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# **D1.2 Q-Tales Pedagogical Framework**

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Abstract	<p>The Q-Tales Pedagogical Framework document presents the pedagogical and developmental theories central to the creation of e-books to enhance childrens' literacy and engagement in reading. The framework begins with an overview of the importance of literacy development. In particular, it highlights how literacy remains a top educational and social priority. The theoretical underpinnings of the framework; socio-constructivism, constructionism, and action and skill development theory, and how they relate to children's literacy development, are then introduced. Narrative identity development and the relationship between technology and storytelling are also discussed. An overview of the pedagogical framework is then provided. Finally, normal literacy developmental stages are discussed, along with suggested skills for each of the literacy developmental levels which might be incorporated into Q-tales e-book design in order to support childrens' literacy development and engagement in reading.</p>
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## 1 Executive Summary

The present document constitutes the Pedagogical Framework of the Q-Tales Project. It presents the Pedagogical Framework of Q-Tales, its building blocks and the guidelines for the process of its application and expansion.

Central to the Q-tales pedagogical framework is a focus on literacy skills development and engagement in reading. For this reason, the framework begins with an overview of the importance of literacy development. In particular, it highlights how literacy remains a top educational and social priority, especially in Europe where statistics in recent years point to problematic, low literacy levels among a large proportion of Europe's citizenry. The conceptualisation of literacy, especially in the contemporary 'Digital Age', is also briefly introduced and outlined; to begin to locate a critical and cogent interpretation of literacy that will help to inform the design, implementation and evaluation of educational technology within the Q-Tales Project.

The theoretical underpinnings of the framework; socio-constructivism, constructionism, and action and skill development theory, and how they relate to children's literacy development, are then introduced. Narrative identity development and the relationship between technology and storytelling are also discussed. An overview of the pedagogical framework is then provided. Finally, normal literacy developmental stages are discussed, along with suggested skills for each of the literacy developmental levels which might be incorporated into Q-tales e-book design in order to support childrens' literacy development. The main sections of the framework will now be briefly introduced.

### **Definition of Literacy**

Central to the Q-tales pedagogical framework is a focus on the design of a support structure to promote *engagement in reading*. The definition of literacy employed by PISA 2015 (OECD, 2013) focuses on the concept of *reading literacy*, which is construed as: "understanding, using, reflecting on and engaging with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society" (OECD, 2013, p. 9). The definition in use in the current, ongoing PISA assessment (2015) encompasses text in both traditional print and innovative digital formats.

## Theoretical underpinnings

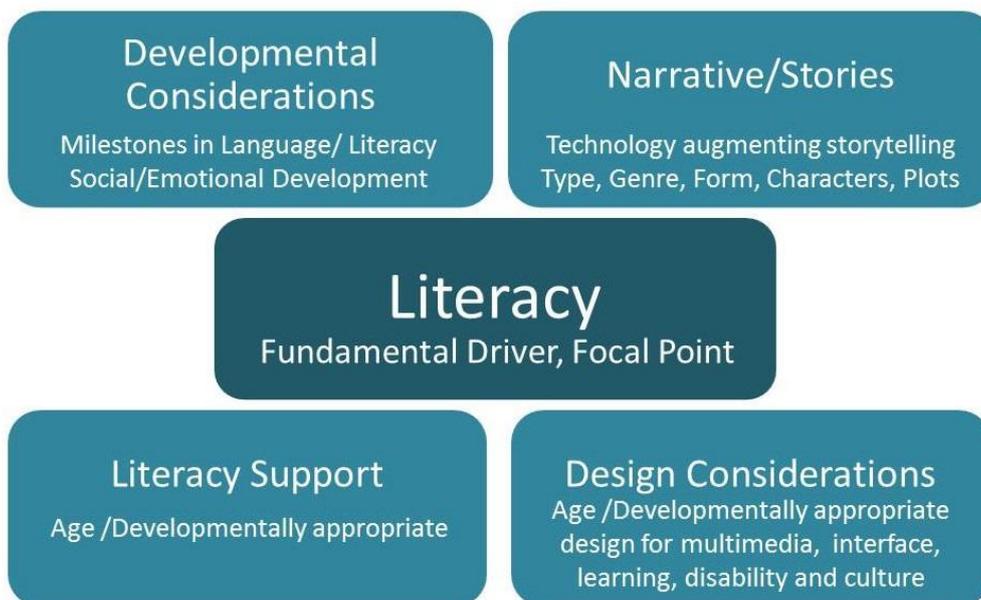
The Q-tales pedagogical framework is based on a socio-constructivist view of literacy development. The goal of reading is the construction of meaning from text (Braunger & Lewis, 1998, p. 28). By working together with the people around us, and the technological affordances provided by our culture, we construct new understanding and knowledge. In this light, literacy development is influenced by social contexts, social supports and interactions, and the artefacts of culture, including the language, learning strategies, and technologies used by cultural groups.

Papert's theory of constructionism (1990) is also central to the Q-tales pedagogical framework. Based on Papert's earlier work with Piaget and constructivism, constructionism advocates learning through the design and the construction of personally meaningful projects. As part of the Q-tales pedagogical framework, we envision children using the Q-tales technology to construct their own meanings, through interactions with e-books developed by others, and through their use of the platform to develop their own e-books.

Extending the focus on knowledge and meaning that is central to constructivism and constructionism, the Q-tales project includes a broader focus on skill development and the central role of reading in broader categories of skill development, including cognitive problem solving, meta-cognitive control over learning, and social-emotional development of children. Psychological skills, including reading skills, have their origins in *action*. The concepts of *action* and *activity* – common to the seminal developmental theories of Baldwin, Dewey, Piaget, Vygotsky, Papert and others – bring together the various processes that we call *psychological* into a single unit.

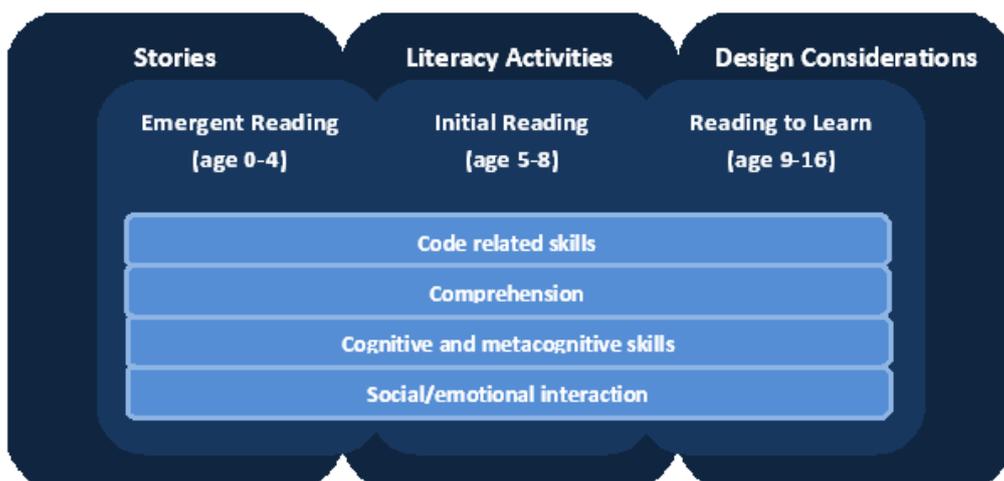
## Overview of pedagogical framework

Central to the Q-Tales pedagogical framework is a focus on literacy skill development and engagement in reading. Our framework is grounded in developmental considerations derived from an analysis of the broad developmental psychology and education literature. These considerations shape our ultimate activity- and design-focused pedagogical ontology (Figure 1).



**Figure 1 Q-Tales pedagogical framework**

At a high level, our framework and ontology includes 3 themes: (1) stories, (2) literacy activities, and (3) design considerations, each of which has a number of dimensions. Notably, our pedagogical framework is structured in light of developmental considerations relevant to three broad age categories, that is, children aged 0-4, 5 –8 and 9 – 16, based roughly on three broad stages of literacy development: (1) emergent reading, (2) initial reading, and (3) reading to learn. Finally, our pedagogical literacy activities focus is based on four categories of literacy development: (1) code related skills, (2) comprehension, (3) cognitive and metacognitive skills, and (4) social/emotional interaction (Figure 2).



**Figure 2 Overview of Q-Tales Ontology Themes**

Narrative and stories: This section outlines a codeable category system for Q-tales narratives which include:

1. **Story plots and types:** This component of the category system aims to span the broad cognitive, emotional and social landscape of childhood. The diverse story plots and types include, for example: individual and collaborative storytelling; problem solving and imaginative narrative; fantasy and science fiction; and playful and serious stories.
  2. **Story characters and archetypes:** This dimension of the ontology encompasses universal narrative characters and archetypes, such as hero, villain/malefactor, detective, secret agent, king/queen and magician/magus.
  3. **Story forms:** This aspect of the codeable Q-Tales category system identifies a broad range of different narrative formats. These include, *inter alia*: short story, poems, songs and epistolary forms such as the card, diary and letter.
  4. **Story genres:** This part of the Q-Tales story category system identifies and draws together different genres of stories, including: mystery, fairytale and fantasy, science fiction, comedy, playful or nonsense stories, and epic and classic narratives.
  5. **Story technology:** This category is based on analysis of current trends in storytelling tools and technologies, and the classification of three major developments in children's engagement with digital narrative. These are: Children Apps, Book-Like Apps, eBooks and augmented digital forms of the traditional, printed book.
- B. Developmental considerations: This section of the deliverable encompasses developmental considerations in relation to the pedagogy of reading literacy from birth to adolescence, in particular, focusing on three broad stages of literacy development:
1. **Emergent reading:** Oral skills (i.e., expressive and receptive oral skills), reading skills, and writing skills that young children acquire before they begin formal schooling.
  2. **Initial reading:** Building on emergent literacy skills developed in the preschool years, children learn to identify letters and learn letter-sound correspondences. Writing skills also develop at this time. Over the course of

the early years of schooling, children who learn to read successfully are able to identify printed words, read for meaning and read with fluency.

3. **Reading to learn:** As children reach the age of 8 or 9, they are increasingly expected to be able to read to learn new ideas and to gain new knowledge. At this stage of reading development, the texts read in school go beyond what the reader already knows and contain information that is beyond the reader's language and knowledge.

C. Pedagogical literacy focus: In this section we focus in particular on pedagogical activities organised according to developmental level, each of which is broken down into the following categories:

1. **Code related skills:** Assist in childrens' development of phonological awareness, the alphabetic principle, an understanding of the correspondence between sounds and spellings, developing a repertoire of sight words that can be easily recognised, and the ability to decode unknown words (Neuman & Celano, 2010).
2. **Comprehension:** These activities assist children in developing oral language skills, enhancing their vocabulary, building their conceptual knowledge base, and verbal reasoning abilities in order to understand what is being read.
3. **Cognitive and metacognitive skills:** Cognitive strategies are those we use when thinking, learning and studying, whereas metacognitive strategies are those we use to make sure a learning goal is being or has been reached (Teaching Excellence in Adult Literacy Center, 2015).
4. **Social/emotional interaction:** Social/emotional interaction skills support children's social/emotional interactions with reading. From a Vygotskian (1978) perspective, working with others in a social educational setting, learners are able to achieve goals and tasks that they would not be able to accomplish on their own.

D. Design considerations: We focus on a set of design considerations which we see as complementary to the pedagogical literacy focus:

1. **Multimedia design:** Principles dealing with the multimedia aspects of design such as sound, motion, voiceover, animations and graphics.

2. **Interface design:** Principles dealing with how children interact with the e-book interface.
3. **Learning design:** Principles dealing with design to enhance childrens' learning and literacy development.
4. **Disability design:** Principles dealing specifically with design for learners with disabilities such as ADHD, sight and hearing impairments and reading disabilities.
5. **Cultural design:** Principles dealing with designing for cultural sensitivity.

At all times, the focus of the Q-tales pedagogical framework is on literacy skills development and engagement in reading. To this end, the report includes a set of recommendations for the Q-tales e-book designers in relation to literacy activities and design considerations.

## 2 Introduction

### 2.1 Literacy rates and the importance of literacy development

This first section of the report outlines the broad context on literacy rates and the importance – personal, cultural, economic and societal – of literacy development. In particular, it highlights how literacy remains a top educational and social priority, especially in Europe where statistics in recent years point to problematic, low literacy levels among a large proportion of Europe’s citizenry. The conceptualisation of literacy, especially in the contemporary ‘Digital Age’, is also briefly introduced and outlined; to begin to locate a critical and cogent interpretation of literacy that will help to inform the design, implementation and evaluation of educational technology within the Q-Tales Project.

#### 2.1.1 Literacy – a national and international educational priority

Literacy remains a highly significant priority on national and international educational policy and research agendas. UNESCO (UNESCO, 2015) defines literacy as a fundamental, incontrovertible human right, a prerequisite for enabling each and every citizen to engage meaningfully and productively in economy and civil society. UNESCO (2015) employs the phrase ‘Literacy as Freedom’ to emphasise the vital importance of literacy and its essential place in the lives of each and every person; how it supports their meaningful understanding of, and active participation in the world of work, culture, creativity and communication.

Publication of the most recent data of the Programme for International Student Assessment PISA 2012 (Organisation for Economic Co-operation and Development, 2014) highlights the imperative to continue to focus intensively, strategically and systemically on improving and supporting literacy, in particular the encouragement of reading among young people. Although half of OECD countries assessed for PISA 2012 indicated improved reading scores, the other half showed no change, or indeed disimproved. Of the 64 countries with comparable data in reading performance throughout their participation in PISA, 32 improved their reading performance, 22 showed no change, and 10 deteriorated in reading performance. The most recent data also point to an apparent, emerging gender gap in reading performance in certain jurisdictions. Specifically, between 2000 and 2012 the gender gap in reading performance – favouring girls – widened in 11 countries and economies. Notably, in Bulgaria, France and Romania, the gender gap in reading performance increased by more than 15 score points and only in Albania did the gap narrow as a result of a greater improvement in reading performance among boys than among girls. The PISA 2012 data also indicates considerable capacity for improvement in terms of developing top-performing readers. Across the OECD,

according to the most recent PISA data, only 8.4% of students are classified as top performers in reading (Organisation for Economic Co-operation and Development, 2014).

The educational and societal importance of literacy and literacy development was highlighted by the United Nations' designation of 2003 to 2012 as a 'Decade of Literacy'. The rationale for the UN Literacy Decade emerged from the central role that literacy plays in an individual's learning throughout their lifetime, and their potential as a result to engage fully and effectively in today's culture, economy and society. As stated in one UN report, 'literacy is crucial to the acquisition, by every child, youth and adult, of essential life skills that enable them to address the challenges they can face in life, and represents an essential step in basic education, which is an indispensable means for effective participation in the societies and economies of the twenty-first century' (United Nations, 2002b, p. 155)

The inculcation, development and promotion of key literacy skills among children and young people – from the earliest stages in their education - is of paramount importance. International data highlight how difficult it is to redress literacy difficulties in adulthood: "The number of illiterate adults remains stubbornly high at 774 million, a fall of 12% since 1990 but just 1% since 2000. It is projected only to fall to 743 million by 2015...Universal literacy is fundamental to social and economic progress. Literacy skills are best developed in childhood" (United Nations Educational Scientific and Cultural Organization, 2014, p. 4)

The 2012 Act Now! Report of the EU High Level Group of Experts on Literacy (European Commission, 2012) highlights the imperative to address the challenges of promoting and improving literacy as a European educational, economic and societal priority, particularly considering: "We are living a paradox: while the digital age requires ever higher levels of literacy, millions of Europeans of all ages continue to fail to reach the mark." The Report, "a wake-up call to the literacy crisis that affects every country in Europe", has found that "One in five European 15-year-olds and almost one in five adults lack the literacy skills required to successfully function in a modern society" (European Commission, 2012, p. 29)

### **2.1.2 Defining 'literacy' in the 21st Century**

The definition of literacy employed by PISA focuses on the concept of *reading literacy*, which is construed as: "understanding, using, reflecting on and engaging with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society" (OECD, 2013). Since PISA 2009, and for the two successive, most recent PISA assessments (2012, 2015), *engagement in reading* has become a key focus of the definition of reading literacy. The definition in use in the current, ongoing PISA assessment (2015) encompasses

text in both traditional print and innovative digital formats. Central to the Q-Tales pedagogical framework is a focus on the design of a support structure to promote *engagement in reading*.

Further to highlighting the fundamental personal, social and economic importance of literacy, UNESCO's description of 'Literacy as Freedom' also reflects

...the [current] evolution of the conception of literacy: beyond its simple notion as the set of technical skills of reading, writing and calculating . . . to a plural notion encompassing the manifold meanings and dimensions of these undeniably vital competencies. Such a view, responding to recent economic, political and social transformations, including globalization, and the advancement of information and communication technologies, recognizes that there are many practices of literacy embedded in different cultural processes, personal circumstances and collective structures (UNESCO, 2006, p. 155).

As an example of this more plural approach to literacy, in Ireland, one of a number of EU-27 countries with a nationwide school-based literacy policy, literacy is inclusively defined as going beyond a print-centric focus to encompass speech, communications media and new technology. Here the focus is on "the capacity to read, understand and critically appreciate various forms of communication including spoken language, printed text, broadcast media, and digital media." (Department of Education and Skills, 2011, p. 8)

UNESCO's broad and encompassing definition exemplifies the complexity of defining literacy, particularly in today's digital world. New literacies research has emerged to examine literacy in new creative and communicative contexts where digital media and technologies are increasingly used (Mills, 2010; Futurelab, 2010). Further to reading, writing and arithmetic, which are often categorised and grouped together under the term 'literacy', new literacies research expands the definition of literacy to include new and emerging 'post-typographic' (Reinking, 1998) communicative, creative and expressive modalities, and the impact of the Internet and collaboration/social technologies on contemporary literacy activities and practices. In the contemporary context, literacy encompasses a broad set of content and competences for engaging critically with texts in both traditional print and innovative digital mediums. The young reader today must be able to decode and derive meaning from diverse sources of information and in multiple, text and non-text, digital formats.

