement: Children collectively discover how technology may be utilized for both data collection and reflective purposes, for sharing knowledges,

attitudes, opinions, and expressing themselves, whilst understanding that it may also be utilized as a tool for learning. Through discussion and active participation, children may explore differences in attitudes, values and knowledges relating to their individual interests. Involving children within their learning process, and orientating activities with a child-centred approach, further provides children with a sense of agency and importance in matters pertaining to their immediate environment.

Thinking and learning: Children are encouraged to be inquisitive in the exploration of new knowledges pertaining to their individual interests and curiosities, in addition to those of others, through discussion, discovery, and playful exploration with technology.

Contents and learning modules:

Which learning modules detailed in the basics of the preschool education plan will be covered?

Exploring and Interacting with my environment: Children are encouraged to think independently and inquisitively in relation to their ECEC surroundings and matters pertaining to their individual attitudes and interests. Exploring their environment, capturing images or videos of the things that are important to them regarding play and their learning environment, and sharing their ideas and findings with others.

Me and my community: Children participate in a collective community project 'promoting children's interest in societal activities.' (Section 4.3). Utilizing technology, children are afforded the opportunity to capture and share their knowledges, perceptions, attitudes and values relating to their individual interests and things that they particularly enjoy, thus establishing an understanding of both similarities and individual differences and learning of the importance of cooperation and community.

Diverse forms of expression: 'Children's capabilities for learning, social skills and positive self-image are strengthened as they develop capabilities for structuring the world around them. These capabilities evolve as children explore, interpret and express themselves and the world by practicing different skills of expression.' (Section 4.3)

Rich world of the language: Facilitated through the use of technology, active reflection and discussions within the group, language may be used as '...both an object and a vehicle for learning...' (Section 4.3).

What activities does this enable the children to engage in?

Children participate in exploring their immediate environment collectively, they are encouraged to actively engage in discussions pertaining to their individual interests, and the utilisation of technology within their learning process, for problem solving, data collection, and reflective purposes.

What do the children learn or what skills do they practice?

Children both learn and practice key skills relating to sharing, cooperation, understanding, patience, self-expression, ICT based skills and multiliteracy skills such as utilising the tablet for data collection, reflection, and expression.

Methods:

Collectively: Educators and children engage in discussions that both develop and encourage positive attitudes and reflections of children's everyday experiences within preschool.

Children: Are actively encouraged to support one another and to respect individual differences.

Educator: Promotes experimentation and exploration using the technology, encouraging the positive reflection, and capturing of images pertaining to the children's

individual interests and experiences within preschool. Modelling and scaffolding may be used to encourage children's active participation.

Arrangement of the working environment:

As the children are exploring their natural learning environment, the environment does not need to be arranged in any particular order as the children may either familiarise themselves with, or already be familiar with the learning environment.

As there will be 6 tablets present, and 23 children likely present, children may choose their groups of up to 4 individuals. Children who are not able to form a group by themselves will be supported and encouraged by adults into a group.

Work division and roles:

Educators present during the activity (all adults present) should be assigned to a group to attempt to actively observe and participate within children's learning experiences to facilitate inclusion and equity within the group, in addition to encouraging collaboration and ensuring that each individual has had their turn utilising the tablet. As there will be 6 groups and 3 adults, it may be necessary to assist in multiple groups, depending on children's individual needs and requirements for support. Children should also be encouraged to support one another during their collective and individual learning experiences. During the active discussion and reflection, one educator may collectively reflect upon children's learning experiences utilising the images and video's captured with the group as a whole.

Children's inclusion is supported by ensuring that educators are available to both support and assist children should they require, in addition to actively engaging with children through discussion and enquiry throughout the activity.

Activity progression:

1. Firstly, I will introduce myself, my purpose for being in attendance, and what I am interested in exploring during my time with the children – as they are like 'co-detectives' in exploring this way of finding evidence and sharing knowledges with one another, ensuring they are aware that if they don't want to do the project with me and the tablets, they have the right to withdraw at any time.
2. After a brief introduction, I will ensure that each group is familiar with accessing the video capture mode on the tablet, and explain the activity to the children – to explore their individual interests, their favourite things to do in daycare – it can be during their free play, or activity time, whatever they wish to express and show.
3. Children will then need to be arranged into groups depending on the number of children and number of tablets, with additional consideration for the number of staff and children's requirements for additional support. In this instance, 6 tablets and 23 children: thus 6 groups of 3-4 children. Once children have chosen their groups, they will then be free to explore the classroom and find and capture their favourite things to do within their ECEC environment.
4. Once each child has had the opportunity to capture their favourite thing/s to do, they can return to the mat to look at the images with their group members and reflect upon them within their groups, as other groups may still require assistance.
5. Once all groups have returned, the reflection stage of analysis can begin, and one educator can analyse the 'data' (images or videos) collected by children and ask who captured the image? Why is it their favourite? How

often and who with do they get to play with their favourite toy? Simply to encourage discussion pertaining to their individual interests to share with the group.