New literacies research (e.g. Coiro & Castek, 2010; Lankshear & Knoble, 2006) defines contemporary literacy as constituting a set of collaborative, socially-mediated practices that enable learners to connect and integrate critically their own prevailing discourses: their identities and prior knowledge with extant and emerging literacy practices within the wider culture and society. Crucially, this new meaning-making is often mediated by new and

emerging technologies and digital media, which can facilitate forms of literacy and creativity that go 'beyond text' and individuation, resulting in the shared production and publication of collaborative multimedia artefacts and projects. In this context, literacy with technology itself and digital competences are regarded as forms of literacy, as they can facilitate and promote further creativity and collaboration with technology (Futurelab, 2010).

The conceptual-evaluative framework currently employed for PISA 2015 maintains the same definition of reading literacy for traditional print medium text that it does for digital reading, that is, literacy with electronic text. The PISA 2012 assessment showed that in most countries, performance in print reading closely matched performance in digital reading. Furthermore, PISA 2012 reported that students are developing digital reading literacy mainly by using computers at home to pursue their interests. It was also found that a digital divide – invariably linked to socioeconomic status - has emerged where access to technology significantly impacts upon students' literacy levels as 'digital readers'.

There are several key aspects to literacy and the development of literacy that are outlined in key policy and research on this issue. UNESCO has found that "Engagement in everyday reading activities helps sustain literacy skills" (United Nations Educational Scientific and Cultural Organization, 2014, p. 73). Furthermore, it has been shown (UNESCO, 2014) that children who engage in reading for pleasure generally perform better at school, thereby highlighting the importance of this activity for general education and lifelong learning.

Research also underscores the importance of the conditions and culture of learning in helping to promote engagement in reading for pleasure and the development of reading literacy. A recent study (Laurenson et al., 2015) on encouraging and enhancing reading for pleasure in the school noted the importance of allocating time in children's and young people's *crowded lives* specifically for reading for pleasure and enjoyment. Furthermore, the research showed that certain conditions and factors can significantly prevail upon and improve young people's reading engagement. These include:

- a) The availability of good quality material suitable for all reading ages that will appeal to the varying tastes of adolescent readers
- b) The opportunity for students to choose books, talk about books and recommend books to each other
- c) The willingness of the teacher and all the students to engage fully in the activity

- d) The visibility of books and book-related material in the classroom
- e) The involvement of parents who talked with their sons and daughters about the books they were reading and, in some instances, read the books themselves
- f) The continuing excitement of students at the prospect of reading
- g) The modelling of good reading practice by the teacher

## 2.2 Pedagogical theory and literacy

### 2.2.1 Constructivism

The goal of reading is “the construction of meaning from text. It is a cognitive and affective process where readers actively engage with the text and build their own understanding” (Braunger & Lewis, 1998, p. 28). The Q-Tales pedagogical framework is based on a socio-constructivist view of literacy development.

Based on the work of Vygotsky and Piaget among others (Fosnot, 1996), constructivism holds that we construct our knowledge in the context of active efforts to adapt to our reality. Piaget focused largely on the individual actor and highlighted how knowledge is constructed by individuals working to develop increasingly adequate mental models of reality. Vygotsky (1962) viewed language as paramount in the knowledge construction process, and he also emphasised how knowledge construction is being mediated by our social and cultural context (O’Byrne et al., 2011). In understanding the world around us, we do not act alone. In social situations, including classrooms, we are presented with new ideas for consideration. By working together with the people around us, and the technological affordances provided by our culture, we construct new understanding and knowledge. In this light, literacy development is influenced by social contexts, social supports and interactions, and the artefacts of culture, including the language, learning strategies, and technologies used by cultural groups.

Vygotsky (1978) strongly emphasised the important role of social supports, or scaffolding, during the learning process. Vygotsky (1978) proposed two distinct levels of learning; the actual development level of the learner, and a potential development level which could be reached with the assistance of adults or capable peers. Vygotsky (1978) described the difference between these two levels as the “zone of proximal development” (ZPD). He felt that in working with others in a social educational setting, learners would be able to achieve goals and tasks that they would not be able to accomplish on their own, and once the learner

had reached this new level of development, he would be able to achieve this on his own in the future.

“...learning awakens a variety of internal developmental processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers. Once these processes are internalized, they become part of the child’s independent developmental achievement” (Vygotsky, 1978, p. 90).

The pedagogical activities promoted by this framework hold that “children are active learners, drawing on direct social and physical experience as well as culturally transmitted knowledge to construct their own understandings of the world around them” (Bredenkamp & Copple, 1997, p. 13).

### 2.2.2 Constructionism

Constructionism, originally proposed by Seymour Papert, is a founding theoretical construct in the field of educational technology (Solomon, 1987). Papert has been a pioneer in the use of technology with children since the 1960s. A founding faculty member of MIT’s Media lab and student of Jean Piaget, he has advocated a very unique way to use technology in the classroom. His theory of constructionism, based on his earlier work with Piaget and constructivism, advocates learning through the design and the construction of personally meaningful projects.

We understand “constructionism” as including, but going beyond, what Piaget would call “constructivism.” The word with the v expresses the theory that knowledge is built by the learner, not supplied by the teacher. The word with the n expresses the further idea that this happens especially felicitously when the learner is engaged in the construction of something external or at least shareable...a sand castle, a machine, a computer program, a book (Papert, 1990, p. 3).

Ackerman (2002) describes Papert’s constructionism as focusing on “...the art of learning, or ‘learning to learn’, and on the significance of making things in learning” (p. 1).

Papert is interested in how learners engage in a conversation with [their own or other people’s] artefacts, and how these conversations boost self-directed learning, and ultimately facilitate the construction of new knowledge. He stresses the importance of tools, media, and context in human development (Ackerman, 2002, p. 1).

One can’t help but marvel at Papert’s (1993) vision for childrens’ future use of computers as machines for personally constructing meaningful objects.

For me, the phrase “computer as pencil” evokes the kind of uses I imagine children of the future making of computers. Pencils are used for scribbling as well as writing, doodling as well as drawing, for illicit notes as well as for official assignments. Kay and I have shared a vision in which the computer would be used as casually and as

personally for an even greater diversity of purposes. But neither the school computer terminal of 1970 nor the Radio Shack home computer of 1980 have the power and flexibility to provide even an approximation of this vision. In order to do so, a computer must offer far better graphics and a far more flexible language than computers of the 1970s can provide at a price schools and individuals can afford (Papert, 1993, p. 210).

Decades before the advent of the tablet computer, Papert had a vision of how the computing technology of the future could be used by children. As part of the Q-Tales pedagogical framework, we envision children using the Q-Tales technology to construct their own meanings, through interactions with e-books developed by others, and through their use of the platform to develop their own e-books.

### 2.3 Action and Skill Development

Extending the focus on knowledge and meaning that is central to constructivism and constructionism, the Q-Tales project includes a broader focus on skill development and the central role of reading is broader categories of skill development, including cognitive problem solving, meta-cognitive control over learning, and social-emotional development of children. Psychological skills, including reading skills, have their origins in *action*. The concepts of *action* and *activity* – common to the seminal developmental theories of Baldwin, Dewey, Piaget, Vygotsky, Papert and others – bring together the various processes that we call *psychological* into a single unit. While the term *action* is often used as a synonym for overt behaviour or movement, the concept of action extends far beyond that of mere movement – it extends to motives, emotions, meaning-making, and quite naturally to language and the creation and understanding of stories. More generally, it does not take long for us to develop an appreciation for the way in which the action of stories is instrumental in shaping our personality, and our life.

Central to many theories of skill development in psychology is the idea that complex, higher-order forms of skill emerge from simpler, lower-order components. This is central to Piaget's account of development, and more recent models (Thelen & Smith, 1994; VanGeert, 1996; Lewis, 2000). In all of these models, the activity of the developing person, the moment-to-moment interactions with the world, shape ongoing learning and development, thus making the context of learning critically important to skill development. Dynamic systems theories (Thelen & Smith, 1994; VanGeert, 1996; Lewis, 2000) also assume that learners cannot be "simply instructed" or "directed" to move or develop from one state to another. Notably, growth and development of the system is described as a process of *self-organization, linking shorter and longer time scales of development*. In the context of learning how to read, the action of the developing child is critical for driving their self-organising skill development.

Thus, we see the emergence of organizational “habits” that grow in strength and replace competing organizations (Thelen & Smith, 1994). By analogy, whatever way water flows down a hill during a rain storm it is more likely to flow there again in future, thus fashioning a permanent stream over time. Therefore, in the context of dynamic variation there can emerge higher-order organizational patterns that define, for example, emotional, cognitive, or personality functioning.

One prominent theory in this space, Dynamic Skill Theory (Fischer, 1980; Fischer & Bidell, 2006; Fischer et al., 2008) describes the process of development by reference to two nested cycles of growth. A longer-term growth cycle sees skills grow through a series of five developmental tiers: (1) reflexes, (2) sensorimotor actions, (3) representations, (4) abstractions, and (5) principles. Reflexes are *innate action elements* (e.g., sucking; grasping); sensorimotor actions are *coordinated actions* on objects (e.g. reaching for an object); representations are symbolic meanings about *concrete* aspects of objects, events and persons, which largely manifest in language (e.g., “Daddy eat carrot”); abstractions are higher-order representations about intangible and generalized aspects of objects and events (e.g., “Dad is my earthly guide, but Buddha is my spiritual guide”). Abstract principles are high level abstractions that tie together multiple abstract systems (e.g., “I advocate monism and not dualism; as such I argue for a complex interdependence between biological, perceptual, cognitive, motor, and social levels of analysis in my theory of mind”).

Dynamic Skill Theory points to a shorter-term growth cycle operating within the longer-term growth cycle. Specifically, within each broad tier of development, skills develop through a series of four levels: (a) single sets, (b) mappings, (c) systems, and (d) systems of systems. In each cycle, the developing person first controls *a single unit of action* – for example, a single action, representation, or abstraction. Next, the developing person relates at least two such units to form a *mapping of actions*, representations, or abstractions. Next the person coordinates at least two mappings to form a *system*. Finally, the person integrates at least two systems to form a system of systems. As such, after reflexes are eventually coordinated and the child has developed some control over action, we see the following sequence of growth: Action systems generate single representations; representational systems generate single abstractions; abstract systems generate single principles<sup>1</sup>. Notably, the Q-Tales

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<sup>1</sup> Principles can also be coordinated. For example, the principle of *sustainable development* (which works to coordinate the concept of a *viable, equitable, and bearable* environment) might well be coordinated with the

pedagogical framework aligns with Fischer’s Skill Theory by arguing, specifically, that good pedagogical design in the Q-Tales platform implies recognition that:

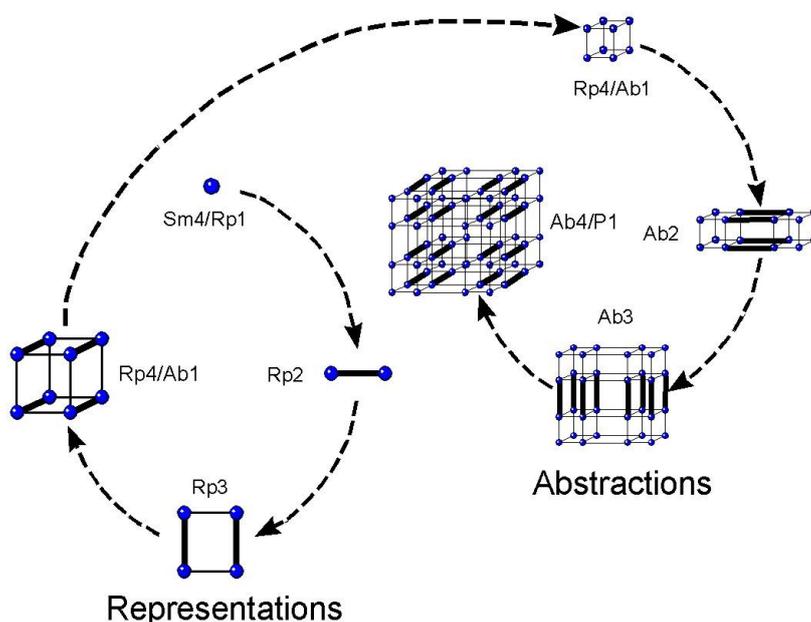
- (a) Children of different ages generally operate at different skill levels
- (b) Activities within the e-book environment can be used to coordinate action and foster skill development
- (c) Although younger children may have difficulty working with complex mappings and systems at the level of representations, and may not understand abstractions, younger children can operate at a higher level of skill when provided with adequate support
- (d) The skill level at which children operate is also a function of the domain of learning and when introducing new domain learning to a child it is important to build skills from the ground up (i.e., from actions, through representations, to abstractions and systems of abstractions)
- (e) A high level of skill manifests across all levels simultaneously (i.e., coordinating actions, representations, abstractions and principles)

Figure 1 illustrates the cycle of skill development from single representations (which are derived from action systems; Sm4/Rp1) to a mapping of representations (Rp2), through to systems of representations (Rp3) and single abstractions (Rp4/Ab1), which ultimately coordinate many representations. Similarly, systems of abstractions (Ab3) can be coordinated to form principles (Ab4/P1). Again, it is important to note that skills are dynamic structures in Dynamic Skill Theory. This has implications for book design and pedagogical design. Skill level varies not only as a function of age, but also as a function of context and domain-relevant knowledge and experience. Skill level depends, for example, on whether or not a particular context supports a high level of skill. Unlike Piaget’s emphasis on all-encompassing cognitive structures that regulate adaptive action, Dynamic Skill Theory emphasizes *localized skills that are tied to particular situational demands, psychological domains and social contexts*. For example, knowing that a physician can make complex judgments about physical illness in a hospital setting does not allow one to predict the physician’s skill level in a business setting (e.g., when negotiating with an investment company). Skill levels and developmental trajectories can only be predicted reliably within specific tasks, task domains and contexts,

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principle of *individualism* (which works to coordinate the concepts of *liberty, originality, self-reliance, privacy, mutual respect; etc.*).

and development is therefore best construed not as a ladder (with people operating at higher and lower skill levels) but rather as a web of variable intra-personal and inter-personal skill activity that varies as a function of time and context. Having said that, when designing books for children aged 2 to 10, one can reasonably assume that many knowledge domains are new to children and representational mappings and system building should be carefully crafted to facilitate the building of skill structures within the story domain.



**Figure 3 Fischer’s Skill Theory Levels**

As noted by Mascolo and Fischer (2010), while skills may develop through the same sequence of structural transformations across different domains, skills in different conceptual domains develop along their own unique trajectories. Mascolo and Fischer (2010) note that the age of emergence of skills at similar levels of structural complexity often shows only weak correlations across conceptual domains. However, e-books can offer unique activity experiences that foster cross-domain integration, for example, when a child is learning about numerical concepts or developing graphicacy skills in the context of engaging with an interesting story or narrative. Table 2 depicts examples of three basic trajectories in the development of skills in three target domains: mathematical skills, narrative understanding, and artistic skill.

As noted previously, contexts differ in the extent to which they support skilled activity (Mascolo, 2005; Morrow & Rogers, 2008; Rosey et al., 2008). For example, a reading context

involving *high support* might support skilled action by modelling specific behaviours (e.g., correct pronunciation of printed words, pointing and naming of objects on the page, or providing cues, prompts or questions that help structure children's skilled reading). These supports can either be provided by skilled adults or older siblings, or they can be implicit in the design of the interactive book itself (e.g., where the narrator or interactive game prompts supports skilled action in context). As described by Mascolo and Fischer (2010), a child's *optimal skill level* refers to the highest level of performance they are capable of achieving in high support contexts, whereas their *functional skill level* refers to their everyday performance in low support contexts.

The provision of support in the context of developing reading skills is often very dynamic, linking key reading experiences across time. For example, a child might be asked to imitate a complex story modelled by an adult and in the context of this adult support, the child's story reveals a higher level of skill than when he or she tells stories in free play (e.g., many more mappings are described and a richer story narrative is provided in the modelling context compared with the free play context). Later, when an adult prompts the child by listing the key components of a story, the child again functions at higher level. In other words, skill level varies across time and context and it has been empirically demonstrated that these fluctuations in skill level can occur in the same child, simply by varying the support context (Fischer et al., 1993; Fischer & Pipp, 1984).

Mascolo and Fisher (2010) also suggest that contexts involving support differ from contexts involving scaffolding (Mascolo, 2005; Wood et al., 1976). In contexts involving support, the individual alone is responsible for coordinating the elements of a given skill, for example, where an adult models a complex story for a child who then produces the story without further assistance. Scaffolding differs from support because it involves direct assistance, for example, when an adult tells the story with the child, elaborating on key aspects of the story as the child relates it, asking story-related questions, constructing more complex mappings in the plot, or linking concrete concepts with abstract ideas, and so on. With quality scaffolding, an individual can achieve even higher skills levels (Fischer et al., 2003; Mascolo, 2005). As such, skill development often occurs in a context where people participate in joint interactions with one another (Rogoff, 1993; Mascolo et al., 1997). Central to our pedagogical framework is the idea that supported and scaffolded co-creation of skills is a critical feature of successful literacy development.

**Table 1 Developmental Transformations in Hierarchical Complexity in Three Domains**

Developmental Level	Number	Narrative	Drawing (Arts)
Abstract Principles (25 years +)	<b>Manipulations of Higher-Order Mathematical Structures and Objects.</b> Study of relations among abstract structures of mathematical operations (e.g., detecting structural isomorphisms between groups of mathematical operations in seemingly disparate areas).	<b>Principled Integration of Literary Forms and Genres.</b> Principled articulation and integration of relations among multiple literary genres, methods, styles etc. into a stable and consolidated style or narrative system that organizes a given narrative.	<b>Principled Consolidation of Style.</b> Visual expression organized in terms of systematic principles that organize multiple dimensions of visual, expressive, methodological, conventional forms and content.
Abstract Systems (18-21 years+)	<b>Higher-Order Mathematical Relations.</b> Capacity to manipulate abstract relations involving change over time (e.g., calculus as an integration of algebra, geometry and arithmetic); capacity to solve two simultaneous abstract relations; abstract algebraic proofs.	<b>Narratives Structured by Integrative Relations.</b> Complex or interweaving narratives organized by relations among multiple qualities of characters and events; integrative use of higher-order literary devices (e.g., anachrony, embedded narrative, higher-order tropes); violation of standard forms to produce novel effects.	<b>Higher-Order Visual-Conceptual Integrations.</b> Manipulation of multiple visual, conventional and/or methodological means to represent intangible, emotional or abstract content. Modification of convention or introduction of novel means to express abstract, emotional and other visual content.
Abstract Mappings (14-15 years+)	<b>Transformation of Algebraic Relationships.</b> Capacity to coordinate the relation between two abstract variables (e.g., $f = m \cdot a$ ; $a^2 + b^2 = c^2$ )	<b>Dialectic Relations among Stable Characters.</b> Complex narratives involving characters with inner states exhibiting continuity over time. Conflicts derive from relations among characters or events.	<b>Visual-Conceptual Integration.</b> Intentional use of variation in visual form, content and/or technique in the service of a conceptual goal or outcome (e.g., use of distortion, variations in color to represent emotional themes); use of visual means that suggest abstract or themes.
Single Abstractions (10 years)	<b>Simple Algebraic Representations.</b> Incipient representation of single abstract variables representing quantity (e.g., $2x = 4$ )	<b>Conflict-Driven Multi-Lined Narrative.</b> Complex stories involving characters with mental states and motives, organized plots and	<b>Three Dimensional Scenes.</b> Draws scenes exhibiting fore-, middle- and background within an integrated continuous space. Fills in details in

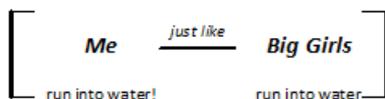
		subplots driven by conflicts and attempts to resolve conflicts.	realistic ways. Use of visual metaphor (e.g., drawing a teacher as a “witch”).
Representational Systems (6-7 years)	<b>Mental Number Line.</b> Understanding relations between numbers on a “mental” number line; capacity for addition and subtraction. By 8-9 years, multiplication and division.	<b>Intentional Story Lines.</b> Temporal-causal plot lines involving characters with mental states and motives (e.g. “We went to the zoo, but then I got hungry so we took train to go buy some yummy hot dogs...”)	<b>Mental Reference Line.</b> Child can draw identifiable persons and objects placed within a particular location or scene (e.g., person and a house; flower under the sun), often with lines indicating ground or sky.
Representational Mappings (3 ½ to 4 years)	<b>Mental Counting Line.</b> Representation of relations between numbers; comparison of more vs. less.	<b>Causal-Temporal Action Sequences.</b> Child relates multiple actions or events in time or in cause-effect relation (e.g., “We went to the zoo and then we got a hot dog”)	<b>Identifiable Objects and Figures.</b> Capacity to draw a recognizable yet barely articulated figure or object (e.g., person), often depicted as hovering on the page.
Single Representations (18-24 months)	<b>Counting Actions.</b> Begins to count objects, slowly developing one-to-one correspondence, capacity to sequence, and understanding that the last number counted represents total number of items.	<b>Global Descriptions and Shift of Focus.</b> Simple descriptions of individual events (e.g., “We went to the zoo”) without links to other simple descriptions. Adults can move narrative forward (shift focus) using questions (e.g., “And then what happened?”)	<b>Scribbles and Post-Hoc Labeling.</b> Scribbling and primate figures; child labels figure after rather than before completion.

Adapted with permission from Mascolo & Fischer (Mascolo & Fischer, 2010).

Literacy skill development is central to the broader language, communication, cognitive, and social development of children. As noted by Fischer, a focus on language and symbolic representation reveals a range of psychological processes and functions that are central to adaptive success of children. For example, in the representational tier, which begins to emerge around 18-24 months of age, a toddler learns to coordinate multiple systems of action into a single symbolic representation. This opens up a whole new world of experience for the child. For example, the developing child can now make one thing stand for another: for example, a child can begin to understand and engage in more and more pretend play activity – they can use a doll to stand for a person, a box to stand for a bus, and a chair to stand for a hotel, and they begin to understand the simple narrative game of a person getting on a bus and going to a hotel. They can also represent and refer to absent objects and begin to question their experience and the experience of others (e.g., “where Daddy?”, “Dolly gone?”).

Mascolo and Fischer notes how at this stage, the toddler begins to make ample use of single concrete declarative sentences (e.g., “Mommy is mad”, “Do it myself!”, or “The milk spilled”).

While these single concrete declarative sentences may be initially demarcate or separate units of experience and action for the child, the spontaneous impulse – a function of dynamic skill development - is to begin mapping these single sentences to create more complex sentence structures that carry more meaning. As such, a 3 ½ to 4 year old child will often demonstrate skill in *representational mapping* where two or more ideas are related in a simple story (e.g., “Mommy is mad, ‘cause I spilled the milk”). As described by Mascolo and Fischer (2010), representational mappings also allows for a variety of concrete conceptual relationships to be described, including big/little, part/whole, reciprocity, contiguity, temporality, cause/effect, and so on. In this way, stories can begin to carry more cognitive and social meaning that reflect more complex adaptive thinking, problem solving, and social functioning. Mascolo and Fischer (2010) provides the example of a 4 year-old child who performs multiple mappings, including describing herself by reference to a concrete social comparisons (e.g., “I can run into the water [beach] *just like* all the big girls do!”). In Fischer’s scheme, these representational mappings are indicated as follows:

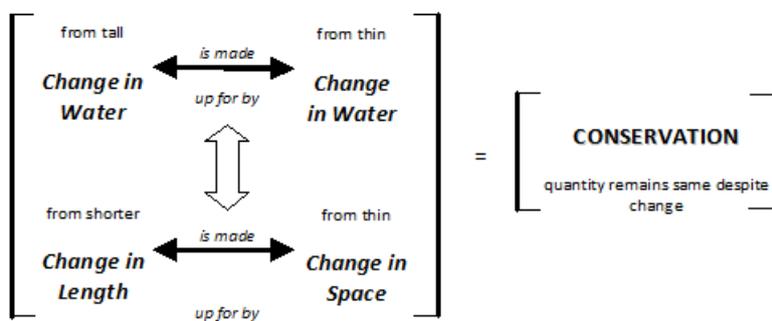


However, again, the spontaneous impulse is to bring these single mappings together into a *representational system* that contains at least two mappings. For example, as noted by Mascolo and Fischer (2010), while a 4 or 5 year-old, using representational mappings, is able to compare the relative height of water contained in two glasses (e.g., “the water in the tall glass is higher than the water in the short glass”), and, separately, compare the width of the two glasses (e.g., “the tall glass is thinner than the short glass”), at around 6-7 years of age the child can represent and coordinate *both* of these mappings and understand that *when water is poured from a tall, thin glass to a short, wide glass, the amount of water is the same and the container has no effect on the volume*. Thus, causal thinking is emerging from the way in which representational mapping are coordinated, and in this case the logic dictates that volume is conserved even if it looks different in different containers.

Using representational systems, a child is able to represent a variety of such concrete, systematic relationships. For example, a child can construct an understanding that “John is

better than I am in maths, but I am better than John in basketball”, or “I like playing with Susan because we can play with dolls, but it’s also not fun because she can be so bossy.”

Finally, a *system of systems* is produced by coordinating two or more representational systems into a single integrated skill structure, which is the equivalent of the *first level* of the next broad tier of development – *abstractions*. For example, Mascolo and Fischer (2010) note that, beginning around 10 or 11 years of age, a generalized concept of conservation may be abstracted from many, similar concrete instances of conservation of volume and conservation of mass and the child might note the abstract idea: “Conservation is the idea that the quantity of something remains the same despite a change in its appearance”.



The ability to use single abstractions provides the foundation for the development of a variety of conceptions, for example, related to morality (e.g., “justice”, “compassion”), identity (e.g., “I am an *intelligent student*”; “I want to be *popular*”), politics (e.g., “democracy”, “nation”) and many other ideas from other conceptual domains.

Again, there may emerge abstract mappings, where individuals now represent the conceptual relation between at least two abstractions. For example, an Irish teenager may describe the relation between two different conceptions of self, such as “I’m content with friends that I know well, but I’m shy when I’m around the popular kids.” These abstract mappings have real world implications for people, for example, as illustrated in the stories people tell when recounting past problems or planning out their solution to future problems.

Beginning at around 17-19 years of age, if the right type of educational support is provided, young adults may be able to coordinate two or more abstract mappings into an *abstract system*, thereby representing relations between abstract relations. For example, as suggested by Mascolo and Fischer (2010), a college student might think through career plans and suggest to friends, for instance, that “in order to *become an executive* in a *prestigious marketing firm*, I need to *specialize in college* so that I can get into a widely recognized graduate business school. However, I’ll need to *delay starting a family* in order to devote myself full time to my

ambitions, which will involve *forming networks of connections* with people in the marketing field.

Finally, around 23-24 years of age, single principles may arise when two abstract systems are coordinated into a system of abstract systems. Principles are often be used to organize large systems of knowledge, meaning and experience, and Fischer provides some interesting examples in his various writings, including an analysis of the principles that emerged in the development of Darwin's evolutionary thinking. Again, there can be more or less stability in both the content and the structure of core emotional, cognitive, and social skills that regulate action. Pedagogical contexts provide a structure that supports skilled action. When there is stability in both the contexts of development and the goals being pursued in these contexts, specific skill structures will likely develop as part of an adaptive response to these contexts and may be reasonably stable and increasingly coordinated with one another over time.

## 2.4 Narrative identity development

Narrative and storytelling are fundamentally important in education, culture and life. According to Bruner, narrative/storytelling is "about the most generic thing we have". He argues that "Over and beyond their organising power, [narratives have an] astonishing range of uses: confessions, excuses, justifications, just to know what happened" (Bruner, 2007).

Life itself is autobiographical – we are each the protagonist, the main character in our own, ontogenetic narrative. Stories provide an "Enormous amount of unification within a society"; Bruner (2007) would go as far as to argue, "There is no culture in the world without stories".

Narrative and storytelling are so inextricably and intrinsically a part of human experience that we are born with an innateness to structure the world narratologically – in story-form.

Our learning of syntactic structures and grammars in early life is even determined by our inherent predisposition to make stories of our experiences in the world: "one of the most ubiquitous and powerful discourse forms in human communication is narrative. Narrative structure is even inherent in the praxis of social interaction before it achieves linguistic expression; it is a "push" to construct narrative that determines the order of priority in which grammatical forms are mastered by the young child" (Bruner, 1990, p. 77).

Schank (Schank, 1990, p. 16) argues that "All we have are experiences – but all we can effectively tell others are stories. Knowledge is experiences and stories, and intelligence is the apt use of experience and the creation and telling of stories".

The influence of narrative extends throughout our lives, bestowing meaning and structure on what we experience: “it is our preferred, perhaps even our obligatory medium for expressing human aspirations and their vicissitudes, our own and those of others. Our stories also impose a structure, a compelling reality on what we experience, even a philosophical stance” (Bruner, 2002, p. 89).

Bruner’s (2007) conception of the educational significance of narrative is predicated on Aristotle’s Poetics (c.335 BC), including his twin ideas of peripeteia – “the story’s peripeteia, the thing that turns it on its head”- the twist in the tale; and coda (or commentary/ message: essentially the moral of the story). Crucially, narrative and storytelling shape significantly children’s moral and socio-emotional development, enabling them to understand the consequences of actions.

Narrative and storytelling also help significantly to foster and develop children’s imagination, supporting a dyadic dynamic between the everyday and the exceptional - a process that is fundamental to the development and growth of creativity. Stories help to make the strange familiar, but they also serve to render the ordinary exceptional. This dual narrative process between ordinariness and exception cultivates, according to Bruner (2007), “a lively sense of the possible” in education and life. The key to effective teaching is to exploit this dynamical potential of narrative – effective teaching is effective storytelling. Egan (1989) outlines how we can make learning – in any discipline or subject – engaging by locating and exploring the narrative binaries inherent in key concepts, debates and topics.

Bruner (2007) proffers three fundamental narrative principles for education. These principles demonstrate the important role of narrative and stories in the complex and rich, human development of intelligence and understanding.

- Multiplicity: there are many possible ways of knowing;
- Perspectival: our interpretation of anything is shaped by our worldview, which challenges the verifiability of human understanding;
- Comparative: the scope of our understanding is affected by the existence of alternative ways of knowing or seeing the world.

## 2.5 Technology and storytelling

In the last twenty years particularly, technology has emerged that creates new possibilities for storytelling, creativity and creative education. Plowman and Stephen (2003) point to the educational potential of novel computing:

New technologies may lead to new concepts of play and learning in which ICT is much more than the “benign addition” referred to by Cuban (2001), especially as new ways are found of conceptualising ICT so that the term does not simply denote standard computers. These shifts in thinking may lead to technologies that can encompass participation by practitioners, parents and children in different learning spaces and promote discovery, delight, curiosity, creativity, self-expression and pleasure in learning (Plowman & Stephen, 2003, p. 160).

The advent of tablets and smartphones (especially, larger screen models) has shifted the focus of digital book reading from desktop to mobile. Given the pervasiveness of mobile operating systems (OS) such as iOS and Android, digital story reading now happens across three categories, integrated within the curation and selling systems of these two OS as distributors: (1) children apps which enable new forms of storytelling, (2) book-like apps (different only in that they use an electronic medium) and (3) standard eBooks (with enhanced features or plain text and image).

Following the three categories of digital story engagement and reading, current examples of story-capable educational technologies include:

#### CHILDREN APPS:

**Children apps bundling video content:** NOGGIN by Nickelodeon, PlayKids by Movel, YouTube Kids by Google, Thomas & Friends Watch and Play by PBS Kids

**Hidden Objects:** Midnight Castle by Big Fish, Moonbeeps by Moonboot Studios,

**Collection and Breed/Grow:** Restaurant Story by Big Blue Bubble, Hay Day by Supercell, Family Farm Seaside by Fun+, Township by Playrix, My Very Hungry Caterpillar by StoryToys

**Profession – work:** Restaurant Story by Storm8 Studios, Kitchen Scramble by RockYou, Toca Experiment Box (bundle) by Toca Boca

**Interactive/Make/Crafts:** Disney Junior Appisodes by Disney, Dora and Friends by Nickelodeon, Sesame Street Video Maker by Sesame Street, Foldify Dinosaurs by Pixle, Hopscotch by Hopscotch Technologies, Drawing Together by Tipitap

**World Build:** DragonVale by Backflip Studios, Tap Paradise Cove by Pocket Gems, SimCity by Electronic Arts, Minecraft by Mojang

**Fight:** Clash of Clans by Supercell, Heroes Charge by uCool

This category, due to the capabilities provided by language platforms such as Swift or character-building platforms such as Metal, include various other story-enhanced implementations, constrained only by the imagination of the creators and the processing power and memory capacity of the devices themselves.

BOOK-LIKE APPS:

**Flip-through Stores** (relying in subscription and volume): EPIC by Epic Creations, Reading Rainbow by Reading Rainbow

**Interactive Kids Stories:** Little Mermaid by TouchDelight, Carmesina by Play Creatividad, Nighty Night by Fox and Sheep

**Multiplots:** Book Builder by Education.com

**Read-together:** Kindoma Storytime by Kindoma (video chat).

This intermediate story-containing category has enhanced app features used in the standard old-book format (flipping pages, narration and music files) and usually utilizes classic stories or creates new characters with the capacity of becoming print products.

EBOOKS (Enhanced or plain):

E-books plain: text

**E-books illustrated:** text with non-moving illustrations are included

E-books illustrated enhanced: text with simple illustrations

The latter are usually curated according to ages (Ages 6-9), characters (Dr. Seuss, Lego), and, or themes (non-fiction, survival, skills etc).

The first two offerings (children apps and book-like apps) are usually sold in similar environments (App Store, Google Play) and therefore, sales and appeal data and analytics are available to their creators and often, to the market at large. eBooks from the third category are sold in separate apps (iBooks or Google Books) inside the devices or on e-readers, and analytics concerning their sales and actual use are harder to find. Most commercial interest is now centred on the first two categories of digital storytelling.

It is also evident that the role of desktop educational offerings (i.e. e-learning initiatives or story options via websites etc.) has become greatly diminished in the past year, leaving the

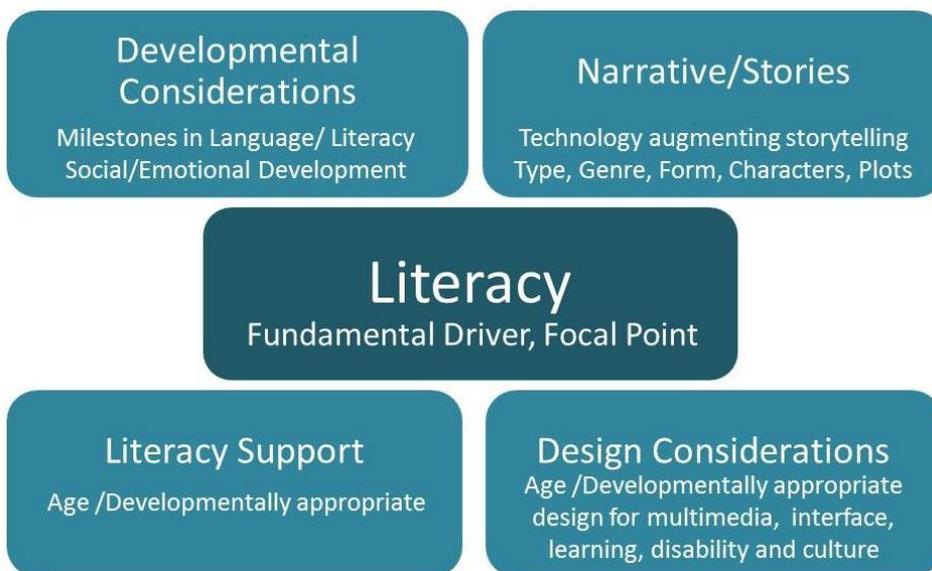
door open for the creators of these offerings (authors, illustrators etc.) to use desktop/laptop computing as the primary locus of work, before they bundle their work online for mobile consumption in the app stores or eBook stores. This is the strategy also proposed to be followed by the Q-Tales ecosystem, in order to facilitate better interactive book creation capabilities (larger screens, higher computing capacity).

The larger issue becomes the extent to which the human curation efforts of the platform, according to the set pedagogical framework can be extended in the future to a richer machine analytics environment, in order to bring about a new paradigm of analytics that would provide the right offering to the right person according to her own pedagogical needs or developmental and emotional stage.

Q-Tales aims to explore new potential and possibilities for education and pedagogy when intuitive, elegant and easy-to-use technologies are combined with intrinsically powerful human forms of creativity, expressiveness and interpretation, principally narrative and storytelling. The emergence of new technology is helping to realise new contexts, opportunities and resources for creative and interactive storytelling, especially through the growing mobility and ubiquity of computer applications and devices that are “eminently easy to use” (Hall, 2012, p. 111).