6. After the reflection phase, children are thanked for their participation, and then the follow up questions regarding the utilisation of tablets and the activity are presented to the children collectively.

Assessment:

Children's activities will be assessed through dialogic teaching and the application of inclusive teaching practices such as listening, discussing, observing, evaluating, and reflecting. Whilst children utilize the tablets, educators can observe, question, and encourage children's self-reflection and active participation, in addition to their cooperation as a group. Aim's will be evaluated collectively as to how successful we feel the activity was in supporting our collective learning goals, with particular emphasis on individual difference and self-expressiveness as part of a collective group discussion, children's inclusion will also be facilitated within a short evaluative discussion at the end of the activity.

Time for activity: approx. 1h-1h30m.

8.2.2 Activity 2: Volcano Science

Meaningfulness of the activity:

Some children had highlighted that they were particularly interested in science projects such as rockets and volcanoes, and others were very interested in Minecraft and the volcanoes within Minecraft, thus it made sense to engage in children's expressed interests and orientate the activity around science and volcanoes. Children had also stated that they enjoyed utilising tablets during their activities, some stating they would like to use the video camera feature rather than the camera, and they also seemed to particularly enjoy the reflection process of reviewing their collected data/ the products of their learning experiences.

Objectives:

To familiarise oneself with, and utilise, technology as a tool for learning: As children familiarise themselves with tablets, they may express themselves and their feelings, their attitudes, and values through the camera's lens and through discussions relating to the images or videos captured. They may also begin to understand the camera as a tool for both documentation and reflection, relating directly to their individual learning process.

Language and interaction: To facilitate the sharing of information with children in a playful and joyful experience utilising science and children's particular interest in volcanoes as a facilitative platform for their epistemological curiosities that affords children the opportunity to share their interests, past experiences, or understandings of chemical reactions, volcanoes, or anything further that pertains to their individual interests or knowledges.

Social skills: working together in a group, children create a basic chemical reaction, record the results utilising the video camera in real time, and review them collectively in the form a small collective evaluation and discussion of both their participation and learning experiences. Children must learn to take turns, discuss roles,

and understand the significance of working together with regards to their completion of the experiment.

Self-regulation, focus and teamwork: the nature of small group activities often requires a more constructive and negotiated learning experience between all members of the group. Whilst the activity may be considered 'playful' within limitations, children may also practice self-regulation and focus in keeping within the structure of both the activity and the group during this collective, somewhat playful yet readily structured learning experience.

Areas of transversal competence:

Multi-literacy and competence in information and communication technology: Children both interact with, and discover using, multi-literacies (videos and images captured using technology), in addition to being directly involved in the pedagogical documentation process. Children can learn that technology is not only utilized for a singular form (such as play), but also as a tool for documenting their learning process, for reflection, and for data collection, thus encouraging a scientific method of investigation and problem-solving utilizing technology.

Participation and involvement: Children collectively discover how technology may be utilized for both data collection and reflective purposes, for sharing knowledges, attitudes, opinions, and expressing themselves, whilst understanding that it may also be utilized as a tool for learning. Through discussion and active participation, children may explore differences in attitudes, values and knowledges relating to their individual interests. Involving children within their learning process, and orientating activities with a child-centred approach, further provides children with a sense of agency and importance in matters pertaining to their immediate environment. As children participate within group activities, a sense of community and shared interests may be generated so long as the environment is both conducive in supporting positive learning experiences.

Thinking and Learning: One of the main goals of the activity is 'to encourage and help children to develop their thinking and learning skills and to strengthen children's confidence in their own competences.' Through structured yet experimental role play, children can engage as scientists exploring their epistemological curiosities relating to chemical reactions and volcanoes, in addition to colour experimentation in successfully creating a chemical reaction. Furthermore, utilising the video camera, children can record and review their observations, learning experiences and findings and participate in a short discussion reflecting upon their individual learning experiences whilst sharing knowledges and interests pertaining to their experiences during the activity. This encourages children's agency within the evaluative process.

Contents and learning modules:

Which learning modules detailed in the basics of the preschool education plan will be covered?

Me and my community: Children participate in a collective community project 'promoting children's interest in societal activities.' (Section 4.3). Utilizing technology, children are afforded the opportunity to capture and share their knowledges, perceptions, attitudes and values relating to their individual interests and things that they particularly enjoy, thus establishing an understanding of both similarities and individual differences and learning of the importance of cooperation and community.