## 2.6 Overview of pedagogical framework

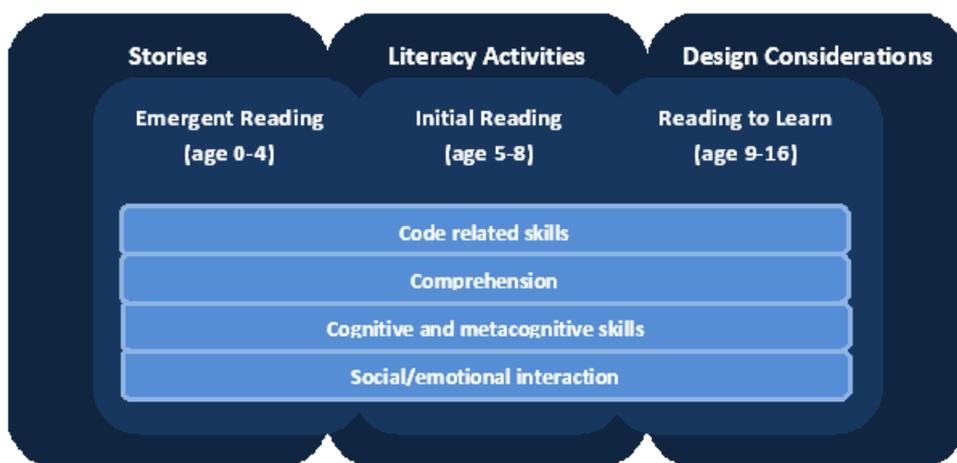
Central to the Q-Tales pedagogical framework is a focus on literacy skill development and engagement in reading. Our framework is grounded in developmental considerations derived from an analysis of the broad developmental psychology and education literature. These considerations shape our ultimate activity- and design-focused pedagogical ontology (Figure 11).



**Figure 4 Q-Tales pedagogical framework**

At a high level, our framework and ontology includes 3 themes: (1) stories, (2) literacy activities, and (3) design considerations, each of which has a number of dimensions.

Notably, our pedagogical framework is structured in light of developmental considerations relevant to three broad age categories, that is, children aged 0-4, 5 –8 and 9 – 16, based roughly on three broad stages of literacy development: (1) emergent reading, (2) initial reading, and (3) reading to learn, influencing the focus of content and delivery across some of the other categories (Figure 12).



**Figure 5 Overview of Q-Tales Ontology Themes**

**A. Narrative and Stories:** An important point of entry to enhanced engagement in reading is a strong pedagogical focus on stories children find interesting to read and create. Review of relevant literature and research, including McLeod (2014), Booker (2004), Aarne (1961)

and Thompson (1977), has guided the development and synthesis of a codeable category system for Q-Tales narratives. This design has also been informed by analysis of category systems already in use, such as the ontology currently deployed by Amazon: <https://kdp.amazon.com/help?topicId=AR3T2MGL2A6ZT>.

The Q-Tales ontological categories are designed to be pedagogically meaningful and useful for e-book designers. As such, the stories category includes:

- 1) Story Plots and Types:** This component of the category system aims to span the broad cognitive, emotional and social landscape of childhood. Therefore, a rich diversity of different narrative intentions and structures are incorporated within this aspect of the Q-Tales story ontology. The diverse story plots and types include, for example: individual and collaborative storytelling; problem solving and imaginative narrative; fantasy and science fiction; and playful and serious stories.
- 2) Story Characters and Archetypes:** This dimension of the ontology encompasses universal narrative characters and archetypes, such as hero, villain/malefactor, detective, secret agent, king/queen and magician/magus.
- 3) Story Forms:** This aspect of the codeable Q-Tales category system identifies a broad range of different narrative formats. These include, *inter alia*: short story, poems, songs and epistolary forms such as the card, diary and letter.
- 4) Story Genres:** This part of the Q-Tales story category system identifies and draws together different genres of stories, including: mystery, fairytale and fantasy, science fiction, comedy, playful or nonsense stories, and epic and classic narratives.
- 5) Story Technology:** This category is based on analysis of current trends in storytelling tools and technologies, and the classification of three major developments in children's engagement with digital narrative. These are: (1) Children Apps, which facilitate innovative forms of storytelling; (2) Book-Like Apps, which extend and employ the fundamental structure of the book to mediate creativity; and (3) eBooks and augmented digital forms of the traditional, printed book.

**B. Developmental Considerations:** When developing material to support children's literacy development, designers should take children's literacy knowledge at different ages into account (Haugland & Wright, 1997). A core focus of the Q-Tales pedagogical framework is to facilitate e-book creators in designing e-books to support children's literacy development.

While there are many different types of literacies in modern society (Gee, 2007), we focus on the definition of literacy employed by PISA, which focuses on the concept of reading literacy. This is construed as: “understanding, using, reflecting on and engaging with written texts, in order to achieve one’s goals, to develop one’s knowledge and potential, and to participate in society” (OECD, 2013, p. 9) This section of the deliverable will encompass developmental considerations in relation to the pedagogy of reading literacy from birth to adolescence, in particular, focusing on three broad stages of literacy development: (1) emergent reading, (2) initial reading, and (3) reading to learn (see section 4).

**C. Pedagogical literacy focus.** Here we focus in particular on pedagogical activities. Although the stories category above can imply some filtering according to age, the pedagogical activities category is more developmentally dependent, as certain activities are more appropriate for different age groups to promote engagement in reading. The pedagogical literacy focus is also a more central focus for curation, although curators can also rate the suitability of books and their placement in select stories categories above. Following the constructivist line of our work, each of the categories below breaks down into a set of activities focused on:

- 1) **Code related skills:** Code related skills have to do with children’s development of the understanding that spoken words are composed of smaller elements of speech (phonological awareness), that letters represent these sounds (the alphabetic principle), an understanding of the correspondence between sounds and spellings, developing a repertoire of sight words that can be easily recognised, and the ability to decode unknown words (Neuman & Celano, 2010).
- 2) **Comprehension:** In order to derive meaning from what is being read, children need well developed oral language skills and an expansive vocabulary. In addition, they need “a rich conceptual knowledge base and verbal reasoning abilities to understand messages conveyed through print” (Neuman & Celano, 2010, p. 3). Activities that have to do with the development of these skills can aid childrens’ reading comprehension.
- 3) **Cognitive and Meta-Cognitive Skills:** Cognitive strategies are those we use when thinking, learning and studying, whereas metacognitive strategies are those we use to make sure a learning goal is being or has been reached (Teaching Excellence in Adult Literacy Center, 2015). Metacognition has to do with the process of active control over one's own cognition, including self-appraisal and self-management (Fang & Cox, 1999). Metacognitive strategies help students *‘think about their thinking’* before,

during and after they read (Boulware-Gooden et al., 2007) through such activities as planning, setting goals, generating questions, analysing how to tackle a problem, and selecting and organizing information from text (Fang & Cox, 1999).

- 4) **Social/emotional Interaction:** Social/emotional interaction skills support children's social/emotional interactions with reading. Literacy development is influenced by social contexts, social supports and interactions. From infancy, parents/carers read with and to children. Once in school, children learn the individual skills needed for reading, but also spend a great deal of time in collaborative reading situations with teachers and classmates. From a Vygotskian (1978) perspective, working with others in a social educational setting, learners are able to achieve goals and tasks that they would not be able to accomplish on their own.

D. **Design considerations:** A core focus of the Q-Tales pedagogical framework is to facilitate e-book creators in their design thinking, particularly around design issues that influence the learning experience of children. We focus on a set of design considerations across five themes. We see these design considerations as complementary to the Pedagogical Literacy Activities focus. We highlight established e-Book design principles associated with multimedia design, interface design, and learning design (Roskos et al., 2009; Roskos & Brueck, 2009; Phadung et al., 2012), and we also focus on key design principles that help to realise the power and potential of Pedagogical Literacy Activities in light of disability and cultural needs. As such, our five ontological categories include:

- 1) **Multimedia Design:** Principles dealing with the multimedia aspects of design such as sound, motion, voiceover, animations and graphics.
- 2) **Interface Design:** Principles dealing with how children interact with the e-book interface.
- 3) **Learning Design:** Principles dealing with design to enhance childrens' learning and literacy development.
- 4) **Disability Design:** Principles dealing specifically with design for learners with disabilities such as ADHD, sight and hearing impairments and reading disabilities.
- 5) **Cultural Design:** Principles dealing with designing for cultural sensitivity.

The remainder of this document outlines in detail the nature of these categories.

### 3 Stories

The story constitutes a fundamental mediating structure for human creativity, expression and learning (Bruner, 2007). Narrative is a dynamic and interactive synthesis of several fundamental elements and features, which both define and are defined by their interrelationship within the dialogic process of interpretation between writer and reader. For the purposes of our discussion here, and exposition of the concept of story (narrative) for Q-Tales, we focus specifically on five key elements of storytelling, including: story plots and types; story characters and archetypes; story forms and genres; and technology.

**Table 2 Q-Tales Story Ontology**

<p><b>Story Plots and Types</b></p> <p>Problem solving/use your imagination</p> <ul style="list-style-type: none"> <li>- Defeat the monster</li> <li>- Defeat the evil villain</li> <li>- Find the treasure</li> <li>- Travel to a strange land</li> </ul> <p>E.</p> <p>Individual/team focus</p> <ul style="list-style-type: none"> <li>- You're the hero</li> <li>- The hero needs your help</li> <li>- Let's work together</li> <li>- You're the underdog</li> </ul> <p>Playful</p> <ul style="list-style-type: none"> <li>- Make me laugh</li> <li>- Let's have fun</li> </ul> <p>Fantasy</p> <ul style="list-style-type: none"> <li>- Travel to another planet</li> <li>- Travel through space</li> <li>- Travel back in time</li> <li>- Travel to the future</li> <li>- Meet strange creatures</li> </ul> <p>Serious</p> <ul style="list-style-type: none"> <li>- Growing up</li> <li>- Let's learn something new</li> </ul>	<p><b>Story Characters and Archetypes</b></p> <ul style="list-style-type: none"> <li>- Hero, the goodie</li> <li>- Villain, the baddie</li> <li>- Detective, sleuth</li> <li>- Secret agent, spy</li> <li>- Superhero</li> <li>- Clown, fool</li> <li>- Queen, King</li> <li>- Magician</li> <li>- Revolutionary</li> <li>- Talking animal, pet</li> <li>- Space alien</li> <li>- Robot</li> <li>- Child, girl, boy</li> <li>- Adolescent</li> <li>- Grownup</li> </ul>
<p><b>Story Forms</b></p> <p>Short story                  Longer story, book                  Poems/songs                  Letter, card                  Diary                  Visual book, cartoons                  Online profile, blog                  Biography/documentary</p>	<p><b>Story Genres</b></p> <p>Mystery                  History                  Coming of age                  Fairytale                  Fantasy                  Science fiction                  Comedy/funny or nonsense story                  Epic, classic tale</p> <p><b>Story Technology</b></p> <ol style="list-style-type: none"> <li>1. Children Apps</li> <li>2. Book-Like Apps</li> <li>3. eBooks                         <ul style="list-style-type: none"> <li>- Enhanced</li> <li>- Plain</li> </ul> </li> </ol>

### 3.1.1 Story Plots and Types

According to Booker (2004), there are seven primary or foundational plots. Booker's theorisation is especially germane to Q-Tales as it outlines clearly a range of types of stories that are of interest to children. Booker's *Seven Basic Plots* encompass a rich range of narrative modes, genres, forms and characters.

1. **Overcoming the monster.** protagonist (main character) must defeat the villain to protect themselves or their friends, community;
2. **Rags to Riches.** a poor protagonist gains wealth, power, status; loses it all but finally regains it while growing as a person;
3. **The Quest.** protagonist(s) sets out to find an important object or place, meeting challenges and temptations along the way;
4. **Voyage and Return.** protagonist journeys to an exotic or strange land and returns with stories/experiences;
5. **Comedy** – humorous or light-hearted story with a happy outcome;
6. **Tragedy** – (1) tragic justice (unfavourable or mixed outcomes for the characters); (2) poetic justice (unfavourable outcome for the antagonist or villain);
7. **Rebirth** – the villain who redeems themselves over the course of the story.

Plot is the crucial dimension of storytelling because it draws together, mobilises and synthesises the other elements into a creative, coherent and cogent narrative whole. Consequently, *Story Plots and Types* is a critical component of the Q-Tales ontology. To support technology development, we have refined the generic plots into a codeable categorisation that identifies five further narrative sub-categories: problem solving/use your imagination; individual/team focus; playful; fantasy; and serious. Each of these is operationalised using an imperative statement, e.g. 'Defeat the monster', or 'Travel to another planet', which suggest the plot and type of the story in the Q-Tales Ecosystem.

### 3.1.2 Story Characters and Archetypes

The principal characterisation in a narrative or story is the protagonist, the main character around whom the narrative develops and unfolds. The primary subject of the story, the protagonist interacts with other characters to propel and develop the plot, and there can also be a counter-protagonist or antagonist, who is usually in conflict with the principal character of the narrative. The antagonist may be treacherous or deviant, a malefactor intent on

undermining or destroying the protagonist. The protagonists in stories can typically be classified according to a range of universal archetypes. These can include: clown/jester, king/ruler, magician/magus, villain, hero, revolutionary, etc. A character may be a composite of all these various types, and may evidence the qualities of each of them, along different stages of the unfolding narrative, depending on the particular circumstances and interactions with other characters. Frye (1957) theorised that a primordial, universal archetype is the *auto-secular*, which has origins in religious, sacrificial narratives. The *auto-secular* is a common form of characterisation today. Usually, it entails a hero who is righteous and virtuous, and willing to make significant personal sacrifices for a greater cause and for other people. In the *auto-secular*, the protagonist's character may or not be religiously or spiritually motivated.

The *Story Characters and Archetypes* aspect of the Q-Tales ontology is broad, covering a rich set of possibilities for story characters within the Q-Tales Ecosystem, reflective of the kinds of stories and subjects that will interest children. For example, the different characters and archetypes included in the Q-Tales story ontology are: hero, villain, king, clown/fool, detective, magician, alien, robot and superhero. The typology of characters also contains generic age categories: child, adolescent and grownup.

### 3.1.3 Story Genres

There exist myriad genres, including, *inter alia*, fantasy, science fiction, historical fiction, tragedy, biography and autobiography, comedy and parody. Genre, like other aspects of storytelling, is a creative and dynamic construct. Writers will adapt genre and other elements of narrative to create the atmosphere, feel and characters they want. For the Q-Tales story ontology, a broad set of genre possibilities are included, ranging from mystery and science fiction to comedy and classic/epic narratives.

### 3.1.4 Story Forms

The Q-Tales ontology encompasses a broad set of narrative formats, again reflecting the wide set of possibilities for children to be creative with storytelling. These include: short story, book, poems/songs, letter, card, diary, visual book, cartoons and biography/documentary forms of story.

### 3.1.5 Story Technology

The technology aspect of the ontology is predicated on analysis of current trends in storytelling tools and technologies, and the classification of three major developments in children's engagement with digital narrative. These include: (1) Children Apps, which can facilitate novel forms of storytelling; (2) Book-Like Apps, which extend and employ the fundamental structure

of the book to mediate creativity; and (3) eBooks and augmented digital forms of the traditional, printed book.

## 4 Developmental Considerations

### 4.1 Literacy Developmental Considerations

Learning to read is a complicated process (DeBruin-Parecki et al., 2015; Schugar et al., 2013; National Reading Panel, 2000). It is a complex and multifaceted skill that changes as it is acquired (Snow, 2008). While there are many theories about how reading is best taught (Snow, 2008; Street & Lefstein, 2007), contemporary literacy theorists recommend a balanced literacy approach, which includes both phonics instruction and the teaching of reading for meaning (Street & Lefstein, 2007).

Literacy develops in stages, and is linked to childrens' language development (Sulzby, 1985; Whitehurst & Lonigan, 1998; Chall, 1996). Due to maturational, experiential differences among children, not all children go through these developmental stages at the same time (Burns et al., 1999, p. 58). From the acquisition of literacy skills developed before formal reading instruction, known as emergent literacy (Sulzby, 1985; Sulzby & Teale, 1987), to skills developed in school such as learning to 'decode' letters, acquire new words, grasp the meaning of words and sentences and follow the plot (Snow, 1991), childrens' literacy development usually coincides with their level of language development (Gunn et al., 2004).

### 4.2 Important milestones in language development

Children the world over seem to display similar linguistic achievements at about the same age (Shaffer & Kipp, 2014). Contemporary developmentalists argue that language develops as we develop both biologically and cognitively, in an attempt to communicate with those around us (Shaffer & Kipp, 2014). A summary of important milestones in language development, from birth to adolescence, can be seen in Table 3.

**Table 3 Important milestones in language development, from birth to adolescence (Shaffer & Kipp, 2014, p. 362)**

Age (years)	Phonology	Semantics	Morphology/ syntax	Pragmatics	Metalinguistic awareness
0–1	Receptivity to speech and discrimination of speech sounds Babbling begins to resemble the sounds of native language	Some interpretation of intonational cues in others' speech Preverbal gestures appear Vocables appear Little if any understanding of individual words	Preference for phrase structure and stress patterns of native language	Joint attention with caregiver to objects and events Turn-taking in games and vocalizations Appearance of preverbal gestures	None

1–2	Appearance of strategies to simplify word pronunciations	First words appear Rapid expansion of vocabulary after age 18 months Overextensions and underextensions of word meanings	Holophrases give way to two-word telegraphic speech Sentences express distinct semantic relations Acquisition of some grammatical morphemes	Use of gestures and intonational cues to clarify messages Richer understanding of vocal turn-taking rules First signs of etiquette in children's speech	None
3–5	Pronunciations improve	Vocabulary expands Understanding of spatial relations and use of spatial words in speech	Grammatical morphemes added in regular sequence Awareness of most rules of transformational grammar	Beginning understanding of illocutionary intent Some adjustment of speech to different audiences Some attempts at clarifying obviously ambiguous messages	Some phonemic and grammatical awareness
6–adolescence	Pronunciations become adult-like	Dramatic expansion of vocabulary, including abstract words during adolescence Appearance and refinement of semantic integrations	Acquisition of morphological knowledge Correction of earlier grammatical errors Acquisition of complex syntactical rules	Referential communication improves, especially the ability to detect and repair uninformative messages one sends and receives	Metalinguistic awareness blossoms and becomes more extensive with age

## 4.3 Normal literacy milestones

### 4.3.1 *Chall's stages of reading development*

Chall's (1983; 1996) stages of reading development are presented in Table 4. These stages describe how children typically learn to read. The ages at which the stages occur are approximate, and development at each stage is dependent upon adequate development at the prior stages. In addition, the stages are not discrete; they are continuous and overlapping. Many adults may never reach the final stage of reading, even after four years of college (**Chall, 1983**).

**Table 4 Chall's (1983) stages of reading development**

Stage	Approximate Age/Grade	Characteristics and Masteries by End of Stage	How Acquired	Relationship of Reading to Listening
Stage 0: Pre-reading  "pseudo reading"	6 months – 6 years  Preschool	Child "pretends" to read, retells story when looking at pages of book previously read to him/her, names letters of alphabet; recognizes some signs; prints own name; plays with books, pencils and paper.	Being read to by an adult (or older child) who responds to and warmly appreciates the child's interest in books and reading; being provided with books, paper, pencils, blocks, and letters. Dialogic reading.	Most can understand the children's picture books and stories read to them. They understand thousands of words they hear by age 6 but can read few if any of them.
Stage 1: Initial reading and decoding	6 – 7 years old  1st grade and beginning 2nd	Child learns relation between letters and sounds and between printed and spoken words; child is able to read simple text containing high frequency words and phonically regular words; uses skill and insight to "sound out" new one syllable words.	Direct instruction in letter--sound relations (phonics) and practice in their use. Reading of simple stories using words with phonic elements taught and words of high frequency. Being read to on a level above what a child can read independently to develop more advanced language patterns, vocabulary and concepts.	The level of difficulty of language read by the child is much below the language understood when heard. At the end of Stage 1, most children can understand up to 4000 or more words when heard but can read about 600.
Stage 2: Confirmation and fluency	7 – 8 years old  2nd and 3rd grade	Child reads simple, familiar stories and selections with increasing fluency. This is done by consolidating the basic decoding elements, sight vocabulary, and meaning context in the reading of familiar stories and selections.	Direct instruction in advanced decoding skills; wide reading (instruction and independent levels) of familiar, interesting materials that help promote fluent reading. Being read to at levels above their own independent reading level to develop language, vocabulary and concepts.	At the end of Stage 2, about 3000 words can be read and understood and about 9000 are known when heard. Listening is still more effective than reading.
Stage 3: Reading for learning the new  Phase A  Phase B	9 -- 13 years old 4th – 8th grade  Intermediate 4th – 6th  Junior high school 7th – 9th	Reading is used to learn new ideas, to gain new knowledge, to experience new feelings, to learn new attitudes, generally from one viewpoint.	Reading and study of textbooks, reference works, trade books, newspapers, and magazines that contain new ideas and values, unfamiliar vocabulary and syntax; systematic study of words and reacting to the text through discussion, answering questions, writing, etc. Reading of increasingly more complex text.	At beginning of Stage 3, listening comprehension of the same material is still more effective than reading comprehension. By the end of Stage 3, reading and listening are about equal for those who read very well, reading may be more efficient.
Stage 4: Multiple viewpoints	15 – 17 years old  10th – 12th grade	Reading widely from a broad range of complex materials, both expository and narrative, with a variety of viewpoints.	Wide reading and study of the physical, biological and social sciences and the humanities, high quality and popular literature, newspapers, and magazines; systematic study of words and word parts.	Reading comprehension is better than listening comprehension of materials of difficult content and readability. For poor readers listening comprehension may be equal to reading comprehension.
Stage 5: Construction and reconstruction	18+ years old  College and beyond	Reading is used for one's own needs and purposes (professional and personal); reading serves to integrate one's knowledge with that of others, to synthesize it and to create new knowledge. It is rapid and efficient.	Wide reading of ever more difficult materials, reading beyond one's immediate needs; writing of papers, tests, essays, and other forms that call for integration of varied knowledge and points of view.	Reading is more efficient than listening.

### 4.3.2 Emergent literacy

Children's understandings about literacy begins in infancy in the home (National Association for the Education of Young Children, 1998). Long before children start formal reading instruction in school, they are developing skills and understandings as they move along the developmental literacy continuum (Whitehurst & Lonigan, 1998). Emergent literacy encompasses oral skills (i.e., expressive and receptive oral skills), reading skills, and writing skills that young children acquire (Sulzby, 1985; Sulzby & Teale, 1987).

Children learn to use symbols, combining their oral language, pictures, print, and play into a coherent mixed medium and creating and communicating meanings in a variety of ways. From their initial experiences and interactions with adults, children begin to read words, processing letter-sound relations and acquiring substantial knowledge of the alphabetic system. As they continue to learn, children increasingly consolidate this information into patterns that allow for automaticity and fluency in reading and writing. (National Association for the Education of Young Children, 1998, p. 3)

One of the most important ways parents and carers can support children's emergent literacy development and chances of school success is through the practice of reading directly to children (Amulya, 2015). The ideal time to begin sharing books with children is during babyhood (Butler, 1998; Burns et al., 1999). Pre-school aged children who engage in regular interactive book reading with a parent or caregiver are more successful in language growth, emergent literacy and reading achievement, regardless of the socioeconomic level of the family or the parents' level of education (Bus et al., 1995).

Reading stories to a child gives one the opportunity to facilitate growth in the child's vocabulary and knowledge of the world, to familiarize the child with a structure commonly found in books most frequently read in the early grades of school, to demonstrate strategies for appropriating meaning from text and to engage in a fun interaction with a child (Sonnenschein & Munsterman, 2002, p. 334).

Areas of family functioning that can influence reading development include the value placed on literacy by parents, parental expectations for academic achievement, availability and use of reading materials in the home, reading with children, and opportunities for verbal interaction (Hess & Halloway, 1984, cited in Snow et al., 1999). Spending time with children in one-on-one conversation, reading books with them, providing them writing materials, supporting their dramatic play, demonstrating the uses of literacy and maintaining a playful

atmosphere around literacy activities are some of the ways parents can promote a literacy rich environment in the home (Snow et al, 1999).

Materials available in the home such as high-quality books, alphabet blocks, magnetic refrigerator letters, posters, writing materials and newspapers, as well as parent-child attention to environmental print can enhance children's awareness of print (Burns et al., 1999; Snow et al., 1999). In addition, labelling items in the child's environment with signs that the child can help decorate, and allowing children to 'write' (or scribble) their own lists or letters can also add to print awareness (Burns et al., 1999).

The approach parents take for facilitating children's reading can have a powerful effect on the child's motivations for reading (Sonnenschein & Munsterman, 2002) . In order to develop a child's love for and motivation to read, shared reading time should be enjoyable for the parent/carer and the child (Burns et al., 1999). Allowing children to choose reading material and making reading interactions fun and interesting can positively affect reading development (Sonnenschein & Munsterman, 2002).

#### 4.4 Emergent Literacy Skills

During the emergent literacy stage, children develop skills in

- awareness of print
- knowledge of the relationship between speech and print
- text structure
- phonological awareness, and
- letter naming and writing ( Gunn et al, 2004)

These skills are an important part of early literacy development which continue to develop during the preschool and early school period. Acquisition of these skills can substantially affect how children learn to read and write (Gunn et al., 2004). A brief description of each of these emergent literacy skills can be seen in Table 5.

**Table 5 Synthesis of Gunn et al’s (2004, pp. 6-13) description of emergent literacy skills**

<b>Awareness of print</b>	<ul style="list-style-type: none"> <li>• A child’s knowledge of the forms and functions of print, such as knowledge of the conventions of print and the purposes and uses of print</li> <li>• Conventions of print                             <ul style="list-style-type: none"> <li>○ Children learn that although print differs from speech, it carries messages just like speech</li> <li>○ Eventually children learn that print - not pictures - carries the story</li> <li>○ Through shared reading experiences, children learn how stories are structured, and that text begins at the top of the page, moves from left to right, and carries over to the next page when it is turned</li> <li>○ Children’s writing develops from scribbles that take on the characteristics of writing, to letter-like forms, to actual familiar letters such as those in the child’s name</li> </ul> </li> </ul>
<b>Knowledge of the relationship between speech and print</b>	<ul style="list-style-type: none"> <li>• The ability to map oral language onto print</li> <li>• Understanding the relationship between phonemes (the sound of language) and graphemes (the written form of language) in English</li> </ul>
<b>Text structure</b>	<ul style="list-style-type: none"> <li>• An understanding of story grammar and text structures, which children learn through exposure to grammatical and discourse structures</li> <li>• Through exposure to storybook reading dialogue in the home, children develop an understanding for the schematic structure and organization of stories from a very young age</li> </ul>
<b>Phonological awareness</b>	<ul style="list-style-type: none"> <li>• The ability to perceive spoken words as a sequence of sounds</li> <li>• Beginning readers must use the alphabetic code to understand the link between the sounds of speech and the signs of letters</li> <li>• Young children must be helped to notice that words encode sounds as well as meaning</li> <li>• Skills include rhyming and alliteration, followed by the ability to segment words into syllables and the ability to segment words into phonemes</li> <li>• These latter skills usually require specific instruction and most children often master them later than other foundations for print literacy</li> </ul>
<b>Letter naming and writing</b>	<ul style="list-style-type: none"> <li>• May be acquired either through formal instruction or incidentally through being read to</li> <li>• Provides the basis for forming connections between the letters in spellings and the sounds in pronunciations</li> </ul>

#### 4.4.1 Literacy accomplishments during the pre-school years (ages 0-4)

Snow et al (1999) synthesized the developmental accomplishments of literacy acquisition that are likely to be exhibited by the successful learner during the preschool years (Table 6). Not all children will reach accomplishments at the same age due to maturational and experiential differences. The list is not exhaustive, but it does highlight many literacy accomplishments found in the literature (Snow et al , 1999).

**Table 6 Developmental Accomplishments of Literacy Acquisition, Birth to Age 4 (Snow et al., 1999, p. 61)**

Birth to Three-Year-Old Accomplishments
Recognizes specific books by cover.
Pretends to read books.
Understands that books are handled in particular ways.
Enters into a book-sharing routine with primary caregivers.
Vocalization play in crib gives way to enjoyment of rhyming language, nonsense word play, etc.
Labels objects in books.
Comments on characters in books.
Looks at picture in book and realizes it is a symbol for real object.

Listens to stories.
Requests/commands adult to read or write.
May begin attending to specific print such as letters in names.
Uses increasingly purposive scribbling.
Occasionally seems to distinguish between drawing and writing.
Produces some letter-like forms and scribbles with some features of English writing.
<b>Three- to Four-Year-Old Accomplishments</b>
Knows that alphabet letters are a special category of visual graphics that can be individually named.
Recognizes local environmental print.
Knows that it is the print that is read in stories.
Understands that different text forms are used for different functions of print (e.g., list for groceries).
Pays attention to separable and repeating sounds in language (e.g., Peter, Peter, Pumpkin Eater, Peter Eater).
Uses new vocabulary and grammatical constructions in own speech.
Understands and follows oral directions.
Is sensitive to some sequences of events in stories.
Shows an interest in books and reading.
When being read a story, connects information and events to life experiences.
Questions and comments demonstrate understanding of literal meaning of story being told.
Displays reading and writing attempts, calling attention to self: "Look at my story."
Can identify 10 alphabet letters, especially those from own name.
"Writes" (scribbles) message as part of playful activity.
May begin to attend to beginning or rhyming sound in salient words.

## 4.5 Initial reading

### 4.5.1 Literacy accomplishments in formal schooling, ages 5-9

Conventional reading usually starts between the ages of 5-7 (Snow et al., 1999) as children enter formal schooling. Over the course of the early years of schooling, children who learn to read successfully are able to identify printed words, read for meaning and read with fluency (Burns et al., 1999). Children from supportive home literacy environments continue to make rapid growth in literacy skills once they start school (Snow et al., 1999). Building on emergent literacy skills developed in the preschool years, children must learn to identify letters and learn letter-sound correspondences. Writing skills also develop at this time, and invented spellings based on children's developing phonemic awareness, signal an important breakthrough (Snow et al., 1999). As children move into the deciphering stage, they begin to attend to all letters in words and map them to phonemes. This stage is known as full productive reading because the child can apply the alphabetic principle very generally across encounters with words (Snow et al., 1999).

Children develop phonological skills in a predictable developmental order (Moats & Tolman, 2009). Table 7 outlines the relative difficulty of phonological awareness tasks in developmental order from most basic to advanced.

**Table 7 Phonological skills, from most basic to advanced (Moats & Tolman, 2009, p. 1)**

Phonological Skill	Description
<b>Word awareness</b>	Tracking the words in sentences. Note: This semantic language skill is much less directly predictive of reading than the skills that follow and less important to teach directly (Gillon, 2004). It is not so much a phonological skill as a semantic (meaning-based) language skill.
<b>Responsiveness to rhyme and alliteration during word play</b>	Enjoying and reciting learned rhyming words or alliterative phrases in familiar storybooks or nursery rhymes.
<b>Syllable awareness</b>	Counting, tapping, blending, or segmenting a word into syllables.
<b>Onset and rime manipulation</b>	The ability to produce a rhyming word depends on understanding that rhyming words have the same rime. Recognizing a rhyme is much easier than producing a rhyme. [The initial consonant that changes the meaning of the word is called an onset and the following vowel/consonant combination that remains constant is called a rime.]
<b>Phoneme awareness</b>	Identify and match the initial sounds in words, then the final and middle sounds (e.g., "Which picture begins with /m/?"; "Find another picture that ends in /r/"). Segment and produce the initial sound, then the final and middle sounds (e.g., "What sound does <b>zoo</b> start with?"; "Say the last sound in <b>milk</b> "; "Say the vowel sound in <b>rope</b> "). Blend sounds into words (e.g., "Listen: /f/ /ē/ /t/. Say it fast"). Segment the phonemes in two- or three-sound words, moving to four- and five- sound words as the student becomes proficient (e.g., "The word is <b>eyes</b> . Stretch and say the sounds: /ī/ /z/"). Manipulate phonemes by removing, adding, or substituting sounds (e.g., "Say <b>smoke</b> without the /m/").

As children develop their reading abilities in the early years of school, there are specific ages for the development of typical phonological skills development. Table 8, developed by Moats and Tolman (2009), shows a synthesis of the research regarding these skills, and the typical age at which 80 to 90% of children master these skills. Most children need to be taught these skills directly and systematically (Moats & Tolman, 2009).

**Table 8 Ages at which 80-90 percent of typical students have achieved a phonological skill (Moats & Tolman, 2009, p. 2)**

Age	Skill Domain	Sample Tasks
<b>4</b>	Rote imitation and enjoyment of rhyme and alliteration	<b>pool, drool, tool</b> "Seven silly snakes sang songs seriously."
<b>5</b>	Rhyme recognition, odd word out	"Which two words rhyme: <b>stair, steel, chair?</b> "
	Recognition of phonemic changes in words	" <i>Hickory Dickory Clock</i> . That's not right!"
	Clapping, counting syllables	<b>truck</b> (1 syllable) <b>airplane</b> (2 syllables)

		<b>boat</b> (1 syllable) <b>automobile</b> (4 syllables)
<b>5½</b>	Distinguishing and remembering separate phonemes in a series	Show sequences of single phonemes with coloured blocks: /s/ /s/ /f/; /z/ /sh/ /z/.
	Blending onset and rime	"What word?" th-umb qu-een h-ope
	Producing a rhyme	"Tell me a word that rhymes with car." ( <b>star</b> )
	Matching initial sounds; isolating an initial sound	"Say the first sound in <b>ride</b> (/r/); <b>sock</b> (/s/); <b>love</b> (/l/)."
<b>6</b>	Compound word deletion	"Say <b>cowboy</b> . Say it again, but don't say <b>cow</b> ."
	Syllable deletion	"Say <b>parsnip</b> . Say it again, but don't say <b>par</b> ."
	Blending of two and three phonemes	/z/ /ū/ ( <b>zoo</b> ) /sh/ /ō/ /p/ ( <b>shop</b> ) /h/ /ou/ /s/ ( <b>house</b> )
	Phoneme segmentation of words that have simple syllables with two or three phonemes (no blends)	"Say the word as you move a chip for each sound." <b>sh-e</b> <b>m-a-n</b> <b>l-e-g</b>
<b>6½</b>	Phoneme segmentation of words that have up to three or four phonemes (include blends)	"Say the word slowly while you tap the sounds." <b>b-a-ck</b> <b>ch-ee-se</b> <b>c-l-ou-d</b>
	Phoneme substitution to build new words that have simple syllables (no blends)	"Change the /j/ in <b>cage</b> to /n/. Change the /ā/ in <b>cane</b> to /ō/."
<b>7</b>	Sound deletion (initial and final positions)	"Say <b>meat</b> . Say it again, without the /m/. "Say <b>safe</b> . Say it again, without the /f/."
<b>8</b>	Sound deletion (initial position, include blends)	"Say <b>prank</b> . Say it again, without the /p/."
<b>9</b>	Sound deletion (medial and final blend positions)	"Say <b>snail</b> . Say it again, without the /n/. "Say <b>fork</b> . Say it again, without the /k/."

Reading accomplishments from age 5 – 9 are presented in Tables 9 to 12 below. These tables are taken from Snow et al's (1999) landmark paper, *Preventing Reading Difficulties in Young Children*. While the authors collated these reading accomplishment skills for children in the US school system of Kindergarten to 3<sup>rd</sup> grade, we have added in the approximate age for each of these school years so our Q-Tales partners can apply them to their own school systems and approximate age levels at which these skills will occur.