Rich world of the language: Facilitated through the use of technology, active reflection and discussions within the group, language may be used as '...both an object and a vehicle for learning...' (Section 4.3).

Diverse forms of expression: ‘Children’s capabilities for learning, social skills and positive self-image are strengthened as they develop capabilities for structuring the world around them. These capabilities evolve as children explore, interpret and express themselves and the world by practicing different skills of expression.’ (Section 4.3)

Exploring and Interacting with my environment: Through scientific exploration, children can explore the fundamentals of chemical reactions through the creations of a simple acid-base experiment planned in accordance with their previously expressed epistemological curiosities of science and volcanoes. “Observations, experiences and knowledges connected to the operating environment and structuring and describing them help children’s development as thinkers and learners.” “Children are also guided to observe technology in the environment and to experiment and find solutions together.” (Section 4.3).

What activities does this enable the children to engage in?

Children are able to observe, experiment, and find solutions based on the simple science of an acid: base reaction, in addition to questioning why and how the reaction occurs whilst hypothesising what is likely to happen when the components are mixed. The experiment also includes the potential to mix colours, encouraging children to consider the potential outcomes of colour combinations during the acid: base reaction. Children must work together to create the chemical reaction and erupt the volcano, whilst one child documents the experiment. Children will then review their explorations and discuss their findings based on the video footage, encouraging reflection, the potential for additional observations, and expressing ones attitudes, values, or feelings related to the learning experience.

What do the children learn or what skills do they practice?

Children both learn and practice key skills relating to cooperation, understanding, patience, self-expression, amounts (regarding the volume of vinegar, amount of bicarbonate of soda), in addition to ICT based skills and multiliteracy skills such as utilising the tablet for data collection, reflection, and expression.

Methods:

Collectively: The present educator and children work together to create an acid-base reaction and find the solution of how to make the volcano erupt using the basic apparatus available. The educator encourages children to place

Children: Are actively encouraged to support one another and to respect individual differences.

Educator: Promotes the acknowledgement of children’s capabilities and achievements, also encourages reflections and the acknowledgement of differentiating attitudes, values, and roles when collaborating and reflecting upon learning experiences using technology.

Arrangement of the working environment:

A separate space is required for the experiment to ensure a more peaceful and perhaps more concentrated team effort in creating the volcanic eruption. The ready-made volcano (made from papier-mâché and a plastic bottle) is placed in the centre of a tray in the middle of a table. The other components (colour dye, water and soap mix, food colouring, baking soda) are placed around the table and each child is then asked to utilise a single component during the experiment. A plastic bag and paper towels will be utilised to clean up the experiment ready for the next group.

Children are divided into groups of 6, and groups will interchange once they have completed the experiment and reflection exercises.

Work division and roles:

The attending educator guides children's exploratory learning experience towards the completion of the acid-base volcanic eruption reaction. The educator may offer assistance or advice, or provide questions that engage children's learning or expressed curiosities. Whilst the group of 6 children are participating in the science experiment, the other children are performing their normal daily routine with the other available educators. During the active discussion and reflection, one educator may collectively reflect upon children's learning experiences utilising the images and video's captured with the group as a whole.

Children's inclusion is supported by ensuring that educators are available to both support and assist children should they require, in addition to actively engaging with children through discussion and enquiry throughout the activity.

Activity progression:

1. The first 6 children in attendance are introduced to the various components of the experiment and are asked which they would like to utilize during the experiment. They are then asked to hypothesize what they think is likely to happen.
2. The group must decide on a colour for their lava, and the experiment may begin
3. One child is asked to document the experiment using the tablet for reviewing purposes – only the result of the experiment is documented and reviewed (the reaction).
4. Each child takes turns to add each component to the bottle, liquids will be added through a funnel, and the bicarbonate using a spoon. The Vinegar must be added lastly.
5. The chemical reaction occurs, and children can enjoy the moment
6. They are then asked if they want to see the explosion again, and they can then review it on the tablet
7. children are asked why? and how? it occurred, in addition to any curiosities they may have.
8. Children then return to the larger group and a new group of 6 attends.

Assessment:

Children's activities will be assessed through dialogic teaching and the application of inclusive teaching practices such as listening, discussing, observing, evaluating, and reflecting. Whilst children utilize the tablets, educators can observe, question, and encourage children's self-reflection and active participation, in addition to their cooperation as a group. Aim's will be evaluated collectively as to how successful we feel the activity was in supporting our collective learning goals, with particular emphasis on individual difference and self-expressiveness as part of a collective group discussion, children's inclusion will also be facilitated within a short evaluative discussion at the end of the activity.

Time for activity: approx. 15m per group, 1h-1h30m total.