**Table 9 Kindergarten [age 5-6] Accomplishments in Reading (Snow et al., 1999, p. 80)**

<b>Kindergarten Accomplishments [age 5-6]</b>
• Knows the parts of a book and their functions.
• Begins to track print when listening to a familiar text being read or when rereading own writing.
• "Reads" familiar texts emergently, i.e., not necessarily verbatim from the print alone.
• Recognizes and can name all uppercase and lowercase letters.
• Understands that the sequence of letters in a written word represents the sequence of sounds (phonemes) in a spoken word (alphabetic principle).
• Learns many, though not all, one-to-one letter sound correspondences.
• Recognizes some words by sight, including a few very common ones (a, the, I, my, you, is, are).
• Uses new vocabulary and grammatical constructions in own speech.
• Makes appropriate switches from oral to written language situations.
• Notices when simple sentences fail to make sense.
• Connects information and events in texts to life and life to text experiences.
• Retells, re-enacts, or dramatizes stories or parts of stories.
• Listens attentively to books teacher reads to class.
• Can name some book titles and authors.
• Demonstrates familiarity with a number of types or genres of text (e.g., storybooks, expository texts, poems, newspapers, and everyday print such as signs, notices, and labels).
• Correctly answers questions about stories read aloud.
• Makes predictions based on illustrations or portions of stories.
• Demonstrates understanding that spoken words consist of a sequences of phonemes.
• Given spoken sets like "dan, dan, den" can identify the first two as being the same and the third as different.
• Given spoken sets like "dak, pat, zen" can identify the first two as sharing a same sound.
• Given spoken segments can merge them into a meaningful target word.
• Given a spoken word can produce another word that rhymes with it.
• Independently writes many uppercase and lowercase letters.
• Uses phonemic awareness and letter knowledge to spell independently (invented or creative spelling).
• Writes (unconventionally) to express own meaning.
• Builds a repertoire of some conventionally spelled words.
• Shows awareness of distinction between "kid writing" and conventional orthography.
• Writes own name (first and last) and the first names of some friends or classmates.
• Can write most letters and some words when they are dictated.

#### 4.5.2 Literacy accomplishments in first grade [age 6-7]

**Table 10 Accomplishments in reading, age 6-7 (Snow et al., 1999, p. 81)**

<b>First Grade Accomplishments [age 6-7]</b>
• Makes a transition from emergent to "real" reading.
• Reads aloud with accuracy and comprehension any text that is appropriately designed for the first half of grade 1.
• Accurately decodes orthographically regular, one-syllable words and nonsense words (e.g., sit, zot), using print-sound mappings to sound-out unknown words.
• Uses letter-sound correspondence knowledge to sound out unknown words when reading text.
• Recognizes common, irregularly spelled words by sight (have, said, where, two).
• Has a reading vocabulary of 300 to 500 words, sight words and easily sounded out words.
• Monitors own reading and self-corrects when an incorrectly identified word does not fit with cues provided by the letters in the word or the context surrounding the word.
• Reads and comprehends both fiction and nonfiction that is appropriately designed for grade level.
• Shows evidence of expanding language repertory, including increasing appropriate use of standard more formal language registers.
• Creates own written texts for others to read.
• Notices when difficulties are encountered in understanding text.
• Reads and understands simple written instructions.
• Predicts and justifies what will happen next in stories.
• Discusses prior knowledge of topics in expository texts.

<ul style="list-style-type: none"> <li>• Discusses how, why, and what-if questions in sharing nonfiction texts.</li> </ul>
<ul style="list-style-type: none"> <li>• Describes new information gained from texts in own words.</li> </ul>
<ul style="list-style-type: none"> <li>• Distinguishes whether simple sentences are incomplete or fail to make sense; notices when simple texts fail to make sense.</li> </ul>
<ul style="list-style-type: none"> <li>• Can answer simple written comprehension questions based on material read.</li> </ul>
<ul style="list-style-type: none"> <li>• Can count the number of syllables in a word.</li> </ul>
<ul style="list-style-type: none"> <li>• Can blend or segment the phonemes of most one-syllable words.</li> </ul>
<ul style="list-style-type: none"> <li>• Spells correctly three- and four-letter short vowel words.</li> </ul>
<ul style="list-style-type: none"> <li>• Composes fairly readable first drafts using appropriate parts of the writing process (some attention to planning, drafting, rereading for meaning, and some self-correction).</li> </ul>
<ul style="list-style-type: none"> <li>• Uses invented spelling/phonics-based knowledge to spell independently, when necessary.</li> </ul>
<ul style="list-style-type: none"> <li>• Shows spelling consciousness or sensitivity to conventional spelling.</li> </ul>
<ul style="list-style-type: none"> <li>• Uses basic punctuation and capitalization.</li> </ul>
<ul style="list-style-type: none"> <li>• Produces a variety of types of compositions (e.g., stories, descriptions, journal entries), showing appropriate relationships between printed text, illustrations, and other graphics.</li> </ul>
<ul style="list-style-type: none"> <li>• Engages in a variety of literary activities voluntarily (e.g., choosing books and stories to read, writing a note to a friend).</li> </ul>

### 4.5.3 Literacy accomplishments in second grade, ages 7-8

**Table 11 Second grade (ages 7-8) reading accomplishments (Snow et al., 1999, p. 82)**

<b>Second-Grade Accomplishments [age 7-8]</b>
<ul style="list-style-type: none"> <li>• Reads and comprehends both fiction and nonfiction that is appropriately designed for grade level.</li> </ul>
<ul style="list-style-type: none"> <li>• Accurately decodes orthographically regular multi-syllable words and nonsense words (e.g., capital, Kalamazoo).</li> </ul>
<ul style="list-style-type: none"> <li>• Uses knowledge of print-sound mappings to sound out unknown words.</li> </ul>
<ul style="list-style-type: none"> <li>• Accurately reads many irregularly spelled words and such spelling patterns as diphthongs, special vowel spellings, and common word endings.</li> </ul>
<ul style="list-style-type: none"> <li>• Reads and comprehends both fiction and nonfiction that is appropriately designed for grade level.</li> </ul>
<ul style="list-style-type: none"> <li>• Shows evidence of expanding language repertory, including increasing use of more formal language registers.</li> </ul>
<ul style="list-style-type: none"> <li>• Reads voluntarily for interest and own purposes.</li> </ul>
<ul style="list-style-type: none"> <li>• Re-reads sentences when meaning is not clear.</li> </ul>
<ul style="list-style-type: none"> <li>• Interprets information from diagrams, charts, and graphs.</li> </ul>
<ul style="list-style-type: none"> <li>• Recalls facts and details of texts.</li> </ul>
<ul style="list-style-type: none"> <li>• Reads nonfiction materials for answers to specific questions or for specific purposes.</li> </ul>
<ul style="list-style-type: none"> <li>• Takes part in creative responses to texts such as dramatizations, oral presentations, fantasy play, etc.</li> </ul>
<ul style="list-style-type: none"> <li>• Discusses similarities in characters and events across stories.</li> </ul>
<ul style="list-style-type: none"> <li>• Connects and compares information across nonfiction selections.</li> </ul>
<ul style="list-style-type: none"> <li>• Poses possible answers to how, why, and what-if questions.</li> </ul>
<ul style="list-style-type: none"> <li>• Correctly spells previously studied words and spelling patterns in own writing.</li> </ul>
<ul style="list-style-type: none"> <li>• Represents the complete sound of a word when spelling independently.</li> </ul>
<ul style="list-style-type: none"> <li>• Shows sensitivity to using formal language patterns in place of oral language patterns at appropriate spots in own writing (e.g., decontextualizing sentences, conventions for quoted speech, literary language forms, proper verb forms).</li> </ul>
<ul style="list-style-type: none"> <li>• Makes reasonable judgments about what to include in written products.</li> </ul>
<ul style="list-style-type: none"> <li>• Productively discusses ways to clarify and refine writing of own and others.</li> </ul>
<ul style="list-style-type: none"> <li>• With assistance, adds use of conferencing, revision, and editing processes to clarify and refine own writing to the steps of the expected parts of the writing process.</li> </ul>
<ul style="list-style-type: none"> <li>• Given organizational help, writes informative well-structured reports.</li> </ul>
<ul style="list-style-type: none"> <li>• Attends to spelling, mechanics, and presentation for final products.</li> </ul>
<ul style="list-style-type: none"> <li>• Produces a variety of types of compositions (e.g., stories, reports, correspondence).</li> </ul>

#### 4.5.4 Literacy accomplishments in third grade, ages 8-9

**Table 12 Third grade (ages 8-9) reading accomplishments (Snow et al., 1999, p. 83)**

<b>Third-Grade Accomplishments [age 8-9]</b>
• Reads aloud with fluency and comprehension any text that is appropriately designed for grade level.
• Uses letter-sound correspondence knowledge and structural analysis to decode words.
• Reads and comprehends both fiction and nonfiction that is appropriately designed for grade level.
• Reads longer fictional selections and chapter books independently.
• Takes part in creative responses to texts such as dramatizations, oral presentations, fantasy play, etc.
• Can point to or clearly identify specific words or wordings that are causing comprehension difficulties.
• Summarizes major points from fiction and nonfiction texts.
• In interpreting fiction, discusses underlying theme or message.
• Asks how, why, and what-if questions in interpreting nonfiction texts.
• In interpreting nonfiction, distinguishes cause and effect, fact and opinion, main idea and supporting details.
• Uses information and reasoning to examine bases of hypotheses and opinions.
• Infers word meanings from taught roots, prefixes, and suffixes.
• Correctly spells previously studied words and spelling patterns in own writing.
• Begins to incorporate literacy words and language patterns in own writing (e.g., elaborates descriptions, uses figurative wording).
• With some guidance, uses all aspects of the writing process in producing own compositions and reports.
• Combines information from multiple sources in writing reports.
• With assistance, suggests and implements editing and revision to clarify and refine own writing.
• Presents and discusses own writing with other students and responds helpfully to other students' compositions.
• Independently reviews work for spelling, mechanics, and presentation.
• Produces a variety of written works (e.g., literature responses, reports, "published" books, semantic maps) in a variety of formats, including multimedia forms.

#### 4.6 Reading to learn

As children reach the age of 8 or 9, they are increasingly expected to be able to read to learn. In Chall's third stage of reading development, which spans ages 9 to 13, (Table 4, above), the child is expected to use reading to learn new ideas and to gain new knowledge (Chall, 1983). At this stage of reading development, the texts read in school go beyond what the reader already knows and contain information that is beyond the reader's language and knowledge. Reading tasks usually incorporate unfamiliar material and the reader's knowledge, language and vocabulary need to expand. Children who have not yet mastered the skills of the earlier stages of reading may fall behind in acquiring the knowledge that others are able to gain from their more advanced reading abilities (Indrisano & Chall, 1995).

At this stage of reading development, reading instruction and curricula focus more strongly on reading comprehension and skills (Harlaar et al., 2007). An integral part of being able to comprehend reading at this level is vocabulary knowledge and being able to understand the meaning of words read in academic texts. Students need to be able to integrate new knowledge from texts with their prior background knowledge (Lawrence et al., 2011). Langer (1999) defines the level of literacy needed by adolescents as "high literacy" (p. 1). Adolescents need literacy skills that go beyond the basic reading skills learned in earlier years of school.

They also need "... the ability to use language, content, and reasoning in ways that are appropriate for particular situations and disciplines...This notion of high literacy refers to understanding how reading, writing, language, content, and social appropriateness work together and using this knowledge in effective ways" (Langer, 1999, p. 1).

## 5 Activities to support literacy skills

This section will describe activities that can be implemented at the different stages of literacy development outlined in this pedagogical framework: emergent reading, initial reading and reading to learn. These are divided according to the four categories outlined in section 2.6; code related skills, comprehension, cognitive and metacognitive skills and social/emotional interaction.

### 5.1 Emergent reading, age 0-4

Several different types of activities have been shown to support literacy development in the pre-school years (Burns et al., 1999). Types of emergent literacy skills and activities parents and caregivers can engage in to support infants and toddlers' emergent literacy development follow. Activities have been adapted from Burns et al (1999) unless otherwise stated. Some of these activities could be facilitated in the e-book design as interactive activities to support children's language and literacy development. Multimedia interactive additions to e-books that are designed with children's literacy development in mind can be used to successfully support literacy development (de Jong & Bus, 2003).

#### 5.1.1 Code related skills

Activities that can support letter and early word recognition skills, ages 2-4:

- Help children find the initial letter in their own names in the print in the world around them
- Write, display and point out the child's name often
- Print their name on their artwork
- Start to point out other words they see often in the world around them, 'STOP', words on clothing, 'mom or 'dad'
- Watch TV programs such as Sesame Street with your child and learn the letter songs with them

Activities that can support functions of print, ages 2-4:

- Show children how different sorts of written and printed materials work and give them a chance to imitate
- Explain to child when you're leaving notes for others and what it says

- Make writing materials available so children can make pretend lists, letters, menus themselves
- Look up answers to questions using books and other materials (such as the weather) so children can see we use print for information

Activities that can support book and print awareness, ages 2-4:

- provide print-rich environments including access to high-quality books, writing materials, and toys like alphabet blocks and alphabet refrigerator magnets
- point out and read print in the daily environment
- label important things in the child's environment such as their room or toy box, use their name in the signs

Activities to enhance print concept skills, ages 2-4:

- While reading to children, run your finger along the text so they can see it is read from left to right
- Point out the title and authors name on the cover of the book
- Point out the punctuation that shows where a sentence ends

Activities to support phonemic awareness skills, ages 2-4:

Phonemic awareness is the ability to perceive spoken words as a sequence of sounds (Burns et al., 1999). It is the insight that every spoken word can be conceived as units of sounds that are represented by letters of an alphabet (Snow et al., 1999).

- Isolating the first segment of a word (Say the first little bit of 'snake')
- Finding all the objects on a page or poster that begin with a certain letter (sound)
- Discovering what is left when a particular segment is removed from a word
- Breaking one syllable words into their phonemes
- Blending phonemes to make a word
- Talking about letters – both their names and their sounds
- Shared reading – PEER and CROWD sequence for reading with pre-schoolers
- Letter-naming – provide activities that give children the chance to name letters and pictures on the page that go with them
- Treasure hunt to find a letter in a picture in the room
- Encourage pretend writing, congratulate children when they start to make letter-like forms
- Provide support and encouragement for writing letters

- Encourage children to copy letters, sign their drawings, label their drawings
- Encourage inventive spellings, conventional spelling comes later
- Write down children’s personal dictations, exactly the way they are said, and read them back to them
- Get children to act out their dictated stories
- Computer games that allow matching, sorting, patterns, letters and word meanings, explore alphabet letters and sounds, play with rhyming words,
- Games that pronounce each phoneme and highlights each letter

Activities to enhance phonological awareness skills, ages 2-4:

Phonological awareness has to do with knowing that oral language has structure that is separate from meaning (such as the sounds of phonemes or the number of syllables in a word) (Burns et al., 1999).

- Spark children’s awareness of language and sounds by using songs, rhyming games, language play and nursery rhymes
- Talk about words and sounds encountered in everyday activity
- Choose books that focus on sounds (such as Dr Seuss books)
- Make up games with rhyming words, silly sounds and chants
- Sing songs that play with sound
- Sing songs that play with rhyme
- Read rhyming poetry and rhyming stories
- Syllable-clapping - clap as you say each syllable in a word
- Grouping objects according to how their names begin
- Listening carefully – to books read aloud or on tape

### **5.1.2 Comprehension skills**

Activities to support Language development

- Labelling games – encourage children to verbally label objects and events in their world, and pictures in books
- Conversation with children is very important, talk about what you’re doing together, seeing together, reading together
- Let the child sometimes control the subject of conversations

- Pick books that connect to a child's life and talk about those connections
- Encourage preschool age children to become the reader or teller of the story, prompt by asking questions, get child to expand further on the narration

Activities to support comprehension, ages 2-4:

- Listen to an audio recording of a book or story, then have the child draw a picture of their favourite part and talk with them about it
- While reading a book together, ask children questions to help them think about or reflect on vocabulary words, plot, or characters

Activities to support understanding of narrative, ages 2-4:

- Encourage children to start to 'pretend' to read books that have been repeatedly read to them
- Oral storytelling – tell children your own stories, about your family, childhood
- Get children to tell of their own adventures in the form of a story
- Encourage children to tell stories about special events, holidays, trips, use photo albums to prompt these kinds of stories
- Get children to act out stories that have been read to them using their own puppets or dolls
- Encourage children to elaborate on stories that have been read to them, add their own creations to the story, such as new circumstances for characters, or new endings

### **5.1.3 Cognitive and metacognitive skills**

Metacognitive strategies help students 'think about their thinking' before, during and after they read (Boulware-Gooden et al., 2007). At the emergent reading level, metacognition has also been shown to be at an emergent stage (Fang & Cox, 1999).

Activities to support emergent metacognition, ages 0-4

- Storybook reading and language experience with adults
- Invite children to actively interpret the story being read

- Engage young children in language-rich and adult-mediated activities such as dictating stories, storytelling, language play, and process writing (Fang & Cox, 1999)

#### **5.1.4 Social/Emotional Interaction**

Activities to support literacy as a source of enjoyment, ages 0-4:

- Create a warm atmosphere around story time, reading and pretend play activities
- Respond to childrens' remarks and observations about books
- Take time to answer childrens' questions while reading
- Make literacy activities fun and a part of play – events they look forward to
- Allow children to choose books they want to read
- Let them see your enjoyment in choosing books
- Take children to the library often
- Offer children many kinds of books, from story books to non-fiction books about topics that interest them, nursery rhymes, and poetry
- Get books about topics they've seen on TV and videos
- Act out scenes from a favourite video
- Create homemade books with themes from TV shows or videos

## **5.2 Initial Reading, age 5-8**

Several different types of activities have been shown to support literacy development in the early school years (Burns et al., 1999). The broad age range of 5-8 for this stage of reading development has been further broken down by the appropriate year in school, as done in the literacy accomplishment Tables 10 to 12, in section 4 above. Some of the literacy activities highlighted in this section could be facilitated in the e-book design as interactive activities to support children's literacy development. Multimedia interactive additions to e-books that are designed with children's literacy development in mind can be used to successfully support literacy development (de Jong & Bus, 2003). The following types of activities can assist children's beginning reading skills:

### **5.2.1 Code related skills**

Activities to support children's letter recognition, decoding and word recognition skills, ages 5-6:

- Activities that have the child on the lookout for certain letters
- Games that allow children to find all occurrences of a letter in a small amount of text, both upper and lower case
- Games that allow children to sound, blend and identify a given simple word, then swap the initial consonant and repeat (bat, cat, hat...)
- Same exercise as above but replace final consonants (fit, fin, fib...)
- Read rhyming books such as Dr. Seuss books for fun prose filled with rhymes and wordplay
- Build sight vocabulary by playing games such as concentration (find the two matching words on 12 cards – 2 cards for each of 6 words)
- Games to help recognize irregularly spelled sight words such as 'the,' 'have,' and 'two.' Have children point out the chosen word in part of a familiar nursery rhyme

Activities to support children's phonological awareness, ages 5-6:

- Sing songs that play with sound
- Rhyming songs: Sing songs that play with rhyme
- Rhyming songs: Read rhyming poetry and rhyming stories
- Syllable-clapping - clap as you say each syllable in a word
- Grouping objects according to how their names begin
- Listening carefully – to books read aloud or on tape
- Play games that allow children to recognise shared sounds in the words (such as playing the game 'SNAP' using shared sounds)
- Play games to help students count phonemes in one syllable words (count sounds not letters), or to create new words by adding or taking away phonemes
- Games that give children practice in blending onset (the first part of a syllable) and rime (the ending part)

Activities that can support childrens' letter knowledge, ages 6-7:

- Take a passage from a text that was just read. Ask children to find and underline all words that use a certain letter, discuss the different ways the letter is printed (upper or lower case, different font, etc.)
- Have children circle words that begin with a target letter

Activities to support childrens' phonemic awareness, ages 6-7:

- Have children 'break apart' and 'put together' the syllables of words
- Clapping out syllables of words, clapping once as each syllable is said, point out that some words just get one clap, others get many

- Say the word, pausing between each syllable, and ask children to say the whole word, putting the syllables back together
- Have children break apart and put back together the phonemes of simple one syllable words
- Use pictures on cards to represent one syllable words. Hold up a card, say the word. Then say it again, with pauses and claps between each phoneme
- Start by saying the phonemes separately with pauses between each, ask students to put the word together, then showing the picture

Activities to support childrens' word recognition skills, ages 6-7:

- Making words activities:
  - Scramble a word made up of one or two vowels, and three or more consonants. (such a 'train')
  - Ask children to make as many different words as they can out of these letters.
  - Display the correctly spelled words, pointing out letter-sound correspondences and spelling patterns.
  - Have one mystery word (the original word), that children must discover on their own by using all the letters.
  - Children can correct themselves by comparing their spelling with the correct ones.

Activities to support childrens' decoding skills, ages 7-8:

- Practice decoding phonetically regular, two-syllable words and nonsense words
- Using phonics knowledge to sound out unknown words, including multi-syllable words

Activities to support children's print conventions skills, ages 7-8:

- Identify parts of speech such as nouns, verbs, adjectives, and adverbs

### 5.2.2 Comprehension

Activities to support comprehension, ages 5-6:

- Read to children from a wide variety of books and stories that are about different creatures, places and things
- Augment stories with selections of pictures, discussions to augment the stories read
- Socio-dramatic play opportunities that allow children to retell, re-enact or dramatize stories
- Listening to books on tape, call and response songs to develop listening skills

- Offer a variety of texts, both fiction and non-fiction for children to choose from
- Have children ask their own questions about the story, or respond to other's questions
- Get students to follow the text with movement, mime or choral reading
- Draw their attention to forms of print such as punctuation, letters, the space around words, chapter title placement etc.
- Provide repeated readings of the same story so children can gain mastery of the narrative, ideas and language
- Ask children to summarize before and after chapters are read
- Allow children shared book experiences or book clubs for children with similar interests
- Give children access to a wide variety of reading materials
- Allow children to choose their own books

#### Activities to support comprehension, ages 6-7:

- Ask questions that will help children discuss the meaning of what is read
- Surround readings with discussion and activities to help children develop their comprehension and vocabulary skills
- Pre-reading: Provide background knowledge and vocabulary children need to understand the text they will read
- Pre-reading: Point out new, unusual words in the text and discuss/explain.
- Pre-reading: Get children to use the new words in a sentence
- Reading: while the story is being read, orchestrate pauses for questions and discussion that will help comprehension such as compare and contrast, predict, ask how and why, check their understanding of the sequence
- After reading: Promote discussion that helps children to summarize – discuss issues of plot and lead children to summarize what happened in the story
- After reading: Promote discussion that helps children develop character understanding: ask questions about motives, interests and concerns of characters
- Give children the chance to master more difficult texts through repeated readings
- Enhance syntactic abilities by asking questions that encourage them to use words like 'because,' 'after,' 'since,' and 'while,' which help them to be more precise in their vocabulary

#### Activities to support childrens' response to text, ages 6-7:

- Relate texts to their own lives: encourage children to make connections between the texts and themselves, their homes, their neighbourhoods, their feelings and aspirations
- Ask children to write or draw something connected to what they have read

#### Activities to support childrens' spelling and writing, ages 6-7:

- Ask children to create a book about themselves, create a self-portrait of themselves for the book, and small bits of information about their favourite things and things they like to do
- Have children write and read their own writing
- Invite children to read and talk about what they have written
- Create a dialogue journal with children – where they can tell you about anything they want. They have to write two lines twice a week and you have to write back 2 lines twice a week (this gives a chance for regular feedback and motivation to write)
- Dictate words for children to spell. Say the word slowly, ask children to help you spell it.
- Create sentences using spelling words

Activities to support childrens' reading comprehension, ages 7-8:

- comparing and contrasting characters and events across stories
- offer answers to how, why, and what-if questions in nonfiction texts.
- Reciprocal teaching – exchange of turns in dialogues between teacher and students. Practice in 4 strategies – predicting, questioning, summarizing and clarifying. Goal is to practice strategies and come to conclusions about the meaning of the passage read.
- Story maps, plot charts and diagrams can be used to help children analyse a text
- Vocabulary instruction to increase word knowledge and comprehension, exploring new words and concepts, revisiting them frequently, enriching their usage and meaning
- Getting children to read every day, build vocabulary through reading

Activities to support children's learning from text skills, ages 7-8:

- Interpret information from diagrams, charts, graphs, recall facts and details
- Should read to find out answers to their questions and be well acquainted with the purposes of many different print resources, such as dictionaries, atlases, chapter books, weather reports—even joke books

Activities to support children's response to text skills, ages 7-8:

- Dramatizations, oral presentations, and fantasy play.
- Explaining and describing new concepts and information in their own words.

Activities to support comprehension and response to text skills, age 8-9

- Distinguish cause and effect
- Identify the main idea and supporting details of a text
- Examine the bases of hypotheses and opinions
- Use resources to get the information they need (e.g., table of contents, index, dictionary, and available technology).

- Summarize major points and discuss details
- Creative responses to texts, such as dramatizations, oral presentations, and fantasy play

Activities to support language and comprehension skills, age 8-9

- Work with roots, prefixes, and suffixes in order to learn how to take words apart to infer their meanings
- Use comprehension strategies and surrounding information in the text to infer or enrich their understanding of a new word or concept
- Reading long fiction and chapter books independently, ideally at least 20 minutes every day outside school

### **5.2.3 Cognitive and metacognitive skills**

- High-quality storybook reading
- Rich discussions
- Question and answer periods

### **5.2.4 Social/emotional interactions**

- Fun, engaging activities connected to text

## **5.3 Reading to learn, age 9-16**

Reading instruction does not end when students can decode the words. They continue to need instruction that will support their understanding of what they are reading (Boulware-Gooden et al., 2007, p. 71). Adolescents can benefit from instruction in comprehension strategies, cognitive, and metacognitive strategies to help them make sense of academic texts. These skills and strategies are better taught in context rather than on their own in isolation from the content being learned (Meltzer et al., 2001). Many of the following skills and activities could be incorporated into e-books designed for adolescents to assist them with their comprehension, thoughts on, and understanding of the text.

### **5.3.1 Code related skills**

There are less code related skills at this stage of reading development as reading instruction is more strongly focused on reading comprehension and skills. Children who have not yet mastered the decoding skills of the earlier stages of reading may fall behind in acquiring the knowledge that others are able to gain from their more advanced reading abilities (Indrisano & Chall, 1995). Children struggling with decoding skills at this stage may have poor phonemic awareness skills and can lack effective strategies for decoding unknown multi-syllabic words which they encounter in content area texts. This in turn can negatively influence their reading comprehension (National Institute for Literacy, 2007). Types of activities to develop phonemic

awareness discussed for the earlier stages of reading development can be utilised to help struggling readers at this level, but this instruction “should occur within the context of an integrated approach to developing students’ comprehension and use of academic language (that is, the language used in educational settings) and should focus on only one or two skills or strategies at a time” (National Institute for Literacy, 2007, p. 5).

The National Institute for Literacy (2007, p. 7) suggests the following strategies and activities to help struggling adolescent readers:

- Model phonemic awareness skills when introducing new vocabulary
- Focus on identification of rhyming words, blending of isolated sounds to form words, and segmentation of a word into its individual sounds
- Emphasize specialized academic vocabulary for words that change meaning when one phoneme is substituted for another (such as **e**volution and **r**evolution) and emphasize these changes when introducing new vocabulary
- When introducing new vocabulary words, articulate each syllable slowly (e.g., e-co-sys-tem), pausing slightly between the syllables. Repeat this articulation several times.
- Point out patterns in the pronunciation and spelling of prefixes, suffixes, and vowels in selected words (e.g., rac-ism, sex-ism, age-ism, etc.)
- Point out similarities and differences among words that belong to “word families”(e.g., define, definitely, definition)
- Model using new or difficult words in different contexts
- Provide opportunities for students to practice using new or difficult words and reinforce correct pronunciation and usage
- Ask open-ended questions that require students to respond using the new or difficult words (e.g., Do you think racism, sexism, or ageism is more prevalent in our society? Why?)

### 5.3.2 Comprehension

Meltzer et al (2001) suggest several reading strategies that can support comprehension. Each reading comprehension strategy and a brief explanation can be found in Table 13.

**Table 13 Reading comprehension strategies for continuing literacy development**

Activity	Description
Anticipation Guides	Used before reading to activate students' prior knowledge and build curiosity about a new topic. The teacher generates 6-12 questions based on the text, some yes or no questions, and some controversial questions to generate discussion (Duffelmeyer, 1994; University of North Texas, 2008). Examples: <a href="http://www.adlit.org/strategies/19712/">www.adlit.org/strategies/19712/</a>
KWL	KWL charts are graphic organizers that can be used to elicit what a student knows (K), wants to know (W) and learned (L) about a topic. KWL charts help students

(Know, Want to know, Learned)	access information they have about a topic and link it to new learning (Schofield, 2014). KWL charts can help students set a purpose for reading and aid in their comprehension of the text (National Educational Association, 2015). Examples: <a href="http://www.nea.org/tools/k-w-l-know-want-to-know-learned.html">http://www.nea.org/tools/k-w-l-know-want-to-know-learned.html</a>
Reciprocal Teaching	Students become the teacher in small group reading sessions, guide group discussions using four cognitive strategies: summarizing, question generating, clarifying, and predicting, and take turns assuming the role of teacher in leading a dialogue about what has been read (Rosenshine & Meister, 1994). Examples: <a href="http://www.readingrockets.org/strategies/reciprocal_teaching">http://www.readingrockets.org/strategies/reciprocal_teaching</a>
Graphic Organizers	Maps, webs, graphs, charts, frames, or clusters that are used to illustrate concepts and relationships between concepts in a text. These can help readers focus on concepts and how they are related to other concepts (Adler, 2015). Examples: <a href="http://www.readingrockets.org/article/seven-strategies-teach-students-text-comprehension">http://www.readingrockets.org/article/seven-strategies-teach-students-text-comprehension</a>
Question Generating	Students learn to formulate and respond to questions about situations, facts, and ideas while engaged in understanding a text. Question types are: self-monitoring, collecting information, asking the author, classifying, and predicting (Harvey & Goudvis, 2007). Examples: <a href="http://www.adlit.org/strategies/22093/">www.adlit.org/strategies/22093/</a>
Directed Reading-Thinking Activity (DRTA)	A strategy that guides students in asking questions about a text, making predictions, and then reading to confirm or refute their predictions. DRTA is effective with both narrative and expository texts (Ambe, 2007). Examples: <a href="http://www.readingrockets.org/strategies/drt_a">http://www.readingrockets.org/strategies/drt_a</a> , <a href="http://www.adlit.org/strategies/23356/">http://www.adlit.org/strategies/23356/</a>
Think Alouds	Teachers verbalize aloud while reading a selection orally, describing things they're doing as they read to monitor their comprehension, in order to model for students how skilled readers construct meaning from a text (Wade, 1990). Examples: <a href="http://www.readingrockets.org/strategies/think_alouds">http://www.readingrockets.org/strategies/think_alouds</a>
Sensory/Visual Imagery	Constructing mental images as a text as read. Through guided visualization, students learn how to create mental pictures as they read (Gambrell & Koskinen, 2002). Examples: <a href="http://www.readingrockets.org/strategies/visual_imagery">http://www.readingrockets.org/strategies/visual_imagery</a>
Drama	Drama strategies allow students to act out or dramatize a text. Drama strategies include: Story Dramatization, Character Interviews, Tableau and Human Slide Show (Blank Kelnor & Flynn, 2006).
Art	Allows students to illustrate their comprehension of a text visually (Chin et al., 2007).
Structured Note Taking	Teacher created graphic organizer to help students make sense of the text and become more effective note takers (Smith & Tompkins, 1988). Example: <a href="http://www.adlit.org/strategies/19779/">http://www.adlit.org/strategies/19779/</a>

### 5.3.2.1 Directed Activities Related to Text (DARTs)

DARTs are activities designed to improve reading comprehension in content areas by focusing student attention on the text (Davies & Green, 1984). DARTs are designed to assist student literacy development and promote thinking skills within the context of the subject being studied. While these activities were originally designed for the post-primary level, they can also be used with older children in the previous reading development stage.

Table 8 gives a breakdown of DARTs activities, which can be divided into two broad groups, reconstruction activities and analysis activities. The reconstruction activities have game-like characteristics and involve hunting for clues to complete the text that has been modified by the teacher. The analysis activities are more study-like activities than game-like. Pupils need to locate and categorise the information in the text (Davies & Green, 1984).

**Table 14 Directed Activities Related to Text (DARTs) (Davies & Green, 1984, p. 48)**

Reconstruction activities (using text modified by teacher)	Analysis activities (using straight [unmodified] text)
<b>Pupil task:</b> pupils complete text or diagram, reconstructing meaning.	<b>Pupil task:</b> Pupils locate and categorise text information by marking and labelling. Use marked text as basis for summary (diagrammatic or note form).
1. Text completion a) Word completion (selected words deleted from text). b) Phrase completion (selected phrases/clauses deleted from text). c) Sentence completion (selected sentences deleted from text).	1. Text marking Locating and underlining parts of text representing certain meaning of information targets.
2. Sequencing a) scrambled segments of text arranged in logical/time sequence (text cut into segments representing steps/events etc). b) Segments of text classified (texts cut into segments representing certain categories of information).	2. Labelling Pupils label parts of text using labels provided by teacher.
3. Prediction a) Pupils predict next event/step or stage after reading segments of text (text segments presented a section at a time). b) Pupils write next part or end of text (text presented a section at a time).	3. Segmenting Pupils break text into meaning or information units and label/annotate segments of text.
4. Table completion a) Pupils fill in cells of table using row and column headings and text as sources of information. b) (Teacher provides row and column headings.) c) Pupils devise row and column headings using texts and cells of matrix as sources of information. (Teacher fills in cells.)	4. Table construction Pupils produce column and row headings for tables and fill in cells using text(s) as source of information.
5. Diagram completion a) Label completion using text and diagram as sources of information (selected labels deleted from diagrams). b) Diagram completion using text and partly complete diagram as sources of information. (Teacher constructs original diagram: flow diagram, branching tree, network, etc.)	5. Diagram construction Pupils construct and complete diagram appropriate for particular text, e.g. flow diagram for text describing a process, branching tree for a text describing a hierarchical classification, networks, etc.
	6. Pupil-generated questions Pupils read text and generate questions they still need answers to.
	7. Summary Pupils produce headings and summarise information.

In a classroom setting, students would be working together on these activities, discussing, sharing and revising their interpretations of the text (Davies & Green, 1984). E-book designers could incorporate these types of reconstruction and analysis activities into more difficult texts to aid adolescents' reading comprehension. As the original authors saw a gaming aspect in the reconstruction activities, an element of gamification could be applied to the successful completion of these types of interactive activities (See the Q-Tales gamification deliverable, D2.1, for more information on gamification strategies.)

### 5.3.2.2 Vocabulary development strategies

Deficits in vocabulary knowledge may be the most widely shared problem among struggling adolescent readers (Lawrence et al., 2011). In order to read more advanced texts with clear comprehension, students need to understand the words they are reading. "...word meaning and form selection are critical to creating a situation model from text and for integrating new knowledge from the text with prior background knowledge" (Lawrence et al., 2011, p. 1)

Effective vocabulary instruction connects new vocabulary to students' prior knowledge in context and teaches word meanings as concepts (Texas Education Agency, 2002). Several techniques that have proven effective are: Concept Definition Maps, Semantic Mapping, Semantic Feature Analysis, Possible Sentences, Comparing and Contrasting, and Teaching Word Parts. These techniques are briefly described in Table 15.

**Table 15 Effective vocabulary development strategies for continued literacy development (Texas Education Agency, 2002)**

Vocabulary development strategies	
Concept Definition Maps (Word Maps)	Graphic displays that show common elements of a dictionary definition including: (1) the category to which the word being defined belongs ( <i>What is this?</i> ), (2) some characteristics of the word ( <i>What is it like?</i> ), and (3) some specific examples and some non-examples of the word.
Semantic Mapping	Involves a web-like graphic display. Students are presented with a concept that is central to understanding a selection or subject, then brainstorm words that are related to that concept. As students brainstorm, the teacher writes their suggestions on the board, adding words they need to learn.
Semantic Feature Analysis	Draws on students' prior knowledge and uses discussion to elicit information about word meanings. Similar to Semantic Mapping, but it uses a grid rather than a map as a graphic display.
Possible Sentences	Six to eight words that might cause readers difficulty are chosen from the text. An additional four to six words that are more likely to be known by the reader are also chosen and are used to help generate sentences. Readers are to make up sentences that contain at least two of these words, that might be in the selection they are about to read. After reading the selection, the sentences are judged on whether they could be true or not true, based on the reading.
Comparing and Contrasting	Can help students extend their vocabularies by establishing relationships among concepts. Venn diagrams work well as graphic organizers for comparing and contrasting content-area concepts.
Teaching Word Parts	Students learn to recognize and use information from prefixes, suffixes and Greek and Latin roots. Learning common prefixes and suffixes and then breaking words into their parts can be a useful strategy for deciphering unknown words. (e.g. <i>mis-read</i> , <i>inter-dependant</i> .) There are many published lists, such as the one found here, <a href="http://teacher.scholastic.com/reading/bestpractices/vocabulary/pdf/prefixes_suffixes.pdf">http://teacher.scholastic.com/reading/bestpractices/vocabulary/pdf/prefixes_suffixes.pdf</a> , and here, <a href="http://www.readingrockets.org/article/root-words-roots-and-affixes">http://www.readingrockets.org/article/root-words-roots-and-affixes</a> , that can be used to teach students the most common prefixes and suffixes.

### 5.3.3 Cognitive and Metacognitive skills

Adolescent literacy development can also be enhanced by the use of cognitive and metacognitive strategies (Meltzer et al., 2001). Cognitive strategies are those we use when thinking, learning and studying, whereas metacognitive strategies are those we use to make sure a learning goal is being or has been reached (Teaching Excellence in Adult Literacy Center, 2015). Many of the comprehension strategies noted in the section above, such as DARTs and graphic organizers are cognitive strategies for learning. Metacognitive strategies

help students 'think about their thinking' before, during and after they read (Boulware-Gooden et al., 2007). Metacognition is a three part process (Fogarty, 1994). To be successful thinkers, students must:

1. Develop a **plan** before approaching a learning task.
2. **Monitor** their understanding; use "fix-up" strategies when meaning breaks down.
3. **Evaluate** their thinking after completing the task (Fogarty, 1994).

Students can ask themselves questions about their thinking before, during and after reading:

Planning:

- What am I supposed to learn?
- What prior knowledge will help me with this task?
- What should I do first?
- What should I look for in this reading?
- How much time do I have to complete this?
- In what direction do I want my thinking to take me?

Monitoring:

- How am I doing?
- Am I on the right track?
- How should I proceed?
- What information is important to remember?
- Should I move in a different direction?
- Should I adjust the pace because of the difficulty?
- What can I do if I do not understand?

Evaluation:

- How well did I do?
- What did I learn?
- Did I get the results I expected?
- What could I have done differently?
- Can I apply this way of thinking to other problems or situations?
- Is there anything I don't understand—any gaps in my knowledge?

- Do I need to go back through the task to fill in any gaps in understanding?
- How might I apply this line of thinking to other problems? (Teaching Excellence in Adult Literacy Center, 2015)

#### 5.3.4 *Social/emotional interaction*

- Create spaces and opportunities for collaboration
- Tap into learning through social interactions (Literacy Gains, 2012)
- Creative responses to texts, such as dramatizations, oral presentations, and fantasy play
- Working collaboratively with classmates on reading comprehension and vocabulary building activities

## 6 Design Considerations for Literacy Development

### 6.1 Design considerations

The pedagogical value of an e-book is influenced by the design of the book and a number of design considerations are important for e-book creators to keep in mind. A core focus of the Q-Tales pedagogical framework is to facilitate e-book creators in their design thinking, particularly around design issues that influence the learning experience of children. While there are a multitude of design considerations that are important, many of which are shaped by the creative actions of book authors and designers, we focus on a set of principles across five themes. These principles derive both from existing research findings on best practice in e-book design and design principles that are central to the promotion of learning for children of all ability levels. We see these design principles as complementary to the Pedagogical Literacy Activities highlighted in section 4. We highlight design principles that help to realise the power and potential of Pedagogical Literacy Activities in light of disability and cultural needs, while also focusing on established e-Book design frameworks that highlight principles associated with multimedia design, interface design, and learning design (Roskos et al., 2009; Roskos & Brueck, 2009; Phadung et al., 2012).

In relation to disability, we highlight a sub-set of the full set of design considerations that are potentially important, as it is difficult without awareness of specific cases to make recommendations that fit every need. However, it has been noted that many students with significant intellectual disabilities have limited opportunities for effective literacy acquisition because of the poor quality or absence of literacy instruction, often combined with educators' low academic expectations. Therefore, implementation of some of the learning and disability design principles we highlight may serve to improve the experience of children with a disability who are learning to read. Notably, literacy instruction for students with significant intellectual

disabilities has traditionally focused on drill and practice instruction of sight words and other basic literacy skills in isolated contexts, with little consideration given to balanced literacy instruction. Few studies have investigated fluency, vocabulary, or reading comprehension, indicating the lack of knowledge regarding how to instruct students with significant intellectual disabilities in these more complex areas of literacy (Coyne et al., 2012). Coyne et al (2012) highlight a promising approach to enabling more children with significant intellectual disabilities to gain access to research-based, balanced literacy training via a framework for the design of learning environments that scaffold and provide (a) multiple ways to access information and knowledge, (b) multiple ways to approach strategic tasks, and (c) multiple ways of becoming and staying engaged in learning. We include these design principles along with many others in our disability design principles section. Central to these design principles is the provision of additional scaffolding to children with a disability, over and above or in conjunction with the learning activities that drive learning for children of all ability levels. Importantly, we view literacy abilities along a continuum and we appreciate the need for greater scaffolding and sensitivity to specific needs for some individuals compared with others. Scaffolding implies a socially and technically supported context whereby a tutor or interactive learning device enables a child to solve a problem, carry out a task, or achieve a goal that would be beyond his or her ability if unassisted. Technology, and good e-book design, can be used to provide scaffolds directly within digital text to support reading (MacArthur, Ferretti, Okolo, & Cavalier, 2001; Strangman & Dalton, 2005). Technology is increasingly being used to create customized scaffolded learning experiences for students with diverse needs (Dalton & Proctor, 2007; Pisha & Coyne, 2001; Wehmeyer, Smith, Palmer, Davies, & Stock, 2004). More work is needed to understand how best to adapt technology to the needs of specific users. There is a need for e-book designers and e-book creators can make increasingly well-informed decisions by studying the needs of users and evaluating the impact of e-book learning experiences on learning outcomes. Q-Tales provides a new design environment with the potential to do good work in this regard.

In general, when designing e-books to enhance children's literacy, it is important to include multimedia that supports the child's understanding of the storyline. Multimedia storybooks that contain multimedia effects that are congruent with and support the storyline have been termed 'considerate' storybooks, those that include multimedia effects that are incongruent with or incidental to the story have been termed 'inconsiderate' (Labbo & Kuhn, 2000). Including multimedia assets that do not support the storyline can confuse children and actually impair their comprehension of the story (Labbo & Kuhn, 2000). De Jong and Bus (2003) make

a distinction between the different kinds of multimedia storybooks, which they label as 'talking books' (those with a minimum of multimedia and interactivity), 'living books', which include multimedia combined with minimal interactivity, and 'interactive books', stories that combine multimedia with interactivity (p. 158). Of the three types of multimedia storybooks, 'interactive books' have been shown to provide the most support for story understanding (de Jong & Bus, 2003). Multimedia storybooks can serve as an electronic scaffold which provides children access to stories that may be beyond their reading level (de Jong & Bus, 2003; Labbo & Kuhn, 2000). Research shows that written text together with synchronised narration, multimedia elements such as animated pictures and sound effects that relate to the storyline, and the inclusion of an interactive dictionary that provides meaning of rare words, can support children's literacy development (Korat, 2010).

Further analysis reveals that the following design principles are important to keep in mind:

#### 6.1.1.1 Multimedia Design

1. Using motion and sound to attract children's attention.
2. Using introductory animations that are short and interesting to capture attention and interest.
3. Design interesting characters, animations and special effects that are not distracting and that are child-friendly.
4. Ensure that pictures and corresponding text display together and are clearly related.
5. Using simple and relatively large fonts that are clearly legible on the screen.
6. Using the narration that is conversational and presented in an age-appropriate style.
7. Using narration that is spoken in a friendly human voice, using age-appropriate language.
8. Narration with text highlights can help to reduce distractibility during book reading for young readers.
9. Text can be highlighted in sentences, phrases or words (Korat, 2010; de Jong & Bus, 2003).
10. While text is highlighting, other multimedia should not be active as this can distract attention from the text (de Jong & Bus, 2003).
11. Printed text should not be placed over graphics (de Jong & Bus, 2003).
12. Oral pronunciation of words in the text can increase childrens' sight word acquisition skills (Labbo & Kuhn, 2000).

13. Dynamic visuals (animations) in e-books “should be carefully crafted as logical and engaging story components” so that they support the child’s engagement and understanding of the story (Labbo & Kuhn, 2000, p. 207) and do not distract from it.

#### 6.1.1.2 Interface Design

1. Allow children to control the multimedia and interact with characters.
2. Design interface with key standards, consistency, error prevention, flexibility and efficiency of use in mind.
3. Navigation buttons can be provided to stimulate an orientation toward reading, right pointing arrow for forward, left pointing arrow for back (Shamir & Shlafer, 2011).
4. Provide hotspot activation aligned with text and a dictionary option that allows repeated action by children.
5. Hotspots may be related to text or graphics.
6. More than 5 hotspots on a screen can be distracting for children. Keeping to no more than 5 hotspots on a screen can raise children’s enjoyment and keep them moving through the story (Korat, 2010).
7. Hotspots should combine multimedia and multi-sensory options such as text, voices, pictures and animations and should be placed on words and objects appropriate for the child’s skill and age level (Shamir & Shlafer, 2011).
8. Instead of providing children with a word’s definition when the word is clicked, children could be presented with multiple choice questions or images that help them to define the word. Smeets & Bus (2012) found that the use of multiple choice questions instead of definitions might benefit children more because of higher levels of involvement with the text.
9. Including an interactive dictionary in an e-book can enhance children’s word learning (Smeets & Bus, 2012), vocabulary, and comprehension (Shamir & Shlafer, 2011).
10. An interactive dictionary can provide both oral and visual explanations of a word (Shamir & Shlafer, 2011; Korat, 2010).
11. Shamir and Shlafer (2011) suggest the following format for an effective interactive dictionary: Explanations for difficult words “appear on the screen only after the entire page has been read by the narrator. With its appearance on the screen, the word is clearly pronounced by the narrator; concurrently, pictures supporting the word’s meaning appear on the screen” (p. 1992).
12. Design clickable items (we use the term clickable to subsume touch-sensitive items) that look clickable and consider the distinction between clickable and non-clickable items, ensuring distinctions are clear and meaningful.

13. Provide immediate feedback showing that children's actions have had some effect. Moreover, children need praise and positive reinforcement.
14. Providing interactive features suitable to the motor skills of children. For example, one-click interfaces are easier than dragging or double clicking/tapping.
15. Touch screens are good for young children because they have difficulty targeting small objects on the screen, but it is important to appropriately space out items for this reason.
16. Choices can be provided for the user to "Read story only", "Read story with dictionary" and "Read and Interact" in order to minimise distractions when desired (Shamir & Shlafer, 2011)
17. An animated figure at the beginning of the story can be used to introduce the different operational modes (Shamir & Shlafer, 2011).

#### 6.1.1.3 Learning Design

1. Design literacy activities holistically with appropriate linkage across activities of reading, writing, listening and speaking.
2. Scaffolding and guidance can help children remember and learn tasks. This is important for children of all abilities and particularly important for children with disabilities.
3. Use literacy activities associated with meaning making and question asking to promote creative thinking, critical thinking and problem solving skills.
4. The learning process should generate transfer activities that encourage children's ability to tell their story and apply their new knowledge to other situations or other topics.
5. Children should be actively participating in the literacy activity and receive feedback on their activity.
6. Design literacy activities that support imagination and enhanced self-confidence of children.
7. Design literacy activities that encourage social interaction and collaboration.
8. Hearing words more than once in the same e-book increases the chances of vocabulary learning - repetition can be helpful.
9. Hotspots can add to the storyline, and thus improve the child's comprehension of the story by providing additional information about characters, elaborate on words or themes in the story, explain a word or allow the child to navigate through the e-book (Korat, 2010).

10. Word recognition and the relationship between printed text and oral narration can be supported by providing text that highlights as it is read aloud ( Labbo & Kuhn, 2000; de Jong & Bus, 2002; Korat, 2010; Shamir & Shlafer, 2011).
11. Children’s phonological awareness can be supported by creating interactive text that when clicked, displays the syllabicated form of the word, and pronunciation of the word and the separate syllables (Shamir & Shlafer, 2011).
12. Use relevant graphics and text to communicate content.
13. Use animations to demonstrate procedures; use a series of stills to illustrate processes.
14. Use simpler visuals to promote understanding; use explanatory visuals that show relationships among content topics to build deeper understanding.
15. Integrate text nearby the relevant graphic on the screen.
16. Allow learners to play an animation before or after reviewing a text description.
17. Avoid separating information that must be integrated for learning.
18. Avoid irrelevant graphics and lengthy text.
19. To personalise learning, write or narrate learning task instructions in a conversational style using first and second person.
20. Where appropriate, use virtual coaches to deliver instructional content such as examples and hints.
21. Break content down into small topic chunks that can be accessed at the learner’s preferred rate.
22. Teach important concepts and facts prior to procedures or processes.
23. When teaching concepts and facts prior to procedures or processes, maintain the context of the procedure or process.
24. Use relevant graphics explained by audio narration to communicate content.
25. Maintain information the learner needs time to process in text on the screen, for example, directions to tasks, new terminology.
26. Do not allow separation of visuals and audio that describes the visual.
27. Avoid irrelevant animations, music, and lengthy narrations.
28. Script virtual coaches to present instructional content such as examples and hints via audio.
29. Break content down into small topic chunks that can be accessed at the learner’s preferred rate using a continue or next button.
30. Use a continue and replay button on animations that are segmented into short logical stopping points.

31. Insert questions next to worked steps to promote self-explanations.
32. Add explanations to worked out steps in problems in some situations, as a form of guidance.
33. Provide several diverse worked examples for far transfer skills (skills and knowledge being applied in situations that change).
34. Promote active comparisons of varied context worked examples to promote transfer of learning.
35. For more critical skills and knowledge, include more practice questions.
36. Mix practice types throughout lessons rather than grouping similar types together.
37. Provide explanatory feedback in text for correct and incorrect answers.
38. Design space for feedback to be visible close to practice answers.
39. Avoid feedback that directs attention to the self rather than to the task.
40. Use asynchronous communication tools for projects that benefit from reflection and independent research.
41. Use synchronous communication tools for projects that benefit from group synergy and social presence.
42. Allow learners choices over topics and instructional methods such as practice.
43. Use adaptive diagnostic testing strategies when:
  - a) Learners are novice to the content, skill outcomes are important, and learners lack good self-regulatory skills.
  - b) Learners lack good self-regulation skills and the instructional outcomes are important.
  - c) Learners are heterogeneous regarding background and/or instructional needs and the cost to produce tests and decision logic gives a return on investment.
  - d) Always give learners options to progress at their own pace, replay audio or animation, review prior topics/lessons, and quit the program.
44. To promote feedback and reflection, provide learners with a map of their problem-solving steps to compare with an expert map.
45. Align the goals, rules, activities, feedback, and consequences of any game or simulation to desired learning outcomes.
46. Avoid open-ended games and simulations that require unguided exploration.
47. Integrate proven instructional strategies such as explanatory feedback and self-explanation questions into games and simulations.
48. Manage goal and interface complexity to minimize extraneous cognitive load.

49. Design interface and activities to make the relevance of the activity salient.

#### 6.1.1.4 Disability Design

1. Make it usable: For a product to be usable, people with disabilities must be able to learn about it via information, instructions and user guides.
2. Make it accessible: A product or service is deemed accessible if it provides accessible input, control and mechanical functions, as well as accessible output, display and control functions. For example, an e-book that has both audio and visual controls for inputting information, as well as both audio and visual methods for retrieving messages, would be accessible to a person who is blind or deaf.
3. In the case of dyslexia, use short lines of 2-3 words per line; space letters slightly more apart; and increase the vertical space between lines.
4. Help children get organised with activities by providing an advance organizer.
5. Review previous lessons before moving on to the next lesson.
6. In the case of ADHD, simplify instructions, choices, and scheduling.
7. Structure and consistency are very important for children with ADHD; many do not deal well with change. Minimal rules and minimal choices are best for these children.
8. Provide students with ADHD with private, discreet cues to stay on task and advance warning that they will be called upon shortly.
9. Probe for the correct answer after allowing a child sufficient time to work out the answer to a question.
10. Describe how students can identify and correct their own mistakes and empower them to self-correct.
11. Remind students to keep working and to focus on their assigned task.
12. Highlight key words in the instructions on worksheets to help the child with ADHD focus on the directions.
13. Eliminate or reduce frequency of timed tests, and thus allow more time for reading, problem solving, interacting.
14. Instruct students on how to begin preparing for the next lesson.
15. Break down assignments into smaller, less complex tasks.
16. State what students are expected to learn during the lesson.
17. Provide sentence-by-sentence human digitized voice with synchronized highlighting to support reading and focus on words.
18. Provide animation and oral pronunciation of onset-rhyme for phonetically regular words.
19. Make hyperlinked glossary items available with graphic and multimedia illustrations.

20. Include story illustration enhancements (e.g., click on a character to hear what the character is thinking and feeling).
21. Use graphics and photos to build background information that supports reading comprehension.
22. Provide prompts to apply reading comprehension strategies (e.g., predict, question, retell, connect) and personal response (e.g., How is the character feeling?).
23. Use pedagogical agents or characters within the book that provide prompts, think alouds, and models.
24. Include varied response options (e.g., visual multiple choice, sentence starters, open responses typed or audio-recorded).
25. Include prompts to echo read, partner read, and read independently guided by pedagogical agents who demonstrate the process.
26. Generate student work logs capture all written and audio-recorded responses.
27. To foster reading, make use of and advance upon popular children's stories with quality illustrations.
28. Provide children with control and encourage them to decide when to click on a support option and are given control so that they are in charge of navigation.
29. Children are encouraged to choose their response option (typed or audio-recorded).
30. Children are provided with an opportunity to listen to their oral reading recordings.
31. Provide prompts to reflect on progress and identify what they like or don't like.

#### 6.1.1.5 Cultural Design

1. Design stories and multimedia experiences that are familiar to children such as ethnic costumes, community values and beliefs and so on.
2. Use plots and characters that help children understand the relationship between their culture and other cultures.
3. If the intended focus is a global audience, work to identify culturally universal themes, plots and characters.
4. Use contents related to children's identity that have meaning for them and their lives on a personal, family, community, or national level.
5. Choose topics that reflect the home-school connection to help children reflect on their own culture and experience and to help them to understand the culture of the language that they are learning.
6. Incorporate cultural themes to promote critical thinking, conceptual understanding, vocabulary skill development and so on.
7. Connect with the history and lived experience of your target audience.

8. Allow for a play on words and unique expressions that align with the everyday language experience of the child.

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